SOCIO-ECONOMIC SURVEY

ON

THE LIMON DEL YUNA AREA

AGRICULTURAL DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

(The data compiled in this survey are confidential)

SOCIO-ECONOMIC SURVEY OF THE FAMILIES LIVING IN THE VILLAGES AT YUNA RIVER DOWNSTREAM AND ITS NEIGHBORHOOD

SURVEY No. _____
DATE _____
SURVEY CARRIED OUT BY _____

SECTION I - GENERAL INFORMATION OF THE INTERVIEWEE

I-1 Village:

_____

I-2 Is the interviewee the head of the family?
( ) Yes
( ) No (specify) _____

I-3 Sex of the head of the family: Male _____ Female _____

I-4 Age of the head of the family: _____ years

I-5 Do you read and write?
Yes _____ No _____

I-6 Education level of the head of the family:
( ) Primary ( ) Middle High School
( ) High School ( ) University
( ) None

I-7 Have you always lived in the same village or place?
Yes _____
No _____

I-8 How long have you been living in this village?
_____ years

I-9 Where are you from?
Section _____
Municipality _____
Province _____

I-10 Where did you live before coming to this locality?
Section _____
Municipality _____
Province _____

I-11 How many persons are there in the house?
Total _____ persons
Heads of the family _____ persons
Children _____ persons
Relatives _____ persons
No relatives _____ persons

I-12 How many members of the family have left the house and don't live there anymore (permanently)?
_____ members

I-13 How much the house income has increased last year for each item:

SOURCE OF INCOME	YEARLY VALUE IN (RD$) ESTIMATED	
	HEAD OF THE FAMILY	OTHER MEMBERS OF THE FAMILY
Agricultural income		
Livestock income		
Salary income		
Coal exploitation income		
Commercial activity income		
Others		

I-14 Monthly expenses for the household support

1) Food: (if they are self-supply food, show the consumed quantity by the family members)

- Rice : _____
- Grains except rice : _____
- Plantain : _____
- Haricot beans and other beans : _____
- Yautia : _____
- Vegetables and fruits : _____
- Cassava, potato and other tuberous root crops _____

2) Condiments:

- Sugar : _____
- Salt : _____
- Oil : _____
- Others : _____

3) Clothes and shoes _____

4) Water, electricity and other uses _____

5) Medical treatment, medicines and other expenses related with health care _____

6) Furniture and other housing goods _____

7) Electronic goods _____

8) Maintenance and improvement of the house _____

9) Education and cultural life _____

10) Miscellaneous _____

TOTAL OF MONTHLY EXPENSES _____

SECTION II - HOUSING AND BASIC SERVICES

II-1 The house where you live is:
1. Own _____
2. Rented _____
3. Occupied without paying _____

II-2 The water used in the house is taken from:
1. Reservoir inside the house _____
2. Common reservoir _____
3. Well _____
4. River, stream, brook _____
5. Others _____

II-3 The family carries out its physiological necessities in:
1. Flush lavatory _____
2. Toilet in the house _____
3. Common toilet _____
4. In the backwoods _____

II-4 Is the house provided with electricity?
1. Yes _____ 2. No _____

II-5 The utilized electricity comes from:
1. CDE _____
2. Own generator _____
3. Other _____
4. None _____

SECTION III - GENERAL CHARACTERISTICS OF THE AGRICULTURAL LAND

III-1 How many parcels or other lands do you have?
_____ parcels or lands

III-2 How many "tareas" does your land have?
_____ "tareas"

III-3 Detail in the following table the extension and tenure of the parcels. (in priority order)

Parcel No.	Surface ("tareas")	Tenure (code)*	Working Years in the land
1			
2			
3			
4			
5			
Total			

Remark: * Use the codes of the Table III-10

III-4 How many years have you been engaged in agricultural and animal husbandry?
_____ years

III-5 Have you always worked in the same land?
1. Yes _____ 2. No _____

III-6 How long have you been working in this land?
_____ years

III-7 In how many parcels (properties) did you work before the present ones?
_____ parcels

III-8 How did you dispose the previous parcels?
1. Sold _____ 2. Lent _____
3. Permuted _____ 4. Rented _____
5. Given _____ 6. Abandoned _____
7. Others _____

III-9 Due to which of the following reasons did you abandon or give them?
1. _____ They belonged to your father or to any relative
2. _____ Evacuated
3. _____ Economical problems
4. _____ Soils deterioration
5. _____ Other (specify)

III-10 Summing up, how many "tareas" do you have according to the following ownership?

PROPERTY KINDS	AREA ("tareas")
A. Own	
B. Possessed as a property (heritage or succession)	
C. Possessed as a property (another kind)	
D. Rented (paid in cash)	
E. Rented (paid with part of the production)	
F. Rented (another kind of payment)	
G. Other kind of tenure	
H. AREA	

Remarks: _____

_____

_____

_____

III-12 Area destined to the following uses:

USE OF THE LAND	AREA ("tareas")
A. Rice cultivation	
B. Other perennial crops (specify)	
C. Permanent crops	
D. Fallow land	
E. Land without use	
F. Pastures	
G. Underbrushes and clear forest	
H. Dense forest	
I. Other uses	
J. TOTAL AREA	

SECTION IV - ECONOMIC CHARACTERISTICS OF THE AGRICULTURAL AND CATTLE BREEDING PRODUCTION

IV-1 How many "tareas" did you harvest and which production did you obtain from the crops sowed last year? (Detail the crops in importance order)

SEMESTER A

	CROPS	PLANTED AREA ("tareas")	SOWING DATE	HARVESTED AREA ("tareas")	HARVEST DATE	OBTAINED PRODUCTION (qq)	MARKETING OF THE PRODUCTION		
							SOLD	SELF-CONSUMPTION	SEED
1									
2									
3									
4									
5									

SEMESTER B

	CROPS	PLANTED AREA ("tareas")	SOWING DATE	HARVESTED AREA ("tareas")	HARVEST DATE	OBTAINED PRODUCTION (qq)	MARKETING OF THE PRODUCTION		
							SOLD	SELF-CONSUMPTION	SEED
1									
2									
3									
4									
5									

IV-2 Which quantity of the agricultural production did you market last year?

	CROP	QUANTITY SOLD (qq)	SELLING PRICE (RD$/qq)	SOLD TO:	WHERE IT WAS SOLD
1					
2					
3					
4					
5					

IV-3 Which quantity of animals do you possess?

KIND OF ANIMALS	QUANTITY (HEADS)	MAIN DESTINY
1. Cows		
2. Horses		
3. Pigs		
4. Goats and sheep		
5. Poultry		

IV-4 Marketing of cattle breeding products

1. Milk

Sold quantity (monthly) _____
Selling price (RD$) _____
Sold to _____
Where it is sold _____

2. Which kind of cattle do you sell at a year and how many?

KIND	HEADS	SELLING AVERAGE PRICE (RD$)	SOLD TO:
Cows			
Thin young calves			
Fat young calves			
Bulls			
Pigs			
Others			

SECTION V - CHARACTERISTICS OF LABOR FORCE AND AGRICULTURAL MACHINERY UTILIZED IN THE AGRICULTURAL AND CATTLE BREEDING SECTOR

V-1 Who carried out the mayor part of the agricultural tasks?
1. _____ The farmer and his family's members
2. _____ Employed persons
3. _____ Others (specify)

V-2 Detail the quantity of persons working in the parcel, being members of the family or paid employed persons,

WORKERS	TOTAL	QUANTITY FIXED	TEMPORARY
Paid employed persons			
Members of the family			
Total			

V-3 Did you contract workers in salary basis for the last year activity?
1. Yes _____ 2. No _____

V-4 Did you utilize free work of the community neighbors?
1. Yes _____ 2. No _____

V-5 Which activities did the employed workers do?

ACTIVITY	No. OF PERSONS	DURATION

V-6 How much did you pay a day for the employed workers?
RD$ _____ /day

V-7 Payment for the contract

ACTIVITY	VALUE (RD$)	UNITY

SECTION VI - ACCESS TO THE SUPPORT SERVICES FOR THE PRODUCTION

VI-1 Detail the machinery and equipment you are used to utilize in the farmland and their tenure (you can mark more than one per line)

EQUIPMENT & MACHINERY	OWN	RENTED	LENT	DON'T USE
Tractor				
Plow-beam (pulled by animal				
Power cultivator				
Rotator				
Pulper machine				
Sowing machine				
Fumigation pump				
Sprinkler				
Pasture chopper				
Cart pulled by animal				
Water pump				

VI-2 As for the below mentioned points, which ones do you normally utilize in your farmland?

KIND	USE	DON'T USE
1. Chemical manure		
2. Organic manure		
3. Herbicide		
4. Pesticide		
5. Irrigation		
6. Credit		
7. Storage facility		
8. Improved seeds		

VI-3 Which kind of energy did you utilize in the farming works?
1. Animal _____
2. Mechanical _____
3. Manpower only _____

VI-4 Show the irrigation method you utilize to wet the land:
1. By gravity _____
2. By sprinkler _____
3. By drip _____
4. None _____

VI-5 Show the water source for the irrigation:
1. Rivers _____
2. Canals _____
3. Wells _____
4. Drains _____

VI-6 Do you receive agricultural credit?
1. _____ Yes: What entity? _____
For what activity? _____
Value _____
Term _____
Interest _____

2. _____ No: Why don't you receive agricultural credit?
Enough own resources
Yes _____
No _____ (specify)
_____
_____

VI-7 How do you transport your products to the market or to the truck?

1. Vehicle _____
2. Animal _____
3. Manpower _____
4. Other _____

VI-8 Where do you sell the greater part of your main production?

1. At the farmland _____
2. Local market _____
3. Municipal market _____

SECTION VIII - ASPECTS OF THE FARMERS ORGANIZATION

VIII-1 Do you take part or have you ever taken part in any kind of farmers' organization or community organization?

1. Presently is participating _____
2. Don't participate _____
3. Has never participated _____

Why _____

_____

VIII-2 Kinds of organization in which you participate or had participated? (you can mark more than one alternative)

1. Community development _____
2. Farmers _____
3. Religious _____
4. Clubs _____
5. Cooperative _____
6. Other kind _____

VIII-3 Which productive activities do you carry out through the organizations? (you can mark more than one alternative)

1. Marketing _____
2. Use of machinery _____
3. Storage _____
4. Use of inputs _____
5. Transport _____
6. Agricultural training _____
7. Credit _____
8. None _____

SECTION X - INTENTION ABOUT THE AGRICULTURAL PROPERTY

X-1 If your parcel does not have irrigation, would you like to have it?
_____ Yes, why? _____
_____ No, why? _____

X-2 If your parcel is irrigated, would you like to improve the system?
_____ Yes, why? _____
_____ No, why? _____

X-3 Do you want to go on sowing the present crop(s)?
_____ Yes, why? _____
_____ No. Which crops would you like to sow? _____

X-4 Do you want to enlarge the size of your parcel in order to sow a bigger area of the present cultivation?
_____ Yes. How?
_____ Purchase
_____ Rental
_____ Others (specify) _____

X-5 Are you satisfied with the present crops?
_____ Yes, why? _____
_____ No. Which crops would you like to sow? _____

SECTION XI - PROBLEMS IDENTIFICATION

XI-1 Agricultural and cattle breeding property

- The products are not profitable	____Yes	____No
- The parcel is not productive	____Yes	____No
- Water shortage	____Yes	____No
- Inundated farmland	____Yes	____No
- The irrigation system doesn't work properly	____Yes	____No
- The size of the parcel is not enough	____Yes	____No
- Lack of technical assistance	____Yes	____No
- Inputs availability	____Yes	____No
- High cost of inputs	____Yes	____No
- Overrating of agricultural credit	____Yes	____No
- Deficiency of labor force	____Yes	____No
- Acquisition of certified seed	____Yes	____No
- Not suitable climate for the cultivation	____Yes	____No

- Others (specify) _____
_____

- Last year, did you have any part of your parcel without sowing?
_____ Yes, why? _____
_____ No

XI-2 Marketing of products

- Unstable prices ____Yes ____No
- Supporting price lower than that in the private sector ____Yes ____No
- Payment term in arrears ____Yes ____No
- The prices evaluation methods of INESPRE are not satisfactory ____Yes ____No
- Lack of factories or other marketing infrastructures ____Yes ____No
- Availability of transportation means for the factory and other closer collecting center ____Yes ____No
- Lack of capacity to negotiate with the traders ____Yes ____No
- Others (specify) _____
_____

GENERAL REMARKS

ANNEX F : AGRICULTURE

ANNEX F : AGRICULTURE

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ANNEX F : AGRICULTURE

F.1 Current Agricultural Situation of The Study Area

F.1.1 Outline of Agriculture

(1) Rice production

The Study Area measures 12,000 ha, 6,680 ha of which are paddy fields — IAD settlements make up 4,380 ha and privately owned lands 2,300 ha. On the other hand, data on the IAD settlement area states that the planted area, harvested area, production and yield of rice between 1985 and 1994 averaged 5,781 ha, 5,280 ha, 20,544 tons and 3,993 kg/ha, respectively (see Table F.1.1). From information obtained from records on financial credits given to farmers and the results of the survey on farmers' socio-economic condition and the field reconnaisance survey, the total area of land cultivated in the Study Area each year is estimated to be 9,500 ha; 6,000 ha undergoes first cropping of which 3,500 ha has a second cropping. The yield per hectare as calculated by quadrat sampling and assumptions obtained from investigations indicate 3.9 tons/ha for the first crop and 2.6 tons/ha for the second crop (see Table F.1.2). Consequently, it is broadly calculated that the Study Area produces 32,500 tons of rice yearly. The potential irrigated lands were predicted to be around 7,860 ha as a result of the field reconnaissance survey and measurement.

(2) Upland crop production

Cultivation is also carried out in the uplands along the Yuna River. Perennial crops such as cacao, plantain and coconuts are predominant, although sweet potatoes, cassava, maize, haricot beans and vegetables (pumpkins, sweet peppers, cucumbers, etc.) are cultivated as well. However, most of the areas planted with cacao, plantain and coconuts are categorized as "forest area" in the above-mentioned land use. Due to undulations, 10 to 30 ha of upland fields planted with tubers, pulses and vegetables are scattered in the paddy field zone. A part of the upland field has become fallow due to shortage in farming funds and farm machinery. Harvested area and production of upland crops are shown in Table F.1.3.

(3) Livestock production

The slightly elevated areas in the southern half of the settlement area are used as pasture. Each settler is generally allotted 60 tareas (3.8ha) of land on which they use to graze 10 - 15 cattle. These cattle are generally for dairy and meat production. Irrigation by gravitation is difficult to implement in this area because of its elevation, and although this is a major reason why settlers do not cultivate their lands as paddy fields, productivity is also assessed to be low owing to poor soil quality. There are also privately owned pastures of up to 700ha on the

northeastern and northcentral parts of the Study Area where cattle-raising is comparatively productive. According to the results of a survey on livestock, graziers hold 2,180 ha of the Study Area; average pasture land per grazier is 9.0 ha with the average number of head being 7.1.

F.1.2 Rice Culture

(1) Cropping system

The fundamental rice cropping system in Limon del Yuna is as follows:

First cropping:	Seeding in nursery in December
	Transplanting in January - March
	Harvesting in May - July
Second cropping:	Seeding in nursery in May - July
	Transplanting in June - August
	Harvesting in October - December

The weather in the area is not an impediment to year-round rice planting activities as the monthly temperature suits this cultivation practice. Rather, it is influenced by the availability of irrigation water and the availability of funds.

Table F.1.4 shows the results of the study on data fundamental to the water fee collection activities of INDRHI. The values indicated in the table are considered to underrate the actual situation, but almost accurately indicate seasonal rice cropping patterns. Although transplanting and harvesting are carried out every month, transplanting scale is particularly huge in February, the first cropping period, and in August and September, the second cropping period. Harvest, on the other hand, is particularly abundant in May, June and July for the first cropping period, and in November for the second cropping period.

The rice cultivation practice that predominates is transplanting; transplanting of rice seedlings is carried out on 80% of the fields while direct seeding is carried out on the remaining 20%. Generally the yield for transplanting and direct seeding is about the same. However, in the Study Area, because of inadequate field leveling the yield for direct seeding is lower.

(2) Working system

1) Nursery bed

Nursery beds are 1 meter wide, 10 - 20 meters long, and are surrounded by a drain. They are seeded with 110-150 g/m² of rice seeds which were soaked for 1.5 days and dried in the shade for half a day to induce sprouting. Nursery beds of 100 m² produce enough seedlings for paddy fields of 2000 - 2500 m². Fertilizer is generally not applied.

2) Paddy field preparation

Plowing is generally carried out either by a rotary tiller or draft cattle. Leveling is also carried out in the same way using a leveling board. These works are carried out by contractors. Large scale land owners use tractors for rotary tilling and leveling. Manual leveling works and the construction of small levees for water depth control are carried out by the farmer himself if deemed necessary. Although the paddy field of the IAD settlement is divided into a rectangle of 400 to 450 by 100 meters it is divided again into smaller plots provided by the farmers with small levees because of poor leveling. These small plots usually range from 200 to 300 m^2, sometimes less than 100 m^2.

3) Transplanting

The number of stocks generally planted per square meter is 40 - 45, though CEDIA recommends a density of 16 - 20 stocks/m^2. However, farmers carry out planting in a more dense planting thinking this would prevent weed growth. Some farmers, on the other hand, think that sparse planting will result in poor harvest. Ropes or any other standard method of measurement are not used when planting. Transplanting work including the uprooting of seedlings is carried out at a rate of 0.09 - 0.12 ha/laborer/8-hour day.

4) Fertilizer application

290 kg/ha of compound fertilizer "15-15-15" is applied a week after transplanting, though CEDIA recommends the application of 215 kg/ha of "15-15-15" a week and five weeks after transplanting respectively. In addition, 50 kg/ha of urea is applied at the young panicle formation stage.

5) Weeding

Herbicides are sprayed 2 - 3 days and 1 month and a half after transplanting. Further, manual weeding of barnyard millet and wild rice is also carried out if necessary. Aside from the spraying activities carried out by the farmers, aerial spraying companies can also be hired. This is done at a rate of 11.5 ha/hour.

Weeds that seriously damage crops are as follows:

Luciola subintegra	*Echaemun rugosam*
Echinocloa colonum	*Fimbristylis filiformes*
Cyperus spp.	*Eterantera reniformis*

6) Plant protection

Rodents are considered the most dangerous animals. Though rodenticide is used it is not a sufficient deterrent. While the most harmful insect pest is the Rice Cut Worm also called Gusano (*Spodoptera litura*), damage caused by the Southern Green Stink Bug or Hiedevivo (*Nezara viridula*) and Rice Whorl Maggot

(*Hydrellia philippina*) is occasionally detected as well. Of harmful diseases the most destructive is Blast (*Pyricularia oryzae*), while Brown Spot (*Cochliobolus miyabeanus*) and Cercospora Leaf Spot (*Sphaerulina oryzina*) have also often been detected. Aside from the spraying activities carried out by farmers, companies specializing in aerial spraying are also hired.

The main insecticides and fungicides actually used are as follows:

Organophosphorus insecticide

Application time and dosage: 60 days after transplanting, 1 liter/ha, and 95 to 100 days after transplanting, 1 liter/ha

Target insects: *Spodoptera litura, Spodoptera frugipera, Nezara viridula*

Pyrethroid insecticide

Application time and dosage: 10 to 20 days after transplanting, 150 cc/ha, an 30 to 40 days after transplanting, 150 cc/ha

Target insects: *Hydrellia philippina*

Fungicide

1 liter/ha of fungicide is mixed with organophosphorus insecticide and applied.

Target fungi: *Pyricularia oryzae, Cochliobolus miyabeanus, Sphaerulina oryzina*

7) Harvest

More than 95% of the area's entire paddy fields are harvested using combine harvesters from either the Federacion Agraria de Limon del Yuna or private contractors. The farmers work ends after the sacks of unhulled rice are delivered for marketing. The transport and drying activities are undertaken at the rice mills.

(3) Varieties

Juma 57 and Isa 40 make up about 90% and 10% respectively of the entire rice grown in Limon del Yuna. Juma 57 is a good quality and high yielding variety evolved from the hybridization of Milo and IR8. Thirty (30) days is said to be the ideal period for rice seedlings to remain in the nursery, although even if they are left in the nursery for 60 days normal growth will result after transplantation. The total time from transplanting to ripening varies according to season due partly to photoperiodic sensitivity. Growing time is 125-130 days for the first cropping and 115-120 days for second cropping. Yield in the second cropping also varies between 20-50% lower (average 35%) than the first cropping (see Table F.1.5).

The main reasons for the widespread use of Juma 57 are as follows:

- high lodging resistance
- high yield
- high resistance to disease, *Pyricularia oryzae* in particular
- highly responsive to fertilizer
- highly flexible to various environmental conditions

(4) Paddy yield and land classification

Surveys were carried out in both cropping periods. Lands were classified in the Study Area for rice production (see Fig. F.1.1), based on the quadrat sampling yield survey and the proposals by the technical personnel from the IAD and SEA whose estimates were based on years of experience (see Table F.1.2).

The current rice yield and area of paddy fields in respective class are as follows;

	Current Yield (Ton/ha)		
Class	1st. Crop	2nd Crop.	Current Area(ha)
Class 1	4.5	3.1	2,450
Class 2	4.0	2.6	3,080
Class 3	2.5	1.6	1,150
Total	3.9*	2.6*	6,680

* weighted average

The annual yield for the double cropping system was also estimated (see Fig. F.1.2) and the results indicate that the best cropping seasons for maximum annual yield are as follows:

Cropping season	Transplanting time	Harvesting time
First cropping	from early Jan. to early Mar.	from early May to mid July
Second cropping	from early July to early Sept.	from late Nov. to late Dec.

F.1.3 Upland Crop Cultivation

(1) Cacao

The cultivation of cacao trees is considered profitable because they continue to produce beans several years to several decades after they have been planted. Cacao trees need little care and have an estimated annual yield of 700 - 1000 kg/ha. Although the climate, over 2000 mm/year and an average daily temperature of 25°C, is favorable the actual yield is less than 700 kg/ha due to a lack of good new varieties. However, the introduction of good quality and high yielding varieties is possible through the guidance of the Centro Nacional de Desarrollo Tecnologico del Cacao (CENDETECA), an agency with holdings of comparatively excellent

varieties. Harvested cacao beans are sold by the farmers to outside traders after they are dried and threshed.

Rodents are the most harmful animals, inflicting damages that cannot be sufficiently prevented with the application of rodenticides. There are also no effective measures to prevent woodpeckers, the second most harmful pest. Copper fungicide are sprayed to prevent *Phytophthora spp.* from permeating the fruits during heavy rain.

(2) Vegetables and edible crops

Maize, cassava and sweet potatoes are the major crops, followed by haricot beans (*Phaseolus vulgaris*), pumpkins, and yautia (*Xanthosoma sagittifolium*). Other vegetables such as sweet peppers, cucumbers, eggplants, and pigeon peas are cultivated as well.

There is no fixed cropping pattern. The cultivation of non-seasonal crops is continued as long as they are harvestable, then they are replaced by other more suitable crops. The cultivation period of major crops is as follows:

Crop	Period from seeding to harvesting	Harvest period	Main seeding season
Sweet peppers	2.5 months	3 to 5 months	non seasonal
Cucumbers	1.5 months	1 month	non seasonal
Eggplants	2.5 months	4 to 5 months	non seasonal
Pumpkins	2.5 months	2 to 2.5 month	Oct. to Nov.
Tomatoes	3 months	1 to 2 months	Sept. to Oct.
Haricot beans	3 months		Nov. to Jan.
Maize	3 to 4 months		Oct. to Nov.
Sweet potatoes	6 to 7 months		May and Oct.
Cassava	7 to 9 months		non seasonal

Pigeon pea is seeded in February, harvested in December, and starts growing back in the following March.

F.1.4 Livestock Farming

(1) Pasture

The IAD's settlement plan intends to use the slightly elevated and fertile area along the Yuna River for upland crop cultivation. It also plans to use other areas for rice cultivation as much as possible, while areas considered unsuitable will be used for grazing.

Lands used for pasturage and not for paddy cultivation have the following characteristics:

(a) Although soil quality is good, gravity irrigation is impossible due to high elevation;

(b) Although soil quality is not so bad, gravity irrigation is impossible due to high elevation;

(c) Frequent flooding;

(d) Although irrigation is possible, the area is a reclaimed wetland and has poor soil quality.

Except for privately owned lands, these pastures are mainly distributed in the southern half of the settlement project area, in the following locations:

(a) East of Los Contreras, 300m from the southern mountain area.

(b) Mainly south of Paraguay, between Barraquito and Guaraguao (these are all 300 - 400m from the southern mountain area).

(c) West of Guaraguao.

(d) Narrowly extended to the east and west in between the settlement project area and the southern mountain area. They are also distributed en masse north of Cristal.

Most privately owned lands used for pasturage are situated in the northeastern and northcentral parts and have the (a) characteristic above-mentioned.

(2) Cattle breeding

Generally, each settler is allotted 60 *tareas* of land (3.8ha), which they usually use to graze 10 - 15 heads of cattle. The lands are usually divided into three parts whereby a 10 - 15 day grazing period is carried out on a rotational basis according to the condition of the grass. Most of the cattle are for milk and beef production; milk is sold to the market, while generally cattle for beef production are sold when they reach 15 months, for marketing. Some farmers only sell the milk, keeping the cattle as insurance for rainy days.

There are also privately owned pastures of about 700 ha in the northeastern and northcentral parts of the Study Area where cattle-raising is relatively productive. The following are the results of a survey of graziers who own lands totaling 2,180 ha of the Study Area:

- Average pasture area:	9.0 ha
- Percentage of improved pasture:	48 %
- Number of heads per ha:	7.1 heads/ha
- Weight at weaning:	62 kg
- Interval between delivery:	15 months
- Milk yield:	5.4 liters/day/head
- Lacting period:	177 days
- Pattering rate:	600 grams/day

F.1.5 Agricultural Output and Value

(1) Crop production

Making reference to the information on the harvested area and unit yield presented in the previous section, the output of crops for the year of 1994 to cover the whole Study area is resumed as shown in the table below.

Crops		Harvested Area (ha)	Unit Yield (ton/ha)	Output (ton)
Paddy	1st Crop	6,000	3.9	23,400
	2nd Crop	3,500	2.6	9,100
	Sub-total	9,500		32,500
Perennial crops	Cacao tree	500	0.67	335
	Plantain	610	6.4	3,904
	Coconut palm	250	10.0	2,500
	Sub-total	1,360		6,739
Annual upland crops	Maize	100	1.0	100
	Sweet potato	50	5.1	255
	Cassava	50	5.1	255
	Haricot bean	12	1.3	16
	Vegetables*	30	6.3	189
	Sub-total	242		815
Total		11,102		40,054

Note: * Represented by pumpkin, cucumber and sweet pepper

The paddy absorbed more than 80% of the total output in the Study area, while perennial crops occupied approximately 17% of it. So far as annual upland crops are concerned, because cultivation for respective crop is small in area and capricious with less advanced technology, their productivity remains inferior to the national average and the sum of their output narrowly exceeded 2% of the total output of the Study area.

(2) Livestock production

The major production in the area is beef and milk and their output was estimated according with the survey result to local farmers together with information provided by IAD, BAGRICOLA and other relevant sources.

1. Milk production: Pasture area x carrying capacity of cattle per area x unit productivity (*l*/head/day) x annual duration period for milk production

= 2,180 ha x 2.6 heads x 5.41 *l* x 177 days
= 5,428,000 liters

2. Beef production: Heifer and steer: Pasture area x head per area
= 2,180 ha x 1.45 head = 3,161 heads
Cow: pasture area x head per area
= 2,180 ha x 0.5 head = 1,090 heads

(3) Crops and livestock production value

With data on output and farm-gate price (refer to the section 3.8 - Marketing and processing of agro-products), the crops and livestock production value was roughly estimated as summarized in the following table.

Crops	Output (Ton)	Price (RD$/ton)	Value (RD$)	%
Paddy	32,500	4,500	146,250,000	68.61
Cacao	335	10,753	3,602,255	1.69
Plantain	3,904	4,965	19,383,360	9.09
Coconut	2,500	2,344	5,860,000	2.75
Sut-total (Perennial crops)			28,845,615	13.53
Maize	100	4,007	400,700	0.19
Sweet potato	255	2,618	667,590	0.31
Cassava	255	3,450	879,750	0.41
Haricot bean	16	18,656	298,496	0.14
Vegetables*	189	4,323	817,047	0.38
Sub-total (Annual upland crops)			3,063,583	1.44
Milk**	5,428	3,730	20,246,440	9.50
Beef (Heifer and steer)***	3,161	3,253	10,282,733	4.82
Beef (Cow)***	1,090	4,115	4,485,350	2.10
Sub-total (Livestock products)			35,014,523	16.43
Total			213,173,721	100.00

Note: * Represented by pumpkin, cucumber and sweet pepper
** Output (kl), Price (RD$/kl)
*** Output (head), Price (RD$/head)

Values for paddy, livestock products and perennial crops represented 66%, 16% and 13%, respectively. The value for annual upland crops was around 2%, which coincides with the proportion of the output. The production values attained by crops and livestock produced in the Limon del Yuna area are equivalent to 1.2% and 0.5% of those for the national statistics.

F.1.6 Production Cost and Balance Sheet of Crop Farming and Livestock

(1) Production cost

The production cost for paddy cultivation is calculated to be RD$ 15,094/ha, which was obtained referring to the "Plan de Inversion (Investment Plan)" prepared by IAD's project office as well as to the socio-economic survey conducted by the Study team. Breakdown of this production cost is shown in Table F.1.6. This production cost is classified respective category of cost is as follows: Fertilizers and agro-chemicals (27.3%), Manpower (27.8%), Mechanical contract work (28.9%), Seed (6.6%), Interest and commission of agricultural credit (8.3%), and Water charge (1.2%).

Like other developing countries, the Dominican Republic imports the great majority of agricultural inputs such as fertilizers, agro-chemicals and agricultural

machinery are imported (the proportion of foreign exchange portion against the total cost for fertilizers/agro-chemicals and agricultural machinery is estimated to be 90% and 70%) and this is the major factor that hiked the production cost (tariffs imposed on import commodities is the highest in the Dominican Republic among Latin American countries). Besides, production cost is raised by higher rate (18%/year) of interest and commission due to agricultural credit, which is considered to be relatively high if modest inflation rate of the country is taken into account. Because of these factors, JAD (The Dominican Agri-business Council) concludes that the production cost for paddy prevailed in the Dominican Republic is almost twice as high as that in Argentine, Colombia and Ecuador.

In the Study area such cultural items as plowing, fumigation and harvest are mechanized, although farmers do not posses machinery (tractor, cultivator, etc.) and equipment, but to employ contractor who undertake these works, meanwhile leveling of paddy fields and transportation of bagged harvests from paddy fields to the nearest road are made by animals. The rest of cultural category depends on manpower (family and/or hired labor).

The unit rate for major cost items of paddy cultivation is as given below.

Items	Unit rate (RD$)	Remarks
Plowing	1,788.00 (ha)	By tractor (Contractor)
Leveling	357.50 (ha)	By animal
Fumigation	143.10 (ha)	By light air craft
Harvest	25.00 (bag)	
Agricultural credit	18%(per annum)	12%(Interest), 6%(Commission)
Water charge	175.22 (ha)	RD$ 11.02/tarea
Hired labor	100 (day)	

It is supposed that only 8% of the manpower input in rice cultivation is represented by family members.

The production cost for crops other than paddy is resumed in the Table F.1.7. This table is prepared on the basis of the BAGRICOLA's document entitled as "Programa de Préstamo para el Año 1994 (Credit Program for the Year 1994)"; cost for irrigation and credit are excluded because these crops are rain-fed without credit.

(2) Farming balance sheet

According to BAGRICOLA's cost-benefit analysis on crops, paddy is a promising crop with expected net return around RD$ 7,000/ha. Nevertheless, the Study team's survey has revealed that farmers in the area attained far lower net return of paddy cultivation attributable to depressed productivity affected by inconsistent supply of irrigation water, poor drainage, inundation, etc.; even at lands with 1st-class capability the attained net return was as few as RD$ 1,500/ha on average - about 20% of the BAGRICOLA's target; balance sheet at

lands with 2nd and 3rd-class capability resulted in deficit as a consequence of income-cost analysis.

Balance sheet for crops except for paddy is estimated as indicated in the Table F.1.8 (it should be pointed out that values calculated herewith is subject to major fluctuation, because unit yield and farm-gate price which are the basic factors for calculating crop profitability go ups and downs greatly by season). Tuberous root crops represented by sweet potato and cassava got higher profit owing to lower production cost; plantain and coconut palm also considered to be highly profitable crops, should capital for initial investment be available; in the same manner, the net return got by haricot was satisfactory (RD$ 13,660/ha) owing to its excellent productivity superior (1.3 times) to the national average).

The net return expected by livestock farming is as follows (refer to Table F.1.9 for further information)

Gross Income (RD$/ha/year):	RD$ 13,511
Production Cost (RD$/ha/year):	RD$ 10,898
Net Return (RD$/ha/year):	RD$ 2,613

An extensive farming practice prevailed in the Study area has left livestock farmers with less profit.

F.2. Agricultural Development Plan

F.2.1 Principles on Formation of the Plan

The agricultural production and farming system development plan is formulated with a view of putting an intensive farming system into force with raising cropping intensity per ha of land. The area covered by the relevant plan shall be 8,820 ha which coincides with the area that will benefit from the development of irrigation and drainage system. The improvement in irrigation and drainage works envisages to realize double cropping of paddy yearly in irrigable fields which comprise not only agrarian reforms' lands but also private lands located between the Yuna River and Cascarrilla Canal. It is proposed that some lands in which paddy rice is actually planted should be converted into uplands because their higher elevation constitutes negative factor to receive irrigation water by gravity. Uplands and pastures, on the other hand, will be switched into paddy fields as far as water can be distributed there by gravity; concerning uplands and pastures that will not be benefited by irrigation water shall be used as they are. In addition, some moorlands and swampy lands totaling approximately 30 ha will be converted into arable land owing to improvement of irrigation and drainage systems.

Bearing above proposal into mind, the present agricultural production and farming system development plan is formulated with an emphasis laid on elaborating scenario for increasing and stabilizing of paddy production. The area to be covered by uplands and pastures will decrease in line with the development plan, but measures which pretend to mitigate decline in production of crop and livestock production as far as possible will be proposed.

F.2.2 Cropping Area

Referring to the land use plan, the arable land's area within the development area can be summarized as given below(See Table F.2.1 for detailed information).

Land Use	Without Project (ha)	With Project (ha)		
		Alternative A	Alternative B-1	Alternative B-2
Paddy field	6,680	6,650	7,860	7,570
Upland	270	170	110	110
Pasture	1,840	1,330	0	360
Sub-total	8,790	8,150	7,970	8,040
Swamp	10	0	0	0
Moorland	20	0	0	0
Total	8,820	8,150	7,970	8,040

The implementation of irrigation and drainage system development project sacrifices some portion of arable lands for construction/expansion of canals and other related structure, so the net area of arable lands in "With Project" situation will be reduced in comparison of that in "Without Project" situation. Nevertheless, with improving cropping intensity, the cultivated area "With Project" situation will increase by 31% for the Alternative A, by 39% for the Alternative B-1, and by 37% for the Alternative B-2

in comparison with the "Without Project" situation. Thus, the cultivated area for respective of the "With Project" situation will become as given below.

Alternative A

Crops	Without Project (ha)			With Project (ha)			Balance (ha)
	1st Crop	2nd Crop	Total	1st Crop	2nd Crop	Total	
Paddy	6,000	3,500	9,500	6,650	6,650	13,300	3,800
Up.Crops	65	65	130	170	170	340	210
Pasture	1,840	-	1,840	1,330	-	1,330	-510
Total	7,905	3,565	11,470	8,150	6,820	14,970	3,500

Up.Crops: Upland Crops

Alternative B-1

Crops	Without Project (ha)			With Project (ha)			Balance (ha)
	1st Crop	2nd Crop	Total	1st Crop	2nd Crop	Total	
Paddy	6,000	3,500	9,500	7,860	7,860	15,720	6,220
Up.Crops	65	65	130	110	110	220	90
Pasture	1,840	-	1,840	0	-	0	-1,840
Total	7,905	3,565	11,470	7,970	7,970	15,940	4,470

Up.Crops: Upland Crops

Alternative B-2

Crops	Without Project (ha)			With Project (ha)			Balance (ha)
	1st Crop	2nd Crop	Total	1st Crop	2nd Crop	Total	
Paddy	6,000	3,500	9,500	7,570	7,570	15,140	5,640
Up.Crops	65	65	130	110	110	220	90
Pasture	1,840	-	1,840	360	-	360	-1,480
Total	7,905	3,565	11,470	8,040	7,680	15,720	4,250

Up.Crops: Upland Crops

F.2.3 Rice Cropping Plan

(1) Farming system improvement plan

The daily mean temperature suitable for rice cultivation is over 25° C and the desired diurnal range is over 10° C. A slight decrease in yield generally occurs if the daily mean temperature in the heading stage is below 25° C. The recorded data of the Barraquito Meteorological Observation Station indicates the following monthly mean temperatures:

April to November : monthly mean temperature of 25 - 27°C
December to March : less than 25° C
January to February : 23.6° C

Although a year-round cultivation of rice is possible so long as water is available, the yield and the growing period vary according to cropping season

which is highly influenced by two factors, photoperiod and temperature. A season is considered most favorable for cropping when a maximum double cropping production can be achieved, and is determined based on these factors (see Table F.1.5 and Fig. F.1.2). If possible, the paddies should be made to rest for as long as possible from any activity between the second cropping and the first cropping of the following year for the repair of irrigation facilities and the insulation of the sources of diseases and insect pests. A balance in the supply and demand with respect to work and manpower should be established as well. The desired duration for every seeding, transplanting and harvesting work is a minimum of 50 days.

The rice double cropping plan will be formulated based on the above conditions and as indicated in Figure F.2.1 The table below sums up the working period based on the cropping plan.

Work	First cropping	Second cropping
Seeding on nursery bed	from early December to mid January	from early June to mid July
Transplanting	from early January to mid February	from early July to mid August
Harvesting	from early May to late June	from late October to mid December

A half a month delay in transplantation does not affect the total double cropping production: delay in the first cropping increases yield while delay in the second cropping decreases yield.

(2) Rice cultivation plan

The cultivation techniques, materials and agricultural implements for production, and the working system, in accordance with the cropping plan, are as follows:

1) Varieties : Juma 57 and Isa 40

The cultivation of Juma 57, a high-yielding variety, highly resistant to disease and highly responsive to fertilizer, is becoming so popular that now it occupies about 90% of the rice cropping area in the Study Area. However, the cultivation of more than 3 varieties is recommendable in consideration of the possible outbreak of a disease by specific fungus race in case of the monopoly of cropping area by one variety. It is expected the quick breeding of good varieties being match for Juma 57.

2) Seeding and nursery bed

Seed disinfection will be carried out after seed selection by specific gravity with salt solution. Rice seeds forced to sprout will be sown on 1 m wide and 10 - 20 m long nursery beds surrounded with drains. Sprouting is induced by soaking the seed for 1.5 days and drying it under the shade for half a day. The

nursery bed area will be equivalent to 5% of the paddy field where the seedlings are to be transplanted and the amount to be sown will be equal to 140 g/m² of dry paddy weight. The amount of rice seeds required per ha is 70 kg. The fundamentally established growth period in the nursery bed is 30 days. For direct seeding, the amount to be sown will be set at 100 kg/ha. However, direct seeding is not recommendable if field surface leveling is not properly carried out.

3) Paddy field preparation

Plowing, harrowing, puddling and leveling should be conducted directly prior to transplanting to prevent soil reduction, by using power tillers or tractors after flooding and fertilizer application. Machinery or draft animals are used to drag flat boards to level the field for water management.

4) Transplanting and direct seeding

Regular planting is recommended and it requires a transplanting rate of 20-25 stocks/m² at a spacing of 25cm x 20cm or 30cm x 15cm. One stock contains 3 - 4 seedlings. Stocks will not be planted deeply and the water during the active tillering stage will be shallow.

A drilling spacing of 25 cm is recommendable for direct seeding.

5) Fertilizer Application

The target fertilizer amount is 100kg-40kg-30kg of N-P-K per hectare. In accordance with the availability of compound fertilizers in the market, the fertilizer amount and application method will be as follows:

(a) 440 kg/ha of 15-15-15 will be applied before transplanting and mixed with soil

(b) 70 kg/ha of urea

- 9 weeks after transplanting (20 days before heading) for 1st cropping
- 8 weeks after transplantating (20 days before heading) for 2nd cropping

The first application of fertilizer is currently carried out a week after transplanting. However, to prevent nutritional loss by denitrification application should be carried out before transplanting.

6) Weeding

Herbicides are sprayed 2-3 days and 1.5 months after transplanting. In the first application, 30kg of 2.5% Butachlor granules are spread per hectare, while 30kg of 11% Bentazone granules are spread per hectare in the 2nd application. Barnyard millet and wild rice will be weeded out by hand, if necessary. If aerial spraying is to be carried out, the first application will be 5 liters of 58.9% Butachlor emulsion per hectare, while 5 liters of 40.3%

Bentazone emulsion or 10 liters of 35% Propanil emulsion per hectare will be applied in the 2nd application.

Herbicides will be sprayed in the area where direct seeding was carried out in consideration of the rice growth stage after germination, using the same rules used in transplanting.

Regular planting for transplantating and drilling for direct seeding is recommendable because they enable the use of a rotary weeder, reduce the application of herbicides and consequently contribute to environmental preservation.

7) Plant protection

Benomyl should be used for seed disinfection as it is very effective in preventing Blast and Helminthosporium Leaf Spot. The most harmful insect pest is the Rice Cut Worm. This insect can only be exterminated as a young larva by spraying Fenitrothion; insecticides become ineffective exterminators once the larva is old. Therefore, spraying should be carried out as early as possible. Other insects such as Southern Green Stink Bugs, Rice Whorl Maggots and Black Paddy Bugs, etc. are exterminated easily with Fenitrothion, Diazinon, Triclorfon, etc. Rodents are the most dangerous animals. Though rodenticide is used it is not a sufficient deterrent. It is, therefore, important to make the uncomfortable environment for rodent; for example removal of weeds and covering matters in around the field.

A mixture of 1 liter of 50% Fenitrothion emulsion per hectare and 1 liter of 30% Edifenphos or Kasugamaycin emulsion will be sprayed per hectare 60 days and 90 days after transplanting to control the prevalence of the above-mentioned diseases and insects.

8) Harvest

The use of the combine harvester results in minimum loss during harvesting, better selection and less cracks during threshing. In addition, its working efficiency is very high. Therefore, harvesting work shall be carried out by the combine harvester of contractor.

9) Water management

The water system of the entire area should be adequately managed to prevent water shortage or excessive discharge in the main, secondary and terminal canals. To manage irrigation water discharge according to the growth stage of the paddy within the field level, discharge in the terminal level must be administered by the cooperation of a group of beneficiaries.

(3) Yield projections and target rice production

1) Projected rice yield

Stable irrigation water supply, improvement of drainage condition and newly introduced technology resulting from the implementation of the Project, may bring about the yields projected in the table below. The rice productivity of lands categorized under Class 3 is lower than that of lands under Class 2 because of poor drainage, although the essential soil properties of the former are not inferior to that of the latter. Therefore, the lands under both classes are assumed to reach the same degree of productivity once drainage conditions are improved.

Class	Current Yield (t/ha)		Projected Yield (t/ha)	
	1st Crop.	2nd Crop.	1st Crop.	2nd Crop.
Class 1	4.5	3.1	6.0	5.0
Class 2	4.0	2.6	5.5	4.6
Class 3	2.5	1.6	5.5	4.6
Weighted average	3.9	2.6	5.7	4.8

Of the various effects that resulted from improved cultivation techniques, those considered to be most important are: (1) effective use of water and uniform growth due to field leveling, and (2) increase in fertilizer application amount (from 66 kg/ha to 90 kg/ha of nitrogen) and improved fertilizer application method (application before transplantating by mixing it with the soil to prevent nutritional loss by denitrification). The cultivation experiment of CEDIA which entailed the application of 100-60-60 kg/ha of N,P,K on several fields planted with Juma 57 shows the following yields in the first cropping season:

Site of Experiment	Yield kg/ha
Juma-Bonao	7,371
Rincon-La Vega	8,912
El Pozo-Nagua	7,832
Esperanza-Mao	8,425
San Juan de La Maguana	6,688

Given the above results, it is safe to assume that a paddy yield of 6 tons per hectare in fields categorized under Class 1 is not difficult to achieve.

2) Target rice production

The paddy field area based on the Land Use Plan is shown in Table F.2.1. The table below sums up the measurement of the paddy fields in each class by alternative. (See Table F.2.2 for detailed information).

Class	Current Area (ha)	Alternative A (ha)	Alternative B-1 (ha)	Alternative B-2 (ha)
Class 1	2,450	2,500	2,800	2,510
Class 2	3,080	3,050	3,400	3,400
Class 3	1,150	1,100	1,660	1,660
Total	6,680	6,650	7,860	7,570

Current cropping ratio is presently low because of irrigation water shortage and poor drainage. However, the construction of irrigation and drainage facilities will enable the implementation of the double cropping system.

Based on the above alternatives, the target production volume was established and shown in Table F.2.3. The table below sums up the cropping area, production volume and increase in production volume by alternative. Production volume will be more than doubled; 2.1 times for the Alternative A, 2.5 times for the Alternative B-1 and 2.4 times for the Alternative B-2.

Item	Without Project	With Project		
		Alternative A	Alternative B-1	Alternative B-2
Cropping area (ha/year)	9,500	13,300	15,720	15,140
Yield (ton/ha)	3.42	5.22	5.21	5.20
Output (ton/year)	32,500	69,415	81,906	78,716
Incremental output (ton/year)	0	36,915	49,406	46,216

F.2.4 Upland Crop Cropping Plan

(1) Outline

Since gravity irrigation is difficult to conduct in highly elevated areas, 110 ha of t paddy fields in highly elevated areas were converted into upland fields. In exchange, some of the upland fields which can be irrigated by gravity system will be converted into paddy fields. Consequently, the total areas of upland fields will decrease to 170 ha for Alternative A, and 110 ha for Alternatives B-1 and B-2, respectively(See Table F.2.1).

Crops produced in said farmlands are important to the farm household economy in the area. It should keep, therefore, the higher output than current output by means of improvement of cropping ratio and increase of yield due to technology improvement. The plan intends to increase vegetable and edible crop production in order to increase farmers' cash income, curtail daily expenses by intraregional supply and improve farmers' diet.

Cacao production plan is excluded although cacao is important cash crop, because its cultivated area is located at the out sid of the Project area.

(2) Production plan for vegetables and edible crops

The plan aims to establish a sustainable cropping system with the continuous cultivation of current main crops and the introduction of some new crops in consideration of social and natural environmental conditions. A rotation system will be established in order to prevent injuries that may result from the continuous cropping of solanaceous vegetables and haricot beans.

1) Cropping plan

A three year rotation system consisting of three patterns of double or triple cropping of annual crops is established. The fundamental cropping patterns are as follows (ratio of cropping area is shown by %);

Pattern I: cucumbers — solanaceous vegetables (sweet peppers 40%, tomatoes 40%, eggplants 20%)

Pattern II: leafy vegetables — leafy vegetables — pumpkins
(leafy vegetables: Chinese kale, pak-choi, etc.)

Pattern III: haricot beans — maize

The area to be covered by each cropping pattern will be the same. On the other hand, sweet potatoes, cassavas, yautia and pigeon peas will still be cultivated continuously on the same field.

Besides organic compost, the application of chemical fertilizers is also recommendable. The amount of fertilizer (showing in N-P-K elements) to be applied according to crop is established as follows:

Crop	Fertilizer Application Amount kg/ha (by N,P,K element)	Application Method
Fruit Vegetables	100-50-60	N & K: basal application of 40 kg, remainder will be divided for three applications P: basal application only
Leafy Vegetables	70-50-60	N: basal application of 40 kg, remainder will be used as top dressing P: basal application only K: basal application of 30 kg, remainder will be used as top dressing
Haricot bean	10-10-10	Basal application only
Maize	50-30-30	N: basal application of 30 kg, the remaining amount will be used as top dressing P & K: basal application only
Sweet potato, Cassava & Yautia	20-20-20	N & K: basal application of 10 kg, the remaining amount will be used as top dressing (K will be divided for two applications) P: basal application only
Pigeon pea	10-10-10	Apply the fertilizer around the base of the plant in a circle with a radius of 50 cm and mix it with soil

The cropping plan formulated based on the above-mentioned rule is shown in Fig. F.2.2.

2) Target production

Reasonable cropping systems and new technologies resulting from the implementation of the Project may bring about an increase in crop yield. The expected crop yields are as follows:

Crop	Current Yield ton/ha	Expectable Yield ton/ha
Cucumber	4.0	15.0
Pumpkin	8.2	12.0
Sweet pepper	2.6	12.0
Tomato	-	15.0
Eggplant	3.4	10.0
Leafy Vegetables	-	5.0
Haricot bean	1.3	2.0
Maize	1.0	3.0
Sweet potato	5.1	10.0
Cassava	5.1	10.0
Yautia	5.1	10.0
Pigeon pea	2.0	2.0

However, the cropping area decreases in accordance with the land use plan which is focused on rice production.

Based on the above conditions, the target production volume was established and is shown in Table F.2.3. The total production of vegetables in alternatives A, B-1 and B-2 amounts to 1,494 tons, 996 tons and 996 tons, respectively. The marketing of 500 to 1,000 tons of vegetable per year may be possible.

F.2.5 Agricultural Output

Following above-cited cropping plans, the sum of agricultural output (from 6th year on after completion of construction works) consists of rice, uplands crops and livestock is calculated as given in the table below.

Unit: ton

Crops	Without Project	With Project					
		Altern. A	Balance	Altern. B-1	Balance	Altern. B-2	Balance
Paddy	32,500	69,415	36,915	81,906	49,406	78,716	46,216
Upland Crops	440	2,428	1,988	1,588	1,148	1,588	1,148
Sub-total	32,940	71,843	38,903	83,494	50,554	80,304	47,364
Beef[1/]	3,588	3,112	-476	0	-3,588	842	-2,746
Milk[2/]	4,581	3,970	-611	0	-4,581	1,080	-3,501

Note: 1/ - kiloliter, 2/ - head

And, in accordance with this output plan together with actual farm-gate price, an annual production value within the development area (from 6th year on after completion of the construction works) is obtained in the following manner.

Unit: RD$ x 1000/year

Crops	Without Project	With Project					
		Altern. A	Balance	Altern. B-1	Balance	Altern. B-2	Balance
Paddy	146,250	312,368	166,118	368,577	222,327	354,222	207,972
Upland Crops	1,642	9,307	7,665	5,955	4,313	5,955	4,313
Sub-total	147,892	321,675	173,783	374,532	226,640	360,177	212,285
Beef	12,464	10,811	-1,653	0	-12,464	2,925	-9,539
Milk	17,088	14,808	-2,280	0	-17,088	3,140	-13,948
Sub-total	29,552	25,619	-3,933	0	-29,552	6,065	-23,487
Total	177,444	347,294	169,850	374,532	197,088	366,242	188,798

The above estimation reveals that the increase of agricultural value "With" project will be in proportion with 196% (Alternative Plan A), 211% (Alternative Plan B-1) and 206% (Alternative Plan B-2) in comparison with "Without" project.

F.2.6 Farm Economy

The implementation of the present agricultural project will enable farmers in the development area to realize double cropping of paddy a year owing to consistent supply of irrigation water, improvement of drainage condition and mitigation of flood damage. As a consequence of this betterment, cropping intensity of paddy will be elevated from 142% to 200% a year, and unit yield of the same crop will attain higher level from 3.42 ton/ha to 5.20 ton/ha.

On the other hand, in so far as the production cost of paddy is concerned, the above-mentioned enhancement of productivity will be brought by external factors such as consistent supply of irrigation water and improvement of drainage condition, an increase in amount of inputs will not be accompanied except for harvesting; conversely, it is recognized that seed, fertilizer and agricultural chemicals are applied in excess of optimum amount, therefore reduction of application amount of these inputs is proposed in this cropping plan. Although rising of water charge (from RD$ 176/ha at the "Without" project situation to RD$ 394/ha at the "With" project situation - Alternative Plan A) is induced by improvement of irrigation system, this rise will not affect greatly profitability of paddy farming because the share of water charge within the global cost of production is extremely trivial (fewer than 1%). In sum, the proposed production

cost of paddy will have a slight increase from RD$ 15,095 ("Without" project) to RD$ 15,720 ("With" project).

Taking above-mentioned discussion into account, the net return of paddy farming for both "Without" and "With" project situations with regard to average farmer is estimated in the following manner.

	"Without" Project	"With" Project
Paddy field (ha)	4.5	4.5
Cultivated area (ha/year)	6.4	9.0
Unit yield (ton/ha)	3.42	5.20
Production (ton/year)	21.9	46.8
Farm-gate price (RD$/ton)	4,500	4,500
Gross return (RD$/year)	98,550	210,600
Production cost (RD$/ha)	15,095	15,720
Production cost (RD$/year)	96,608	141,480
Net return (RD$/year)	1,942	55,170
Net return (RD$/ha)	303	6,130

ANNEX F : TABLES

Table F.1.1 Planted Area, Harvested Area, Production and Yield of Rice in Limon Del Yuna

(IAD's settlement area only)

Year	Planted Area ha	Harvested Area ha	Production ton	Yield kg/ha
1985	4,956	5,125	18,752	3,659
1986	4,727	3,124	13,144	4,207
1987	5,500	4,992	19,224	3,851
1988	6,590	5,270	18,342	3,480
1989	5,045	6,888	27,164	3,944
1990	5,166	6,330	25,686	4,058
1991	6,744	4,422	18,865	4,266
1992	5,490	7,078	23,330	3,296
1993	7,005	4,437	19,647	4,427
1994	6,943	5,133	21,282	4,146
Mean	5,781	5,260	20,544	3,933

(Source: Division of Statistics, Evaluation and Data Processing, IAD)

Table F.1.2 Estimated Rice Yield in Limon Del Yuna

Sampling Site	E.F.Yield 1st Cropping kg/ha	E.F.Yield 2nd Cropping kg/ha	Proposed Yield 1st Cropping kg/ha	Proposed Yield 2nd Cropping kg/ha
A Los Peynados	4,480			
B Reventazon	4,408			
C La Verde	4,947			
Class 1	4,612		4,500	3,100
D Las 600 bajas	3,901			
E Las 300 bajas	3,817	2,936		
F Las 300 bajas	3,325			
G La Reforma	4,037	3,185		
H La Reforma	3,291			
I Los Contreras	4,213			
Class 2	3,764	3,061	4,000	2,600
J Los Contreras	2,985			
K Paraguay	2,530			
L Las Cuevas	2,655			
M Guaraguao	2,338	1,587		
N Guaraguao	2,827			
Class 3	2,588	1,587	2,500	1,600

E.F.Yield: (Estimated Farm Yield) The yield calculated from the results of the quadrat sampling survey in consideration of environmental conditions.
Proposed Yield: The yield which was proposed by the officers of IAD & SEA based on their empirical knowledge.

Table F.1.3 Harvested Area, Yield and Production of Upland Clops in Limon Del Yuna at 1994 based on Reconnaissance Survey

Crops	Harvested Area (ha)	Yield (ton/ha)	Production (ton)
Maize	100	1	100
Sweet potato	50	5	250
Cassava	50	5	250
Haricot bean	12	1.3	16
Pumpkin	18	8.2	148
Cucumber	7	4	28
Sweet pepper	5	2.6	13
Cacao tree	500	0.67	335
Plantain	610	*37.8/ha	*23058
Coconut palm	250	**25.8/ha	**6450

* : Unit in thousands (number of fruit clusters)
** : Unit in thousands (number of fruits)

Table F.1.4 Monthly Rice Planting Area Registered by INDRHI for Water Charge

(1989/90-92/93)

Month	Planting ha	Harvesting ha	Actual Growing ha	Fallow ha
November	294.47	1,132.45	1,108.55	1,566.10
December	226.98	298.87	1,036.60	1,637.99
January	368.74	199.12	1,206.23	1,468.36
February	663.21	253.46	1,678.93	1,066.48
March	367.42	49.87	1,933.52	748.93
April	322.96	194.59	2,061.95	620.57
May	462.77	598.55	1,926.04	756.35
June	331.95	405.91	1,852.20	830.25
July	385.35	497.42	1,740.13	943.90
August	593.14	265.85	2,067.36	616.67
September	526.10	298.49	2,291.82	392.20
October	153.27	346.79	1,998.68	685.41
Total	4,696.35	4,541.38	-	-
Mean	-	-	1,741.83	944.43

(Source: Division of Operations, INDRHI)

Table F.1.5 Model of Seasonal Variation of Growing Days and Yield of JUMA 57

(Estimated from the data of CEDIA)

Date of Transplanting	Growing Days		Date of Ripening	Yield kg/ha	
	Number	Difference		Value	Index
Jan. 1st	126	-4	May 6th	5320	70
Jan. 16th	127	-3	May 22nd	6080	80
Feb. 1st	129	-1	Jun. 9th	6840	90
Feb. 16th	129	-1	Jun. 24th	7600	100
Mar. 1st	129	-1	Jul. 8th	7600	100
Mar. 16th	129	-1	Jul. 22nd	7600	100
Apr. 1st	130	0	Aug. 8th	7600	100
Apr. 16th	130	0	Aug. 23rd	7600	100
May 1st	128	-2	Sept. 5th	7220	95
May 16th	127	-3	Sept.19th	6840	90
Jun. 1st	123	-7	Oct. 1st	6460	85
Jun. 16th	120	-10	Oct. 13th	6460	85
Jul. 1st	114	-16	Oct. 22nd	6080	80
Jul. 16th	114	-16	Nov. 6th	6080	80
Aug. 1st	114	-16	Nov. 22nd	5320	70
Aug. 16th	114	-16	Dec. 7th	4940	65
Sept. 1st	114	-16	Dec. 23rd	4180	55
Sept. 16th	114	-16	Jan. 5th	3800	50
Oct. 1st	114	-16	Jan. 22nd	3800	50
Oct. 16th	114	-16	Feb. 6th	3420	45
Nov. 1st	113	-17	Feb. 21st	3800	50
Nov. 16th	118	-12	Mar. 13th	3800	50
Dec. 1st	123	-7	Apr. 2nd	4180	55
Dec. 16th	125	-5	Apr. 19th	4560	60

Growing Days: Number of days from transplanting to ripening.
Difference: Difference of growing days with the longest days.

Table F.1.6 Details of Production Cost

Crop: Rice
Variety: Juma 57 & 58
Cropping System: Irrigated & Transplant

Unit: RD$/ha

ITEMS	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1. Purchase of Seeds & Agro-chemicals				
- Seed	kgr.	106.00	9.45	1,001.70
- Fertilizer (Simple)	kgr.	109.00	4.38	477.42
- Fertilizer (Compund)	kgr.	460.00	3.75	1,725.00
- Insecticide (Nuvacron 60)	lt.	2.80	370.00	1,036.00
- Fungicide (Manzate)	kgr.	0.90	200.00	180.00
- Rodenticide	kgr.	0.52	70.00	36.40
- Herbicide (2-4-D)	lt.	2.15	60.00	129.00
- Herbicide (Propanil)	lt.	5.30	100.00	530.00
Sub-total				5,115.52
2. Preparation and Maintenance of Nursery				
- Preparation of nursery (by animal)	ha	1.00	127.00	127.00
- Maintenance of nursery	m-d	0.47	100.00	47.00
Sub-total				174.00
3. Clearing of Canals	m-d	1.59	100.00	159.00
4. Land Preparation				
- Plowing & bordering	ha	1.00	1,525.00	1,525.00
- Leveling (by animal)	ha	1.00	357.50	357.50
- Reconstruction of borders	m-d	1.00	100.00	100.00
Sub-total				1,982.50
5. Transplant	m-d	15.74	100.00	1,574.00
6. Application of Fertilizer & Agro-chemicals				
- Application of fertilizer	m-d	2.40	100.00	240.00
- Application of agro-chemicals	m-d	5.70	100.00	570.00
- Aerial fumigation	ha	1.00	143.10	143.10
Sub-total				953.10
7. Weeding	m-d	11.10	100.00	1,110.00
8. Irrigation				
- Water control	m-d	2.86	100.00	286.00
- Water charge payable to INDRHI	ha	1.00	175.22	175.22
Sub-total				461.22
9. Harvest & Transport				
- Harvest by combine	bag	63.00	25.00	1,575.00
- Transport (by animal)	bag	63.00	10.00	630.00
- Supporting work	m-d	1.14	100.00	114.00
Sub-total				2,319.00
Total of Direct Production Cost (Item 1 thru 9)				13,848.34
11. Agricultural credit (18% per annum)				1,246.35
TOTAL COST PER TAREA				15,094.69

Source: Prepared based on the field survey (interview to farmers) of the Study Team

Table F.1.7 Summary of the Production Cost

Unit: RD$/ha

Crops	Cropping System	Seed		Fertilizers		Agro-chemicals		Labor Force		Mech. Works		Water Charge		Sub-Total		Financial Cost		Total Cost
		Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	
Rice	Irrigated & Transplant	1,001.7	6.6	2,202.4	14.6	1,911.4	12.7	4,200.0	27.8	4,357.6	28.9	175.2	1.2	13,848.3	91.7	1,246.4	8.3	15,094.7
Rice	Irrigated & Direct Seeding	1,566.0	10.6	2,782.0	18.9	2,864.9	19.4	3,303.0	22.4	2,848.6	19.3	175.2	1.2	13,539.7	91.7	1,218.6	8.3	14,758.3
Cacao	Dry farming	111.3	1.7	2,687.1	42.0	424.0	6.6	3,021.0	47.3	148.4	2.3	0.0	0.0	6,391.8	100.0	0.0	0.0	6,391.8
Plantain	ditto	800.0	5.4	2,424.0	16.5	3,488.0	23.7	5,302.7	36.0	2,720.0	18.5	0.0	0.0	14,734.7	100.0	0.0	0.0	14,734.7
Coconut	ditto	480.0	5.2	2,560.0	27.9	80.0	0.9	5,750.0	62.6	310.0	3.4	0.0	0.0	9,180.0	100.0	0.0	0.0	9,180.0
Maize	ditto	60.4	1.3	763.2	16.2	381.6	8.1	2,226.0	47.3	1,272.0	27.0	0.0	0.0	4,703.2	100.0	0.0	0.0	4,703.2
Sweet Potato	ditto	318.0	4.2	508.8	6.8	286.2	3.8	4,897.2	65.1	1,510.5	20.1	0.0	0.0	7,520.7	100.0	0.0	0.0	7,520.7
Cassava	ditto	238.5	3.8	0.0	0.0	318.0	5.1	4,372.5	70.5	1,272.0	20.5	0.0	0.0	6,201.0	100.0	0.0	0.0	6,201.0
Haricot Bean	ditto	1,431.0	13.5	841.6	7.9	2,720.0	25.7	4,319.4	40.8	1,280.0	12.1	0.0	0.0	10,592.0	100.0	0.0	0.0	10,592.0
Vegetables*	ditto	1,000.4	7.8	2,920.1	22.9	1,865.6	14.6	5,241.8	41.1	1,728.0	13.5	0.0	0.0	12,755.9	100.0	0.0	0.0	12,755.9

Note: * Vegetables are represented by pumpkin, cucumbeer and sweet pepper

Source: Rice (Irrigated & Transplant) -Table F**
Rice (Irrigated & Direct Seeding) and Other crops - COSTO DE PRODUCCION DE LOS PRINCIPALES CULTIVOS AGRICOLAS PERMANENTES Y TEMPOREROS FINANCIADOS POR EL BANCO DE AGRICOLA

Note: Financial cost is not considered for crops other than rice, because they are cultivated in the Study area without credit

Table F.1.8 Profitability of Crop Production

Crops	Yield (Ton/ha)	Farm-gate Price (RD$/ton)	Gross Return (RD$/ha)	Produc-tion Cost (RD$/ha)	Net Return (RD$/ha)	Cost-Benefit Ratio
Rice						
- 1st class lands*	3.9	4,500	17,550	16,057	1,493.0	0.09
- 2nd class lands*	3.5	4,500	15,750	16,057	-307.0	-0.02
- 3rd class lands**	2.5	4,500	11,250	14,758	-3,508.0	-0.24
Cacao	0.7	10,753	7,527	6,392	1,135.3	0.18
Plantain	37.8	844	31,903	14,735	17,168.2	1.17
Coconut	25.8	914	23,581	9,180	14,401.2	1.57
Maize	1.0	4,007	4,007	4,703	-696.0	-0.15
Sweet Potato	5.1	3,901	19,895	7,520	12,375.1	1.65
Cassava	5.1	3,450	17,595	6,201	11,394.0	1.84
Haricot Bean	1.3	18,656	24,253	10,592	13,660.8	1.29
Vegetables***	4.9	4970	24,353	12756	11,597.0	0.91

Note: * Transplnt
** Direct Seeding
*** Represented by pumpkin, cucumber and sweet pepper

Table F.1.9 Profitability of Cattle Farming

1. Gross Income

1.1 Sale of Milk

No. of milking cow per ha x Milk production (l/head/day)
x Milk production period (Days/year) x Unit price of milk (RD$/l)
= 3.9 heads x 2.6 l/head/day x 177 days x RD$ 3.73
= RDS 6,695

1.2 Sale of Cow

No. of cow marketted a year(heas/ha) x Price of cow (RD$/head)
= 0.36 x RD$ 4115
= RD$ 1,481

1.3 Sale of heifer and steer
No. of heifer and steer marketted a year(heas/ha) x
Price of heifer and steer (RD$/heas)
= 1.64 x RD$ 3253
= RD$ 5,335

Total of the gross income = RD$ 6,695 + RD$ 1,481 + RD$ 5,335
= RD$ 13,511

2. Production cost

2.1 Depreciation of the initial investment = RD$ 1,471/year

2.2 Annual operation and maintenance cost RD$ 9,427

Total of the anual production cost = RD$ 1,471 + RD$ 9,427
= RD$ 10,898

3. Net return

Net return = Gross income - Production cost
= RD$ 13,511 - RD$ 10,898
= RD$ RD$ 2,613/ha/year

Table F.2.1 Conversion Profile of Land Use

Unit: ha

Land Use	Actual Situation			With Project (Alternative Plan A)					
	Development Area	Alienated Area	Total	Paddy Field	Upland	Pasture	Reservoir	Other Infrastruc.	Total
Paddy field	6,680	0	6,680	6,140	110	0	0	430	6,680
Upland	270	220	490	180	60	0	0	30	270
Pasture	1,840	340	2,180	300	0	1,330	140	70	1,840
Wetland	10	70	80	10	0	0	0	0	10
Virgin Land	20	0	20	20	0	0	0	0	20
Total	8,820	630	9,450	6,650	170	1,330	140	530	8,820

Land Use	Actual Situation			With Project (Alternative Plan B-1)					
	Development Area	Alienated Area	Total	Paddy Field	Upland	Pasture	Reservoir	Other Infrastruc.	Total
Paddy field	6,680	0	6,680	6,140	110	0	0	430	6,680
Upland	270	220	490	230	0	0	0	40	270
Pasture	1,840	340	2,180	1,460	0	0	0	380	1,840
Wetland	10	70	80	10	0	0	0	0	10
Virgin Land	20	0	20	20	0	0	0	0	20
Total	8,820	630	9,450	7,860	110	0	0	850	8,820

Land Use	Actual Situation			With Project (Alternative Plan B-2)					
	Development Area	Alienated Area	Total	Paddy Field	Upland	Pasture	Reservoir	Other Infrastruc.	Total
Paddy field	6,680	0	6,680	6,140	110	0	0	430	6,680
Upland	270	220	490	230	0	0	0	40	270
Pasture	1,840	340	2,180	1,170	0	360	0	310	1,840
Wetland	10	70	80	10	0	0	0	0	10
Virgin Land	20	0	20	20	0	0	0	0	20
Total	8,820	630	9,450	7,570	110	360	0	780	8,820

Table F.2.2 Area of Paddy Field by Land Use Plan

(Unit: hectare)

Name	Current Paddy Field			
	1st Class	2nd Class	3rd Class	Sub Total
Ponton	1,690			1,690
Payabo		350	500	850
Guaraguao		1,810	200	2,010
La Cueva		180	150	330
El Cercado		170	100	270
Lag. Cristal		570	200	770
Borojol	760			760
Total	2,450	3,080	1,150	6,680
Name	Alternative A			
	1st Class	2nd Class	3rd Class	Sub Total
Ponton	1,630			1,630
Payabo		230	500	730
Guaraguao		1,690	200	1,890
La Cueva		280	100	380
El Cercado		170	100	270
Lag. Cristal		680	200	880
Borojol	870			870
Total	2,500	3,050	1,100	6,650
Name	Alternative B-1			
	1st Class	2nd Class	3rd Class	Sub Total
Ponton	1,890			1,890
Payabo		520	660	1,180
Guaraguao		1,860	490	2,350
La Cueva		190	190	380
El Cercad		170	100	270
Lag. Cristal		660	220	880
Borojol	910			910
Total	2,800	3,400	1,660	7,860
Name	Alternative B-2			
	1st Class	2nd Class	3rd Class	Sub Total
Ponton	1,600			1,600
Payabo		520	660	1,180
Guaraguao		1,860	490	2,350
La Cueva		190	190	380
El Cercad		170	100	270
Lag. Cristal		660	220	880
Borojol	910			910
Total	2,510	3,400	1,660	7,570

Table F.2.3 Target Production of Rice

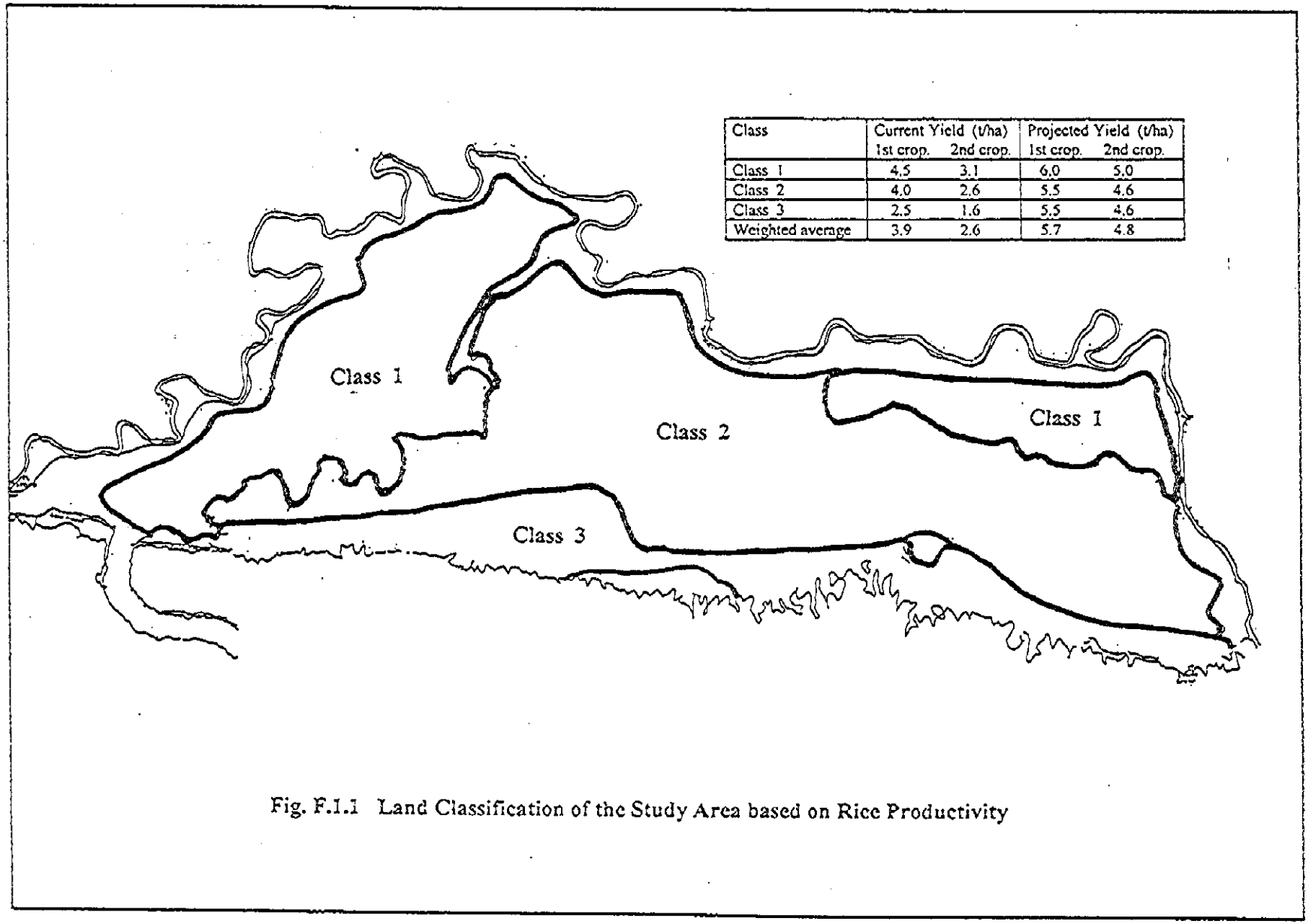
Class	CURRENT CROPPING							
	First Cropping			Second Cropping			Total	
	Area ha	Yield ton	Production ton	Area ha	Yield ton	Production ton	Area ha	Production ton
Total	6,000	3.9	23,400	3,500	2.6	9,100	9,500	32,500
Class	ALTERNATIVE A							
	First Cropping			Second Cropping			Total	
	Area ha	Yield ton	Production ton	Area ha	Yield ton	Production ton	Area ha	Production ton
Class 1	2,500	6	15,000	2,500	5	12,500	5,000	27,500
Class 2	3,050	5.5	16,775	3,050	4.6	14,030	6,100	30,805
Class 3	1,100	5.5	6,050	1,100	4.6	5,060	2,200	11,110
Total	6,650	5.68	37,825	6,650	4.75	31,590	13,300	69,415
Class	ALTERNATIVE B-1							
	First Cropping			Second Cropping			Total	
Class 1	2,800	6	16,800	2,800	5	14,000	5,600	30,800
Class 2	3,400	5.5	18,700	3,400	4.6	15,640	6,800	34,340
Class 3	1,660	5.5	9,130	1,660	4.6	7,636	3,320	16,766
Total	7,860	5.68	44,630	7,860	4.75	37,276	15,720	81,906
Class	ALTERNATIVE B-2							
	First Cropping			Second Cropping			Total	
	Area ha	Yield ton	Production ton	Area ha	Yield ton	Production ton	Area ha	Production ton
Class 1	2,510	6	15,060	2,510	5	12,550	5,020	27,610
Class 2	3,400	5.5	18,700	3,400	4.6	15,640	6,800	34,340
Class 3	1,660	5.5	9,130	1,660	4.6	7,636	3,320	16,766
Total	7,570	5.68	42,890	7,570	4.75	35,826	15,140	78,716

Table F.2.4 Target Production of Vegetables and Other Food Crops

Cropping System	Alternative A			Alternative B-1 & B-2		
	Area ha	Yield ton/ha	Production ton	Area ha	Yield ton/ha	Production ton
Pattern I	30)			20)		
*Cucumber	30	15	450	20	15	300
*Sweet pepper	12	12	144	8	12	96
*Tomato	12	15	180	8	15	120
*Eggplant	6	10	60	4	10	40
Pattern II	30)			20)		
*Leafy vegetables	60	5	300	40	5	200
*Pumpkin	30	12	360	20	12	240
Pattern III	30)			20)		
Haricot bean	30	2	60	20	2	40
Maize	30	3	90	20	3	60
Continuous cropping	80)			50)		
Sweet potato	33	10	330	20	10	200
Cassava	40	10	400	25	10	250
Yautia	5	10	50	4	10	40
Pigeon pea	2	2	4	1	2	2
Total			2428			1588
Total of Vegetables			1494			996

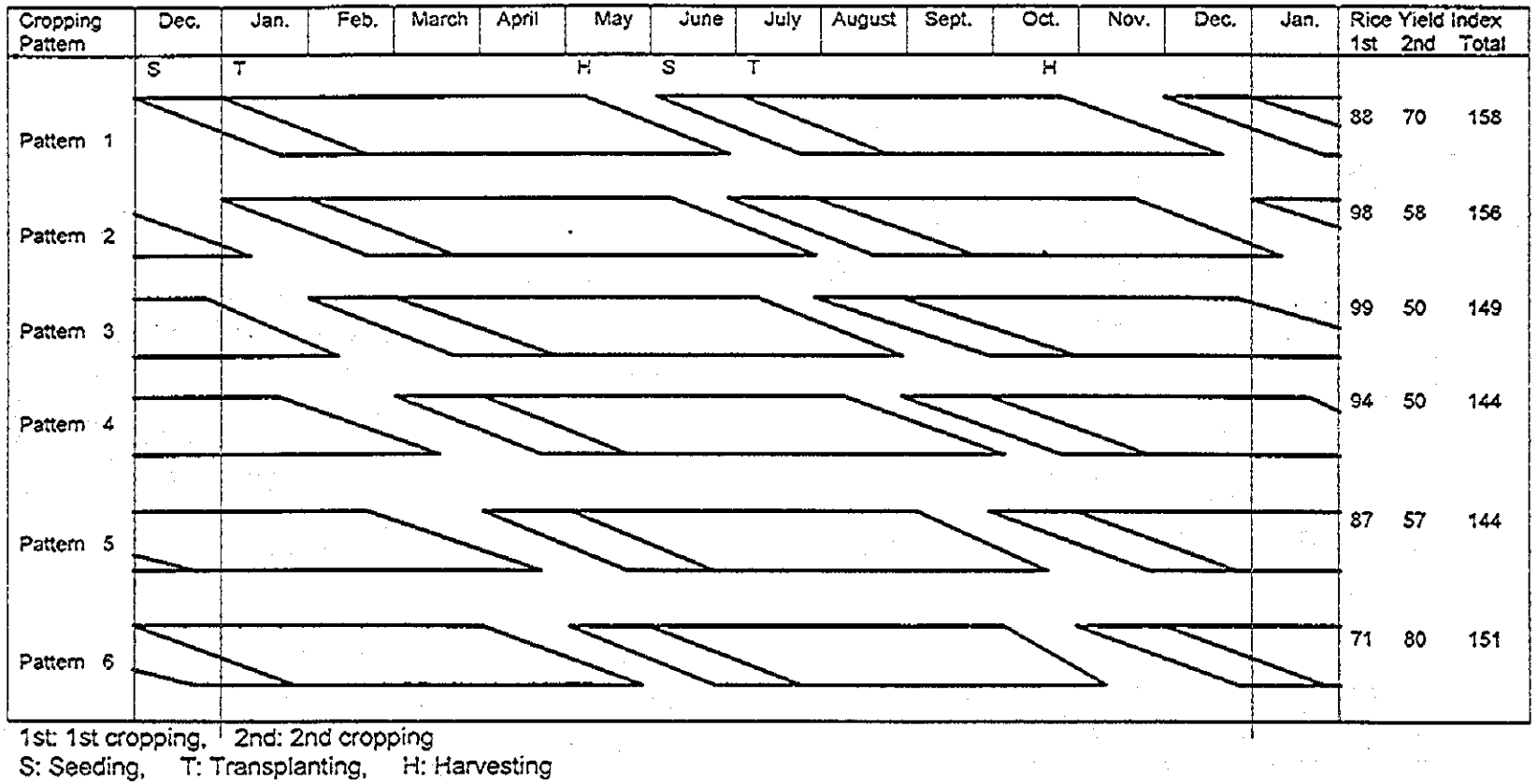
*: Vegetable
**: Unit in thousands(number of fruit clusters)

ANNEX F : FIGURES



Class	Current Yield (t/ha)		Projected Yield (t/ha)	
	1st crop.	2nd crop.	1st crop.	2nd crop.
Class 1	4.5	3.1	6.0	5.0
Class 2	4.0	2.6	5.5	4.6
Class 3	2.5	1.6	5.5	4.6
Weighted average	3.9	2.6	5.7	4.8

Fig. F.1.1 Land Classification of the Study Area based on Rice Productivity



1st: 1st cropping, 2nd: 2nd cropping
S: Seeding, T: Transplanting, H: Harvesting

Fig. F.1.2 Estimation of the Yearly Rice Yield for the Double Cropping System

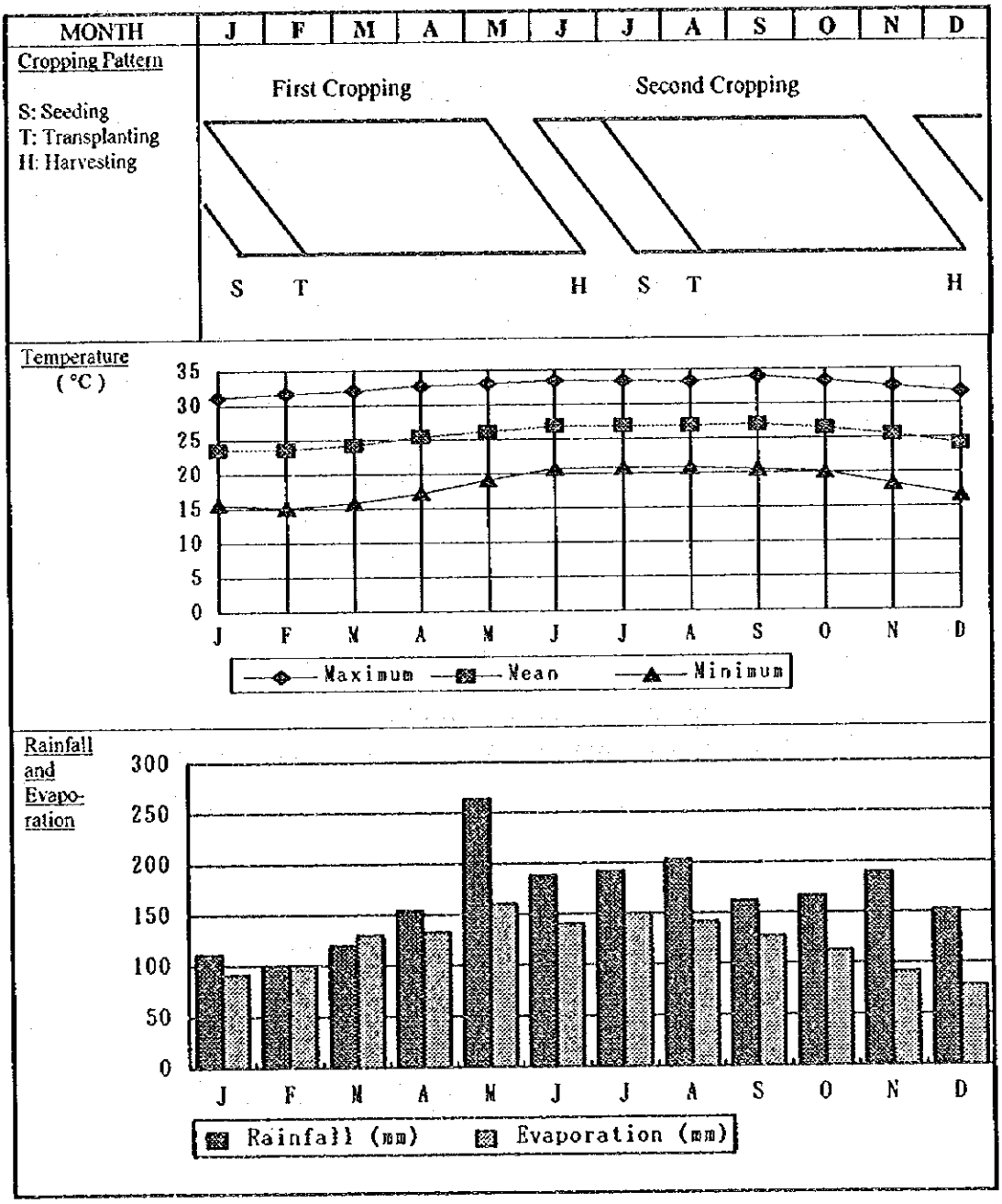
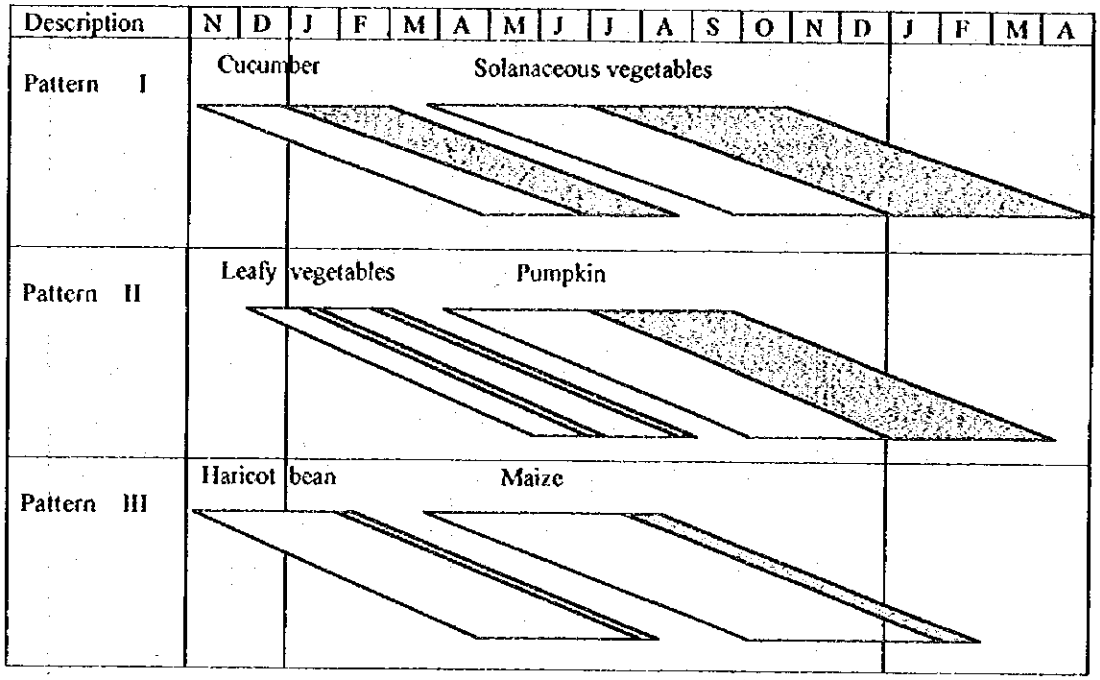
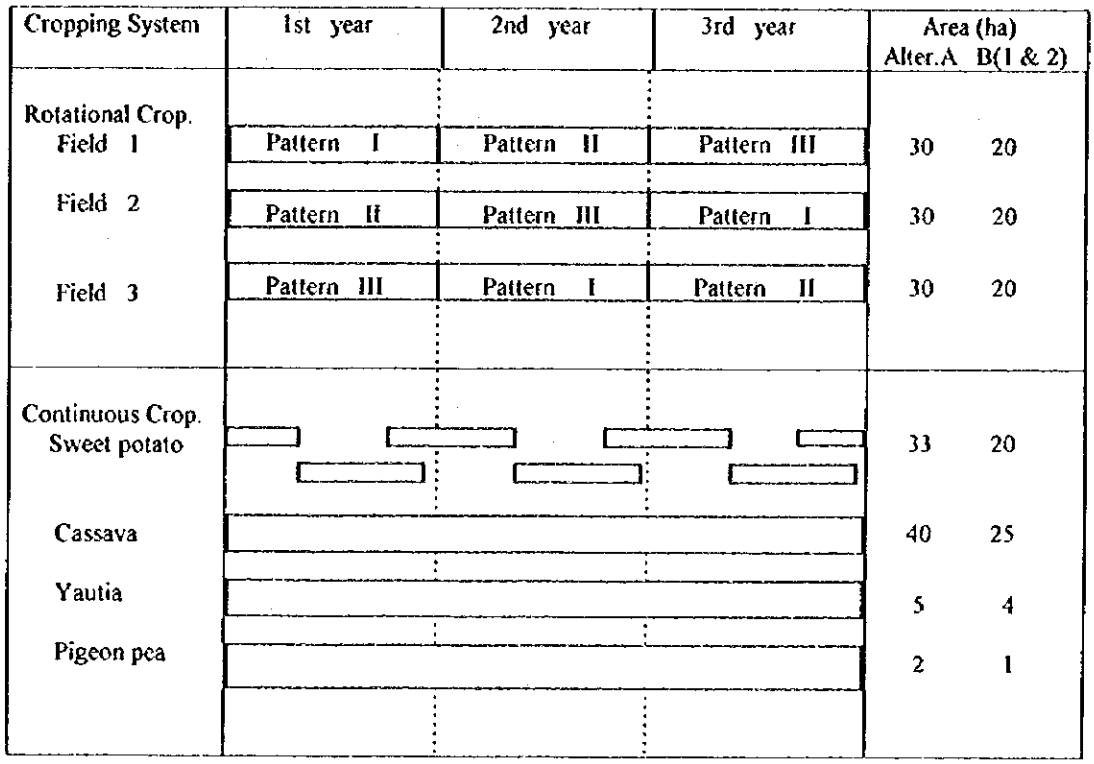


Fig. F.2.1 Rice Cropping Plan



: Harvesting season

Fig. F.2.2 Upland Crop Cropping Plan
(1) Fundamental Patterns of Rotational Cropping



Alter. : Alternative

Fig. F.2.2 Upland Crop Cropping Plan
(2) Three Years Rotational and Continuously Cropping System

ANNEX G : MARKETING AND PROCESSING OF AGRO-PRODUCTS

ANNEX G : MARKETING AND PROCESSING OF AGRO-PRODUCTS

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ANNEX G Marketing and Processing of Agro-Products

G.1 Actual Marketing System

G.1.1 Rice

Although rice is the most important foodstuff for the diet of Dominican people, its output has not been consistent, because the prevailing cropping system depend largely on climatological conditions. Under the circumstances, the country had to import this basic cereal in eight years for the last 10 years to fulfill domestic demand. For this year of 1995, due to reduced output in 1994 which was caused by unexceptional drought throughout the country, the country imported 30,000 tons of rice in March. With an exception for the year of 1992, an annual output of rice remains in low to compare with its level of 10 years ago, thus, in 1993, an apparent consumption per-capital of rice became the lowest level of the last decade with a quantity of 42.8 kg, equivalent to 68% of the same attained in 1986 (see Table G.1.1).

In the Dominican Republic, up to 1987 INESPRE (Price Stabilization Agency) had played a vital role within the marketing channel of rice (about 80% of paddy was purchased by this organization), purchasing paddy directly from farmers on the basis of the supporting price established every harvest season of the year. And, due to financial and administrative problems INESPRE's function related with marketing of rice has been turned over to BAGRICOLA since 1987. However, BAGRICOLA does not intervene directly in purchase and processing of paddy as INESPRE had done, but supervise silos turned over by INESPRE, control importation and exportation of rice, and establish through the National Rice Commission reference price of paddy to be traded between farmers and rice mills. Without direct intervention of public organization, paddy are traded in the following manner.

Generally speaking, harvested paddy are bagged by combine and are transported from fields to nearest roads or to some designated sites by animals, then bagged paddy are transported and processed through one of the following channels:

1) Trucks of large-scale rice mills (factorias) come to pick bagged paddy up to transport them to their own mills and dry paddy by drier and unhull them by milling machine.

2) Middlemen purchase paddy from farmers to sell them to large-scaled rice mills (mainly located far from the area).

3) Farmers takes by themselves bagged paddy to the nearest small-scale rice mills (molino) where paddy are dried in the sun and unhulled with milling machine.

The survey to farmers in the Study area has revealed that 57% of the paddy are processed at rice mills within the Study area. Furthermore, according to the same survey, it is estimated, that about 17% of the paddy produced in the Study area is destined for self-consumption of farmers and their family members

There are some small-scale rice mills which service is limited to receive already dried paddy from farmers and to husk them for self-consumption of farmers.

In the past (or before 1987), the payment from INESPRE to farmers was made in cash after deducting amount due to the BAGRICOLA from the gross amount payable to farmers, while at present, without intervention of INESPRE, paddy of farmers who owe the BAGRICOLA are delivered to the Bank through rice mills after being processed. Processed rice are also sold by rice mills to wholesalers or directly to supermarkets.

Pricing system of paddy is complex in some aspects, because each paddy contains different portion of moisture and foreign materials. Most of rice mills are not equipped with laboratory to assess moisture content, therefore paddy are determined their price without being assessed exactly their proportion of moisture and foreign materials (this assessment is generally made by means of so-called "al ojo (by eye)".

Paddy is priced on the basis of the unit called "fanega"; if paddy contains 20% of moisture and 5% of foreign materials, then one "fanega" is determined to be 120 kg; if paddy is well dried having less foreign materials, it may come to 110 or 115 kg, meanwhile in the opposite case, more than 120 kg of paddy is evaluated to be one "fanega". As of January, 1995, one "fanega" of paddy is sold in the range of RD$ 540-560 (equivalent to RD$ 4,500-4,670 per ton) in the Study area. According to the rice mills around the Study area, farm-gate price of paddy fluctuates from RD$ 583/fanega to RD$ 440/fanega during 12 months for the year of 1994 in the following manner:

Month	Average Price (RD$/fanega)
Jan./94	440
Feb.	474
Mar.	540
Apr.	581
May	583
Jun.	546
Jul.	560
Aug.	570
Sep.	560
Oct.	540
Nov.	540
Dic.	540
Average	540

As mentioned before, although the supporting price for paddy was repealed in 1986, the Government persist to intervene in the market by means of establishment of reference price so that the negotiation of the grain between the buyers (rice mills) and farmers should be made based on this reference price. In such manner, the farm-gate price of paddy in the country is kept in higher level in comparison with that of other countries; the prevailing farm-gate price of RD$ 540/fanega, equivalent to RD$ 4,500/ton in paddy or RD$ 7,500/ton (US$ 582.75/ton) in milled rice is roughly calculated to be twice as high as the FOB price of the Thai rice (US$ 296/ton, as of December 1994).

So far as the transaction volume is concerned, rice is processed throughout the year, but, generally speaking, peak season falls on October-December and April-May, whereas less volume is processed during January-March.

Annual evolution of price for rice is given in Table G.1.1. Farm-gate price had risen to the highest level of the decade in 1992, but it was dropped by 18% in the next year (1993), thus its index became inferior to that of the consumer price for foodstuff.

Judging from hearing made among rice mills' personnel, one "fanega" of paddy produces hulled rice in the range of 155-165 pounds (69.8-74.3 kgs), so the conversion rate of paddy into milled rice is to be 58-62% on the whole. One bag of paddy weigh 92 kgs on average.

Processed rice are determined their price according with the proportion of split grain. This process is made referring to the criteria for classification of milled rice established by the BAGRICOLA. Up to last year, there were five categories of milled rice in terms of quality (Selected A, Selected B, Superior A, Superior B, Superior C), but facing with difficulty and trouble in assessment, the Bank has decided to reduce categories of milled rice in only two (Selected A and Superior) for this year. Milled rice containing split grain less than 8.5% are assessed to be "Selected A" and those less than 28% to be "Superior". Despite the BAGRICOLA's decision to rice mills in the Study area classify milled rice into various categories and the proportion and price surveyed at some rice mill during October-November 1994 were as shown below.

Category of Milled Rice	Proportion(%)	Price (RD$/qq.)
Selected	12.6	530
Superior A	61.2	500
Superior B & C	2.6	450
Natural	8.6	450
1/2 Grain	2.6	300
Bran	13.4	35

G.1.2 Cacao

Next to paddy, cacao is the most important crop in the Study area to have been cultivated along the Yuna river for several decades. In the national level, cacao constitutes one of four traditional exports that contribute to foreign exchange earning of the country and nearly 90% of its national output is destinated to international market. (The participation of this crop in the total export value of the country was about 7% in 1993). Almost the whole of cacao produced in the country are purchased by only six agents who process the crop for

exportation as well as for domestic consumption. Cacao produced in the Study area are purchased directly by two of six agents mentioned above with head office in San Francisco Macoris or by middleman at Arenoso.

Like other agricultural exports, an international price of cacao had been depressed since 1980; the lowest annual price was recorded in 1993 with US$ 0.71/kg, which was lower than one-third of the level recorded in 1979 (US$ 2.25/kg). Nonetheless, there has shown a sign of recuperation, because after recording the lowest level in the middle of 1993, an international price has began to ascend and it reached up to US$ 1.13/kg in July 1994. In spite of the depression in price, exportation volume of cacao has not decreased drastically as the case of sugar, owing to the governmental policy to promote exportation of the crop with elimination of export tax on it.

Farm-gate price of cacao has been affected by sluggish situation of international price, thus for the last four years (1989-1993) it had grown only by 36%; the poor performance of this growth will be stood out if comparison is made with the same growth rate achieved by rice (264%), haricot bean (332%) and plantain (313%).

G.1.3 Haricot Bean

Haricot Bean (habichuela) is an indispensable foodstuff for the diet of the Dominican people, so a considerable portion of these products are consumed by farmers themselves or locally; some portions are sold to middlemen who transport them in such markets as Nagua, Cotui, San Francisco Macoris and Santo Domingo.

Although the supporting price for most of crops has been abolished since 1990, haricot bean is one of four crops (others are potato, onion and garlic) to which supporting price is established. The supporting price of haricot bean has hiked by 20 times for the last ten years (1984-1993). Owing to this pricing policy, the farm-gate price of this crop remains the most favorable among the crops produced in the Study area and its index excels the consumer price index for foodstuff by 25%.

G.1.4 Plantain

Plantain within the Study area is cultivated in its great portion at large farms located at the section of La Ceiba de los Pajaros. Like haricot bean, plantain is regarded to be of important foodstuff for the Dominican people, so the great majority of the production is supplied to domestic markets. For the last decade 2,500 tons or so are exported yearly to the USA and neighboring Caribbean countries.

Representative marketing channel of plantain for domestic consumption is as follows:

Farmers⇒Middlemen (Transporter)⇒Professional Seller⇒Wholesaler⇒
Retailer⇒Consumer

The transaction of plantain is generally done on the basis of the unit called "carga" (200 units) or "millar" (thousand units).

With an expansion of production, rise of the farm-gate price of plantain remains the lowest among the crops produced in the Study area; plantain's farm-gate price has rose for the last 8 years (1986-1993) by only 491%, which is far inferior to that of rice (670%), haricot bean (856%), cassava (725%), sweet potato (655%), etc.

G.1.5 Maize

The national production of maize is insufficient in the Dominican Republic, therefore domestic supply of this grain for human consumption as well as feeding to animals is satisfied with importation; for the last ten years, on an annual average 343 thousand tons of maize were imported to cover approximately 85% of the domestic supply. Dissimilar to other Latin American countries, maize is not preferably consumed in this country; it is supposed that only 10% of the national output is traded for human consumption.

The production of maize in the Study area is in small volume, so almost the whole production is consumed locally (self-sufficiency and poultry farming of farmers and supply for nearby markets).

Faced with the competition with imported maize, farmers of the grain suffer from its depressed price that does not keep in pace with the rise of the same for other crops and even though with the consumer price index for foodstuff (refer to Table G.1.5).

G.1.6 Tuberous Root Crops

Tuberous root crops cultivated in the Study area are represented by cassava, sweet potato and yautia. The mean annual production, exportation and apparent consumption per-capita for these products during 1984-1993 are as shown below.

Crops	Production (ton)	Exportation (ton)	Apparent consumption per-capita (kg)
Cassava	130,390	4,999	18.6
Sweet potato	45,090	9,517	5.3
Yautia	37,260	17,162	3.0

The major destination of the said exports are USA and Puerto Rico, while small portion of them are exported to neighboring Caribbean countries and islands such as Saint Marteen and Virgin Island.

Being traditionally consumed by Dominican people, some portion of these tuberous crops are used for self-sufficiency and reproduction by farmers and the better part of the remainder are destinated to local and other domestic market by middlemen; not a little volume of the crops are lost in post-harvest; damaged and inferior products are use for feeding animals.

Cassava, sweet potato and yautia are crops that promise high return to farmers supported by higher level of farm-gate price and low production cost; their farm-gate prices were hiked during the last ten year with indexes of 1572 (yautia), 1404 (cassava) and 1111

(sweet potato); these crops require less quantity of fertilizers and agro-chemicals, so their production cost is far economical than grains and vegetables.

G.1.7 Vegetables

Production of vegetables such as squash, pepper and eggplant is capricious in the Study area without being consolidated firm marketing channel; rural population are not accustomed to consuming them, therefore they are marketed to such large cities as Santo Domingo, Santiago and San Francisco Macoris.

The products constitute non-traditional exports, but their volume is insignificant and inconsistent.

Information regarding an annual evolution of the prices for vegetables is not available. The only information related with price of vegetables is monthly average wholesale and retail prices for the year of 1993; according to this information, it is observed that prices for three vegetable crops mentioned here are fluctuated greater than grains and tuberous root crops. The table below illustrates the behavior of wholesale prices of the three products in comparison with rice, haricot bean and cassava.

Products	Highest Monthly Price (RD$/kg)-(A)	Lowest Monthly Price (RD$/kg)-(B)	Coefficient (A)/(B)
Squash	43.29	15.83	2.7
Pepper	11.89	1.88	6.3
Eggplant	1.78	0.63	2.8
Rice	7.03	4.79	1.5
Haricot bean	24.29	12.84	1.9
Cassava	5.42	2.21	2.4

G.1.8 Livestock

Representing approximately 23% of the total arable lands in the Study area, livestock is relatively important economic activity in the area, of which the double purpose (fattening and milk production) cattle farming prevails. According to the survey conducted by the Study Team, 0.36 head/ha of cow and 1.64 head/ha of heifer and/or steer are marketed yearly on average in the Study area with prices of RD$ 3,253/head and RD$ 4,115/ha, respectively. The same survey also revealed that milk are produced at an average rate of 3.73 liters per hectare per annum with a price of RD$ 3.73/*l*.

In the national level, milk production is deficient, so milk (powder milk) has been imported consistently from USA, Denmark, New Zealand, etc. For the decade 1983-1992, about one-fourth of the national supply of milk was covered by imported milk with an average volume of 13,098 ton per year (convertible to 104 thousand kilo liters). An apparent consumption per-capita of milk was around 65 liters (178 cc/day), which is lower than the recommended volume (200 cc/day) of ONAPLAN.

An importation of milk has hiked in 1994 attaining 228 thousand kilo liters and covering about 37% of the national supply. For this year a total of US$ 70 million was paid to importation of milk and this amount was equal to about 5.6% of the total national imports.

Milk are marketed throughout the country in the following manner: direct sale (62.8%), cheese production (17.9%), dairy industry (16.7%), self-consumption (2.0%) and ice cream and candy shops (0.6%).

G.2 Prevailing Farm-gate Price

Farm-gate prices for the major crops and livestock products produced in the Study area are estimated for the year of 1994 as follows:

Crops/Livestock Products	Price (RD$/ton)
Paddy	4,500
Cacao	4,928
Haricot bean	7,707
Plantain	873
Coconut	914
Maize	1,938
Cassava	1,583
Sweet potato	1,122
Squash	1,618
Cucumber	2,786
Pepper	2,361
Milk*	3,730
Cow**	4,115
Heifer and steer***	3,253

G.3 Processing and Storage Facilities

A total of 18 rice mills are installed within the Study area. In the Dominican Republic, rice mill with drier is called as "factoria" and that without drier as "molino" and following this classification practice, the said 18 rice mills are divided into 4 "factoria"s and 14 "molino"s. Of four rice mills with drier, one has been operated by the Limon del Yuna Agricultural Federation (FALY) since 1992. Apart from these four mills, one large-scale mill with drier is found both in Villa Riva and in Arenoso. Furthermore, another 18 rice mills equipped with drier are located within the influential area of the AGUPO project, although 6 of them are out of operation. Most of "molino"s or small-scale rice mills have installed the same milling machine made in Taiwan (trademark: TAKAYAMA, horse power: 15 HP, milling capacity: 650-750 kgs/hour and RPM: 900) . Four of these small-scale mills render only milling services for farmers.

The capacity of each rice mill in the Study together with that in Villa Riva and at Arenoso is as summarized in Table 3.13.8. As shown in this table an integrated milling capacity of rice mills in the Study area reaches 13.73 tons per hour (calculated paddy basis), and if included

rice mills in Villa Riva and Arenoso, the same capacity is to be elevated to 20.16 tons per hour. Referring to the information registered at INDRHI's regional office, the peak harvest month in the Limon del Yuna area come to November when approximately 5.5 thousand tons of paddy are harvested. For processing 5.5 tons of paddy a month, an integrated capacity of 27.5 tons/hour (5500 ÷ 25 ÷ 8 = 27.5) is required for rice mill. This calculation draws the conclusion that the existing facilities in the Study area can not comply with processing of the whole of the paddy to be harvested within the area at the peak harvest season.

Location of rice mills in the Study area is illustrated in Fig. G.3.1.

Regarding to storage facility of grains, there are two government-owned (former property of INESPRE and now transfer to the BAGRICOLA) silos in the neighborhood of the Study area: one in Villa Riva and the other at Arenoso, but they have been abandoned in vain after the withdrawal of INESPRE in marketing of rice.

It is worth while adding that a rice processing and storage complex project has just inaugurated in March 1995 at El Pozo area under the technical and financial assistance rendered by the Government of Italy. This project entitled as "Consorcio Cooperativo Arrocero El Pozo de Nagua-El Pozo, Nagua Rice Cooperative Consortium" is implemented to benefit 3,500 farmers affiliated with 21 cooperatives and cultivating a total of 7,550 ha of paddy fields, and to generate direct job opportunity for 500 persons with a total cost of US$ 20 million (US$ 19.4 million are donated and loaned by the Government of Italy) approximately. The purpose of this project is to produce high-quality rice seeds, to purchase and paddy from settlers of IAD's agrarian reform project area at El Pozo for processing them and to store and market processed rice. The project also aim to process sub-products of rice for their better utilization. At the initial stage for operation of the project, transfer of the technology will be made from Italian experts as well as Dominican public agencies consist of BAGRICOLA, SEA, IAD, INDRHI, INESPRE and IDECOOP (Cooperative Development and Credit Institute), but the operation and management of the project shall be entrusted to the El Pozo Cooperative Consortium in all aspects.

Besides rice mills, there are only a few small dairy processing plants to produce cheese in the Study area.

G.4 Constraints on Development of Marketing and Processing Plan

Paddy production is the mainstay in the Study area, so the greater portion of transaction related with agro-products there is concentrated on this grain. Production of paddy at the national level has been inconsistent and the country was obliged to import this product for eight years among the past decade (1984-1993). And, at present, suffered from drought predominated over the country last year, the Government through the National Rice Commission approved to import rice (in the Dominican Republic, importation of rice is subject to approval by the Government). It is foreseen that the situation would not be improved this year, because water resources needed for irrigation still remain deficient and, under the circumstances, INDRHI recommended not to cultivate paddy in some irrigation areas.

Although the supporting price for paddy was repealed in 1986, the Government persists to intervene in the market advertising reference price so that the negotiation of the grain between the buyers (rice mills) and farmers should be made based on this price. In such manner, the farm-gate price of paddy in this country is kept in higher and stable level in comparison with that at international market; the prevailing farm-gate price of RD$ 540/fanega, equivalent to RD$ 4,500/ton in paddy or RD$ 7,500/ton (US$ 582.75/ton) in milled rice, is roughly estimated to be twice as high as the FOB price of rice at international market.

Paddy produced in the Study area is sold and processed at rice mill located within and adjacent to the area. In the Study area, a total of 18 rice mills are operating and an integrated capacity of these installations reaches 13.73 tons per hour calculated based on paddy. The Study team estimates that the total volume of paddy produced at the peak harvest season is around 27 tons per day, thus nearly half of the harvests at the peak season.

Constraints associated with marketing and processing of paddy may be resumed as follows.

- Farm-gate price of paddy in the Dominican Republic is comparatively elevated in comparison with the international market owing to the governmental policy to protect farmers engaging in production of the grain. With a progress of world-wide tide for opening markets to foreign products, domestic rice farmers would be sacrificed greatly if this high pricing policy shall be maintained in the future.

- Although the Government, through BAGRICOLA, has established policies to facilitate construction of rice mills from the part of farmers organization, in particular, at agrarian reform project areas, but getting finance from BAGRICOLA for this purpose is not easy being required complicated procedure and prolonged period.

- Only 4 of 18 rice mills existing in the Study area are equipped with drier; rice mills without drier dry paddy in the sun without attaining higher rate of drying under higher rainfall condition of the area, which causes to produce inferior quality of milled rice.

- The quality of milled rice is classified in accordance with criteria (mainly based on the proportion of spilt grain) established by BAGRICOLA and although, there were five categories in terms of quality classification until 1993, they are reduced to two in 1994, facing with difficulty and complexity in assessment. This situation discourages rice mills to produce better quality milled rice.

- The determination for the content of moisture and foreign materials to be made by purchasing agents of paddy is made not by means of laboratory test but by traditional method called "al ojo (by eye)". There is no form ground how the determination is made.

- Existing rural organization such as federation, cooperative and association are not working effectively for the purpose of better marketing of paddy as is the case of the Cooperative El Pozo.

Production of crops other than paddy is small in volume and inconsistent. Marketing channel for traditional crops such as cacao, plantain and coconut is relatively firmly consolidated and their farm-gate prices are less variable. Transaction for the rest of crops represented by vegetables, tuberous root crops and beans is made between farmers and intermediaries and the latter has an absolute power to determine the price, which is subject to sharp fluctuation. The marketing system related with crops except paddy presents the following constraints:

- There is no wholesale market in the vicinity of the Study area and farmers do not have vehicles to transport their products, so farmer have only to wait for coming of purchasing agents. This situation brings substantial loss of crops in post-harvest.

- Farmers without being organized have inferior capacity in negotiating prices with purchasing agents.

- In the absence of market information system for transacted volume and prices both national and regional level, farmers are not in a position to decide their cropping plan taking advantage of escalated price.

- Under-development of road network is likely to damage fragile crops such as vegetables and fruits.

G.5 Development Concept and Objectives for Marketing and Processing plan

G.5.1 Development Concepts

The marketing and processing plan for agricultural products shell be delineated in due compliance with agricultural production plan. In addition, the following aspects shall be taken into account in formulating the plan.

- Actual situation for marketing and processing of the products in the Study area, especially, constraints presented by the sector.

- Marketing circumstances not only at regional and national level, but also at international one.

- Government policy on development of the marketing sector.

- Perspective for supply and demand of the products in the future.

- Establishment of duly defined objectives and identification of beneficiaries of the plan

G.5.2 Development Objectives

The plan shall have an objective to reconcile the interests of farmers and consumers by means of reducing unnecessary intervention of commercial agents and promoting aggressive participation of farmers in the marketing sector. This plan also have an objective to develop agro-industry with in the area so as to generate more job opportunity and to decelerate the progress of exodus of local population to urban areas.

G.6 Formulation of theDevelopment Plan

G.6.1 Perspective of the markets and justification for development the plan

With implementation of the present agricultural development project, the output of paddy will have substantial increase in such rate as 200 % for the Alternative A, 235 % for the Alternative B-1, and 225 % for the Alternative B-2. Even the actual production level, an integrated milling capacity of the existing installations is so deficient that about half of the production within the area are processed at rice mills located out of the area. Furthermore, it is worth while to indicate that most of rice mills (14 out of 18) in the area are small-scaled and poorly equipped ones and milled rice produced there is inferior in quality in comparison with those produced at modernized rice mills. Under the circumstances, it is proposed to develop within the area some rice processing facilities equipped with advanced installations to meet with increase in production and to improve quality of milled rice.

In view of strengthening existing rural organizations as well as distributing benefits to be expected by marketing and processing channel to farmers, these facilities shall be owned and operated by federation or cooperative organized by paddy producing farmers.

Under the pressure to open domestic market for foreign products within the context of GATT and, eventually to compete with proposed imported products, rice sectors including farmers and processing agents are requires to make effort to produce internationally competitive grain both in price and quality.

No marketing and processing plan will be touched with crops other than rice, because their production is small in output and will not be increased with implementation of the Project

G.6.2 Formulation of the Development Plan

(1) General description of the plan

The agro-products marketing and processing plan contemplates to construct rice processing facilities equipped with innovated machinery within the Study area which permits to cope with proposed increase in paddy production and to produced improved quality of milled rice. The facilities will be administrated and operated by farmers' organization to comply with the objectives of this plan. At present, five organizations called "Cooperativa" which aim at

performing cooperatism and one organization called "Federacion" have been formed without conducting any substantial activity up to date. Thus these six organizations shall be proposed executing agency of rice milling facilities.

(2) Outline of the facilities

The scale of the rice milling facilities shall approximate the existing facility of FALY located at Guaraguao area. Each facility shall have the following outline:

Lot area

- Total area: 630 m^2
- Area for storage, drying and milling: 450 m^2
- Office: 100 m^2

Equipment and machinery

- Milling machine: 3 ton/hr (milled rice)
- Drying equipment: 100 ton/day
- Generator
- Other equipment such as hopper, moisture gauge, etc.

Vehicles and office equipment

- Truck, pick-up, motor bike
- Set of office equipment and furniture

(3) Balance for operation of rice milling facilities

It is estimated that construction cost for one rice milling facilities to be approximately RD$ 10,000,000. Provided that an average operation rate of rice milling facilities is 50% , the following annual gross income will be anticipated:

3 ton/hr. x 8 hr. x 20 days x 0.5 x 12 months x RD$ 8,700/ton
= RD$ 25,056,000

And, an annual net profit of RD$ 1,253,000 is to be expected subject to setting the rate of return to be 5%.

(4) Location and beneficiaries of the facilities

The facilities will be installed at Baraquito, La Reforma, Los Peinadores, Paraguay and La Pista where five cooperatives are located, and at La Ceiba de los Pajaros one federation is located. Direct beneficiaries of the facilities shall be 625 families in total which are affiliated member of the said six rural organizations.

G.6.3 Justification and Suggestions on Implementation of the Development Plan

The construction of the six rice milling facilities will enable to produce approximately 3,600 tons of milled rice (3 tons/hr. x 8 hrs x 25 days x 6 facilities) a month, which is equivalent to processing 6,000 tons of paddy a month. It is anticipated that the implementation of Limon del Yuna Area Agricultural Development Project will increase paddy output by nearly 20,000 tons per harvest season and the construction of six rice milling facilities will contributes to absorbing one-third of the increased output.

Apart from the above-mentioned contribution, the development of rice milling facilities is expected to promote prosperity of agro-industry within the Study area and to generate job opportunity for local population. In addition, administration and operation of the facilities by farmers' organization will activate these organizations which are actually at a standstill of function and will elevate cooperatism among their affiliated members. It is advised that rice milling facilities will expand their activities in such fields as sale of agricultural inputs and , rental of agricultural machinery, provision of credit, and once realized this expansion, farmers participated in organizations will benefited greatly. In sum, the development of rice milling facilities is justified from the viewpoint of strengthening rural organization, needless to say its direct benefit to process increased paddy.

Judging from above-mentioned explanation, it is considered that the development of rice milling facilities is justifiable. Nevertheless taking account that this kind of agro-industry development is generally alienated from public works development projects to be undertaken by INDRHI, it is suggested that the construction of rice milling facilities should be implemented by private sector, apart from the development of the present project. Because the development of agro-industry is closely related with the development of the Limon del Yuna Agricultural Development Project, the following institutional services to be rendered by governmental organizations are prerequisite for effective implementation of the plan.

- Financial arrangement for construction of facilities and operation of initial capital.
- Technical advise on proper operation of the facilities and production of improved milled rice.
- Educational campaign and training to strengthen farmers' organization.

ANNEX G : TABLES

Table G.1.1 Supply and Price of Rice

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption			Poulation***	Apparent Consumption per-capita(kg)
	Production*	Importation**	Total		
1984	357,600	0	357,600	6,101,775	58.6
1985	353,300	24,250	377,550	6,242,729	60.5
1986	327,300	72,000	399,300	6,380,973	62.6
1987	364,000	40,500	404,500	6,522,048	62.0
1988	301,900	450	302,350	6,666,111	45.4
1989	339,900	39,550	379,450	6,816,791	55.7
1990	306,200	45,350	351,550	6,970,958	50.4
1991	334,000	23,150	357,150	7,128,474	50.1
1992	405,000	3,450	408,450	7,296,371	56.0
1993	319,600	0	319,600	7,468,223	42.8

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

(2) Evolution of the Farm-gate, Wholesale and Retail Prices

	Farm-gate		Wholesale		Retail		Consumer Price Index (1984=100)
	Price (RD$/ton)	Index (1984=100)	Price (RD$/ton)	Index (1984=100)	Price (RD$/kg)	Index (1984=100)	
1984	678.4	100.00	682.0	100.00	0.77	100.00	100
1985	1,031.8	152.09	914.6	134.11	0.55	71.43	n.a.
1986	912.8	134.55	874.8	128.27	0.96	124.68	
1987	982.8	144.87	1,205.8	176.80	0.88	114.29	
1988	955.8	140.89	1,963.2	287.86	2.19	284.42	
1989	2,317.2	341.57	2,981.8	437.21	3.57	463.64	484.66
1990	4,404.6	649.26	4,564.6	669.30	5.48	711.69	914.74
1991	5,744.6	846.79	7,273.8	1066.54	8.55	1110.39	959.27
1992	7,455.0	1098.91	7,286.8	1068.45	9.28	1205.19	981.70
1993	6,115.4	901.44	6,035.6	884.99	8.09	1050.65	965.35

Source: PLAN OPERATIVO 1994, SEA
Consumer Price Index (Foodstuff) - BOLETIN TRIMESTRAL, Banco Central, Enero-Marzo 1994

TAble G.1.2 Marketing Price and Volume of Rice at Rice Milles around the Study area (Last 12 months)

Unit: Volume (Fanega), Price (RDS/Fanega)

Month	Rice Mill-1 (Arenoso)		Rice Mill-2 (Villa Riva)		Rice Mill-3 (Pichinga)		Rice Mill-4 (Nagua)		Average	
	Volume	Price	Volume	Price	Volume	Price	Volume	Price	Volume	Price
Aug./93	1,809	405.78	4,853	399.93	4,220	425.00	9,231	400.00	5,028	407.68
Sep.	1,788	407.15	4,316	398.37	4,823	427.00	9,589	410.00	5,129	410.63
Oct.	7,184	410.47	7,735	438.94	6,923	410.00	8,969	425.00	7,703	421.10
Nov.	6,539	441.66	4,977	449.22	6,646	425.00	9,842	425.00	7,001	435.22
Dic.	5,284	427.17	6,077	449.71	6,246	426.00	7,141	425.00	6,187	431.97
Jan./94	1,874	447.10	2,709	449.23	769	450.00	2,538	420.00	1,973	441.58
Feb.	697	477.36	2,211	487.12	869	460.00	2,442	470.00	1,555	473.62
Mar.	564	582.81	2,994	546.80	7,140	550.00	2,308	480.00	3,252	539.90
Apr.	1,321	587.64	8,833	586.77	7,152	580.00	2,845	570.00	5,038	581.10
May	3,373	582.46	7,302	562.84	13,648	585.00	2,446	600.00	6,692	582.58
Jun.	3,670	531.18	6,923	543.13	3,254	560.00	2,769	550.00	4,154	546.08
Jul.	1,495	554.05	6,511	554.03	1,796	565.00	2,656	565.00	3,115	559.52
Average	2,967	487.90	5,453	488.84	5,291	488.58	5,231	478.33	4,735	485.92

Table G.1.3 Supply and Price of Cacao

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption			Poulation***	Apparent Consumption per-capita(kg)
	Production	Exportation	Total		
1984	43,316	37,666	5,650	6,101,775	0.93
1985	40,462	35,184	5,278	6,242,729	0.85
1986	43,153	37,524	5,629	6,380,973	0.88
1987	42,967	37,362	5,605	6,522,048	0.86
1988	57,838	50,294	7,544	6,666,111	1.13
1989	45,544	39,604	5,940	6,816,791	0.87
1990	60,167	52,319	7,848	6,970,958	1.13
1991	44,226	38,458	5,768	7,128,474	0.81
1992	50,078	43,546	6,532	7,296,371	0.90
1993	53,346	46,388	6,958	7,468,223	0.93

Source: COMPORTAMIENTO DE LA PRODUCCION, EXPORTACION Y CONSUMO LOCAL DEL CACAO, DEPARTAMENTO DE CACAO, SEA

(2) Evolution of the Farm-gate and Exportation Prices

	Farm-gate		Export	
	Price (RD$/ton)	Index (1989=100)	Price (US$/kg)	Index (1989=100)
1989	5,300.6	100.00	1.03	100.00
1990	5,565.2	104.99	0.86	83.50
1991	7,903.8	149.11	0.86	83.50
1992	7,524.6	141.96	0.81	78.64
1993	7,242.2	136.63	0.71	68.93

Source: Departamento de Cacao, SEA

Table G.1.4 Supply and Price of Haricot Bean

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption			Poulation***	Apparent Consumption per-capita(kg)
	Production*	Importation**	Total		
1984	82,600	0	82,600	6,101,775	13.5
1985	67,700	10	67,710	6,242,729	10.8
1986	47,600	6	47,606	6,380,973	7.5
1987	59,800	13	59,813	6,522,048	9.2
1988	90,300	25	90,325	6,666,111	13.5
1989	84,300	18	84,318	6,816,791	12.4
1990	58,000	9	58,009	6,970,958	8.3
1991	88,200	17	88,217	7,128,474	12.4
1992	69,300	11	69,311	7,296,371	9.5
1993	72,800	9	72,809	7,468,223	9.7

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

(2) Evolution of the Farm-gate, Wholesale and Retail Prices

	Farm-gate		Wholesale		Retail		Consumer Price Index (1984=100)
	Price (RD$/ton)	Index (1984=100)	Price (RD$/ton)	Index (1984=100)	Price (RD$/kg)	Index (1984=100)	
1984	1,568.0	100.00	2,286.2	100.00	3.07	100.00	100
1985	2,583.0	164.73	2,726.4	119.25	3.84	125.08	n.a.
1986	2,219.4	141.54	3,095.0	135.38	4.00	130.29	
1987	3,030.4	193.27	3,232.0	141.37	4.55	148.21	
1988	4,326.8	275.94	4,844.2	211.89	7.75	252.44	
1989	5,721.4	364.89	6,926.0	302.95	10.49	341.69	484.66
1990	10,106.8	644.57	11,866.2	519.04	20.26	659.93	914.74
1991	15,014.4	957.55	10,388.0	454.38	20.73	675.24	959.27
1992	16,012.6	1021.21	17,294.0	756.45	26.78	872.31	981.70
1993	19,001.2	1211.81	19,297.6	844.09	29.96	975.90	965.35

Source: PLAN OPERATIVO 1994, SEA
Consumer Price Index (Foodstuff) - BOLETIN TRIMESTRAL, Banco Central, Enero-Marzo 1994

Table G.1.5 Supply and Price of Plantain

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption			Poulation***	Apparent Consumption per-capita(kg)
	Production*	Exportation**	Supply		
1984	157,420	4,889	152,531	6,101,775	25.0
1985	165,240	2,181	163,059	6,242,729	26.1
1986	164,390	1,753	162,637	6,380,973	25.5
1987	153,680	1,549	152,131	6,522,048	23.3
1988	154,530	1,470	153,060	6,666,111	23.0
1989	193,970	4,469	189,501	6,816,791	27.8
1990	198,220	1,049	197,171	6,970,958	28.3
1991	243,100	1,504	241,596	7,128,474	33.9
1992	207,570	4,338	203,232	7,296,371	27.9
1993	238,850	1,709	237,141	7,468,223	31.8

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

(2) Evolution of the Farm-gate, Wholesale and Retail Prices

	Farm-gate		Wholesate		Retail		Consumer Price Index (1984=100)
	Price (RD$/millar)*	Index (1984=100)	Price (RD$/millar)*	Index (1984=100)	Price (RD$/kg)	Index (1984=100)	
1984	n.a.	-	97.67	100.00	0.33	100.00	100
1985	n.a.	-	123.00	125.93	0.49	148.48	n.a.
1986	162.37	100.00	133.24	136.42	0.44	133.33	
1987	184.47	113.61	192.64	197.24	0.60	181.82	
1988	258.41	159.15	304.00	311.25	0.82	248.48	
1989	254.47	156.72	316.00	323.54	1.06	321.21	484.66
1990	572.60	352.65	670.12	686.11	0.62	187.88	914.74
1991	940.45	579.20	940.45	962.89	3.07	930.30	959.27
1992	782.42	481.87	815.59	835.05	2.58	781.82	981.70
1993	797.89	491.40	957.13	979.96	2.69	815.15	965.35

Source: PLAN OPERATIVO 1994, SEA
Consumer Price Index (Foodstuff) - BOLETIN TRIMESTRAL, Banco Central, Enero-Marzo 1994

Note: * millar = one thousand units

Table G.1.6 Supply and Price of Maize

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption			Poulation***	Apparent Consumption per-capita(kg)
	Production*	Importation**	Supply		
1984	102,800	200,000	302,800	6,101,775	49.6
1985	73,600	288,700	362,300	6,242,729	58.0
1986	51,900	187,450	239,350	6,380,973	37.5
1987	47,300	164,500	211,800	6,522,048	32.5
1988	63,000	439,450	502,450	6,666,111	75.4
1989	50,600	345,650	396,250	6,816,791	58.1
1990	43,800	484,700	528,500	6,970,958	75.8
1991	47,700	450,000	497,700	7,128,474	69.8
1992	50,900	354,150	405,050	7,296,371	55.5
1993	56,800	518,150	574,950	7,468,223	77.0

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

(2) Evolution of the Farm-gate, Wholesale and Retail Prices

	Farm-gate		Wholesale		Retail		Consumer Price Index (1984=100)
	Price (RD$/ton)*	Index (1984=100)	Price (RD$/ton)*	Index (1984=100)	Price (RD$/kg)	Index (1984=100)	
1984	360.0	100.00	682.00	100.00	0.55	100.00	100
1985	445.0	123.61	516.80	75.78	0.75	136.36	n.a.
1986	496.20	137.83	516.80	75.78	0.75	136.36	
1987	503.60	139.89	562.20	82.43	0.77	140.00	
1988	930.80	258.56	1147.40	168.24	1.63	296.36	
1989	863.40	239.83	1200.80	176.07	1.94	352.73	484.66
1990	2008.60	557.94	2056.00	301.47	3.16	574.55	914.74
1991	2529.80	702.72	2796.20	410.00	4.19	761.82	959.27
1992	2568.40	713.44	2954.00	433.14	4.77	867.27	981.70
1993	2714.20	753.94	2839.60	416.36	4.75	863.64	965.35

Source: PLAN OPERATIVO 1994, SEA
Consumer Price Index (Foodstuff) - BOLETIN TRIMESTRAL, Banco Central, Enero-Marzo 1994

Table G.1.7 Supply and Price of Tuberous Root Crops

(1) Domestic Supply

Unit: Ton

Year	Supply for Domestic Consumption									Population***	Apparent Consumption per-capita(kg)		
	Cassava			Sweet Potato			Yautia						
	Production*	Exportation**	Supply	Production*	Exportation**	Supply	Production*	Exportation**	Supply		Cassava	S. Potato	Yautia
1984	129,300	7,340	121,960	58,100	9,760	48,340	30,200	19,844	10,356	6,101,775	20.0	7.9	1.7
1985	125,100	6,338	118,762	49,800	9,979	39,821	46,900	22,151	24,749	6,242,729	19.0	6.4	4.0
1986	117,700	6,397	111,303	38,200	10,169	28,031	36,300	20,807	15,493	6,380,973	17.4	4.4	2.4
1987	107,900	5,866	102,034	41,600	8,851	32,749	36,900	15,800	21,100	6,522,048	15.6	5.0	3.2
1988	139,400	5,667	133,733	46,800	9,595	37,205	46,800	16,988	29,812	6,666,111	20.1	5.6	4.5
1989	129,400	6,553	122,847	35,200	10,465	24,735	60,000	20,561	39,439	6,816,791	18.0	3.6	5.8
1990	142,500	6,671	135,829	39,000	9,471	29,529	31,600	15,146	16,454	6,970,958	19.5	4.2	2.4
1991	147,600	2,365	145,235	49,600	9,083	40,517	21,500	13,920	7,580	7,128,474	20.4	5.7	1.1
1992	157,200	1,595	155,605	58,100	8,858	49,242	31,200	13,838	17,362	7,296,371	21.3	6.7	2.4
1993	107,800	1,193	106,607	34,500	8,941	25,559	31,200	12,569	18,631	7,468,223	14.3	3.4	2.5

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

(2) Evolution of the Farm-gate Price

	Cassava		Sweet Potato		Yautia		Consumer Price Index (1984=100)
	Price (RD$/ton)*	Index (1984=100)	Price (RD$/ton)*	Index (1984=100)	Price (RD$/kg)	Index (1984=100)	
1984	192.2	100.00	202.2	100.00	432.0	100.00	100
1985	426.8	222.06	231.2	114.34	566.0	131.02	n.a.
1986	372.2	193.65	342.8	169.54	635.2	147.04	
1987	473.4	246.31	414.4	204.95	937.0	216.90	
1988	617.0	321.02	549.2	271.61	1,706.2	394.95	
1989	819.6	426.43	590.4	291.99	1,227.8	284.21	484.66
1990	1,201.4	625.08	1,264.0	625.12	3,936.6	911.25	914.74
1991	2,482.4	1291.57	2,047.0	1012.36	5,573.0	1290.05	959.27
1992	1,340.2	697.29	1,500.8	742.24	4,746.2	1098.66	981.70
1993	2,699.4	1404.47	2,246.6	1111.08	6,793.0	1572.45	965.35

Source: PLAN OPERATIVO 1994, SEA
Consumer Price Index (Foodstuff) - BOLETIN TRIMESTRAL, Banco Central, Enero-Marzo 1994

Table G.1.8 Supply of Vegetables

Unit: Ton

Year	Supply for Domestic Consumption									Population***	Apparent Consumption per-capita(kg)		
	Squash			Pepper			Egg Plant						
	Production*	Exportation**	Supply	Production*	Exportation**	Supply	Production*	Exportation**	Supply		Cassava	S. Potato	Yautia
1984	12,500	4,470	8,030	6,850	5,929	921	3,550	1,708	1,842	6,101,775	1.32	0.15	0.30
1985	17,350	4,456	12,894	6,550	6,022	528	5,300	2,165	3,135	6,242,729	2.07	0.08	0.50
1986	21,600	4,561	17,039	6,750	6,715	35	6,100	2,648	3,452	6,380,973	2.67	0.01	0.54
1987	18,500	3,575	14,925	10,200	4,448	5,752	9,100	3,377	5,723	6,522,048	2.29	0.88	0.88
1988	15,650	6,221	9,429	13,900	4,489	9,411	11,150	3,447	7,703	6,666,111	1.41	1.41	1.16
1989	27,600	5,904	21,696	9,450	2,137	7,313	8,950	2,252	6,698	6,816,791	3.18	1.07	0.98
1990	17,600	5,519	12,081	8,000	1,977	6,023	5,250	965	4,285	6,970,958	1.73	0.86	0.61
1991	14,600	3,103	11,497	8,350	1,879	6,471	5,950	651	5,299	7,128,474	1.61	0.91	0.74
1992	12,700	1,842	10,858	14,700	1,971	12,729	12,600	819	11,781	7,296,371	1.49	1.74	1.61
1993	9,150	2,171	6,979	13,350	2,523	10,827	8,650	872	7,778	7,468,223	0.93	1.45	1.04

Source: * and ** PLAN OPERATIVO 1994, SEA
*** Projection prepared by ONAPLAN

Table G.1.9 Supply and Apprent Consumption of Milk

Year	National Production* (million liter)	Importation of Milk In Powder** (Ton)	(Conv. in million liter)	Total National Supply (million liter)	Population***	Apparente Consumption per-capita (l)
1983	324	10,280	82.2	406.2	5,964,003	68.1
1984	302	12,301	98.4	400.4	6,101,775	65.6
1985	321	8,908	71.3	392.3	6,242,729	62.8
1986	330	12,946	103.6	433.6	6,380,973	68.0
1987	280	8,944	71.6	351.6	6,522,048	53.9
1988	300	11,400	91.2	391.2	6,666,111	58.7
1989	358	11,200	89.6	447.6	6,816,791	65.7
1990	362	18,000	144.0	506.0	6,970,958	72.6
1991	363	17,000	136.0	499.0	7,128,474	70.0
1992	367	20,000	151.4	518.4	7,296,371	71.0

Source: * SEA, Banco Agricola
** ONE
*** Projection prepared by ONAPLAN

Table G.3.1 Features of Existing Rice Mills

(1) Within the Study Area

Type of Installation	Location	Year of Establishment	Capacity of Installation			Processing Volume (Ton/month)
			Storage (Ton)	Drying (Ton/day)	Milling (Ton/hour)	
Rice Mill with Drier (Factoria)	Barraquito	1990	187	8.7	2.1	7.5
	Guaraguao	1989	1,200	92.0	2.1	352.0
	La Ceiba Arriba	1992	100	7.4	0.8	4.5
	Paraguay	1980	900	22.5	2.8	157.0
Rice Mill without Drier (Molino)	Baraquito	1989	7	0.5	0.5	13.5
	Baraquito	1989	18	0.9	1.1	27.0
	Borojol*	1990	-	-	0.3	1.8
	Guaraguao	1987	7	1.4	0.4	9.0
	Guaraguao*	1990	-	-	0.4	13.5
	Guaraguao	1990	9	0.4	0.7	8.0
	La Ceiba Abajo	1992	18	0.9	0.5	0.2
	La Ceiba Abajo*	1992	-	-	0.4	0.8
	La Ceiba Abajo	1993	5	1.8	0.7	9.0
	La Reforma*	1974	-	-	0.4	1.3
	La Reforma	1990	5	2.7	0.7	40.0
	Los Peinadores*	1974	-	-	0.5	4.5
	Paraguay	1990	30	1.6	0.4	13.5
	Pista	1989	27	0.3	0.3	24.0

Note: * Milling service to farmers only

(2) In the Neighborhood of the Study Area

Type of Installation	Location	Year of Establishment	Capacity of Installation			Processing Volume (Ton/month)
			Storage (Ton)	Drying (Ton/day)	Milling (Ton/hour)	
Rice Mill with Drier (Factoria)	Arenoso	1991	3,750	81.0	1.48	356
	Villa Riva	1988	4,000	108.0	4.95	688
	El Barrio	1991	1,250	27.0	2.00	238
	El Factor	1969	1,350	54.0	3.00	173
	El Factor	1993	625	37.8	3.00	159
	El Pozo	1982	432	21.6	1.20	86
	Km 3 Nagua	1987	1,750	72.0	2.80	n.a.
	Km 5 Nagua	1993	1,000	36.0	4.00	136
	Km 51/2 Nagua	1992	1,250	41.0	2.50	392
	La Pichinga	1986	188	30.0	1.50	132
	La Pichinga	1983	1,000	36.0	1.25	397
	Los Coquitos	1989	250	34.2	2.50	196
	Los Limones	1991	625	37.2	1.75	115
	Telanza	1988	375	54.0	1.88	102

ANNEX G : FIGURES

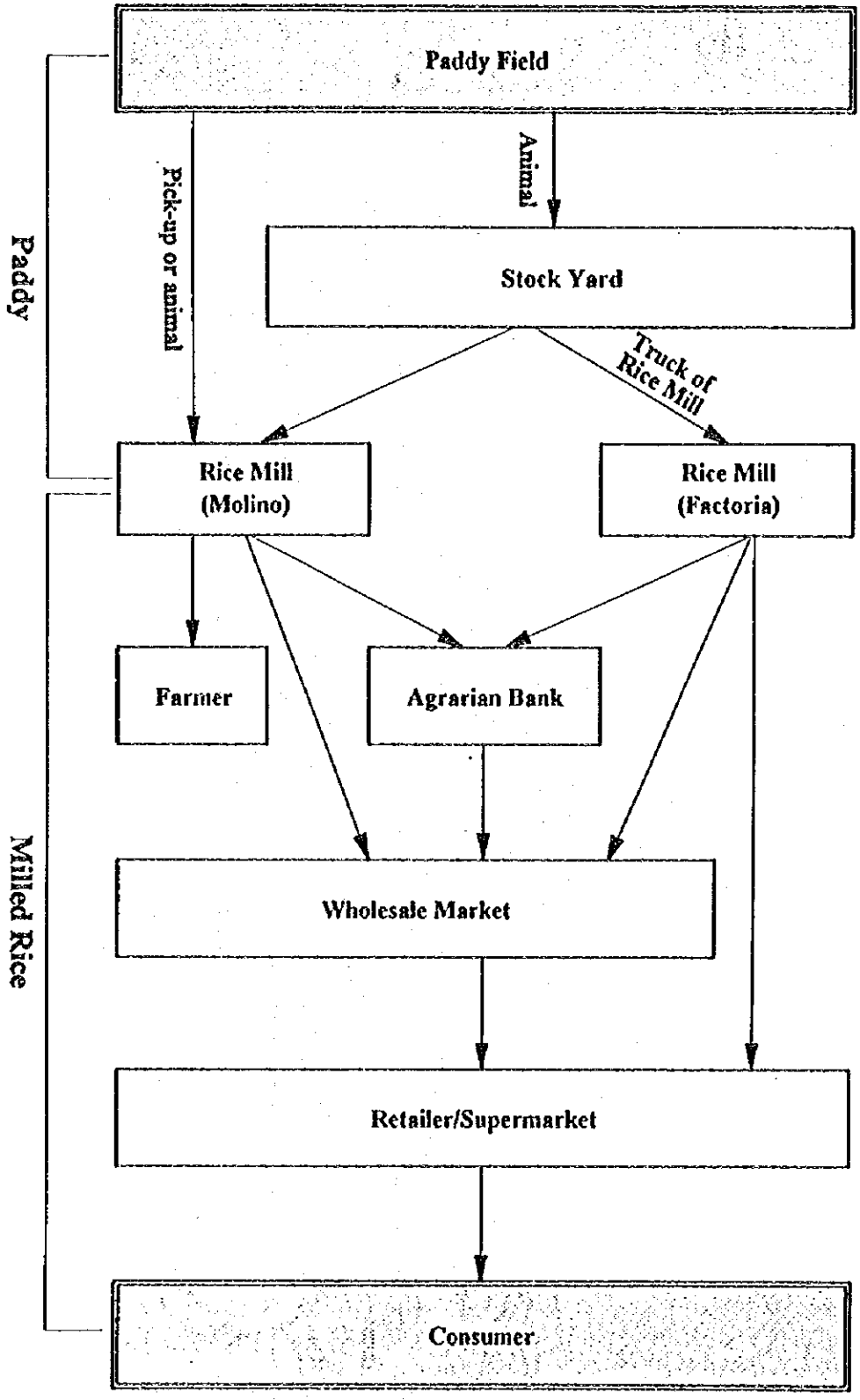

Fig. G.1.1 Marketing Channel of Rice

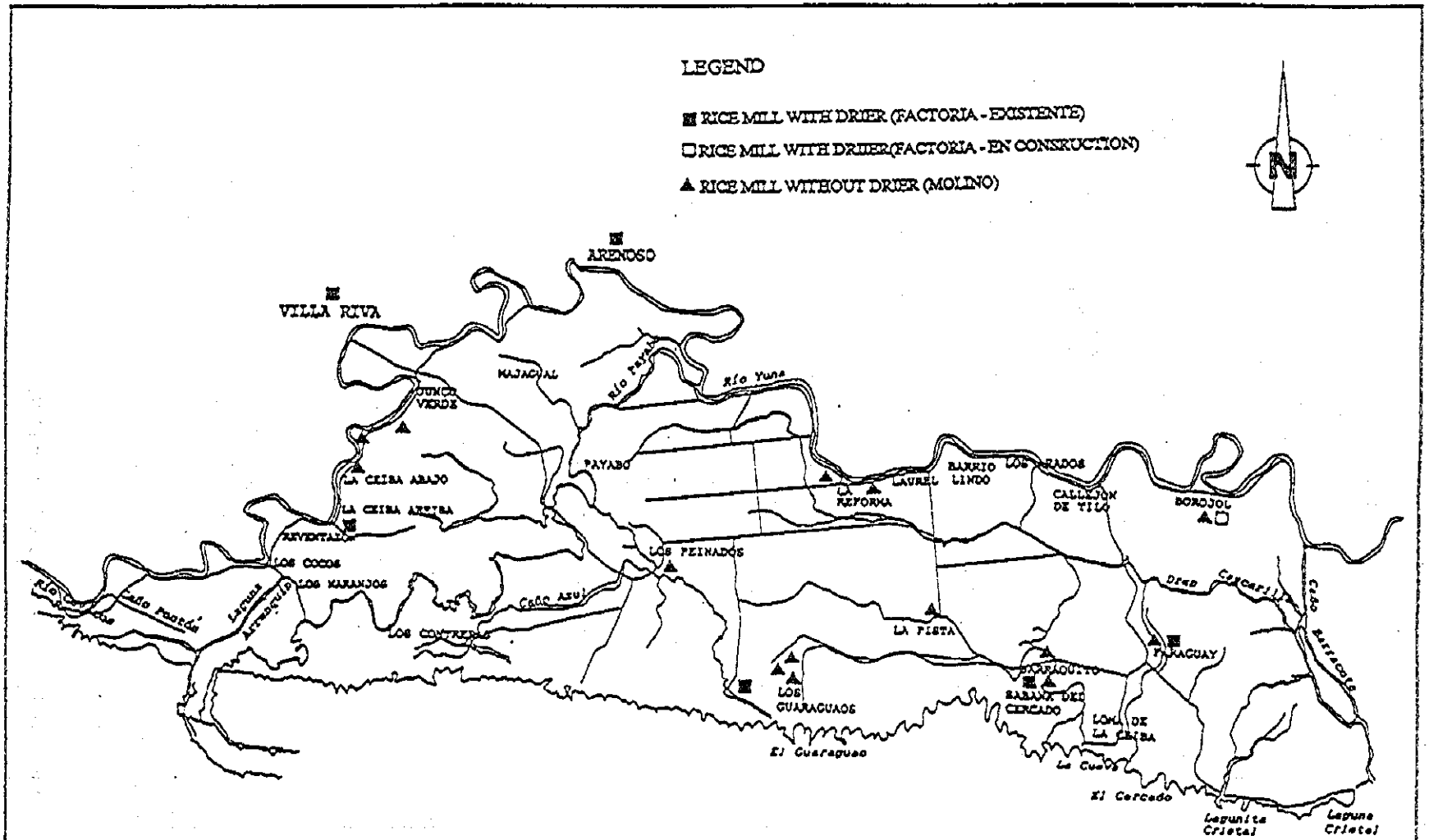

Fig. G.3.1 Location of Existing Rice Mills

ANNEX H : INSTITUTIONAL SUPPORTING SERVICES

ANNEX H : INSTITUTIONAL SUPPORTING SERVICES

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ANNEX II: INSTITUTIONAL SUPPORTING SYSTEM AND RURAL ORGANIZATION

II.1 Responsible Institutions for the Supporting Services

In the Study area, the following governmental agencies are rendering institutional services to enhance and stabilize agricultural as well as to ameliorate living standard of farmers. These institutional services, nevertheless, have not produced anticipated benefits due to lack of both manpower and equipment/materials attributable to insufficient budgetary allocation.

Ministry of Agriculture (SEA):

SEA is responsible for preparing and executing agricultural development policies and takes charge in conservation and utilization of natural resources. SEA's eight regional offices within the country are established to put the policies into force and promoting agricultural activities. The Study area is under control of San Francisco de Macoris regional office, which covers the northeast region of the country comprising 4 provinces. Services provided in this regional office are divided into two departments: agriculture and livestock. Each province has its zone office supervised by the regional office and a total of 18 sub-zone offices are attached there zone offices. In these offices, approximately one hundred extension workers are working to render technical assistance services to farmers. The Study area is under direct control of Limon del Yuna and Villa Riva sub-zone offices.

Dominican Agrarian Institute (IAD):

IAD is an implementing agency of agrarian reform project distributing national lands free of charge to landless candidates who desire to engage in agricultural production and renders socio-economic and technical supporting services to settlers so that their living standard should be improved. For materializing this function IAD has established 11 regional offices and 6 decentralized project offices. In 1967 IAD established new settlement project office for "PROYECTO DESCENTRALIZADO AC-46 LIMON DEL YUNA" at La Reforma. The office is under direct control of IAD's head quarters, taking account of the magnitude of distributed area (7,000 ha) and the number of settlers (2,000 families). The office extends the following services to the settlers:

- to promote forming organization among settlers;
- to instruct and extend farming technique;
- to mechanize cropping culture; and
- to coordinate for getting agricultural credit.

National Institute of Hydraulic Resources (INDRHI):

INDRHI, an agency being in charge of water control, irrigation and drainage, performs functions to study, plan and implement water resources development (including groundwater development), power generation, irrigation . drainage and flood control project, and administrates and supervise irrigation and water control

facilities except for power generation facilities. The institute divides whole the country into nine districts by river basin. The Study area belongs to the Yuna River Lower Basin district office located in Nagua and is directly controlled by Limon del Yuna branch office at Barraquito and Villa Riva branch office, which are undertaken maintaining canals and collecting water charges.

Agricultural Bank (BAGRICOLA):

The BAGRICOLA is a national financing agency to render agricultural credit to farmers, in particular those who are without mortgage. Credits of the Bank are rendered to beneficiaries of the agrarian reform projects under coordination of IAD and to private farmers under assessment of the Bank's agricultural engineers. Study area is under jurisdiction of BAGRICOLA's two branch offices at Arenoso and Villa Riva. The Arenoso office was established in 1974 and is in charge of Limon del Yuna area. The Villa Riva office was established in 1980 and is in charge of the left side of the Payabo river.

Agricultural Materials Sales Center (CVMA):

CVMA's office within the Study area has a function to stabilize prices selling agricultural materials such as fertilizer, pesticides, farm tools and small agricultural implement to farmers.

Rice Research Center (CEDIA):

CEDIA, a decentralized organization of SEA having an office and an experimental farm in Bonao, is in charge of research on improvement of rice variety and rice production technology and has nine divisions (agronomy, seed genetic, breeding, seed production, soil and fertilizer, pest control, water management, laboratory of seed, and mechanization. The branch office at El Pozo is producing husk of rice). CEDIA has developed high-yielding seeds such as Juma 57 and Juma 58; in particular, the latter is highly suitable to agro-climatological conditions of the Dominican Republic and is sowed in 80% of paddy fields throughout the country and 90% of the same in the Study area.

The organization chart for each agency is as per Fig. H.1.1~H.1.5.

H..2 Features of Institutional Services

H.2.1 Agricultural extension services

Extension services of agricultural technology is currently provided by SEA's sub-regional offices and IAD's project office. SEA's services coverage area is divided by the Payabo River; Limon del Yuna office is in charge of the right margin area and the left margin area is covered by Villa Riva office. Meanwhile, IAD's services, which are provided exclusively to settlers, are under the solo responsibility of the Limon del Yuna project office, although its branch office located at La Ceiba de los Pajaros covers partly the left margin area of the Payabo River.
Services rendered by these office include:

- Advise in selection of proper crops;
- Transfer of technology on cropping technology;
- Application method of fertilizer and agricultural chemicals;
- Demonstration of cultivating method at farms;
- Advice in improvement of living environment;
- Coordination for getting agricultural credit;
- Distribution of seed and seedling except rice (SEA); and
- Assistance in improvement of communication network.

Major constraint related with extension services is lack of transportation which limits the frequency of visiting farmers to render services. In addition, deficient office equipment prevents officers to perform adequately collection and administration of data and information. Another aspect of problem concerning with extension services is that, even if the coverage area of these two institutions coincides, there is no substantial coordination between them in relation with exchange of opinions on method and information of the services so that an efficient services may be realized.

H.2.2 Seed multiplication and distribution

In the Dominican Republic, seed multiplication and distribution are undertaken by the following six research centers:

- Agricultural and Livestock Development South Center (CESDA)
- Agricultural and Livestock Development North Center (CENDA)
- Rice Research Center (CEDIA)
- Arid Zone Research Center (CIAzA)
- Saline Soil Recovery Research Center (CIRESS)
- Cacao Technology National Center (CENDATECA)

Of the above-mentioned research center, CEDIA is considered to be the most important one, because only CEDIA is concerned with rice production. CEDIA has developed new varieties of rice named as Juma-57 and Juma-58, which are highly appreciated by farmers throughout the country, Especially, Juma-57 is considered to be an optimum variety in the Deminican Republic and is sowed in about 80% of paddy fields in the Study area.

H.2.3 Agricultural credit

In realizing rice production, farmers in the Study area depend on finance provided by BAGRICOLA, commercial banks, agricultural federations, rice mills, etc. Beneficiaries of the agrarian reform project who do not possess mortgage for the loan have no access to agricultural credit except for that of BAGRICOLA. In getting loan form BAGRICOLA, farmers without mortgage are requested to be a member of any organization subject to IAD's coordination to the matter. On the other hand, private farmers need to be investigated their financial capability to repay loan by bank's officer under the guideline of BAGRICOLA or commercial banks.

The amount financed by BAGRICOLA at Arenoso and Villa Riva in 1993 and their shares for the Study area are as follows:

Arenoso: RD$51.6 million
(95% for the settlers in Limon del Yuna area)
Villa Riva: RD$17.0 million
(80% for the farmers at Ceyba de Los Pajaros area)

The agricultural credit provided by BAGRICOLA's branch office at Arenoso by purpose of use is shown in the Table H.2.1.

The interest rate, commission and other levies accrued to the BAGRICOLA's agricultural credit is set to be 18% (12% for interest, 2% each for legal procedure, technical assistance, and commission) per annum as of 1994. The loan period for annual crops is six month. Loaded interest is imposed on dilatoriness of repayment in such manner as: 0.5% for shorter than 2 months, 1.0% for 2-4 months, and 2.0% for longer than 4 months. The approval for loan is made by the branch office (Fewer than RD$ 400,000; period: about three weeks), by the regional office (RD$ 400,000 - 600,000; period: about one month) and by the head office (More than RD$ 600,000; period: about three months).

The debtors of BAGRICOLA are not necessarily satisfied with the bank's finance and their complains may be summarized as follows:

- They are burdened with higher rate of interest and other levies,
- The interval between application and disbursement of loan is too prolonged,
- The standard for approval of loan is relatively strict,
- The loan term is too short.

II.2.4 Operation and maintenance system of irrigation and drainage facilities

(1) Operation and maintenance organization and method

The irrigation and drainage facilities in the Study represented by intake works, trunk and lateral canals, diversion works and gates area are operated and maintained under responsibility of INDRHI's Lower Yuna District Office and Limon del Yuna Project Office with following equipment and staff.

Description	Number of Person in Charge
Equipment:	
Backhoe: 5 units	13
Dragline: 2 units	4
Bamboo reforestation at the Yuna river's banks:	10
Administration:	
Engineer	2
Driver, Secretary, etc.	14
Water charge collection:	4
Labor:	3
Total	50

The equipment cited above are used for excavation purpose, but their physical deterioration has prevented from functioning well. Furthermore, deficient personnel engaged in O/M services results in inadequate level of the services, and as a consequence, water uses' dissatisfaction has widespread. There is no organized water users' association in the area, so O/M activities from the part of water users are scarcely made. All these situations have brought inefficient distribution of irrigation water and poor drainage at paddy fields, which in turn has lowered land productivity.

(2) Water charge

Because the Government had subsidized greatly the O/M of irrigation system, the proportion of the total amount of water charge collected form water users against the total expense incurred for the O/M services had been below 20% up to 1989. From 1990 on, however, within the context of the structural reform policies, new pricing system of water charge called "factor de cobre (collection factor)" was introduced, and with putting this new system into force, the said proportion had been raised remarkably. In spite of this improvement, the proportion still remains around 70%, and this situation is explained by the fact that (1) there are not a few water users who do not perform their duty to pay water charge and (2) some portion of O/M expenses are still covered by the Government.

For farmers who owe BAGRICOLA water charge is deducted from their loan amount in advance. Water charge is calculated for respective irrigation project and is different within the same project by farm size (larger or smaller than 10 ha) and crops (paddy or other crops) to be irrigated.

In the Dominican Republic, farmers of the AGLIPO Project are imposed the highest water charge and are followed by those of the CONSTANZA Project (See Table H.2.2). So far as the Study area is concerned water charge is collected from farmers according with the following rate:

Gravity irrigation: RD$11.02/tarea = RD$175.37/ha
(Smaller than 10 ha)

Pumping irrigation: from canal	RD$13.24/tarea = RD$210.52 (60% of gravity irrigation)
Pumping irrigation: from the Yuna river	RD$5.52/tarea = RD$87.77/ha (25% of gravity irrigation)

Referring to INDRHI's record of water charge to cover 70% of the total irrigated area of the Limon del Yuna Project, the amount of water charge collected and accumulated debt for the year of 1993 are revealed in the following manner.

Collected water charge: RD$2,406,810.35
Accumulated debt: RD$5,411,429.50

An approximate double amount of the water charge to be paid is overdue.

Major reasons for being overdue are:

- Lack of financial resource to pay water charge
- Refusal to pay because water is not distributed in time of necessity

(3) *Establishment of water users' association*

Like other countries, the privatization policy which pretends to transfer functions and responsibilities of public sector to private sector is in progress in the Dominican Republic, and in line with this policy, some portion of INDRHI's responsibilities and undertakings relevant to operation and maintenance of irrigation system is being turned over to water users' association (Junta de Regantes). Legislative background of this turn-over is the "Water Law", which is examined by legal consulting committee to be placed to the Congress for ratification. The importance of this turnover policy was confirmed by the resolution promulgated by the National Agricultural Council-the top ranking organization to determine government's agricultural policy; in the article 1 of the said resolution, the Resolution No. 4/95, it was declared as "the highest priority of the INDRHI's irrigation policy shall be laid on conforming "Junta de Regantes" and decentralizing gradually the operation of irrigation system to them, which will contribute to better utilization water resources and to raising agricultural productivity of the country".

In advance to the legislation at the Congress, the trend to turn over INDRHI's irrigation system is accelerated and self-operation and maintenance of irrigation system by "Junta de Regantes" has been realized at 7 irrigation projects all over the country. The irrigated area covered by "Junta de Regantes" reach 55,000 ha in total, which represents 24% of the total irrigated area of the country (See Table H.2.3).

"Junta de Regantes" has not been established at the Study area, but is now in operation at the AGLIPO project area.

(4) Operation and maintenance of irrigation system by "Junta de Regantes"

The turn over of irrigation system from INDRHI to "Junta de Regantes" is not made drastically, but gradually; up to date the turn-over is limited to secondary and minor irrigation canals and drainage canals used to evacuate agricultural waste water, so INDRHI's responsibilities still fall on the main irrigation canal and the drainage canal to discharge flooded water.

The water users' association is generally composed of the following two organizations:

- Junta de Regantes: This organization is established to each irrigation project and shall be responsible at the end for construction, improvement, operation and maintenance of common irrigation works from intake to determined point in which irrigation water may dispose to water users. This entity shall also take charge of incorporating and collection water charge.

- Water Users' Association: This organization shall be operation unit in such aspects as distribution and delivery of irrigation water to farmers, and operation and maintenance of minor canals. This entity shall integrate "Junta de Regantes".

In irrigation project areas with "Junta de Regantes", water charges are collected not by INDRHI but by the "Junta de Regantes". Water charges are calculated based on the budget for O/M of irrigation system. It is reported that the proportion for recovery of O/M cost was improved at the irrigation areas managed by the "Junta de Regantes" in comparison their previous situation when they are managed by INDRHI.

With turnover of irrigation system from INDRHI to the "Junta de Regantes", positive effects are observed, but the O/M of irrigation system by the "Junta de Regantes" still has the following limitations:

- "Junta de Regantes" does not have access to request for loan to purchase necessary O/M machinery and equipment as well as to employ technical administrative staff.

- The proportion for recovery of O/M cost still remains low, which prevents from conducting proper O/M services.

- Water charges are included as a component of agricultural credit to farmers and are retained by the BAGRICOLA in disbursement of the credit. This retained amount should be paid immediately from the BAGRICOLA to "Junta de Regantes", but in reality is not the case and it provokes financial crisis of "Junta de Regantes".

- The manual for O/M of irrigation system is not prepared, so there is no innovated O/M services conducted by "Junta de Regantes" to improve them drastically.

H.3 Rural Organization

In the Study area, there are three types of rural organization formed by farmers: association, cooperative and federation. From 1973 on, settlers of IAD's project are obliged to affiliate themselves with any of these organizations. Features of three organizations are as mentioned below:

Association:

This organization, which came out by the Decree No. 520 (July 26, 1920), is a fundamental organization formed by small-scale settlers and the number of affiliated member ranges from 10 to 20 families. A total of 121 associations with 2,000 families have formed up to date in the AC-46 (Limon del Yuna) project area.

Cooperative

This organization, which is contemplated by the Decree No. 127 (January 27, 1964) and is composed of associations, aims to practice cooperativism. In the AC-46 project area, 5 cooperatives have been organized, although they are not working actively. These five cooperatives are:

	No. of Associations Affiliated	No. of Families Participated	Year of Establishment
Barraquito	17	145	Nov. 12, 1993
La Reforma	9	96	Nov. 9, 1994
Los Peinados	7	104	No. 9, 1994
Paraguay	9	99	Dec. 21, 1994
La Pista	10	80	Dec. 21, 1994
Total	52	524	

Federation:

A federation named as "Limon del Yuna Agricultural Federation (FALY)", which was voluntarily established at Guaraguao in 1983 following the said Decree No. 520, is composed of 42 associations with 500 families. Major activities are as follows:

- Agricultural finance;
- Technical assistance;
- Mechanization of agriculture;
- Sale of agricultural materials such as fertilizer, agricultural chemicals, rice seed, etc.;
- Purchase of unhulled rice and their drying and milling;

- Sale of hulled rice; and
- Social services.

Apart from the above-mentioned federation, another federation named as "Rosa del Duran" is being prepared for incorporation with 25 associations composed of 128 families.

II.4 Institutional Services Development Plan

II.4.1 Transfer and extension of cropping technology

In the Dominican Republic, CEDIA is responsible for research and development of technology in relation with rice cultivation. CEDIA has contributed greatly to improvement of paddy productivity throughout the country, in particular, by developing and producing quality seeds represented by Juma 57 and Juma 58 which are highly suitable agro-climatological conditions of the country. CEDIA is also conducting research on adequate cropping technology including mechanization at farm, and fruits of these efforts are exposed at its experimental farm or are introduced through its publications.

Despite the fact mentioned above, cropping technologies on paddy (planting density, application of fertilizers and agro-chemicals, etc.) developed by CEDIA have not been transferred appropriately to farmers of the Study area, which is associated with inferior level of productivity.

There may have various factors that relate with an absence of cropping technologies developed by CEDIA at farm level, but it is no doubt that lack of adequate extension services caused by shortage of extension workers and transportation constitutes the principal one. Furthermore, it is worth while to point out that, although there are two public agencies - SEA and IAD which take charge of extension services, coordination and collaboration between them are scarcely made.

Recommendations on improvement of transfer and extension of cropping technology are:

1. To establish an experimental farm administrated and operated by CEDIA within or in the vicinity of the Study area so that farmers in the area may be more accessible to innovated cropping technologies.

2. To establish a joint-committee participated by SEA and IAD so as to exchange technical issues, views and problems related to crop and livestock production between concerned technical staff of each organization. It is advised that this joint-committee should prepare extension service programs in view of rendering effective services.