8.4 ENVIRONMENTAL CONSERVATION PLAN

8.4.1 Water Quality Preservation Plan

(1) Water quality monitoring

Monitoring activities should be carried out to determine the factors that contaminate water quality in the project area. The conduct of such activities usually require the establishment of water quality parameters, monitoring points and monitoring frequencies.

(2) Water quality parameters

Water quality parameters should be able to clearly point out the causes of and prevention measures for water quality contamination. The selection of parameters should take into consideration the use of the water area and matters that are actually harmful to water quality. For example, the items that are used to indicate the standards for the quality of water for domestic use and agricultural use (paddy irrigation) should be used for the assessment of the water quality of Yuna River which is used as drinking and domestic water source, agricultural (paddy fields and uplands irrigation) and livestock water source, as well as for recreational purposes and fisheries.

Degree of turbidity (organic matter), BOD which always indicates the water's purifying ability, and COD which facilitates the measurement of the total organic load in the water will be included in the list of parameters INDRHI usually uses to monitor water for the irrigation of uplands in dry areas. The inclusion of nitrogen and phosphorus is also recommended to cope with problems on eutrophication that have surfaced in recent years, which cannot be dealt with by the use of BOD and COD parameters alone.

At present INDRHI is not capable of analysing BOD, COD, TN and TP concentrations in water. INDRHI should therefore equip itself with the equipment necessary for this kind of analysis.

(3) Monitoring points and frequency

Several points significantly affected by drainage water discharge from the project area will be selected for monitoring which will be generally carried out once a month.

8.4.2 Soil Conservation Plan

A soil conservation countermeasure should be formulated to prevent soil erosion in the huge Dole pineapple plantation in the upstream area of the Pajabo River.

As a soil erosion countermeasure, INDRHI has formulated a forestation plan at the area upstream from where a dam is to be constructed. It should however immediately formulate the same plan for the downstream area.

There is a strong possibility that the implementation of the project will adversely affect public health as it will result in increased paddy field acreage which will require more agricultural chemicals that contaminate water quality.
Improper agricultural chemical use could either kill or maim human beings. Farmers and their families should therefore be given proper guidance and education with regard to the handling and use of these lethal chemicals. Since the literacy rate in this area is low, the manner of teaching or guidance to be implemented is a major cause of concern. The measures taken to eradicate contamination by agrochemical use, e.g., impose restrictions on their sales and use (harmful ones will be prohibited from the market), will be applied at the places where these materials are produced, hence additional measures should be taken to make sure the former ones are strictly obeyed.

The Dominican Republic has very strict regulations on agricultural chemical use. The number of agricultural chemicals prohibited in this country, which is shown in Figure 8.4.1 is the largest in Central and South America. Nevertheless it is important to also create more regulations on the use of these chemicals.

In 1993, the Environmental Education Department of the Ministry of Agriculture started a seminar for farmers concerning agricultural chemical application methods. However, this seminar was cancelled due to shortage of funds.

Furthermore, it is important to educate the area residents on propper waste disposal method, and to encourage farmers to practice organic agriculture.

8.4.4 Forestation Plan

Farmers in the project area use firewood or propane gas for household fuel. The former is more widely used as the majority of the farmers in the project area cannot afford the price of propane gas. There is a possibility that the forest area of the National Park Haitises will become a future fuel source once the supply of firewood from neighboring areas is depleted. To prevent this from happening, countermeasures that would impel farmers to plant pinon cubano within their premises as a fuel source should be introduced.

8.4.5 Land Use Plan

The wetlands in the area (swamps and marshes) are habitats of snapping turtles and landing areas of migratory birds. In the formulation of the land use plan, the continued use of these wetlands should be given consideration in view of the regulation of irrigation water resource, protection of the ecosystem, and preservation of the rural landscape.

8.4.6 River Plan

The drainage plan for Pajabo River should be formulated with due consideration of the Yuna River plan. To control water resource development, it is extremely necessary to immediately prepare laws pertaining to water use as ordinances relevant to water resource development are incomplete and the jurisdiction of bureaus and agencies monitoring such development activities is unclear.

CHAPTER 9: CONCLUSION AND RECOMMENDATIONS

CHAPTER 9: CONCLUSION AND RECOMMENDATIONS

9.1 CONCLUSION

The three alternative plans proposed in the chapter 5 have been evaluated in connection with the following parameters.

	Alternative Plan A	Alternative Plan B-1	Alternative Plan B-2
Development area of paddy fields	6,650 ha	7,860 ha: to be expanded by 1,210 ha in comparison with Plan A	7,570 ha: to be expanded by 920 ha in comparison with Plan A
Increase in output of rice	36,915 ton	49,406 ton (1.34 times Plan A)	46,216 ton (1.25 times Plan A)
EIRR	14.7%	14.1%	14.2%
Re-distribu-ton of farmland	Possible to expand size of farmland	Possible to expand size of farmland	Possible to expand size of farmland
New Settlement	Not viable	A total of 400 families may be newly settled	A total of 300 families may be newly settled
Intake method of irrigation water	The great majority of irrigation water will be taken by gravity	Greater portion of expanded development area will rely on pumping system	Greater portion of expanded development area will rely on pumping system

Although the Alternative Plans B-1 and B-2 will have more development area, it is recommended to adopt the Alternative Plan A due to the following justifications.

(1). The Alternative Plan A is the most economically feasible plan among three alternative plans with highest rate of EIRR.

(2). The investment cost for the Alternative Plan A is less than the other two plans.

(3). About 200 ha of farmlands which are necessary for distributing to farmers cultivating smaller lands is also contemplated in the Alternative Plan A.

(4). The major components of the present development project is rehabilitation of existing structures and in this context, even if the plan does not envisage new settlement, it is not against the objective of the project. The issues for expansion of farmland to be distributed to beneficiaries of the agrarian reform project should be discussed in the matter of the AGLIPO area in general.

(5). Even though the pumping system proposed in the Alternative B is not large scaled one and consumption of energy in this system will not be large enough, attention should be paid to the passive attitude of the Dominican Government in employment of pumping irrigation system.

It is worth while to point out that the Alternative Plan A also comprises some extension of irrigable area by pumps as given below.

a. Paddy fields with higher land elevation: 82 ha

b. Use of return flow: Block A: 51 ha
Block B: 127 ha

The lands corresponds to above (a) will always have to be irrigated by pumps, meanwhile those corresponds to (b) may be irrigated by gravity in time of abundant availability of water resources.

The total number of farms in the Study area is estimated to be 2,676, of which 2,100 are settlers of agrarian reform project and the remaining 576 are land owners of private farm. It is predicted that a total of 2,200 farms will be benefited directly with supply of irrigation water.

Household	Agricultural	2,676
	Non-agricultural	118
	Total	2,794
Farms	Direct beneficiaries	2,220
	Indirect beneficiaries	476
	Total	2,676

9.2 RECOMMENDATIONS

(1) Earlier commencement of the project

It is advised that the project should be commenced as early as possible, the reasons of which are as mentioned below.

- As the Limon del Yuna project has been put to the final stage of development among three areas of the AGLIPO project, so farmers in this area are anxious for earlier implementation of development project.

- The AGLIPO II project is scheduled to be commenced in 1995. If the Limon del Yuna project is to be implemented in parallel with the AGLIPO II project, it would contribute to 1) alleviating farmers' dissatisfaction on the final development of the area, and 2) INDRHI's rational project implementation.

- An improvement of paddy productivity would not be realized following prevailing whimsical method for maintenance of irrigation system.

- There is no practical proposal but for agricultural purpose in development of the area.

- It is very timely to develop the area in this moment, because the Dominican Government is promoting to organize water users' association at irrigation project areas.

(2) Construction of Rice Mill

The construction of rice mill is alienated from the components to be developed under the present project, because this kind of development works has different characteristics from that of public works for agricultural infrastructures. Nevertheless, the development of agro-industry is highly anticipated not only to comply with increase of paddy production but also to strengthen rural organization and, as a consequence, to activate local economic performance. In this connection, it is advisable that the development of rice milling facilities should be put into force in line with the implementation of the present project. Furthermore, to realize this development, it is suggested that special line of credit should be incorporated.

(3) Establishment of Exhibition Farm

One of the factors which are associated with inferior level of productivity of paddy in the Study area is an absence of adequate transfer network of technologies developed at CEDIA. Bearing this situation in mind, it is proposed to establish an exhibition farm so that farmers in the area may become more accessible to learning appropriate cropping technology.

(4) Agricultural Credit

The planted area of paddy "With" project will increase by 30-40% in comparison with the actual situation and it is supposed that demand for credit also expands in accordance with increase of planted area. The great majority of farmers in the area are economically handicapped settlers with little financial resources, so rendering credit services for these farmers is essential for sowing crops. Under the circumstances, it is recommended that public financing institutions should strengthen their organization both their financing capacity and manpower.

(5) Promotion of Rural Organization

The present project proposes to construct rice milling facilities and operate and administrate them by farmers' organization. This proposal will serve to activate the existing cooperatives and associations which have not virtual performance at present. In addition, if these rice milling facilities would be operated and administrated generating anticipated return, farmers' organization may expand their activities to such fields as sale of agricultural inputs, lease of agricultural machinery, provision of agricultural credits, etc., produced benefits will be distributed to members of cooperatives and associations. For the success of farmers' organization it is expected necessary supports are to be rendered by public

(6) Monitoring and Control of Environmental Aspects

In the moment no serious environmental problem is identified in the Study area. But it is foreseen that the application of agro-chemicals would be increased in parallel with an expansion of cropping area of paddy with implementation of the present project and, as a consequence, degradation of environment would be brought if farmers would not follow an adequate practice for use of agro-chemicals. Under the circumstances, it is essential that an environmental education and instruction to farmers should be carried out by concerned institutions and the environmental monitoring and control system should be established within Juntas de Regantes after implementation of the Project.

APPENDIX: FORMULATION OF THE ALTERNATIVE PLAN A' AND ITS TECHNICAL AND ECONOMIC EVALUATION

APPENDIX: FORMULATION OF THE ALTERNATIVE PLAN A' AND ITS TECHNICAL AND ECONOMIC EVALUATION

1. Foreword

Within the present Feasibility Study on the Limon del Yuna Agricultural Development Project, three (3) alternative plans (Alternative plan A, B-1, and B-2) were presented and the Alternative Plan A was selected as the optimum plan among three plans justified by its technical adaptability and economic profitability. Therefore, the Study team recommended to implement the project based on the Alternative Plan A. The aforementioned three alternative plans were formulated through exchange of opinions between the Study team and the Dominican counterpart personnel during the field works in the Dominican Republic.

Nevertheless, after completing the field works, it is reported that the settlement of persons evacuated from the Los Haitises National Park is in progress in the lands covered by pasture where it is proposed to construct a reservoir in the Alternative Plan A. Faced with this situation, the Dominican side manifested their anxiety about sacrificing the pasture land for construction of a reservoir, and the same anxiety was presented in the comments on the Draft Final Report in such manner is substitutable to the construction of the reservoir.

So as to relax the anxiety of the Dominican side cited before, the Study team has formulated a plan (the Alternative A') which aims to irrigate the same area as contemplated in the Alternative Plan A, not by constriction a reservoir but by installation a pumping station and has evaluated its technical and economic feasibility as presented hereinafter (More detailed information on the subject is as per Annex N).

2. Features of the plan

(1) Irrigation system

A pumping station to substitute for a reservoir shall be placed at about 2 km upstream of the Payabo river from its confluence with the Yuna river. Water to be pumped up from this station will be supplied to the main irrigation canal connecting the weir which is proposed at the Payabo river with the Borojor irrigation block. No substantial modification in the irrigation canal network is contemplated in comparison with the Alternative plan A.

(2) Land Use

The pasture land to be scarified by construction of a reservoir (about 140 ha) proposed in the Alternative plan A can be used for livestock farming as it is done at present.

3. Benefits and Costs of the Plan

(1) Agricultural production

The pasture land (140 ha) will contribute to increasing agricultural production with a value of RD$4.3 million (1.2%) in comparison with the Alternative Plan A.

Unit : RD$x1000/year

Crops	Without Project	Plan A	Plan A'	Balance
Paddy	146,250	312,368	312,368	0
Upland Crops	1,642	9,307	9,307	0
Sub-total	147,892	321,675	321,675	0
Beef	12,464	10,811	11,949	0
Milk	17,088	14,808	16,367	1,559
Sub-total	29,552	25,619	28,316	2,697
Total	177,444	347,294	349,991	4,256

(2) Construction Cost

As the construction cost of the reservoir is almost equivalent to that of the pumping station, so the difference of cost between the Alternative Plan A and the Alternative Plan A' is insignificant..

(Unit:RD$x1000)

	Plan A			Plan A'			Balance		
Item	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total	Local Portion	Foreign Portion	Total
Total Project Cost	109,151	190,969	300,120	108,623	191,355	299,978	-523	386	-142
(Reservoir)	(1,025)	(5,885)	(6,910)	(-)	(-)	(-)			
(Pumping Station)	(-)	(-)	(-)	(513)	(6,220)	(6,773)			

(3) Water Charge

The sum of annual operation and maintenance cost for the irrigation system will increases by 6.7% with construction of a pumping station, which will result in raising water charge by 7%.

	Plan A	Plan A'
M(RD$) : Annual total operation and maintenance cost	6,494,000	7,044,000
SA1(ha) : Irrigable area up to 10 ha	10,110	
SA2(ha) : Irrigable area larger than 10 ha	3,190	
FC(RD$) : Basic water charge	197	214
TA1(RD$) : Water charge up to 10 ha	394	428
TA2(RD$) : Water charge larger than 10 ha	788	856

(4) Project Benefits

Project's benetits for both plans are estimated at economic price in the following manner.

Unit : RD$ x1000

Items	Plan A	Plan A'	Balance
Incremental Net return of Agricultural Production	66,597	66,878	281
Avoidance of Loss in Agricultural Production	1,678	1,678	-
Total	68,275	68,556	281

(5) Project Cost

Project cost for both plans are calculated at economic price as given in the table below.

Unit : RD$ x 1000

Cost Items	Plan A	Plan A'	Balance
Construction Works	249,100	248,982	-118
Acquisition of Machinery	17,179	17,179	0
General Administration	4,350	4,350	0
Consulting Services	53,168	53,168	0
Physical Contingency	32,380	32,365	-15
Total of Investment Cost	356,177	356,044	-133
O/M Cost (year)	3,067	3,327	260
Replacement of machinery	17,179	17,179	0
Replacement of structures	3,256	3,576	320

(6) Economic Internal Rate of Return (EIRR)

The economic internal rate of return (EIRR), which was was calculated based on the above cited bernefits and cost, turned out to be equal for both plans as shown in the following table.

	Plan A	Plan A'	Balance
EIIR (%)	14.7%	14.7%	0

4. Summary

Although the benefit of the Alternative Plan A' is slightly higher than the Alternative Plan A, this increase in benefit will be invalidated by rise in operation and maintenance cost. Consequently, EIRR for both plans is almost the same. Even though the economic return is equal, the undermentioned reasons suggests that the Alternative Plan A is more benefitable than the Alternative Plan A'.

(1) About half of the pasture area is in the habit of being inundated. In such area agricultural productivity remains in relatively low.

(2) Large amount of budget might be spent annually for operation and maintenance of the pumping station. When the pump does not work, a considerable loss in harvest is anticipated. It is desirable that pump should be restricted to inevitable use.

TABLES

Table 3.4.1 List of Soil Series-New Series

New series		Former series Symbol	Area (ha)		Soil order1)	Land class for irrigation2)
Symbol	Name		Unit	Sum		
LC-1 LC-2	Los Contreras	EL(4)*** EJ(2)****	80 90	170	Vertisols	3d/4Rsd
LR-1 LR-2 LR-3 RE	La Reforma**	Pa(1)*** Ldy(4)*** Rf-1(4)*** Re(1)***	80 60 85 50	275	Vertisols	4Rsd 4Rsd 4Rsd 3d
Lac	Lacueva	VR(3)***	55	55	Vertisols	4Rsd
LM	La Majagua	Cc(2)***	60	60	Inceptisols	1
[C.Tilo-1] C.Tilo-2 C.Tilo-3	Callejon deTilo	LCo(4) LCo(2)*** AsD****	- 240 155	395	Inceptisols	3d
BC	Boca de Cevicos	JR(1)***	45	45	Mollisols	1
LV(1) LV(2)	La Verde	n.c.* n.c.*	105 15	120	Alfisols	4Rsd
G-1 G-2 G-3	Guaraguao	EL(9)*** Pr(1)**** Pr(1)****	65 190 585	840	Alfisols	3d/4Rsd
Las 600 Altas		EL(10)*** Ldy(2)***	55	55	Alfisols	4Rsd
LP-1 LP-2	Los Peynados	Re(4)*** Ldy(2)***	50 85	135	Vertisols	4Rsd
PA	La Paraguay**	Re(5)***	40	40	Alfisols	3d
Cr-1 Cr-2	Cristal	CSa***	160 75	235	Histisols	5
Total				2425		

Note * : not established in the past survey.
** : different with the former name.
*** : a part.
**** : the whole.

1) by Soil Taxonomy.
2) by Arens' Classification (1976).
[ ] : not created in the present survey.

Table 3.4.2 List of Soil Series-Corrected Former Series

Corrected former series		Area (ha)		Soil order1)	Soil sub-order1)	Land class for irrigation2)
Symbol	Name	Unit	Sum			
EJ(1)	El Junco	150	150	Vertisols	Cromudert	4Rsd
Pa(1)	Payabo	380	470	Vertisols	Cromudert	4Rsd
Pa(2)		50				
Pa(3)		40				
Ldy(1)	Limon del	90	435	Vertisols	Cromudert	4Rsd
Ldy(2)	Yuna	55				
Ldy(3)		65				
Ldy(4)		225				
VR(1)	Villa Riva	20	360	Vertisols	Cromudert	4Rsd
VR(2)		90				
VR(3)		250				
Ce(1)	Cerrejon	120	710	Inceptisols	Eutropept	1
Ce(2)		440				
Ce(3)		150				
LCo(1)	Las Cotes	285	760	Inceptisols	Eutropept	2d
LCo(2)		60				
LCo(3)		285				
LCo(4)		130				
LCo-2	Las Cotes, poor drainage fase	270	270	Inceptisols	Eutropept	2d
Eto	El Toyo	60	60	Inceptisols	Sulfaquept	5
As(1)	Agua Santa	140	455	Inceptisols	Tropaquept	5
As(2)		290				
As(3)		25				
ErI	El Rincon	305	305	Mollisols	Argiacuol	4Rsd
LCe(1)	La Ceiba	120	330	Mollisols	Hapludol	1
LCe(2)		210				
JR(1)	Janua	345	685	Mollisols	Hapludol	1
JR(2)	Rodriguez	245				
JR(3)		95				
LCe-1	Las Carreras	535	535	Mollisols	Hapludol	3d
EL(1)	El Limon	15	1100	Alfisols	Tropaqualf	3d
EL(2)		30				3d
EL(3)		65				3d
EL(4)		205				3d
EL(5)		50				3d
EL(6)		50				3d
EL(7)		15				3d
EL(8)		115				3d
EL(9)		180				3d
EL(10)		235				3sd
EL(11)		30				3d
EL(12)		110				3sd
Re(1)	Reforma	485	1000	Alfisols	Tropaqualf	3d
Re(2)		10				
Re(3)		5				
Re(4)		440				
Re(5)		60				
Rf-1(1)	Reforma	60	330	Alfisols	Tropaqualf	4Rsd
Rf-1(2)		130				
Rf-1(3)		100				
Rf-1(4)		80				
Rf-0	Reforma	205	205	Alfisols	Tropaqualf	4Rsd
Pr(2)	Paraguay	190	355	Alfisols	Albaqualf	4Rsd
Pr(3)		165				
Ba	Bavari	100	100	Alfisols	Tropudalf	1
LB(1)	La Barca	35	155	Alfisols	Tropudalf	2d
LB(2)		120				
CSa	Cano Sandoval	130	130	Histosols	Tropohemist	5
AsBY(1)*	Bajo Yuna	35	155	Incepti/ Molli/ Enti.	Eutropept/ Hapludol/ Tropofluvent	1
AsBY(2)*		120				
AsIX(1)*	Duarte	0	360	Incepti/ Histo.	Eutropept/ Tropaquept/ Tropohemist	3d
AsIX(2)*		360				
AsEto-AS-LJa*		100	100	Incepti/ Verti.	Sulfaquept/ Tropaquept/ Cromudert	5
Total			9575			

Note *: Soil association.
1) by Soil Taxonomy.
2) by Arens' Classification (1967).

Table 3.7.1 Harvested Area,Yield and Production of Upland Crops 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

*：房の数（単位は千）
**：果実の数（単位は千）

Table 3.9.1 Operation & Maintenance Cost & Collected Water Charge

(Year: 1984 ~ 1991)

Year	(1):O&M Cost (RD$)	(2):Collected Water Charge (RD$)	(2)/(1) (%)
1984	12,447,832	1,168,990	9.4
1985	12,866,985	201,679,750	15.7
1986	17,196,877	270,107,895	15.7
1987	19,361,823	377,272,899	19.5
1988	21,526,770	407,145,016	18.9
1989	21,737,758	398,004,712	18.3
1990	21,573,876	365,562,758	16.9
1991	25,841,107	1,555,953,175	71.2

Data: Yearly report of INDRHI

Table 3.9.2 Water Charge of the Dominican Republic in 1990

IRRIGATION CANALS	Charge/ha	Charge/tarea
Canales de Riego-Zona Dajabon	104.74	6.59
Canales Bajo Yaque del Norte	175.23	11.02
Canales de Riego-Zona Villa Vasquez	208.99	13.14
Canal Ulises Fco. Espaillat	312.87	19.68
Sistema de Riego-Zona Esperanza	176.13	11.08
Sistema de Riego-Zona Valverde Mao	121.52	7.64
Canal camu-La Vega	97.90	6.16
Canales-Zona de Bonao	119.66	7.53
Canales-Zona de Cotui	128.70	8.09
Canales-Zona de Constanza	332.15	20.89
AGLIPO Margen Izquierda	414.77	26.09
AGLIPO Margen Derecha	159.27	10.02
Canales-Zona de Villa Riva	175.37	10.03
Marco A. Cabral-Tramo Bani	216.38	13.61
Marcos A. Cabral Tramo San Cristobal	216.38	13.61
Canal Nizao-Najayo	214.40	13.48
Canal YSURA-Azua	214.40	11.04
Canales-Zona Padre las Casas	175.54	11.04
Canal Jose Joaquin Puello	175.54	6.98
Canales-Zona Las Matas de Farfan	110.91	6.98
Canales-Zona de Barahona	111.10	10.04
Canales-Zona de Neyba	159.60	6.90
Canales-Zona de jimani	109.69	6.90
Canal Los Olivares-Pedernales	65.81	4.14
Canales-Zona Higuey	65.91	4.14
Canales-Zona Bayaguana	146.77	9.23

Data: INDRHI

Table 3.14.1 List of Agro-chemicals prohibited of Importation and/or Trading Presidential Decree of the Dominican Republic (Number 217-91) - 1991

Name of Agrochemical	
ALDICARB (Temik)	EDB
CAMPHECHLOR (Toxaphene)	HCH/BHC
CHLORDANE	LINDANE
HEPTACHLOR	PARAQUAT
CHLORDIMEFORM	PARATHION – Ethyl
DBCP	PARATHION – Methyl
DDT	PENTACHIOROPHENOL
ALDRIN	2,4,5 – T
DIELDRIN	MERCURY CHLORIDE
ENDRIN	PHENYL MERCURY ACETATE

Table 3.14.2 Use of Agro-chemicals in the Study Area

Trade name	Chemical Name	Note	CVMA	Pri. S=1
(1) Insecticide				
Azodrin	Monocrotophos		×=2	
Bidrin	Dicrotophos	Toxic		
Carbodan 48 FW	Carbofuran			
Cypermethrin 25% EC	Cypermethrin			×
Danitol				
Decis	Deltamethrin		×②	×
Derosal	Carbendazim			
Diazinon AG-500	Diazinon			
Diazinon 60% EC	Diazinon			
Dipterex	Triclorfon		×	
Fastac	Alpha-Cypermethrin	Toxic	×①	
Furadan 3G	Carbofuran			×
Inisan	Monocrotophos		×	×
Karate 2.5 EC	Lamda-Cyhalothrin	Toxic		×
Monocrotophos	Monocrotophos		×	×
Nuvacron 60 SCW	Monocrotophos			
Patrole	Mehtamidophos		×	
Perfekthion	Dimethoate	Toxic		×
Sumithion	Fenitrothion		×③	
Sistemin 40 EC	Dimethoate	Toxic		
Pipcord				×

Trade name	Chemical Name	Note	CVMA	Pri. S
(2) Disinfectant				
Bavistin	Carbendazim			
Bencarb	Bendiocarb	Toxic		
Cuprosan	Copper, Zineb & Maneb			
Dithane M-45	Mancozeb			
Hinosan 500 EC	Edifenphos		×	
Kasumin	Kasugamycin			
Kitazin	Iprobenfos	Toxic		
Kocide	Cupric Hydroxide			
Kumulus S	Sulfur			
Manzate 200 DF	Mancozeb			
Mertect				
Polyran DF				
Tri-Miltox				
Vondozeb	Mancozeb			
(3) Rodenticide				
Klerat	Brodifacoum	Toxic		
Ratika	Chlorophacinone	Toxic	×	

Trade name	Chemical Name	Note	CVMA	Pri. S
(4) Herbicide				
Actril DS	Ioxynil octanoate 10%		×	
	& 2.4-D isooctyl 60%			
Ally				
Ametrex				
Arsenal				
Banvel-D				
Basagran	Bentazone		×	
Basta	Ammonium Gulfpsinat			
Diurex 80 SC	Diuron		×③	
Facet			×	
Fenoxal	2.4-D & MCPA			×①
Fuego	Glyphosate and Paraquat			
Furore-I			×	
Fusilade			×	
Glifosato Nortox	Glyphosate-isopropyl Amine		×①	
Gramoxone Super	Paraquat-dichloride		×	
Herbadox	Pendimethalin			
Machete	Butachlor		×	
Paradox	Paraquat			
Propadox	Propanil			
Propanil	Propanil		×	
Propanil	Propanil		×②	
Rifit	Pretilachlor		×	
Ronstar 25EC	Oxadiazon		×	
Roundup	Glyphosate		×	
Stam LV10	Propanil			
Marman 2.4-D				×②
Marman 2.4-D F06				×②

Note: CVMA (Public Sector, IAD branch office)
=1: Private Sector (Agroquimico Polanco, OUAASA)
=2: Sell well (ex. ①: first)

Table 3.14.3 Water Analysis Results

Site	1 Río Payabo (Upstream)					2 El Guayabo			3 La Cueva			4 Laguna Cristal		
Item	1 30/08/94	2 07/09/94	3 28/09/94	4 08/02/95	5 16/02/95	1 30/08/94	2 07/09/94	3 28/09/94	1 30/08/94	2 07/09/94	3 28/09/94	1 30/08/94	2 07/09/94	3 28/09/94
1 Temp (°C)	Non Survey	26 7	Non Survey	25 5	23 8	26 7	23 9	24 1	23 6	25 5	23 8	Non Survey	23 8	23 8
2 SS (mg/l)		163				19	23	12	39	23	19		50 3	50 3
3 E C (mS/cm)		158		220	222	445	432	430	383	346	348		338	340
4 SOI (mg/l)		100		135	139	280	260	274	245	220	222		220	218
5 PH		7 6		7 8	6 8	7	7 1	7 3	7 2	7 3	7 6		7 2	7 5
6 DO (mg/l)		7 3		8 1	10	8 7	9 5	9 4	10 3	9 7	10 8		9 1	10 5
7 Hard (mgCaCO3/l)		65				219	205	185	200	160	214		169	200
8 Na (mg/l)		3 68		9 66	9 08	5 52	5 06	5 75	4 8	3 7	3 9		6 97	10 1
9 K (mg/l)		-		0 78	0 45	1 95	-	0 78	1 6	-	0 78		-	0 78
10 Ca (mg/l)		20		33 6	25 2	72	74	64	70	58	70		56	70
11 Mg (mg/l)		3 6		2 3	0 4	9 6	6 8	8 4	6	3 6	6 6		4 8	6
12 Cl (mg/l)		2 9				29 8	12 4	12 4	28 9	12 4	15		0 65	12 4
13 SO4 (mg/l)		<2 0				<2 0	3 36	11	<2 0	2 2	4 6		8 64	<2 0
14 Alca (mgCaCO3/l)		100				353	315	296	324	241	291		249	251
15 RAS		0 2				0 16	0 15	0 14	0 15	0 13	0 52		0 31	0 61
16 Class		C1-S1		C1-S2	C1-S2	C2-S1	C2-S1	C2-S1	C2-S1	C2-S1	C2-S1		C2-S1	C2-S1
17 N-NO3 (mg/l)		0 26				<0 02	0 17		0 2	0 16			0 18	
18 N-NO2 (mg/l)		-				0 02	-		0 011	-			-	
19 TN (mg/l)		-		+0 98	-0 42		2 81	1 38		3 03	2 03		-	3 62
20 TP (mg/l)		0 23		+50 6	-26 4	-	0 08	0 08	0 1	0 05	0 06		0 1	0 04
21 COD (mg/l)		-		+220	+155	13 4	3 9	12 5	0	8 7	5 9		-	3 95
22 BOD (mg/l)		1 1		2 5	N D	0 2	2 7	0 5	0	0 2	2 9		1 9	0 9
23 F-Coli (MPN/l)						1500	-	910	2300		4300			4600
24 T-Coli (MPN/l)						4300	-	4300	4300		24000			4600
25 Cu (mg/l)		0 029				0 008	<0 02	0 03	0 002	<0 02	0 04		0 02	0 06
26 Hg (ng/ml)		-				1 9	0 27	0 2	1 8	0 2	0 27		-	0 41
27 Ni (mg/l)		<0 02				0 032	0 03	0 04	0 025	0 02	0 01		<0 02	0 12
28 Fe (mg/l)		1 28				0 256	0 2	<0 02	<0 02	0 32	<0 02		0 33	<0 02
29 Cr (mg/l)		0 05				<0 02	0 21	<0 02	<0 02	0 02	<0 02		0 04	<0 02
30 Discharge (m3/s)														
31 Triclofos				N D	N D									
32 Fenitrothion				N D	N D									
33 Monocrotophos				N D	N D									
34 Bentazone				N D	N D									
35 Propanil				N D	N D									
36 Butachlor				N D	N D									

Site	5 Laguna Cristal			6 Río Payabo (Downstream)					7 Gran Cascarilla				
Item	1 30/08/94	2 07/09/94	3 28/09/94	1 30/08/94	2 07/09/94	3 28/09/94	4 08/02/95	5 16/02/95	1 30/08/94	2 07/09/94	3 28/09/94	4 08/02/95	5 16/02/95
1 Temp (°C)	Non Survey		24 2	25	26 9	26 3	25 9	24 5	30 6	29 7	28 4	26 3	27
2 SS (mg/l)			38	81	71	25			8	2 3	27 5		
3 E C (mS/cm)		350	389	332	337	295	212	344	459	433	450	417	445
4 SOI (mg/l)			249	232	250	181			294	310	288	234	235
5 PH		7 2	7 7	7 6	7 5	7 9	7 2	6 5	7 4	7 4	7 7	7 9	6 6
6 DO (mg/l)			11	7 9	8 1	8 3	10 3	9 7	4 6	2 6	2 7	3 9	2
7 Hard (mgCaCO3/l)			180	154	135	204			219	200	219		
8 Na (mg/l)		6 9	32 2	11 3	9 81	16 6	9 9	6 9	12 8	20 5	4 6	10 4	8 5
9 K (mg/l)		-	0 59	2 3	-	1 96	1 12	0 35	2 51	-	2 35	3 13	2 73
10 Ca (mg/l)		62	64	48	32	66	52 4	52 4	58	70	74	62	68
11 Mg (mg/l)		3 6	4 8	8 4	8 4	9 6	10 4	10 4	12	6	8 4	17 5	10 4
12 Cl (mg/l)		12 4	10 7	17 4	12 4	15 5	15 6	14 2	20 9	22 7	10 7	21	21
13 SO4 (mg/l)		9 6	<2 0	3 84	14 4	11	-		8 6	9 2	5 8	-	
14 Alca (mgCaCO3/l)		266	299	249	245	199			282	332	324		
15 RAS		0 28	0 31	0 4	0 18	0 21			0 38	0 63	0 72		
16 Class		C2-S1	C2-S1	C2-S1	C1-S1	C2-S1	C1-S1	C2-S1	C2-S1	C2-S1	C2-S1	C2-S1	C2-S1
17 N-NO3 (mg/l)		0 19		0 14	0 19				0 12	114			
18 N-NO2 (mg/l)		-		0 024	-				0 021	-			
19 TN (mg/l)		3 25	2 29		2 46	2 29	+0 79	+0 65		2 04	3 23	+0 65	-0 7
20 TP (mg/l)		0 17	0 03	0 08	0 12	0 1	+52 4	+7	0 2	0 46	0 07	+48 8	+3 2
21 COD (mg/l)		-	1 8	1 31	37 1	26 2	+117 6	+42	52 3	5 9	11 4	+196 2	+156 8
22 BOD (mg/l)		0 9	0 5	0 5	1 3	3 9	N D	N D	0 8	0 5	2 9	8 5	N D
23 F-Coli (MPN/l)			4300	910	-	2300			2400	-	2100		
24 T-Coli (MPN/l)			9300	2400	-	2300			2400	-	9300		
25 Cu (mg/l)		0 02	0 05	0 024	0 02	0 03			0 005	<0 02	0 04		
26 Hg (ng/ml)		-	0 34	2 8	0 61	0 2			1 4	0 2	0 3		
27 Ni (mg/l)		<0 02	0 1	0 041	0 02	0 04			0 035	0 02	0 08		
28 Fe (mg/l)		0 2	<0 02	0 221	0 31	0 33			0 022	0 22	0 07		
29 Cr (mg/l)		0 05	<0 02	<0 02	<0 02	<0 02			<0 02	<0 02	<0 02		
30 Discharge (m3/s)													
31 Triclofos							N D	N D				N D	N D
32 Fenitrothion							N D	N D				N D	N D
33 Monocrotophos							N D	N D				N D	N D
34 Bentazone							N D	N D				N D	N D
35 Propanil							N D	N D				N D	N D
36 Butachlor							N D	N D				N D	N D

Site	8 Río Yuna					9 Río Nagua		10 Cana Colorado	
Item	1 30/08/94	2 07/09/94	3 28/09/94	4 08/02/95	5 16/02/95	08/02/95	16/02/95	08/02/95	16/02/95
1 Temp (°C)	Non Survey	28 5	30 5	26 6	27 2	Non Survey	27 5	Non Survey	28 8
2 SS (mg/l)		26 5	22 5						
3 E C (mS/cm)		327	333	320	408		1395		1035
4 SOI (mg/l)		210	211	267	228		907		651
5 PH		8	8 3	8	6 7		6 4		6 4
6 DO (mg/l)		8 5	10 6	10 2	9 7		6 2		5
7 Hard (mgCaCO3/l)		144	159						
8 Na (mg/l)		3 6	17 9	13 8	14 7		149 8		137 5
9 K (mg/l)		-	1 56	2 35	1 83		8 18		5 95
10 Ca (mg/l)		36	62	35	45		46		33
11 Mg (mg/l)		13 2	3 6	16 2	17 5		35 1		32 5
12 Cl (mg/l)		8 74	12 4	22 4	24 5		319 9		237 1
13 SO4 (mg/l)		22 6	7 2	-	-		-		-
14 Alca (mgCaCO3/l)		183	224						
15 RAS		0 13	0 58						
16 Class		C2-S1	C2-S1	C2-S1	C2-S1				
17 N-NO3 (mg/l)		0 15	-						
18 N-NO2 (mg/l)		-	-						
19 TN (mg/l)		-	1 69	-0 61	+0 42		+0 79		+0 93
20 TP (mg/l)		0 17	0 1	+45 8	+4		+2		+5
21 COD (mg/l)		-	5 9	+191	+406		+200 9		+444
22 BOD (mg/l)		4 1	0 9	N D	N D		N D		N D
23 F-Coli (MPN/l)		-	910						
24 T-Coli (MPN/l)		-	4300						
25 Cu (mg/l)		0 02	0 06						
26 Hg (ng/ml)		-	0 41						
27 Ni (mg/l)		<0 02	0 15						
28 Fe (mg/l)		0 45	0 23						
29 Cr (mg/l)		0 05	<0 02						
30 Discharge (m3/s)									
31 Triclofos				N D	N D		N D		N D
32 Fenitrothion				N D	N D		N D		N D
33 Monocrotophos				N D	N D		N D		N D
34 Bentazone				N D	N D		N D		N D
35 Propanil				N D	N D		N D		N D
36 Butachlor				N D	N D		N D		N D

* Figures not used on the analysis

Table 5.4.1 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 5.4.2 Area of Paddy Field by Land Use Plan

(単位：ha)

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 5.4.3 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

*：野菜

Table 7.5.1(1) Project's Cash Flow for Economic Costs and Benefits (Alternative A)

(1) Alternative A

Unit : RD$ x 1000

Year in Order	Costs				Benefits			Net Incremental Benefits
	Initial Investment	O/M Services	Replacement Cost	Total	Agricultural Production	Flood Damage	Total	
1	20,302			20,302	0	0	0	-20,302
2	28,494			28,494	0	0	0	-28,494
3	146,033			146,033	0	0	0	-146,033
4	125,374			125,374	0	0	0	-125,374
5	35,974	3,067		39,041	50,054	1,007	51,061	12,020
6		3,067		3,067	53,370	1,175	54,545	51,478
7		3,067		3,067	56,665	1,342	58,027	54,960
8		3,067		3,067	60,000	1,510	61,510	58,443
9		3,067		3,067	63,316	1,678	64,994	61,927
10		3,067		3,067	66,597	1,678	68,275	65,208
11		3,067	17,179	20,246	66,597	1,678	68,275	48,029
12		3,067		3,067	66,597	1,678	68,275	65,208
13		3,067		3,067	66,597	1,678	68,275	65,208
14		3,067		3,067	66,597	1,678	68,275	65,208
15		3,067		3,067	66,597	1,678	68,275	65,208
16		3,067		3,067	66,597	1,678	68,275	65,208
17		3,067	17,179	20,246	66,597	1,678	68,275	48,029
18		3,067		3,067	66,597	1,678	68,275	65,208
19		3,067		3,067	66,597	1,678	68,275	65,208
20		3,067		3,067	66,597	1,678	68,275	65,208
21		3,067		3,067	66,597	1,678	68,275	65,208
22		3,067		3,067	66,597	1,678	68,275	65,208
23		3,067	17,179	20,246	66,597	1,678	68,275	48,029
24		3,067		3,067	66,597	1,678	68,275	65,208
25		3,067	3,256	6,323	66,597	1,678	68,275	61,952
26		3,067		3,067	66,597	1,678	68,275	65,208
27		3,067		3,067	66,597	1,678	68,275	65,208
28		3,067		3,067	66,597	1,678	68,275	65,208
29		3,067	17,179	20,246	66,597	1,678	68,275	48,029
30		3,067		3,067	66,597	1,678	68,275	65,208
31		3,067		3,067	66,597	1,678	68,275	65,208
32		3,067		3,067	66,597	1,678	68,275	65,208
33		3,067		3,067	66,597	1,678	68,275	65,208
34		3,067		3,067	66,597	1,678	68,275	65,208
35		3,067	17,179	20,246	66,597	1,678	68,275	48,029
36		3,067		3,067	66,597	1,678	68,275	65,208
37		3,067		3,067	66,597	1,678	68,275	65,208
38		3,067		3,067	66,597	1,678	68,275	65,208
39		3,067		3,067	66,597	1,678	68,275	65,208
40		3,067		3,067	66,597	1,678	68,275	65,208
41		3,067	17,179	20,246	66,597	1,678	68,275	48,029
42		3,067		3,067	66,597	1,678	68,275	65,208
43		3,067		3,067	66,597	1,678	68,275	65,208
44		3,067		3,067	66,597	1,678	68,275	65,208
45		3,067	3,256	6,323	66,597	1,678	68,275	61,952
46		3,067		3,067	66,597	1,678	68,275	65,208
47		3,067	17,179	20,246	66,597	1,678	68,275	48,029
48		3,067		3,067	66,597	1,678	68,275	65,208
49		3,067		3,067	66,597	1,678	68,275	65,208
50		3,067		3,067	66,597	1,678	68,275	65,208

EIRR= 14.72%

Table 7.5.1(2) Project's Cash Flow for Economic Costs and Benefits (Alternative B-1)

(2) Alternative B-1

Unit : RD$ x 1000

Year in Order	Costs				Benefits			Net Incremental Benefits
	Initial Investment	O/M Services	Replacement Cost	Total	Agricultural Production	Flood Damage	Total	
1	21,147			21,147	0	0	0	-21,147
2	32,758			32,758	0	0	0	-32,758
3	171,251			171,251	0	0	0	-171,251
4	148,445			148,445	0	0	0	-148,445
5	41,051	3,826		44,877	55,032	1,007	56,039	11,162
6		3,826		3,826	58,926	1,175	60,101	56,275
7		3,826		3,826	62,820	1,342	64,162	60,336
8		3,826		3,826	66,714	1,510	68,224	64,398
9		3,826		3,826	70,607	1,678	72,285	68,459
10		3,826		3,826	74,517	1,678	76,195	72,369
11		3,826	17,179	21,005	74,517	1,678	76,195	55,190
12		3,826		3,826	74,517	1,678	76,195	72,369
13		3,826		3,826	74,517	1,678	76,195	72,369
14		3,826		3,826	74,517	1,678	76,195	72,369
15		3,826		3,826	74,517	1,678	76,195	72,369
16		3,826		3,826	74,517	1,678	76,195	72,369
17		3,826	17,179	21,005	74,517	1,678	76,195	55,190
18		3,826		3,826	74,517	1,678	76,195	72,369
19		3,826		3,826	74,517	1,678	76,195	72,369
20		3,826		3,826	74,517	1,678	76,195	72,369
21		3,826		3,826	74,517	1,678	76,195	72,369
22		3,826		3,826	74,517	1,678	76,195	72,369
23		3,826	17,179	21,005	74,517	1,678	76,195	55,190
24		3,826		3,826	74,517	1,678	76,195	72,369
25		3,826	18,253	22,079	74,517	1,678	76,195	54,116
26		3,826		3,826	74,517	1,678	76,195	72,369
27		3,826		3,826	74,517	1,678	76,195	72,369
28		3,826		3,826	74,517	1,678	76,195	72,369
29		3,826	17,179	21,005	74,517	1,678	76,195	55,190
30		3,826		3,826	74,517	1,678	76,195	72,369
31		3,826		3,826	74,517	1,678	76,195	72,369
32		3,826		3,826	74,517	1,678	76,195	72,369
33		3,826		3,826	74,517	1,678	76,195	72,369
34		3,826		3,826	74,517	1,678	76,195	72,369
35		3,826	17,179	21,005	74,517	1,678	76,195	55,190
36		3,826		3,826	74,517	1,678	76,195	72,369
37		3,826		3,826	74,517	1,678	76,195	72,369
38		3,826		3,826	74,517	1,678	76,195	72,369
39		3,826		3,826	74,517	1,678	76,195	72,369
40		3,826		3,826	74,517	1,678	76,195	72,369
41		3,826	17,179	21,005	74,517	1,678	76,195	55,190
42		3,826		3,826	74,517	1,678	76,195	72,369
43		3,826		3,826	74,517	1,678	76,195	72,369
44		3,826		3,826	74,517	1,678	76,195	72,369
45		3,826	18,253	22,079	74,517	1,678	76,195	54,116
46		3,826		3,826	74,517	1,678	76,195	72,369
47		3,826	17,179	21,005	74,517	1,678	76,195	55,190
48		3,826		3,826	74,517	1,678	76,195	72,369
49		3,826		3,826	74,517	1,678	76,195	72,369
50		3,826		3,826	74,517	1,678	76,195	72,369

EIRR= 14.09%

Table 7.5.1(3) Project's Cash Flow for Economic Costs and Benefits (Alternative B-2)

(3) Alternative B-2

Unit : RD$ x 1000

Year in Order	Costs				Benefits			Net Incremental Benefits
	Initial Investment	O/M Services	Replacement Cost	Total	Agricultural Production	Flood Damage	Total	
1	20,650			20,650	0	0	0	-20,650
2	31,987			31,987	0	0	0	-31,987
3	167,223			167,223	0	0	0	-167,223
4	144,953			144,953	0	0	0	-144,953
5	40,085	3,826		43,911	54,847	1,007	55,854	11,943
6		3,826		3,826	58,574	1,175	59,749	55,923
7		3,826		3,826	62,300	1,342	63,642	59,816
8		3,826		3,826	66,027	1,510	67,537	63,711
9		3,826		3,826	69,754	1,678	71,432	67,606
10		3,826		3,826	73,443	1,678	75,121	71,295
11		3,826	17,179	21,005	73,443	1,678	75,121	54,116
12		3,826		3,826	73,443	1,678	75,121	71,295
13		3,826		3,826	73,443	1,678	75,121	71,295
14		3,826		3,826	73,443	1,678	75,121	71,295
15		3,826		3,826	73,443	1,678	75,121	71,295
16		3,826		3,826	73,443	1,678	75,121	71,295
17		3,826	17,179	21,005	73,443	1,678	75,121	54,116
18		3,826		3,826	73,443	1,678	75,121	71,295
19		3,826		3,826	73,443	1,678	75,121	71,295
20		3,826		3,826	73,443	1,678	75,121	71,295
21		3,826		3,826	73,443	1,678	75,121	71,295
22		3,826		3,826	73,443	1,678	75,121	71,295
23		3,826	17,179	21,005	73,443	1,678	75,121	54,116
24		3,826		3,826	73,443	1,678	75,121	71,295
25		3,826	18,253	22,079	73,443	1,678	75,121	53,042
26		3,826		3,826	73,443	1,678	75,121	71,295
27		3,826		3,826	73,443	1,678	75,121	71,295
28		3,826		3,826	73,443	1,678	75,121	71,295
29		3,826	17,179	21,005	73,443	1,678	75,121	54,116
30		3,826		3,826	73,443	1,678	75,121	71,295
31		3,826		3,826	73,443	1,678	75,121	71,295
32		3,826		3,826	73,443	1,678	75,121	71,295
33		3,826		3,826	73,443	1,678	75,121	71,295
34		3,826		3,826	73,443	1,678	75,121	71,295
35		3,826	17,179	21,005	73,443	1,678	75,121	54,116
36		3,826		3,826	73,443	1,678	75,121	71,295
37		3,826		3,826	73,443	1,678	75,121	71,295
38		3,826		3,826	73,443	1,678	75,121	71,295
39		3,826		3,826	73,443	1,678	75,121	71,295
40		3,826		3,826	73,443	1,678	75,121	71,295
41		3,826	17,179	21,005	73,443	1,678	75,121	54,116
42		3,826		3,826	73,443	1,678	75,121	71,295
43		3,826		3,826	73,443	1,678	75,121	71,295
44		3,826		3,826	73,443	1,678	75,121	71,295
45		3,826	18,253	22,079	73,443	1,678	75,121	53,042
46		3,826		3,826	73,443	1,678	75,121	71,295
47		3,826	17,179	21,005	73,443	1,678	75,121	54,116
48		3,826		3,826	73,443	1,678	75,121	71,295
49		3,826		3,826	73,443	1,678	75,121	71,295
50		3,826		3,826	73,443	1,678	75,121	71,295

EIRR= 14.24%

Table 7.7.1 Amortization Schedule of Foreign Currency Loan

Unit: RD$ x 1000

Year	Disbursement Schedule	Accumulated Principal	Repayment of Principal	Remaining Principal	Payment of Interest	Integrated Payment
1	19,935	19,935		19,935	598	598
2	27,649	47,584		47,584	1,428	1,428
3	149,795	197,379		197,379	5,921	5,921
4	130,053	327,432		327,432	9,823	9,823
5	44,148	371,580		371,580	11,147	11,147
6				371,580	11,147	11,147
7				371,580	11,147	11,147
8				371,580	11,147	11,147
9				371,580	11,147	11,147
10				371,580	11,147	11,147
11			18,579	353,001	10,590	29,169
12			18,579	334,422	10,033	28,612
13			18,579	315,843	9,475	28,054
14			18,579	297,264	8,918	27,497
15			18,579	278,685	8,361	26,940
16			18,579	260,106	7,803	26,382
17			18,579	241,527	7,246	25,825
18			18,579	222,948	6,688	25,267
19			18,579	204,369	6,131	24,710
20			18,579	185,790	5,574	24,153
21			18,579	167,211	5,016	23,595
22			18,579	148,632	4,459	23,038
23			18,579	130,053	3,902	22,481
24			18,579	111,474	3,344	21,923
25			18,579	92,895	2,787	21,366
26			18,579	74,316	2,229	20,808
27			18,579	55,737	1,672	20,251
28			18,579	37,158	1,115	19,694
29			18,579	18,579	557	19,136
30			18,579	0	0	18,579
Total	371,580		371,580		190,555	562,135

Table 8.2.1 Environmental Impact Assessment

General Evaluation

(1) Social Environment

	Environmental Issues	Evaluation	Future countermeasurerses
4.	Conflict among communities and people (new settlers and host people)	C	
5.	Impact on native people (many Haitian inhabitants live in the surrounding area)	C	
6.	Population increase (population in the project area increase due to new settlers)	B	
7.	Drastic change in population composition	B	
8.	Changes in bases of economic activites (economic activities of people forced to reside somewhere else will be changed)	C	
10.	Increase in income disparities	B	To grasp the conditions that may lead to income disparities
11.	Modification of water rights and fishing rights (riparian)	C	To adjust water-use among downstream beneficiaries
14.	Increased use of agro-chemicals	B	Adjustment of water-use through the implementation of the project. Diffusion of organic farming.
17.	Residual tendency of agro-chemicals	C	Establish and popularize appropriate agrochemical application method.
18.	Increase in domestic wastes	C	Establishment of domestic waste desposal method
(2) Natural Environment			
20.	Changes in vegetation	C	
22.	Degradation of ecosystems with biological diversity (Increased encroachment on habitats of snapping turtles and migratory birds)	C	Establishment of its relevance to land utilization
24.	Destruction of wetlands and peatlands	C	Establishment of its relevance to land utilization
31.	Soil contamination by agrochemicals and others	C	Establishment and popularization of appropriate agrochemical and fertilizer application methods.
33.	Devastation of hinterland	C	Establishment of its relevance to land utilization
34.	Ground subsidence	C	Establishment of its relevance to land utilization
35.	Change in surface water hydrology (river discharge is influenced by design flood discharge)	A	Making a flood control plan for Payabo river
37.	Inundation and flooding	A	Construction of gate ito fanilitate O/M
38.	Sedimentation	A	Formulation of countermessures for soil erosion during construction works. Making a watershed protection program to prevent soil erosion.
42.	Eutrophication	C	Establishment and popularization of appropriate agrochemical and fertilizer application methods.
44.	Change in water temperature	C	
46.	Damage to landscape	C	Establish and popularize appropriate agrochemical and fertilizer application methods; disposal methods

(Rating)

A: Expected to bring about i serious impacts

B: Expected to bring about ia slight impact

C: unclear (requiring studies, but may be clarified in the course of the project)

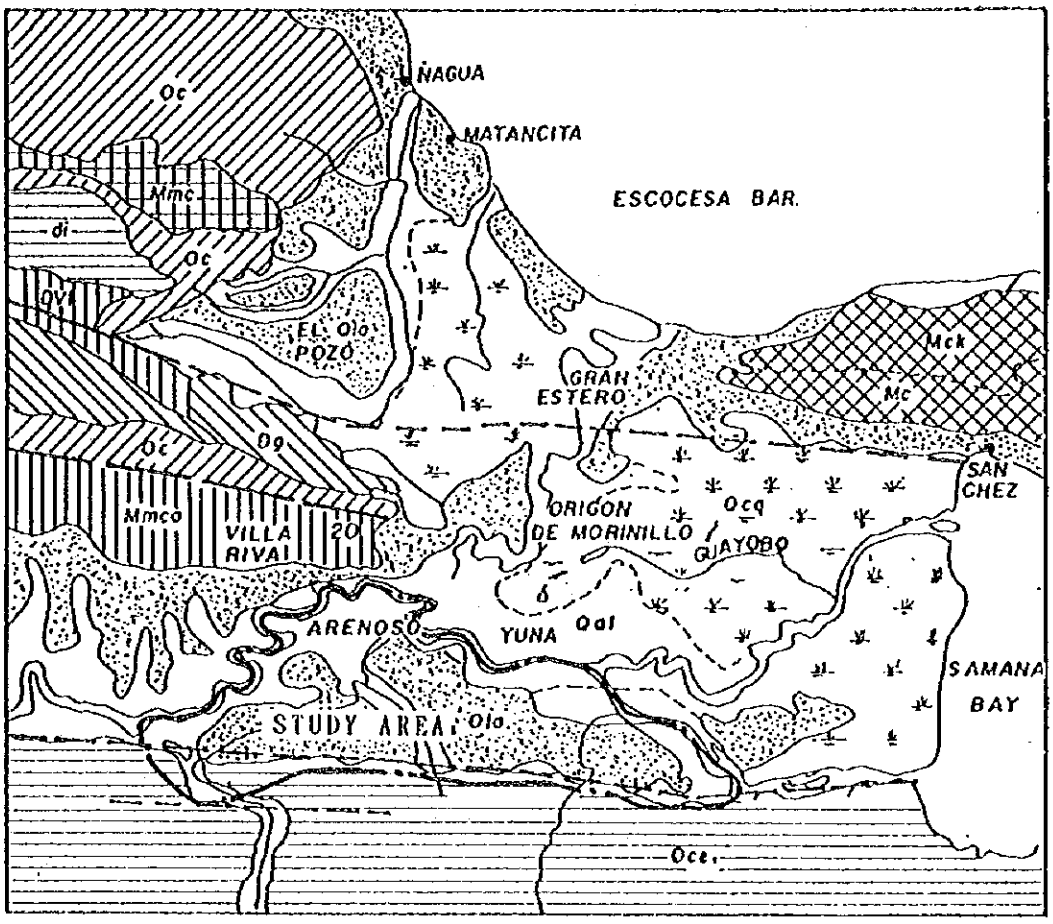
Table 8.3.1 Projection by Agro-chemicals Application

Agrochemicals	Brand	Active Ingredient	Ratio of Active Ingredient (%)	Amount Applied A (kg/ha)	Toxicity to Humanbeings and Livestock	Toxicity to Fish	Area sprayed B (ha)	Amount of Agrochemicals AXB (kg)	Time of Application	Quantity of Active Ingredient Applied Annually (kg)	Runoff Ratio (%)	Runoff Load (Total) (kg/y)	Load Ratio in Payabo Basin (39.2%)	Load Ratio in Cascarilla Basin (60.8%)	Estima-te R.Yunast.No.8 (μg/ℓ)
Herbicide	Machete	Butachlor	2.5	30	Normal	B	16,220	486,600	Jan.Jul.	12,165	5	608	238	370	0.079
	Basagran	Bentazon	11.0	30	Normal	A	16,220	486,600	Mar.Oct	53,526	5	2676	1049	1627	0.349
Insecticide	Sumithion	Fenitrothin	50.0	2	Normal	B	16,220	32,440	Apr.May.Oct. Nov.	16,220	5	811	318	493	0.106
Bactericide	Hinosan 500EC	Edifenphos	30.0	2	Normal	B	16,220	32,440	Apr.May.Oct. Nov.	9,732	5	487	191	296	0.064

Table 8.3.2 Guidelines of WHO(World Health Organization) about the Allowable Quantity of Agro-chemicals in the Drinking Water

Agrochemical	GLs (μ g / ℓ)
DDT (total isomers)	1
Aldrin and dieldrin	0.03
Chlordane (total isomers)	0.3
Hexachlorobenzene	0.01
Heptachlor and heptachlor epoxide	0.1
Gamma-HCH (lindane)	3
Methoxychlor	30
2,4-D	100
Alachlor	0.3
Atrazine	2
Bentazone	25
MCPA	0.5
Metolachlor	5
Molinate	7
Pendimethalin	17
Propanil	175
Pyridate	60
Simazine	17
Trifluralin	170

FIGURES



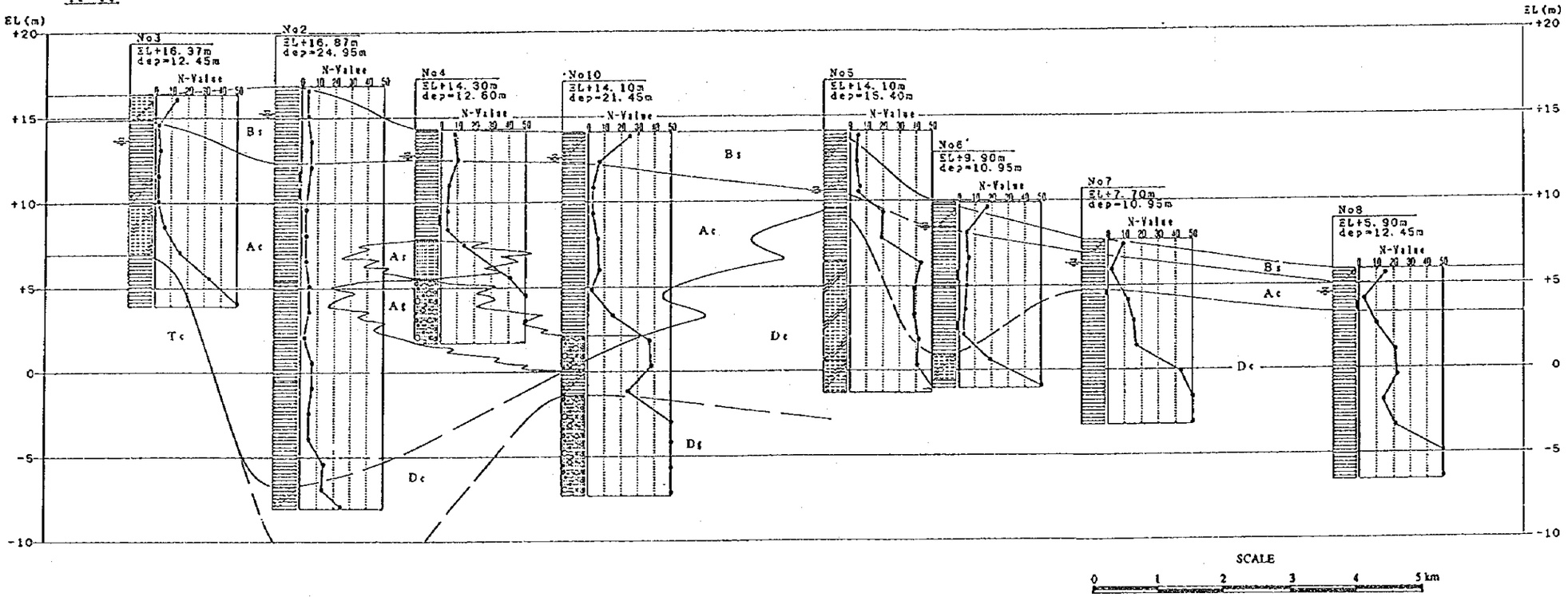
GEOLOGY OF THE PROJECT AREA

QUATERNARY	RECENT		Qal	ALLUVIUM
			Ocq	MARSH
			Qla	LACUSTRINE AND MARINE DEPOSITS: PRINCIPALLY CLAY WITH SAND AND GRAVEL. THIN DEPOSITS FREQUENTLY OCCUR ABOVE BEACH LIMESTONE.
TERTIARY	MIOCENE INDIVISIBLE		Mck	LIMESTONE.
			Mc	LIMESTONE OF LAS ANGOSTURAS AND LAS SALINAS FORMATION.
	MIOCENE MIDDLE		Mlmc	LIMESTONE.
			Mmca	LIMESTONE, MUDSTONE AND CONGLOMERATE OF LA CURATO FORMATION.
	OLIGOCENE INDIVISIBLE		Og	CONGLOMERATE OF LA TABELA FORMATION.
			Oce	LIMESTONE, CALCAREOUS SANDSTONE AND CLAYEY SLATE. FORM PART OF LAS SOMBRERITO FORMATION.
			Oc	LIMESTONE. FORMS PART OF LAS SOMBRERITO FORMATION.
PERIOD UNKNOWN			dvt	VOLCANIC ROCK. PRINCIPALLY TUFF.
			di	METAMORPHIC ROCK.

GEOLOGICAL SYMBOLS
———— FORMATION BOUNDARY
— — — FAULT. DASHED WHERE APPROXIMATELY LOCATED

Fig. 3.3.1 Geological Map of the Study Area

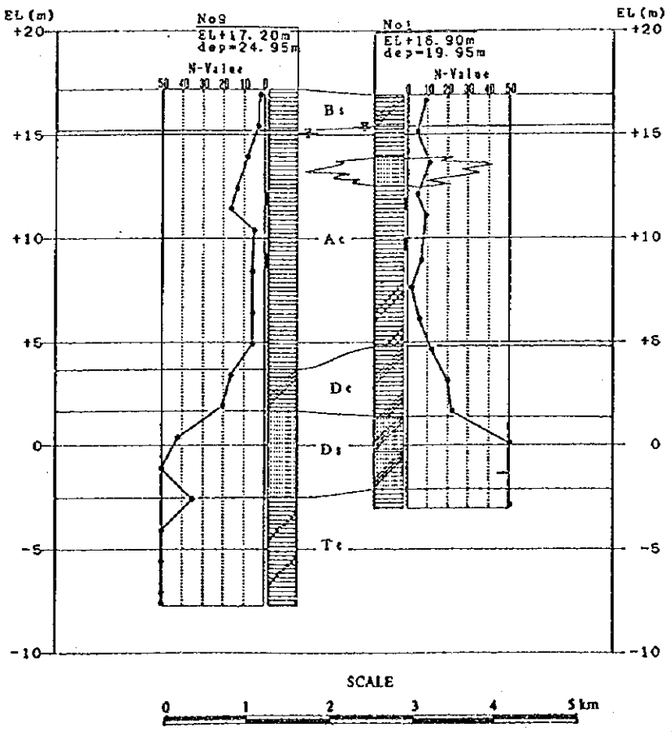
A - A



SCALE

0 1 2 3 4 5km

B - B



SCALE

0 1 2 3 4 5km

Geological Stratigraphy

Period	Epoch	Legend	Soil type
Quaternary	Alluvium (Holocene)	Bs (Top soil)	Gravely clay
			Sandy clay
			Clay
		Ac	Clay
		As	Sand
		Ag	Gravel
	Diluvium (Pleitocene)	Dc	Clay
		Ds	Sand-Clayey sand
		Dg	Gravel
Tertiary	Pliocene	Tc	Clay-Gravely clay

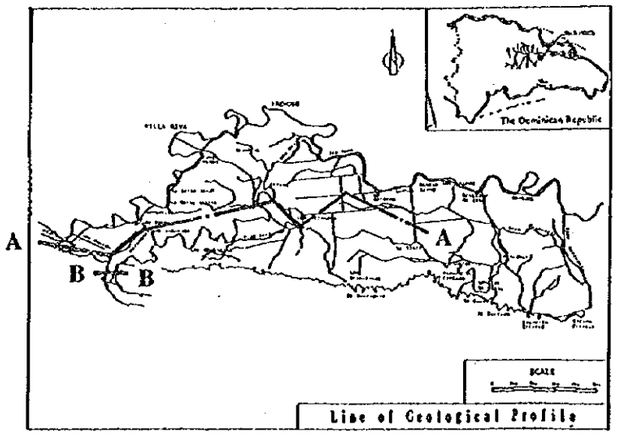
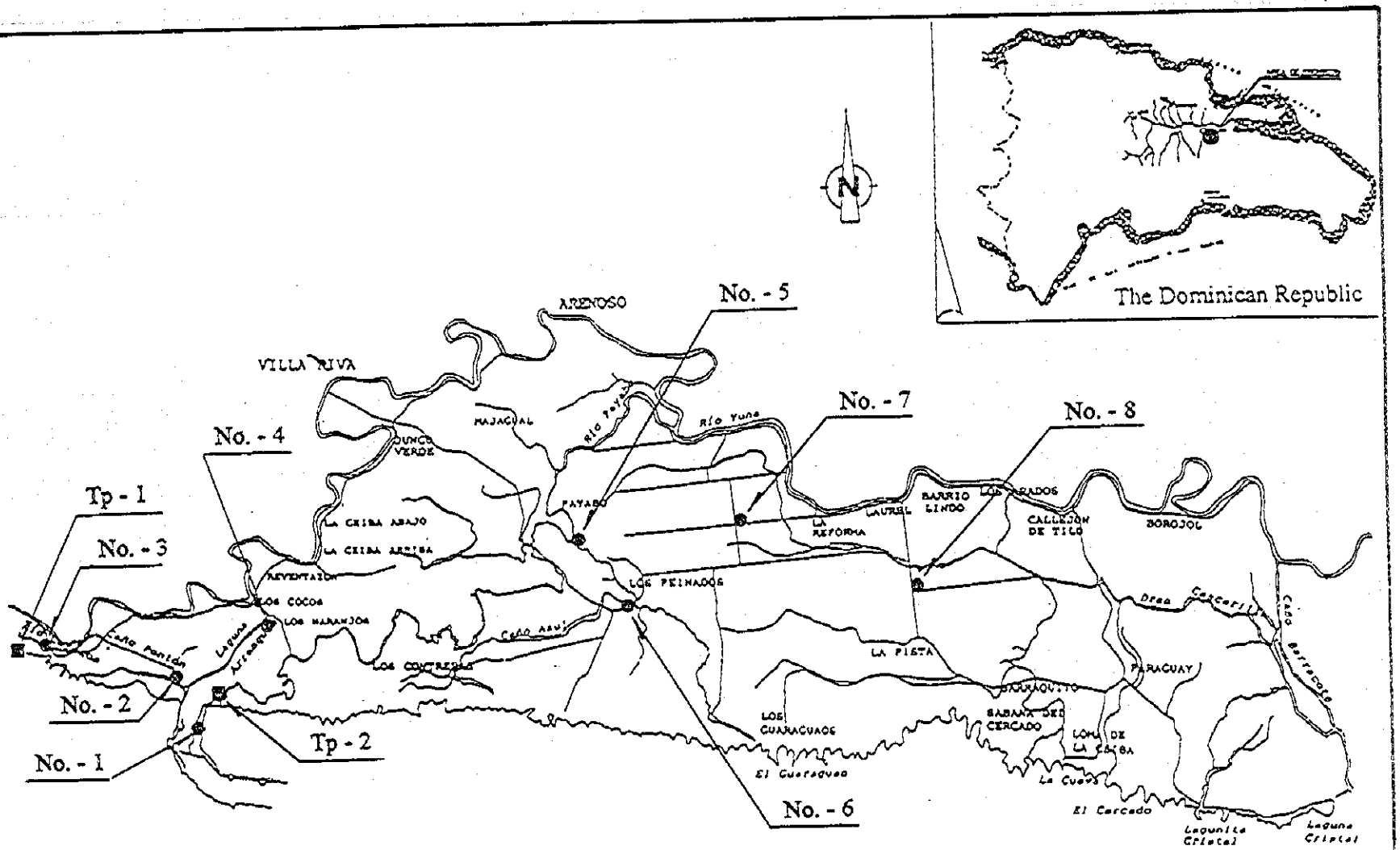


Fig. 3.4.1 Geological Profile



Legend	
●	Boring Point (No. -)
■	Borrow Pit Point (Tp -)

SCALE

0 1km 2km 3km 4km 5km

Fig. 3.4.2 Location of Boring and Borrow Pit

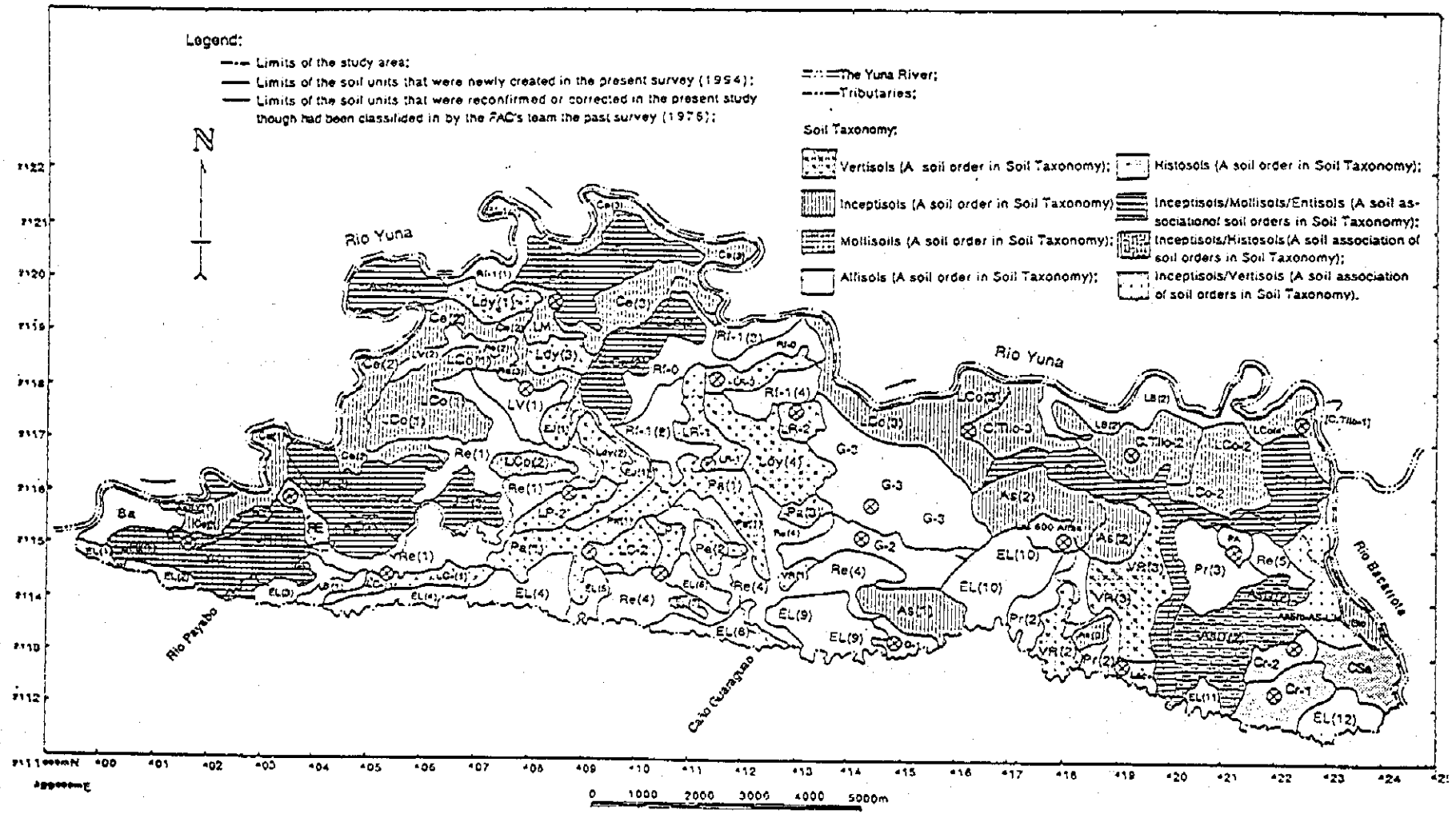


Fig. 3.4.3 Soil Map

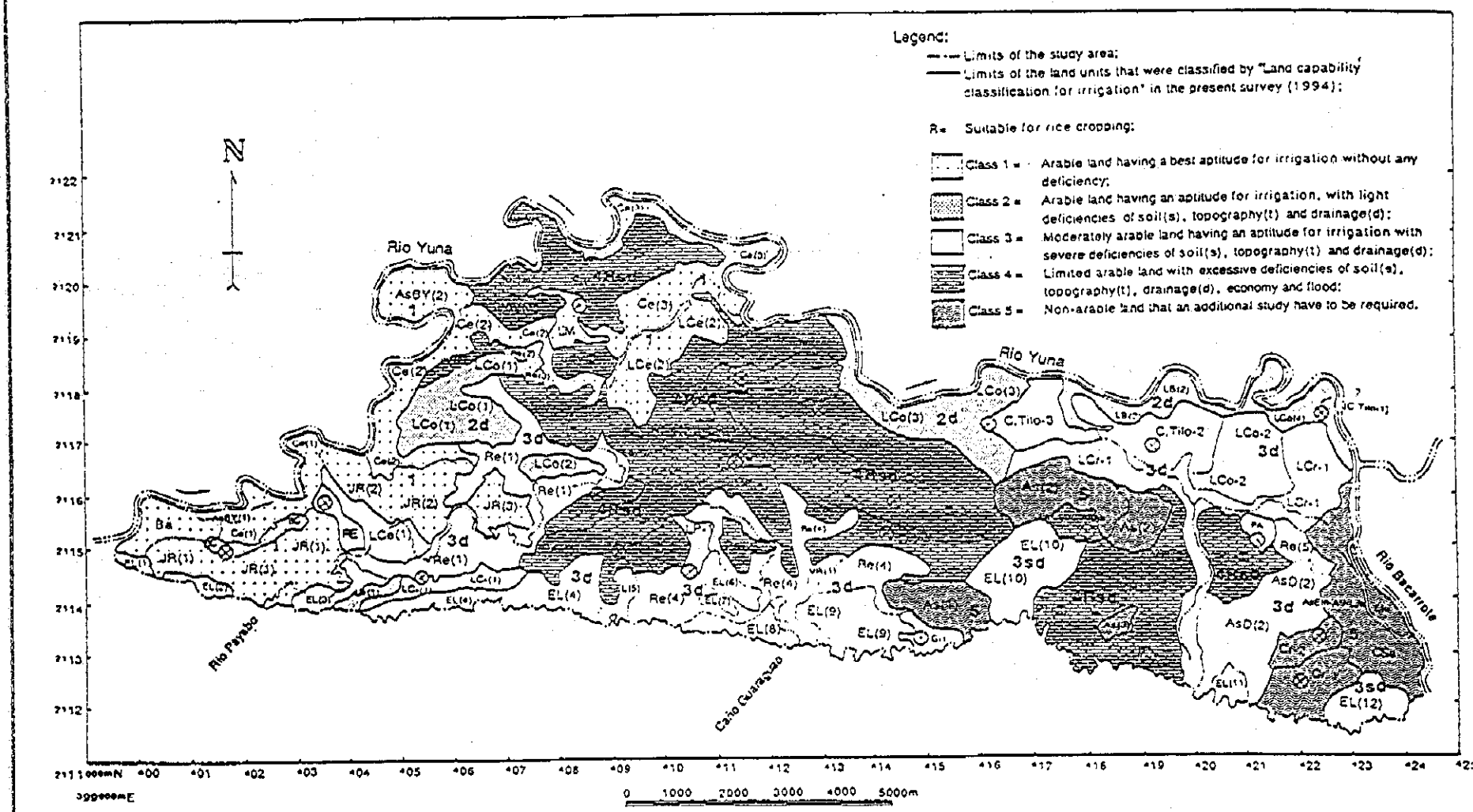


Fig. 3.4.4 Soil Classification Map

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

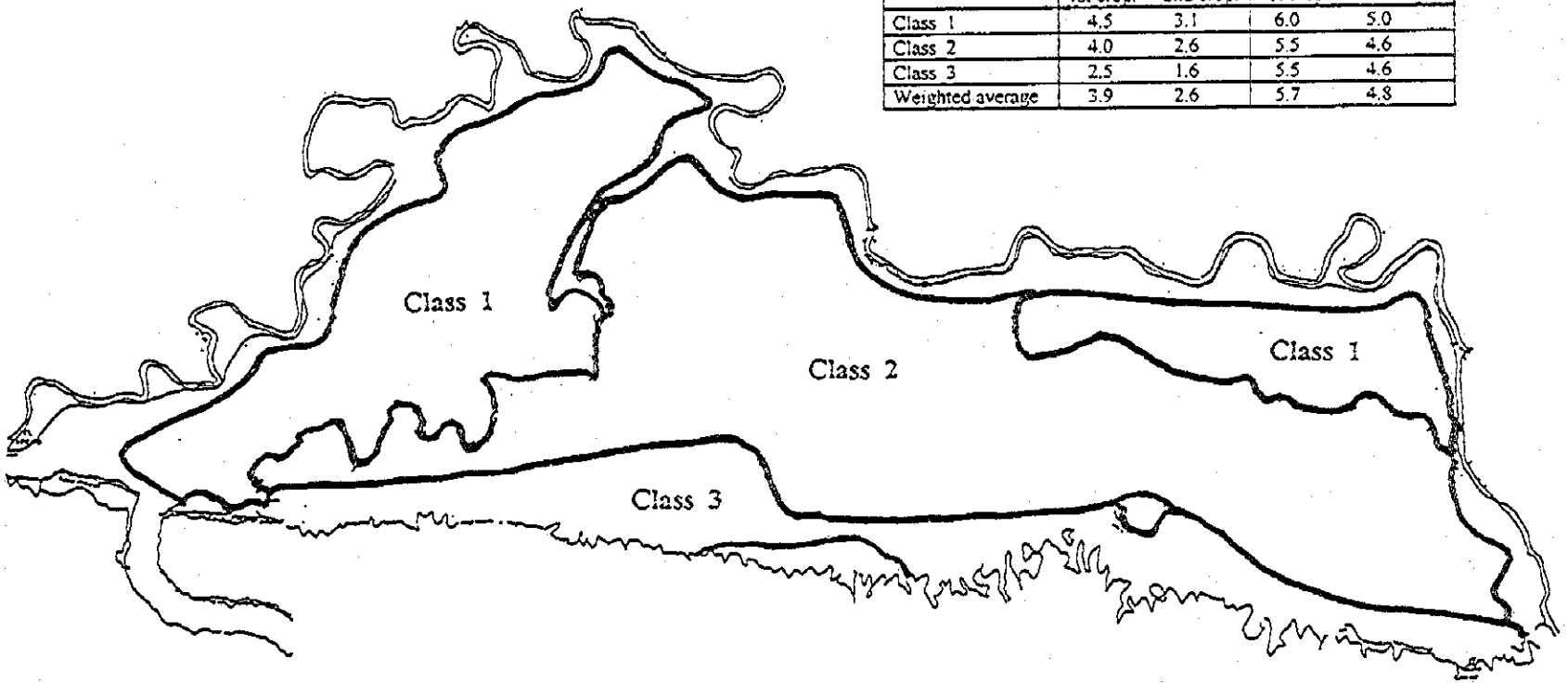


Fig. 3.7.1 Land Classification based on Rice Productivity

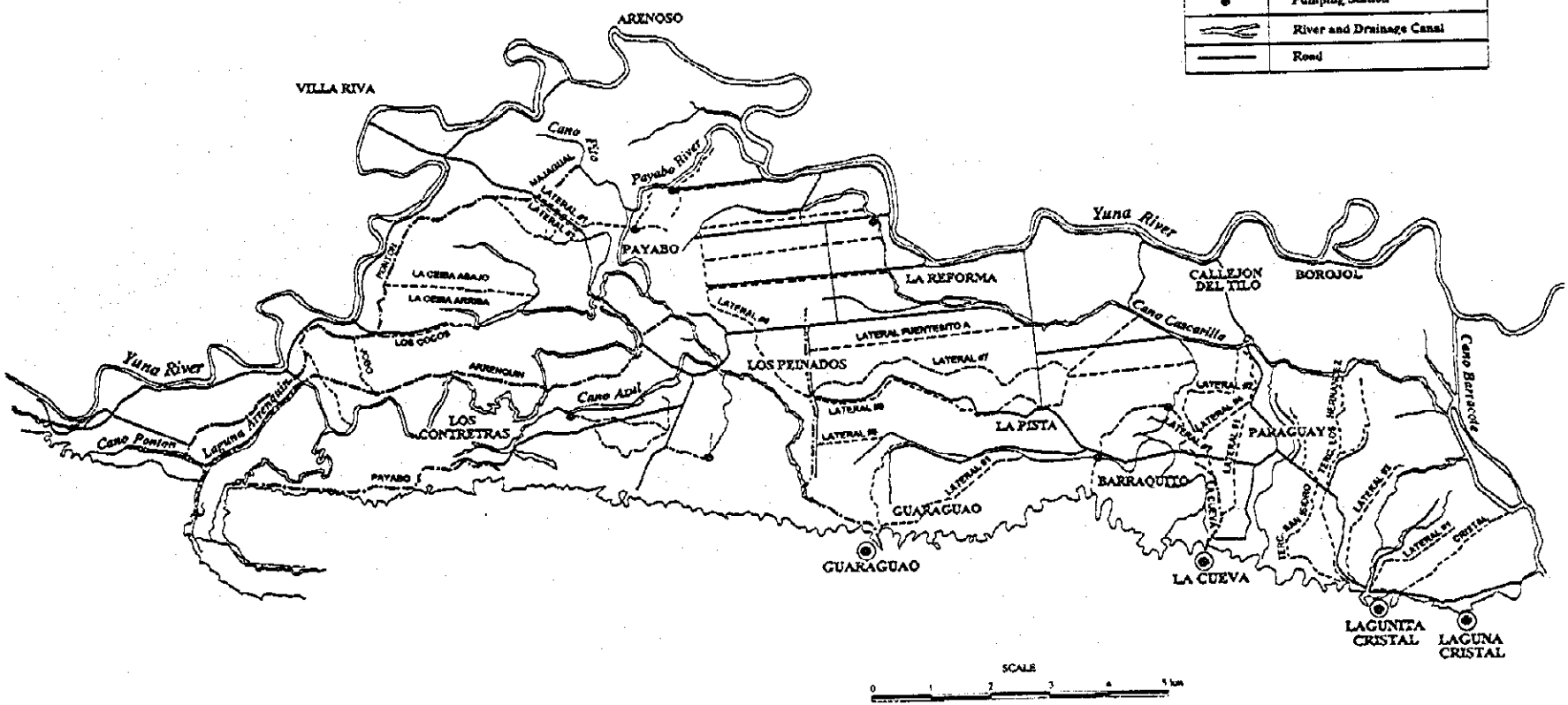
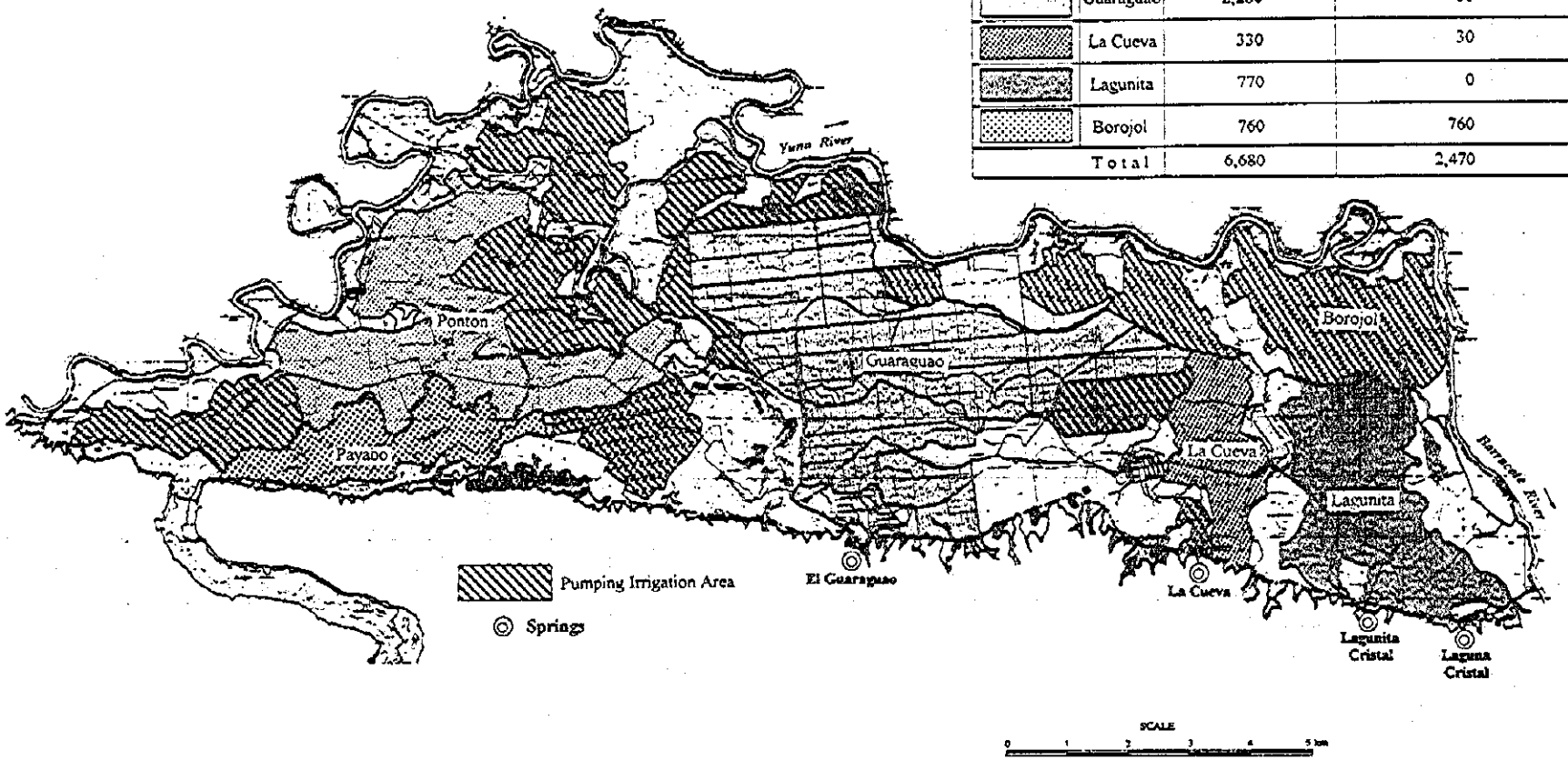


Fig. 3.10.1 Actual Irrigation System



District	Irrigation Area (ha)	Pumping Irrigation Area (ha)
Ponton	1,910	980
Payabo	630	240
Guaraguao	2,280	460
La Cueva	330	30
Lagunita	770	0
Borojol	760	760
Total	6,680	2,470

Fig. 3.10.2 Actual Irrigation Blocks

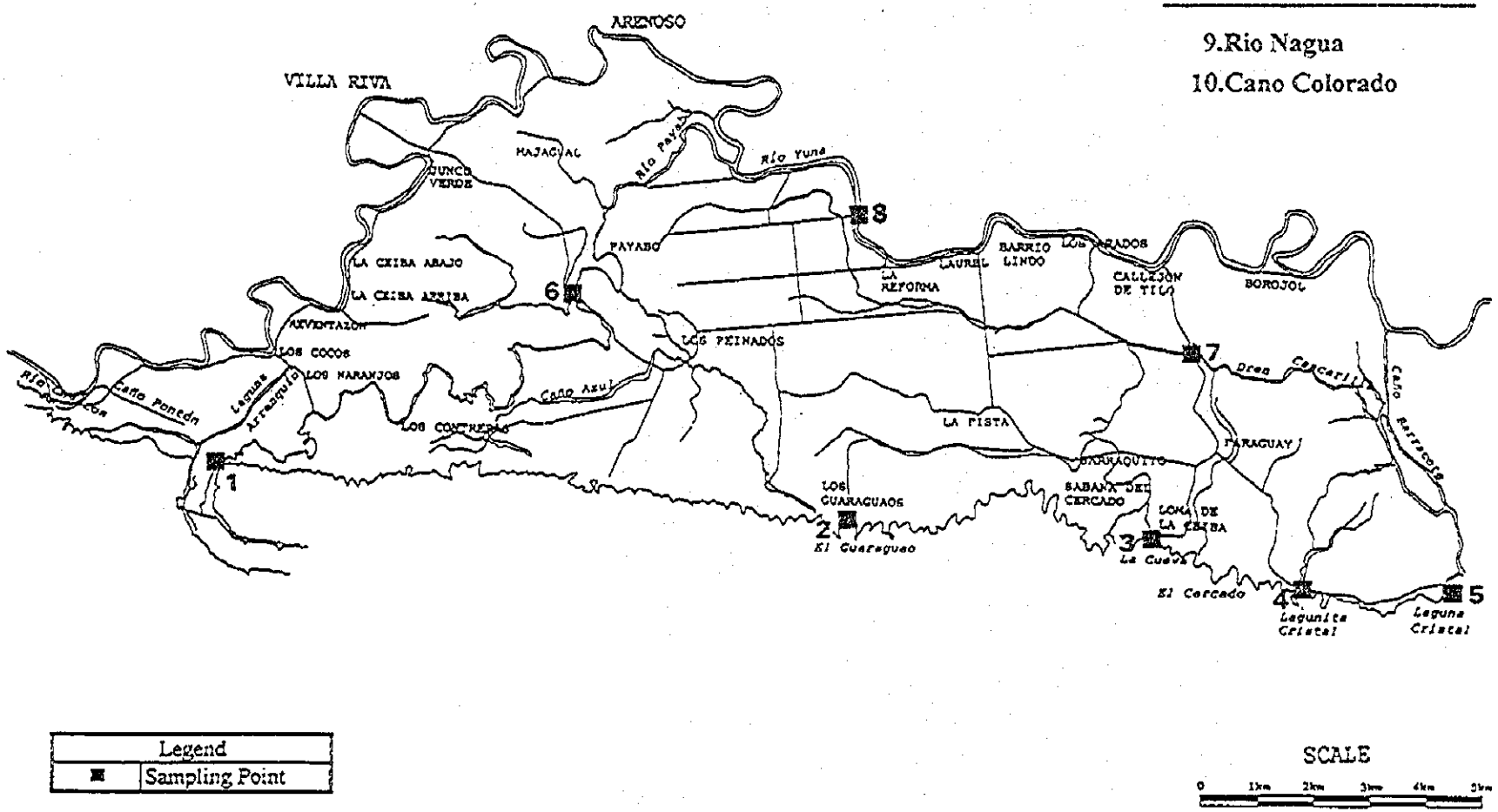


Fig. 3.14.1 Location of Water Quality Analysis

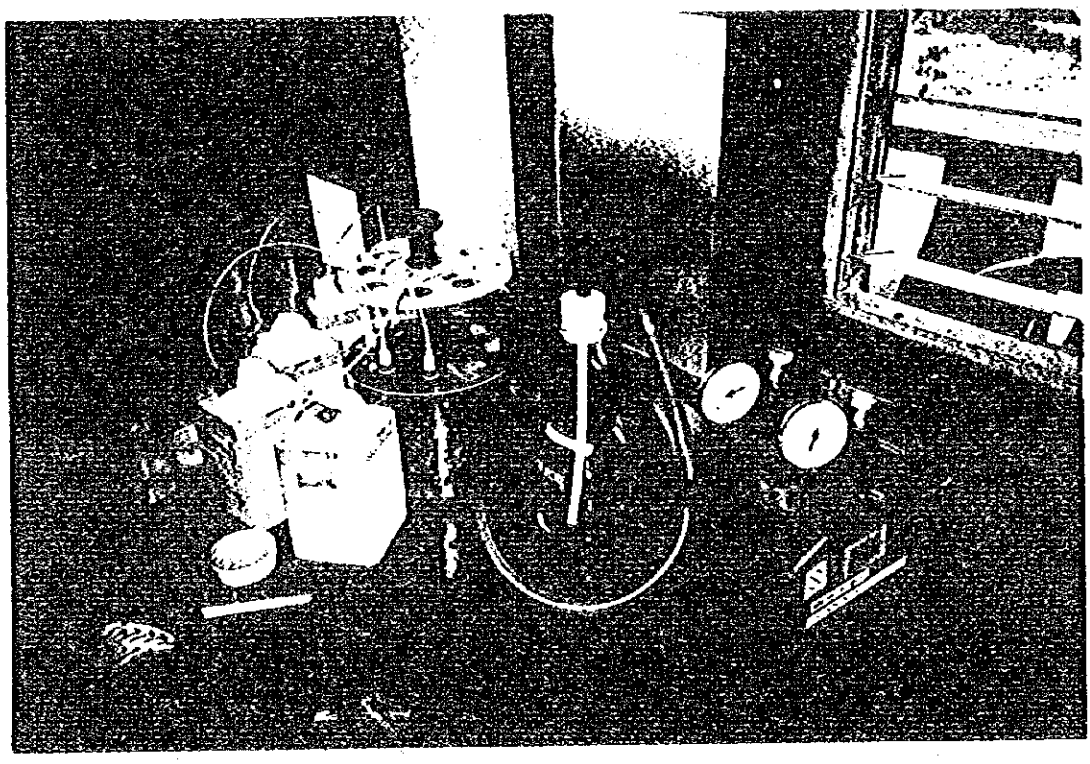
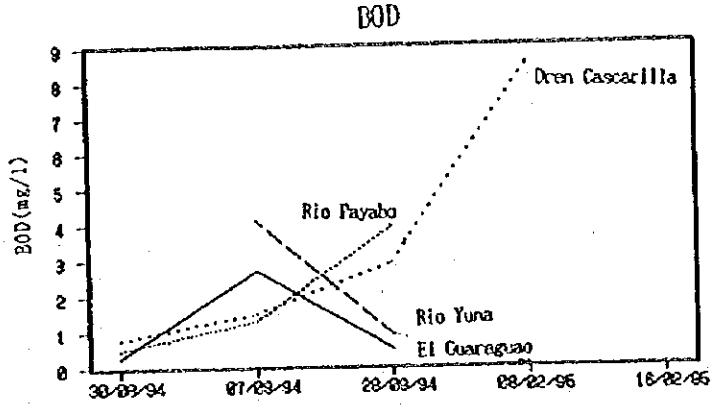
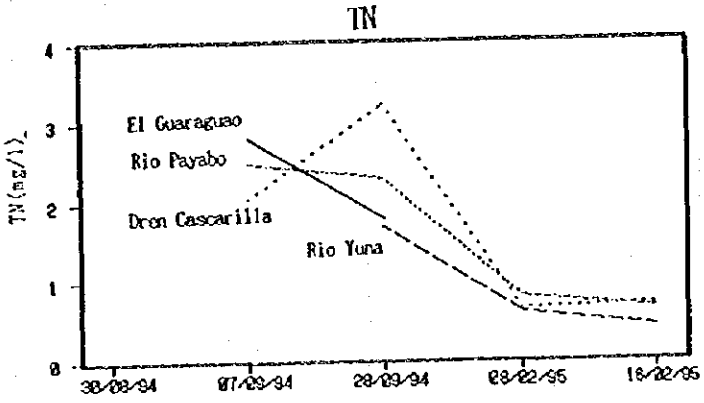


Fig. 3.14.2 Agro-chemicals Analysis Method by Vacuum System





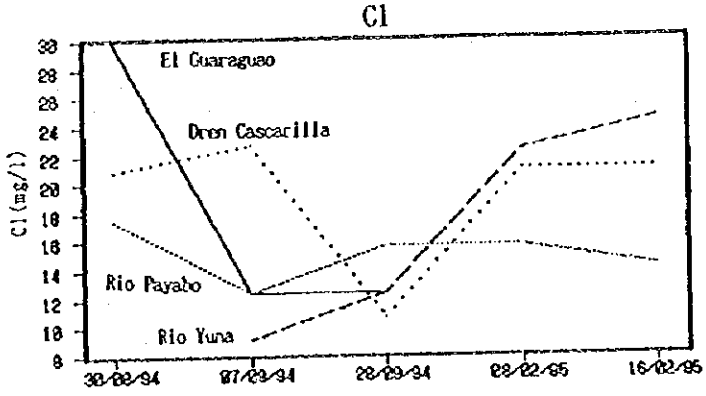
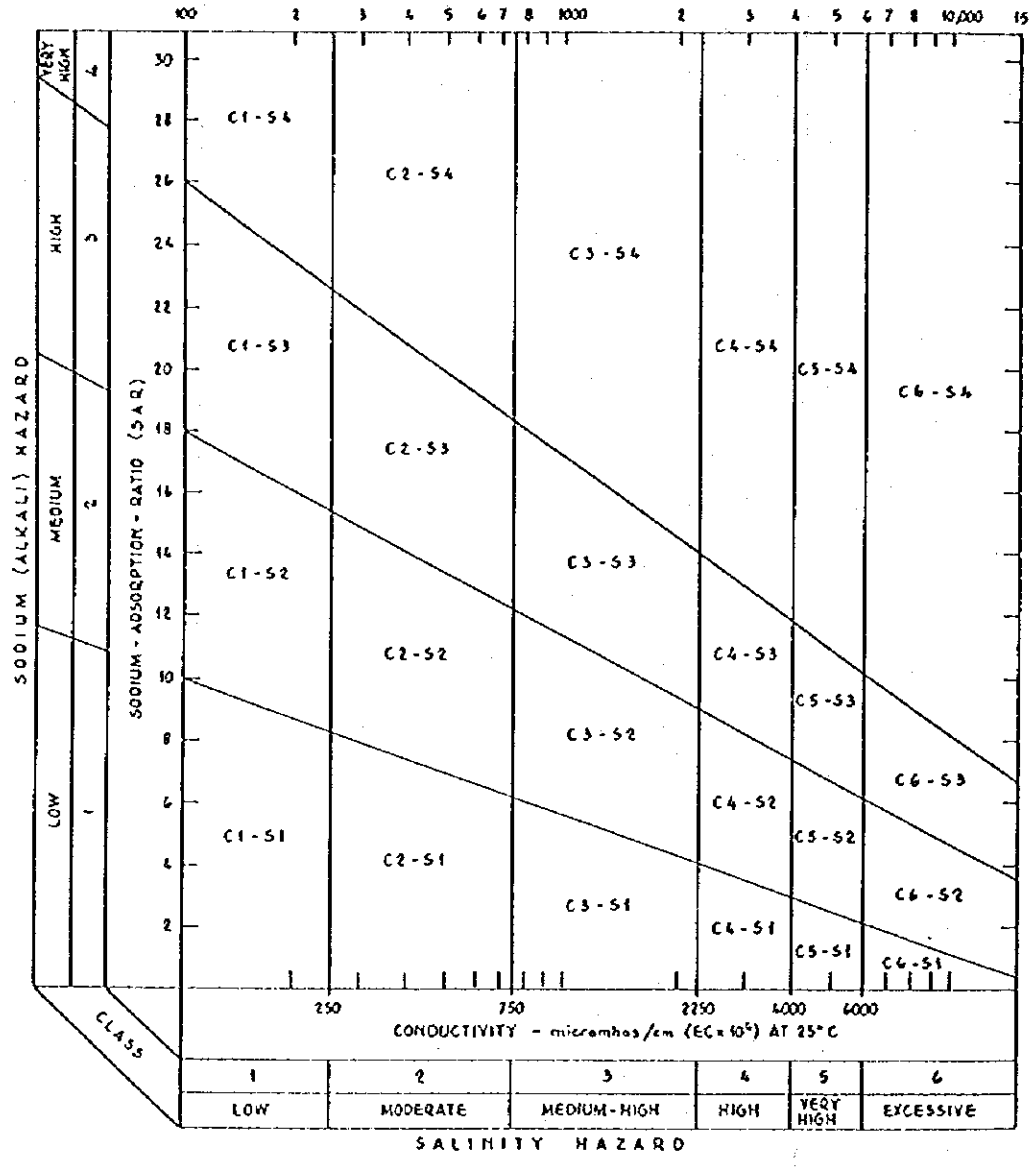


Fig. 3.14.3 Annual Variation of the River Water Quality(1994-1995)

The relative activity of sodium ions in exchange reactions with soil are expressed in the Sodium Adsorption Ratio:

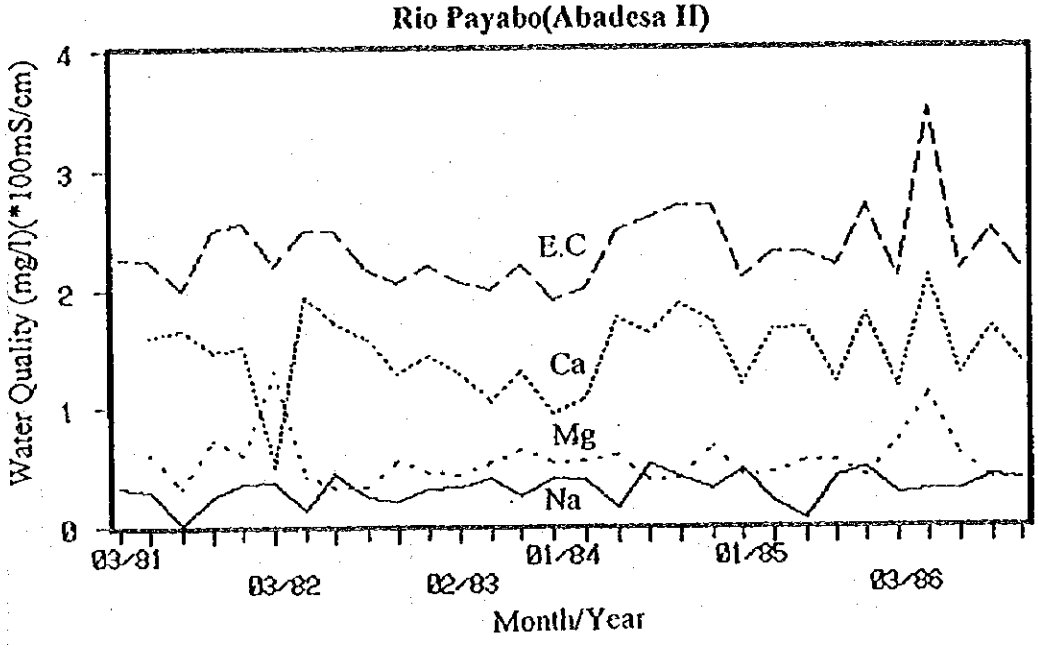
$$SAR = \frac{Na^{+}}{\sqrt{[(Ca^{++}+Mg^{++})/2]}}$$



SOURCE: AGRICULTURE HANDBOOK 60, U.S. DEPT. OF AGRICULTURE

Source Thorne & Peterson (1964).

Fig. 3.14.4 Diagram of Distribution of Irrigation Water



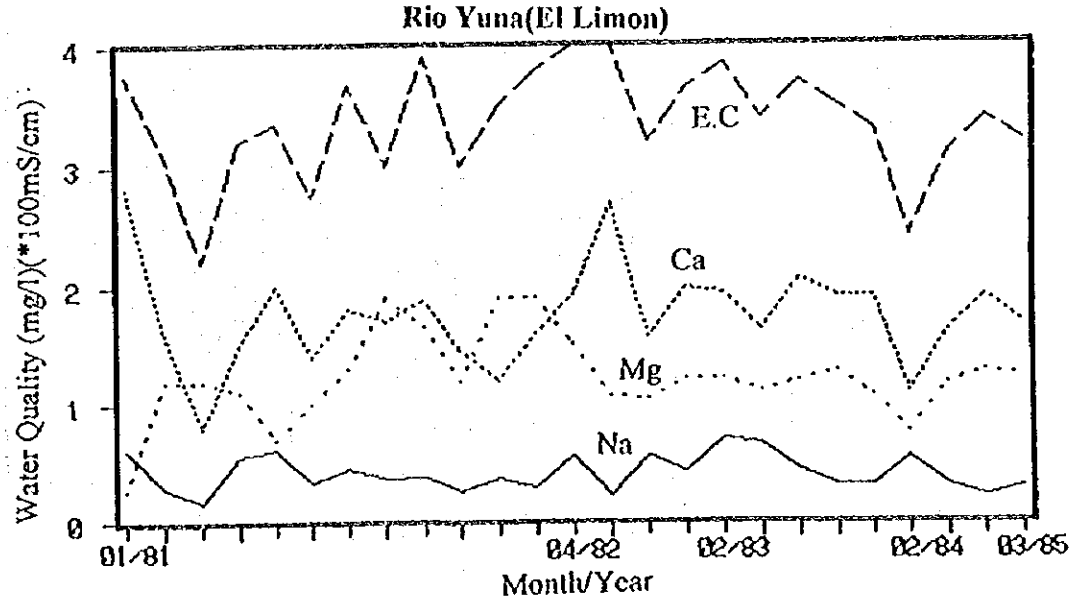


Fig. 3.14.5 Annual Variation of the River Water Quality(1981-1986)

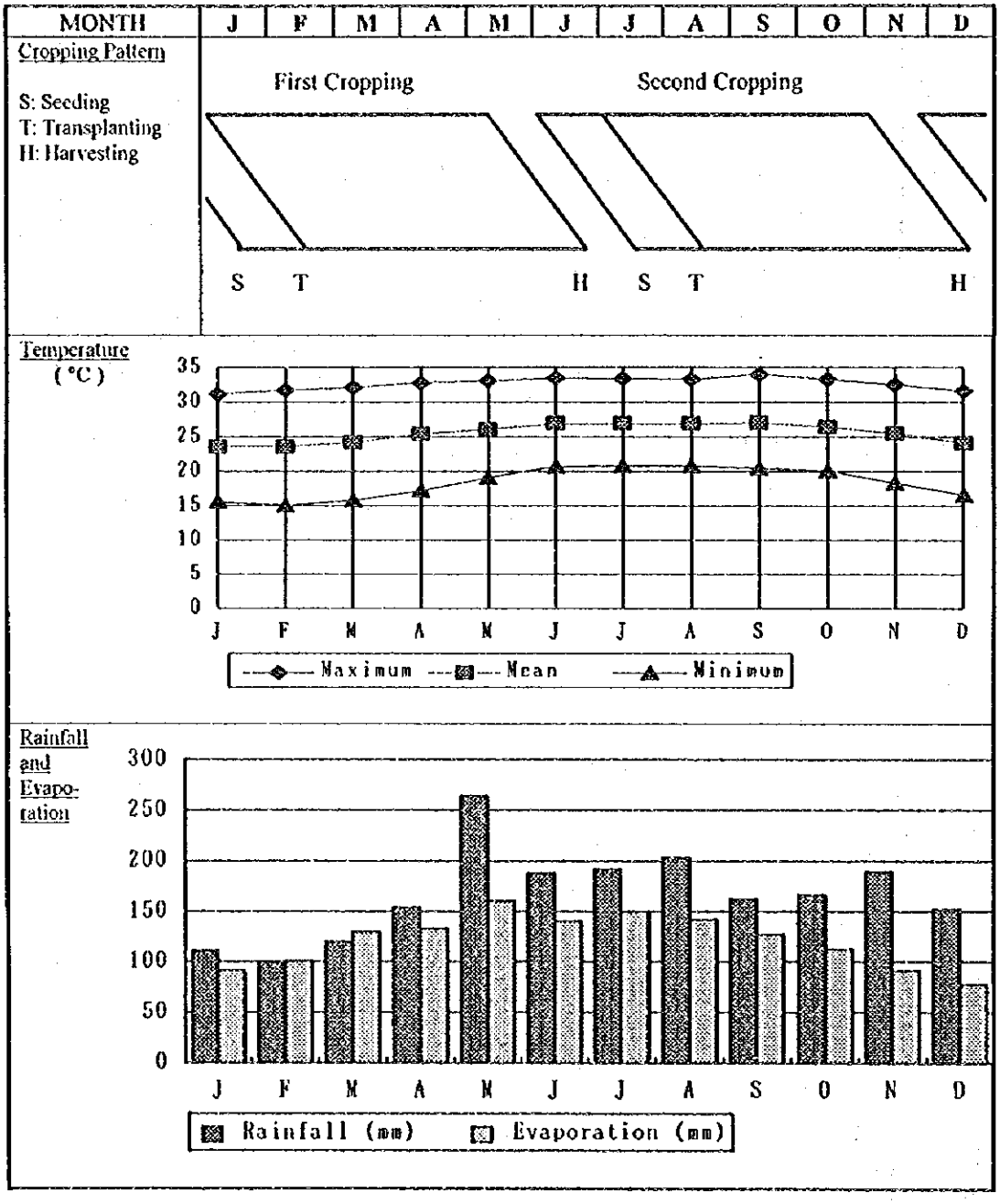
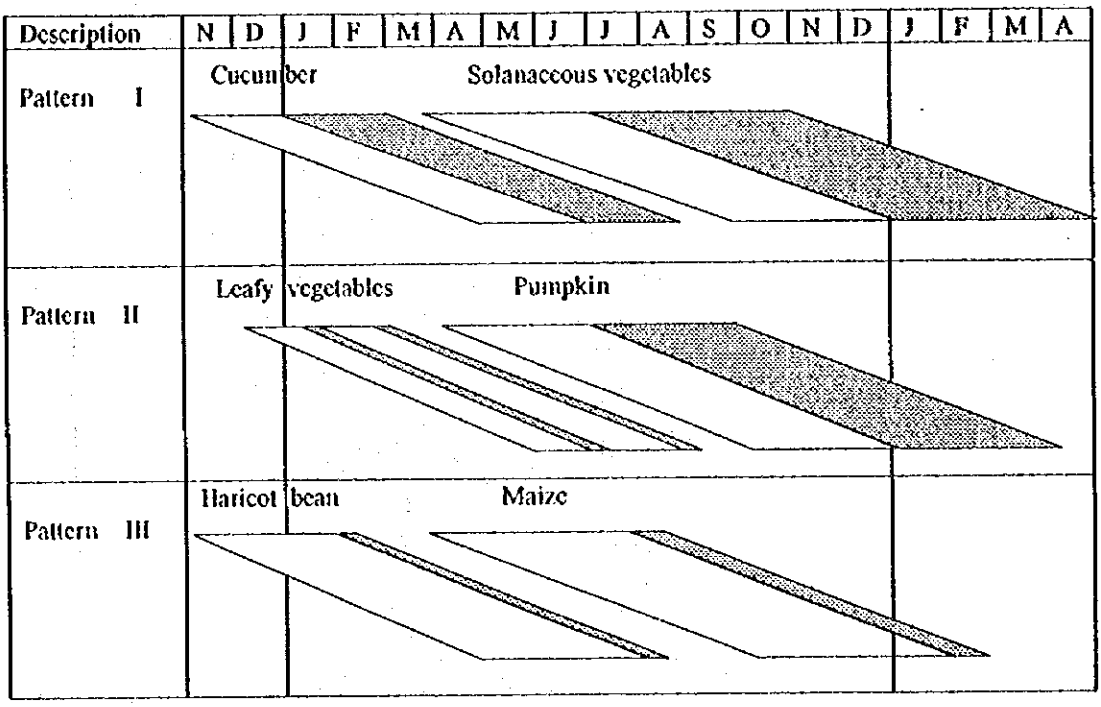


Fig. 5.4.1 Rice Cropping Plan



: Harvesting season

Fig. 5.4.2(1) Upland Crop Cropping Plan (Fundamental Patterns of Rotational Cropping)

Cropping System	1st year	2nd year	3rd year	Area (ha) Alter.A	B(1 & 2)
Rotational Crop. Field 1	Pattern I	Pattern II	Pattern III	30	20
Field 2	Pattern II	Pattern III	Pattern I	30	20
Field 3	Pattern III	Pattern I	Pattern II	30	20
Continuous Crop. Sweet potato				33	20
Cassava				40	25
Yautia				5	4
Pigeon pea				2	1

Alter. : Alternative

Fig. 5.4.2(2) Upland Crop Cropping Plan (Three Years Rotational and Continuously Cropping System)

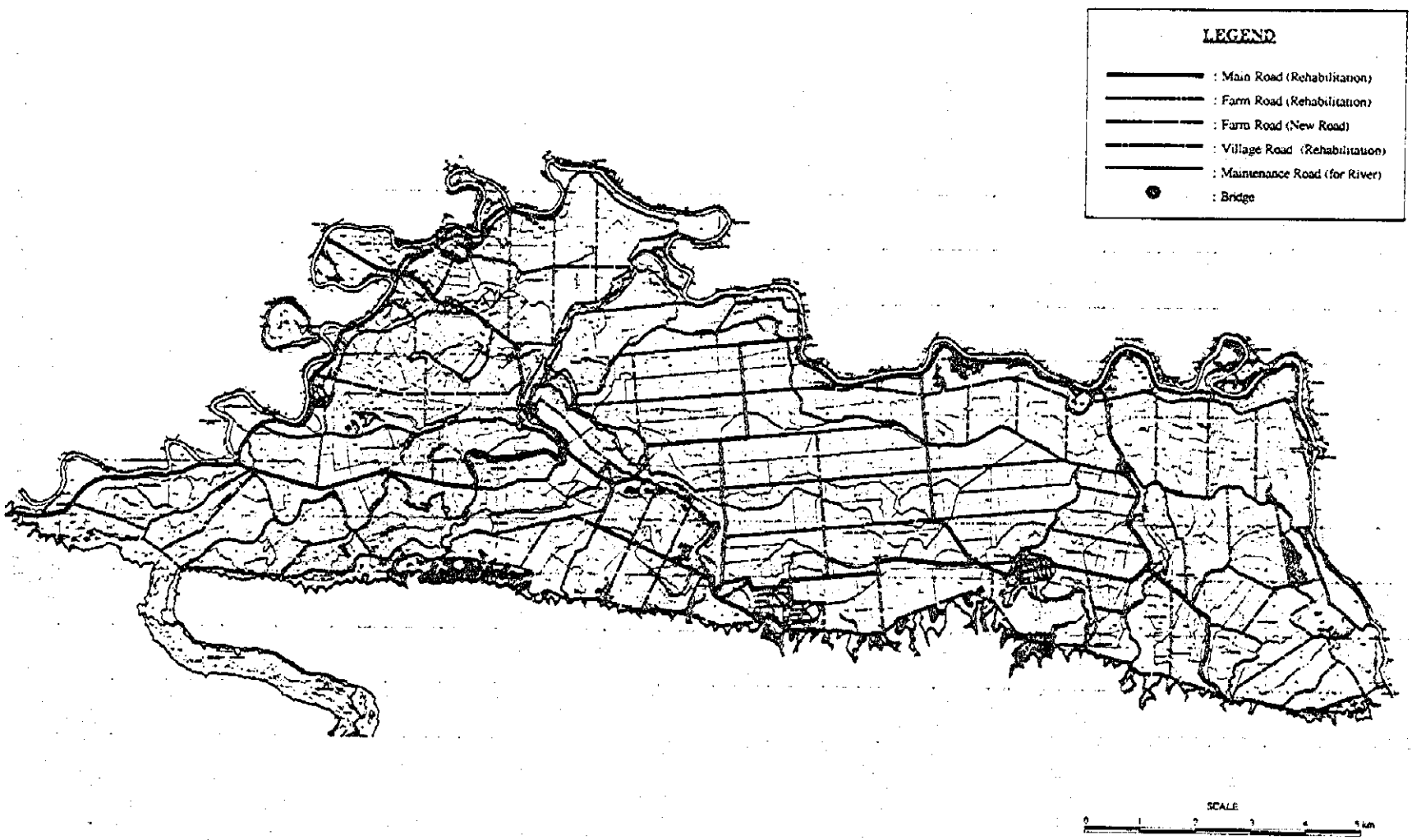
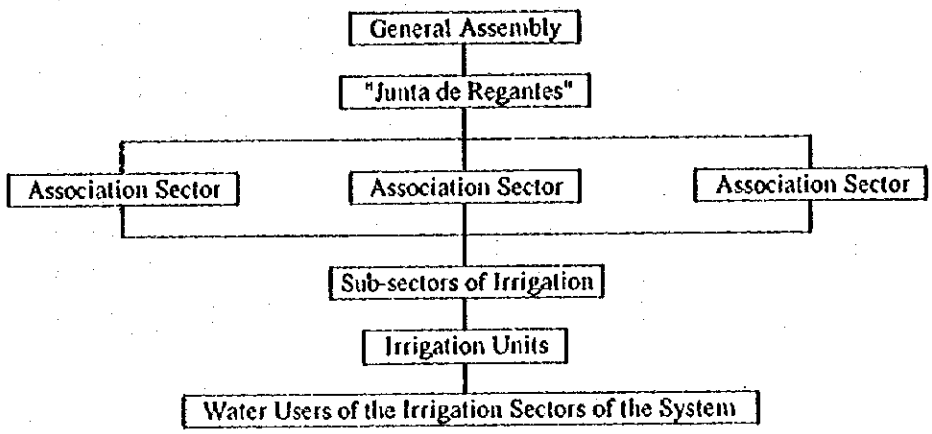
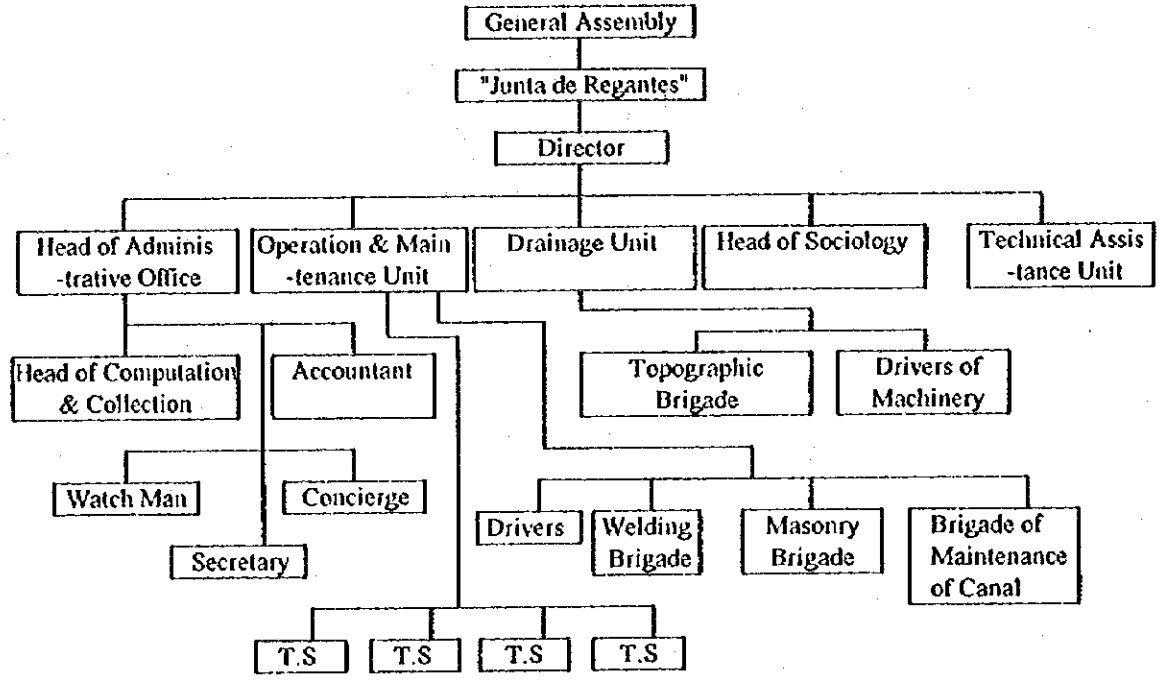


Fig. 5.8.1 Road Network Plan



(1) Organization Chart of the "Junta de Regantes"



(2) Operation Chart of the "Junta de Regantes"

Directives of the "Junta de Regantes"

President
Vice - president
Secretary
Treasurer
Vocal
Adviser

Fig. 6.6.1 Organization Chart of the "Junta de Regantes"

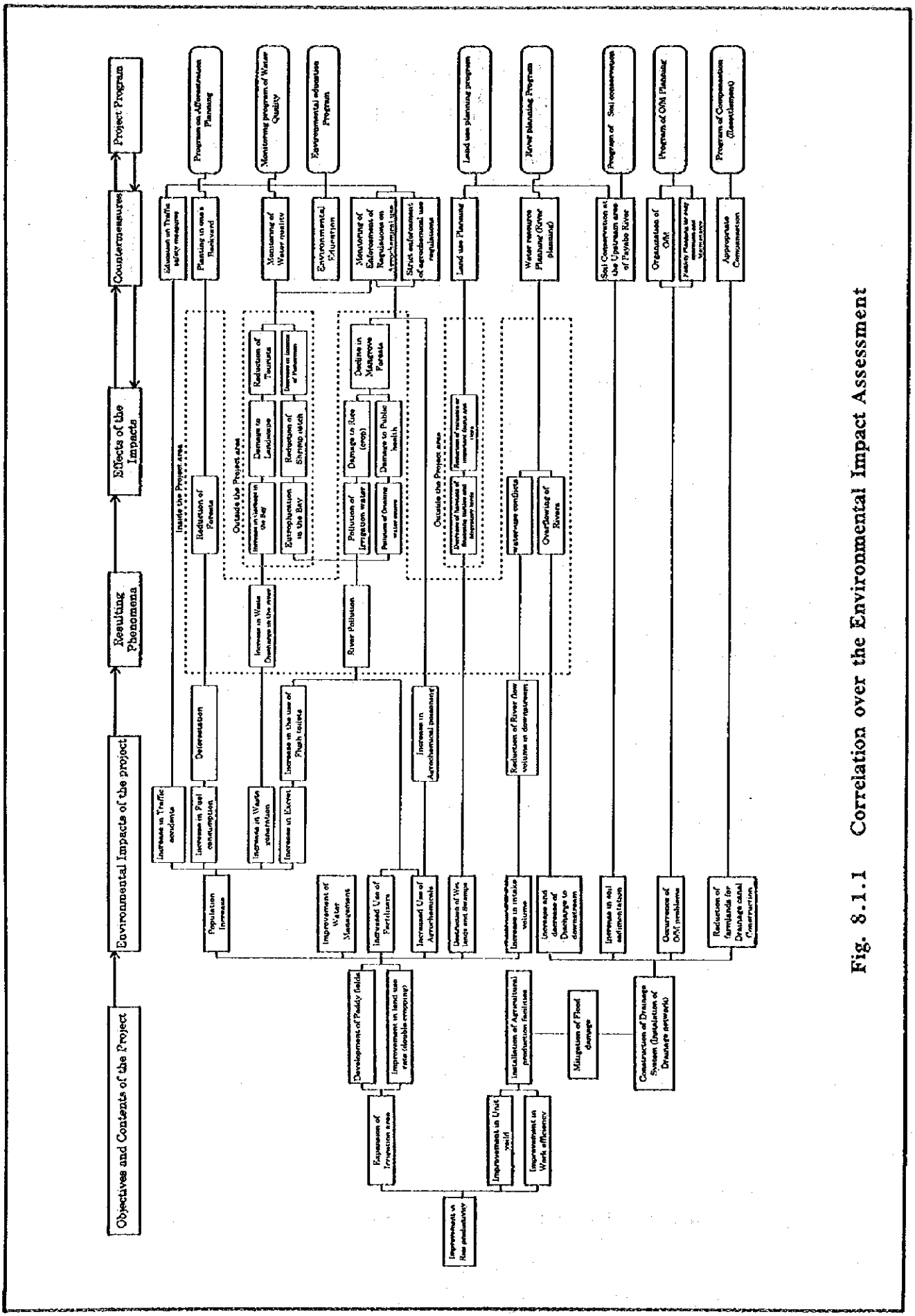
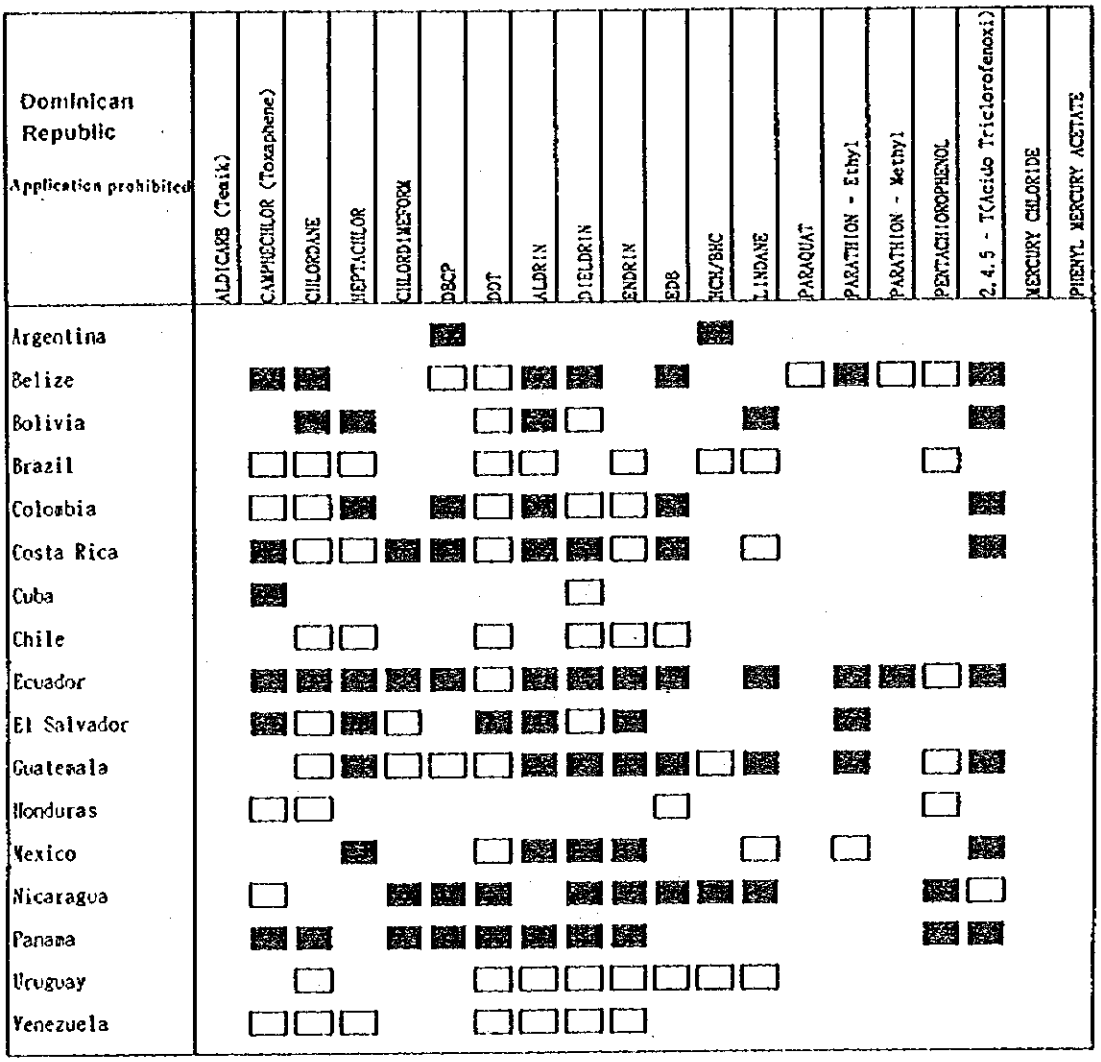


Fig. 8.1.1 Correlation over the Environmental Impact Assessment



Source:-Presidente de la Republic Dominicana (Numero217-91) 1991
-Enlace No.11,Boletin de la Red Accion en Plaguicidas de America Latina
RAP-AL Junio 1989,Quito,Ecuador

Fig. 8.4.1 Agro-chemicals prohibited in the Dominican Republic and other latin-american countries

ATTACHED DOCUMENTS

A.1: SCOPE OF THE WORK FOR THE STUDY AND ITS MINUTES OF MEETING

A.2 MINUTES OF THE MEETINGS DURING THE STUDY

A.3 LIST OF PERSONNEL CONCERNED WITH THE STUDY

A.1 : SCOPE OF WORK FOR THE STUDY AND ITS MINUTES OF MEETING

SCOPE OF WORK
ON
THE TECHNICAL COOPERATION
FOR
THE FEASIBILITY STUDY
ON
THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT
IN
THE DOMINICAN REPUBLIC

AGREED UPON BETWEEN
INSTITUTO NACIONAL DE RECURSOS HIDRAULICOS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

SANTO DOMINGO, 25 AUGUST, 1993

Ing. C. AUGUSTO RODRIGVEZ G.
Exécutive Director,
Instituto Nacional de
Recursos Hidraulicos

Mr. SHOICHI OGASAWARA
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency

I. INTRODUCTION

In response to the request of the Government of the Dominican Republic, the Government of Japan has decided to conduct the Feasibility Study on the Limon del Yuna Area Agricultural Development Project in the Dominican Republic (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Government of Dominican Republic.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. to conduct a feasibility study on the Limon del Yuna area agricultural development project, and
2. to pursue transfer of technology to the Dominican counterpart personnel in the course of the Study.

III. OUTLINE OF THE STUDY

1. Study Area

The Study covers Limon del Yuna area, approximately 10,000ha, in Duarte Province (See location map attached as Appendix II).

2. Scope of the Study

The Study will cover the following items:

(1) Collection, review and analysis of relevant existing data and information, and field survey, in terms of:

1) natural conditions (topography, vegetation, meteorology, hydrology, geology, soil, etc.),

2) social and economic conditions (population, household, employment, regional economy, farmers' economy, land tenure, rural and social infrastructure etc.),

3) agricultural conditions (land use, cropping pattern, agricultural yield/production, irrigation and drainage system, water management, agricultural facility and infrastructure, farming practices, processing, marketing, farmers' organizations, agricultural supporting services including extension and agricultural credit, etc.),

4) environmental conditions (natural condition, social condition, etc.), and

5) others.

(2) Amendment of the exsisting map at the scale of 1/10,000 based upon the exsisting aeropfotograph taken in 1984.

(3) Execution of following surveys:

1) geological survey
2) hydrological survey
3) topographical survey
4) soil survey
5) farmers' household survey
6) survey for the present situation of irrigation and drainage
7) environmental survey
8) others

(4) Preparation of agricultural development plan of the Study area, including:

1) land use and cropping pattern plan
2) farming practices development plan
3) water resource development plan
4) irrigation and drainage development plan
5) post harvest and marketing system development plan
6) farmers' organization and supporting service development plan
7) preliminary design of main facilities
8) project implementation schedule and organization
9) operation and maintenance plan
10) flood protection plan
11) environmental conservation plan

(5) Estimation of project cost and benefit

(6) Project evaluation

(7) Recommendations

Ⅳ. STUDY SCHEDULE

The Study will be carried out in accordance with the attached tentative work schedule. [Appendix Ⅰ]

Ⅴ. REPORTS

JICA shall prepare and submit the following reports to the Government of Dominican Republic, which consist of two versions:

- complete English version, and
- Spanish version with English appendixes.

(1) Inception Report
Five (5) copies in English and ten (10) copies in Spanish at the commencement of the Study.

(2) Progress Report (Ⅰ)
Five (5) copies in English and ten (10) copies in Spanish at the end of the first part of the field work.

(3) Interim Report
Five (5) copies in English and ten (10) copies in Spanish at the end of first part of the home office work.

(4) Progress Report (Ⅱ)
Five (5) copies in English and ten (10) copies in Spanish at the end of the second part of the field work.

(5) Draft Final Report
Five (5) copies in English and twenty (20) copies in Spanish within one (1) month following the end of the second part of the home office work of the Study. The Government of Dominican Republic shall provide JICA with its comments within one (1) month after receipt of the Draft Final Report.

(6) Final Report
Thirty (30) copies in English and fifty (50) copies in Spanish within two (2) months after the receiving comments on the Draft Final Report.

Ⅵ. UNDERTAKING OF THE GOVERNMENT OF DOMINICAN REPUBLIC

1. To facilitate smooth conduct of the Study, the Government of Dominican Republic shall take necessary measures:
(1) to secure the safety of the Japanese study team.

(2) to permit the members of the Japanese study team to enter, leave and sojourn in the Dominican Republic for the duration of their assignment therein and exempt them from foreign resistration requirments and consular fees.

(3) to exempt the members of the Japanese study team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into the Dominican Republic for the conduct of the Study.

(4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emolument or allowance paid to the members of the Japanese study team for their services in connection with the implementation of the Study.

(5) to provide necessary facilities to the Japanese study tear for remittance as well as utilization of the funds introduced into the Dominican Republic from Japan in connection with the implementation of the Study.

(6) to secure permission for entry into private properties or restricted areas for the implementation of the Study.

(7) to secure permission for the Japanese study team to take all data and documents including photographs related to the Study out of the Dominican Republic to Japan, and

(8) to provide medical services as needed. Its expenses will be chargeable on members of the Japanese study team.

2. The Government of Dominican Republic shall bear claims, if any arises, against the members of the Japanese study team resulti from, ocuring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of members of the Japanese study team.

3. The Insutituto Nacional de Recursos Hidraulicos (hereinafter referred to as 'INDRHI') shall act as the counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. INDRHI shall, at its own expense, provide the Japanese study team with the following in cooperation with other relevant organizations concerned:
   (1) available data and information related to the Study,
   (2) counterpart personnel,
   (3) suitable office space with necessary equipment (electricity, drinking water and telephone) near the Study area and in Santo Domingo
   (4) credentials or identification cards

Ⅵ. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, study teams to the Dominican Republic, and
2. to pursue technology transfer to the Dominican counterpart personnel in the course of the Study.

Ⅶ. LANGUAGE

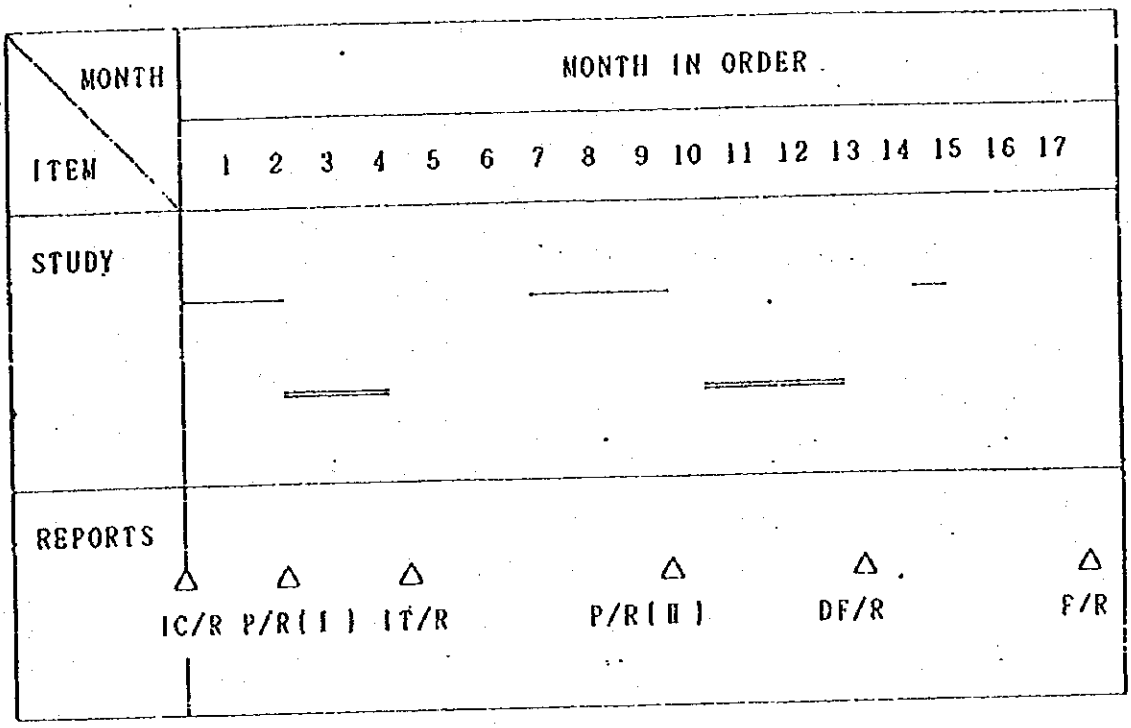
In case any divergence arises about interpretation of this Scope of Work, which is done in English and Spanish, the English text shall prevail.

Ⅷ. CONSULTATION

JICA and INDRHI shall consult with each other in respect of any matter that may arise from or in connection with the Study.

APPENDIX I

TENTATIVE SCHEDULE



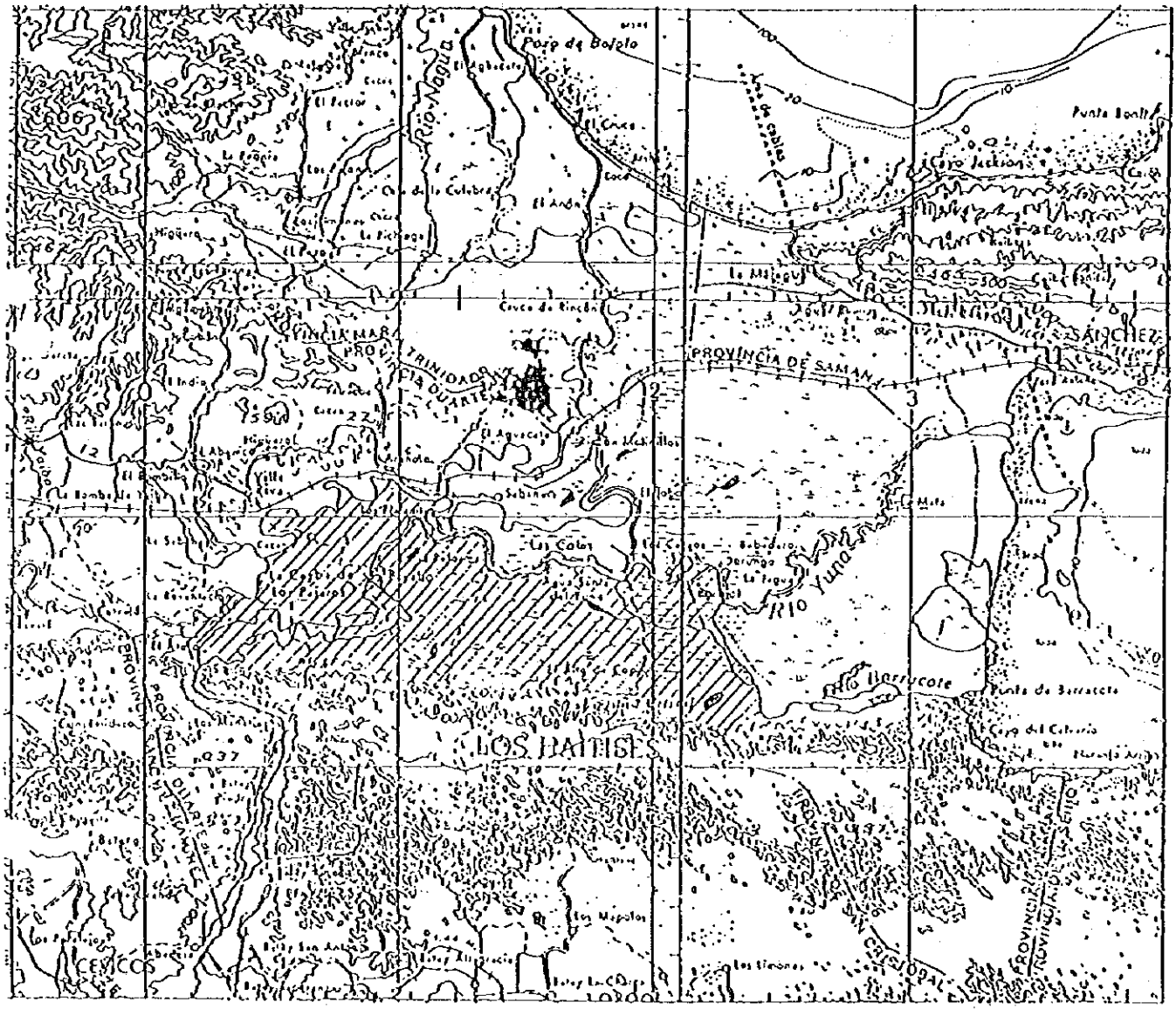
Remarks ——— : Field Work in the Dominican Republic

.....═══ : Home Office Work in Japan

IC/R: Inception Report
IT/R: Interim Report
DF/R: Draft Final Report
P/R[I]: Progress Report[I]
P/R[II]: Progress Report[II]
F/R : Final Report

APPENDIX II

STUDY AREA



: Study Area

Scale: 1/250,000

MINUTES OF MEETING
ON
SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT
IN
THE DOMINICAN REPUBLIC

The preparatory study team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), and headed by Mr. Shoichi Ogasawara, visited the Dominican Republic from August 9 to 28, 1993 for the purpose of discussing and confirming the Scope of Work for the Feasibility Study on the Limon del Yuna Area Agricultural Development Project in the Dominican Republic (hereinafter referred to as "the Study").

The Team had a series of discussions with the officials concerned of Instituto Nacional de Recursos Hidraulicos (hereinafter referred to as "INDRHI") and other organizations on the Scope of Work for the Study. The list of participants of the meeting is attached in the ANNEX.

As a result of the discussions, the Team and INDRHI agreed on the Scope of Work for the Study.

The following are the main issues discussed and agreed upon by both sides in relation to the Scope of Work for the Study.

1. INDRHI shall, at its own expense, install the equipments and investigate water discharge at the proposed springs and Payabo river and rainfall at Los Haitises periodically before the Study, in case that JICA provides INDRHI with survey equipments for water discharge and rainfall.

2. INDRHI shall execute, at its own expense, soil survey and farmers' household survey in consultation with the Japanese study team.

3. INDRHI shall provide the Japanese study team with necessary drivers.

4. JICA will execute the initial environmental examination (IEE) in the first half of the Study. Based upon the result of IEE, JICA will decide in consultation with INDRHI, whether the environmental impact assessment(EIA) should be executed. If necessary, JICA will execute EIA in the latter half of the Study.

5. INDRHI requested that the following equipments necessary for the Study be procured by JICA and be donated to the INDRHI after the termination of the Study. The Team promised to convey its request to the Government of Japan.

   - vehicles
   - sets of survey equipment for soil
   - sets of survey equipment for water discharge and sedimentation
   - sets of survey equipment for climate
   - photocopy machines
   - personal computer sets

6. INDRHI requested the counterpart training in Japan. The team promised to convey its request to the Government of Japan.

SANTO DOMINGO, 25 August, 1993

Ing. C. AUGUSTO RODRIGUEZ G.
Executive Director
Instituto Nacional de
Recursos Hidraulicos

Mr. SHOICHI OGASAWARA
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency

ANNEX

LIST OF PARTICIPANTS

1. Dominican Side

Jose Tiburcio	Director, Dept. of Planning INDRHI
Valentin Cordero	Director, Internacional Cooperation Office, INDRHI
Ignacio S. Guzman	Watershed Management Engineer, INDRHI
Clever Guaroa de la Cruz	Chief, Irrigation & Drainage Division, INDRHI
Carlos M. Cabral D.	Planning Irrigation Office, INDRHI
Gilberto Reynoso	Adviser, Irrigation & Drainage, INDRHI
Dario Rivas	Chief, Project Planning Division, Instituto Agrario Dominicano
Milton Morales	Assistance, Dept. of External Resources, Secretaria de Estado de Agricultura
Yutaka Iwasaki	JICA Expert, INDRHI

2. Japanese Side

Preparatory Study Team

Shoichi Ogasawara	Leader
Hidehiko Hioki	Member
Jinuemon Tatsuta	Member
Takashi Yama	Member
Tsunehiro Sasaki	Member
Isao Dojun	Member
Setsuko Otaki	Member

JICA Dominican Office

Nobukatsu Nakajima	Resident Representative
Nozomu Miyoshi	Staff
Yoshio Yanai	Local Staff
Fior Pichardo	Local Staff

A.2 : MINUTES OF THE MEETINGS DURING THE STUDY

MINUTES OF MEETING
ON
INCEPTION REPORT
OF
THE FEASIBILITY STUDY
ON
THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT
IN
THE DOMINICAN REPUBLIC

Santo Domingo, August 9, 1994

Ing. C. AUGUSTO RODRIGUEZ G.
Executive Director
Institute Nacional de
Recursos Hidraulicos
(INDRHI)

Mr. TAKASHI FUJITA
Leader,
Study Team
Japan International
Cooperation Agency
(JICA)

Mr. IZURU NAKAMURA
JICA
Head Office

In accordance with the Scope of Work for the Feasibility Study on the Limon Del Yuna Area Agricultural Development Project (hereinafter referred to as "the Study"), the Government of Japan dispatched to the Dominican Republic the Study Team headed by Mr. Takashi Fujita through Japan International Cooperation Agency (JICA) for the implementation of the Study.

At the commencement of the Study (on August 3, 1994), the Study Team officially presented Inception Report of (10) copies of the Spanish version and (5) copies of the English version, and explained basic concepts, methodology and schedule of the Study at the presence of Dominican organizations represented by the Instituto Nacional de Recursos Hidraulicos (INDRHI) and the Instituto Agrario Dominicano (IAD).

As the result of explanation and exchange of opinions on the Inception Report, the following points were the main issues discussed and agreed upon by the Dominican side and the Japanese side:

1. The Dominican side agreed upon the contents of the Inception Report wich had been prepared in due compliance with the conditions set forth in the Scope of Work for the Study.

2. Both sides agreed to collaborate for the efficient implementation of the Study so that the objectives of the Study be attained as described in the Scope of Work.

3. INDRHI promised to accelerate the installation of the equipment of water gages and rain gage donated from JICA.

4. INDRHI prepared the following for the Study:

   a. Office near the Study area;

   b. Counterpart personnel; and

   c. (4) Drivers;

5. INDRHI requested the counterpart training in Japan.

Attachment: List of attendants for the Meeting.

List of attendants

1. Dominican Side	
José Tiburcio	Director, Planning Department, INDRHI.
Valentín Cordero	Director, International Cooperation Office, INDRHI.
Ignacio Guzmán	Planning Engineer, INDRHI.
Francis González	Adviser, INDRHI.
María del C. Bautista	Adviser, Planning Department, INDRHI.
Orlado Añil	Chief, Hydrology Department, INDRHI.
Darío Rivas	Chief, Planning Office, IAD.
Laureano A. Acosta	Chief, Soil Division, INDRHI.
Clever Guaroa de la Cruz	Chief, Irrigation & Drainage Division, INDRHI.
Yutaka Iwasaki	JICA Expert, INDRHI.
2. Japanese Side **Study Team**	
Takashi Fujita	Team Leader / Rural Development.
Takashi Kitaguchi	Duputy-Team Leader/Irrigation & Drainage, Flood Mitigation.
Yujiro Itakura	Metro-Hydrology & Water Resources.
Ruriko Tamate	Coordinator.
JICA	
Izuru Nakamura	JICA Head Office.
Nozomu Miyoshi	JICA Dominican Office.

MINUTES OF MEETING
ON
THE PROGRESS REPORT (I)
FOR
THE FEASIBILITY STUDY
ON
THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT

In accordance with the Scope of Work for the Feasibility Study on the Limon del Yuna Area Agricultural Development Project (hereinafter referred to as "the Study"), the Government of Japan through Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Study Team headed by Mr. Takashi Fujita to the Dominican Republic to implement the Study.

The Study Team has conducted the Phase I field works fron August 1, 1994 up to date and the result of this field works is compiled in the Progress Report (I). To finalize the Phase I field works in the Dominican Republic, the Study Team submitted the said Progress Report (I) composed of ten (10) copies of the Spanish version and five (5) copies of the English version to the Government of the Dominican Republic on September 23, 1994.

After the submission of the Report, the Study Team made a comprehensive explanation of the Report with an emphasis laid on Fact Finding and Present Constraints of the Study Area and the Basic Development Plan of the Study, which was followed by an exchange of opinions on the Report between the Study Team and Dominican counterpart personnel represented by the National Institute of Hydraulic Resouces (INDRHI).

As a consequence of the afore-mentioned explanation on the Report as well as an exchange of opinions, the Dominican side manifested that the contents of Progress Report (I) is acceptable to them and, thus, the Study Team could proceed with the Phase I home office works in Japan on the basis of the basic development plan contemplated in the Report.

The following are major issues discussed and agreed upon during the meetig on the Progress Report (I).

1.The Dominican side expressed that the Environmental Impact Assessment (EIA) is essential within the context of the Study, therefore this EIA should be conducted during the phase II field works.

The Study Team replied that they shall take this opinion of the Dominican side into account and convey it to JICA's responsable person(s) in Japan.

2.For establishing future land use plan, an attention should be paid not only to the physical aspects (availability of water, topogaphy, soil fertility, etc) of the Study area, but also to the governmental policies on agricultural development of the Dominican Republic (irrigation system development, agricultural credits, etc.) and profitability analysis of proposed crops.

3.The decision to employ pumping irrigation system should be made in due consideration of the electric power supply condition in the Dominican Republic.

4.Measures to mitigate flooding from the Yuna river shoud not be formulated withing the development plan of the Study, but some recommendations on the matter should be presented in the final report.

5.INDRHI has promised to send the Study Team the result of soil and water analysis and information on land registration of the Study area as soon as possible.

Santo Domingo, September 26, 1994

Ing. José E. Tiburcio A.
Director, Planning Dept.
INDRHI

Mr. TAKASHI FUJITA
Leader
JICA Study Team

LIST OF PARTICIPANTS AT THE MEETING ON THE PROGRESS REPORT FOR THE FEASIBILITY STUDY ON THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT

DOMINICAN COUNTERPART (INDRHI)

Ing. José E. Tiburcio A.	Director, Planning Dept.
Ing. Orland Añil	Director, Hydrology Dept.
Ing. Valentín Cordero Lora	Manager, International Cooperation Office
Ing. Carlos Mayobanex Cabral	Manager, Irrigation Planning Office
Lic. Melania Bautista	Advisor, Planning Dept.
Ing. Laureano Acosta	Manager, Hydrology Div.
Lic. Felix Rodríguez	Manager, Programs and Budgets Div.
Ing. Clever Guaroa de la Cruz	Manager, Irrigation and Drainage Div.
Ing. Reynold Rubby Lewis	Manager, Operation Planning Sect.
Ing. Fidel Pérez	Hydrology Engineer
Ing. Yutaka Iwasaki	JICA Expert

JICA STUDY TEAM

Mr. Takashi Fujita	Team Leader/Rural Development
Mr. Takashi Kitaguchi	Deputy Team Leader/Irrigation & Drainage/Flood Mitigation
Mr. Yujiro Itakura	Meteo-Hydrology/Water Resources
Mr. Tamio Ota	Agro-economy/Project Evaluation
Mr. Masahiro Tajima	Environment & Farm Land Conservation
Dr. Yutaka Watanabe	Soil
Ms. Ruriko Tamate	Coordinator

MINUTES OF MEETING

ON

THE INTERIM REPORT

FOR

THE FEASIBILITY STUDY ON THE LIMON DEL YUNA AREA

AGRICULTURAL DEVELOPMENT PROJECT

Santo Domingo, January 27, 1995

Ing. C. Augusto Rodríguez Gallart
Executive Director of INDRHI

藤 地 孝
Mr. Takashi Fujita
Leader, JICA Study Team

Mr. Nobukatsu Nakajima
Director, JICA in
Dominican Republic

In accordance with the Scope of the Work for the Feasibility Study on the Limon del Yuna Area Agricultural Development Project (Hereinafter referred to as "the Study"), the Study Team of the Japan International Cooperation Agency (JICA) headed by Mr. Takashi Fujita submitted officially to the Government of the Dominican Republic through Instituto Nacional de Recursos Hidraulicos (INDRHI) on January 24, 1995 the Interim Report consisting of 10 copies of the Spanish version and 5 copies of the English version together with 6 sheets of the topographic map of the Study area.

On January 25, 1995 the Study Team, at the presence of representatives of INDRHI, realized presentation of the Interim Report with emphasis laid on chapter 2 (National Socio-economic Background), chapter 4 (Development Potentials) and chapter 5 Alternatives for the Development Plan). Following the said presentation, the Dominican side headed by Mr. Valentin Cordero Lora, Manager of the International Cooperation Office of INDRHI, made comments on the presentation as well as on the contents of the Interim Report and an exchange of opinions regarding the matter was made between the concerned parties.

As a result of the presentation and exchange of opinions on the Interim Report, the followings are agreed upon by both Dominican and Japanese sides.

1. The Dominican side confirmed that the Interim Report has been elaborated in conformity with the stipulations in the Scope of the Work and with schedule and methodology contemplated in the Inception Report.

2. The development potentials and alternatives for the development plan, which are basic concepts in formulating development plans of the Study, have been presented as a consequence of an adequate analysis of the Study area, so they are acceptable to the Dominican side.

3. The comments presented by the Dominican side are, among others,:

- To give priority to conveying water by gravity and to avoid the use of pumps as far as possible within INDRHI's policies on water resources development.

- In accordance with the above-mentioned principle, to prepare and evaluate an alternative for cropping pattern that result in less water requirement and more profitable.

4. In response to the said comments presented by the Dominican side, the Study team manifested that they would bear these comments in mind on formulating the development plans for the Study.

5. Both parties shall cooperate closely in view of accomplishing the targets and schedule of the Phase II field works as contemplated.

Annex: List of participants for the meeting

LISTA DE PARTICIPANTES EN LA REUNION DE DISCUSION
DEL INFORME INTERINO DEL ESTUDIO DE
FACTIBILIDAD DEL PROYECTO DE DESARROLLO AGRICOLA
EN EL AREA DE LIMON DEL YUNA

NOMBRE	CARGO
1. Parte Dominicana	
Valentín Cordero	Enc. Ofic. Cooperación Internacional
José E. Rodríguez L.	Enc. Departamento Proyectos
Orlando Añil	Enc. Departamento de Hidrología
Romer Polanco E.	Enc. División de Geotécnia
Laureano A. Acosta	Enc. División Agrología
Carlos Mayobanex Cabral	Enc. Div. de Estudio y Evaluación de Proyectos
Guaroa de la Cruz	Enc. División Riego y Drenaje
Félix Rodríguez	Enc. División Programación
Salvador Pérez Nina	Enc. Sección Sist. Parcelario
Daniel Solano	Enc. Sección Capacitación
Jorge Daniel V.	Enc. Educación Ambiental
Teófilo Pacheco	Ingeniero Hidráulico (Planificación)
Indhira De Jesús	Ingeniero Ambiental
Ramón Bolívar Batista C.	Ingeniero Agrón. (Planificación)
Francis González C.	Asesor de la Direcc. Ejecutiva
María del Carmen Bautista	Asesora Depto. de Planificación
Yutaka Iwasaki	Experto JICA, INDRHI
Toru Takegama	Asesor Dirección Ejecutiva
2. Parte Japonesa/Equipo del Estudio	
Takashi Fujita	Jefe de Equipo de Estudio / Desarrollo Rural.
Takashi Kitaguchi	Sub-líder/Riego y Drenaje
Shin Onoda	Experto en Diseño y Costos
Tamio Ota	Experto en Economía Agrícola
3. (JICA)	
Nozomu Miyoshi	JICA Oficina Sto. Dgo. en Rep. Dom.

MINUTES OF MEETING

ON

THE PROGRESS REPORT (II)

FOR

THE FEASIBILITY STUDY ON THE LIMON DEL YUNA AREA

AGRICULTURAL DEVELOPMENT PROJECT

Santo Domingo, March 17, 1995

C. Augusto Rodríguez Gallart
Executive Director of INDRHI

藤田 孝
Takashi Fujita
Leader of the Study Team,
JICA

Nobukatsu Nakajima
Director of JICA in the
Dominican Republic

In accordance with the Scope of the Work for the Feasibility Study on the Limon del Yuna Area Agricultural Development Project (referred to as "the Study"), the Government of Japan, through Japan International Cooperation Agency (JICA), dispatched to the Dominican Republic the Study Team headed by Mr. Takashi Fujita to conduct the Phase II field works for the Study.

The Study Team carried out the said field works from January 23, 1995 up to date and the result of this field works is compiled in the Progress Report (II). To conclude with the Phase II field works, the Study Team submitted officially to the Government of the Dominican Republic through Instituto Nacional de Recursos Hidraulicos (INDRHI) on March 15, 1995 the Progress Report (II) consisting of 10 copies of the Spanish version and 5 copies of the English version.

The next day, March 16, 1995, the Study Team, in the presence of the INDRHI personnel, carried out a presentation of the Progress Report (II) which contains seven chapters with related tables and figures. This presentation was followed by the statement of observations from the Dominican side and subsequent explanations from the Study Team.

After the presentation of the Progress Report (II), it has been agreed as follows between the Dominican side and the Study Team.

1. The Dominican side confirmed that the Progress Report (II) has been elaborated in conformity with the stipulations in the Scope of the Work and with schedule and methodology contemplated in the Inception Report.

2. The preliminary formulation of development plans for respective fields of the Study has been made on the basis of an adequate diagnosis and analysis of the potentials and constraints on both physical and socio-economic resources of the Study area, therefore the Dominican side considers it is proper to proceed with the definitive formulation of the development following the concepts and methodology presented in the preliminary formulation of the plans.

3. The Study Team will undertake in Japan the analisis of water samples to determine the concentration of agrochemicals in them. However, the dominican side considers that it will be very important for the Project to continue monitoring the agrochemical water content; therefore, they request the donation of a gas chromatography.

   The Study Team promised to convey the said request made by the dominican side to relevant person in charge of the Study in JICA's Tokyo Office.

LISTA DE PARTICIPANTES EN LA REUNION DE PRESENTACION
DEL INFORME DE AVANCE (II) DEL ESTUDIO DE
FACTIBILIDAD DEL PROYECTO DE DESARROLLO AGRICOLA
EN EL AREA DE LIMON DEL YUNA

NOMBRE	CARGO
1. Parte Dominicana	
Julián Cruz H.	Enc. (I) Dpto. de Planificación
J.D. Peña Geraldino	Enc. Dpto. Distritos de Riego
José E. Rodríguez L.	Enc. Dpto. de Proyectos
Valentín Cordero	Enc. Ofic Cooperación Internacional
Félix Rodríguez	Enc. Div. Programación y Presupuesto
Romer Polanco	Enc. Div. de Geotécnia
Clever Guaroa de la Cruz	Enc. Div. Riego y Drenaje
Salvador Pérez Nina	Enc. Sección Sist. Parcelaria
Daniel solano	Enc. Sección Capacitación
Antonio Ortiz Mena	Enc. Sección Redes Hidrológicas
Pedro Méndez	Ing. Analista de costos
Ramón Bolívar Batista	Téc. Div. de Program. y Presupuesto
Ignacio Guzmán	Enc. Proyecto Valle de Constanza
Arturo Jiménez	Asesor Dirección Ejecutiva
Francis González C.	Asesor Dirección Ejecutiva
Orlando Añil	Asesor Dpto Hidrología
María del Carmen Bautista	Asesora Dpto. de Planificación
Yutaka Iwasaki	Experto JICA, INDRHI
2. Parte Japonesa/Equipo del Estudio	
Takashi Fujita	Jefe de Equipo de Estudio / Desarrollo Rural.
Takashi Kitaguchi	Sub-líder/Riego y Drenaje
Tamio Ota	Experto en Agro-Economía
Yasutaka Uchiyama	Experto en Agronomía
Shin Onoda	Experto en Diseño y Costos
3. (JICA)	
Nozomu Miyoshi	JICA-Oficina Sto. Dgo. en Rep. Dom.
Fior Pichardo	JICA-Oficina Sto. Dgo. en Rep. Dom.
América Minerva Duran	JICA-Oficina Sto. Dgo. en Rep. Dom.

MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT

FOR

THE FEASIBILITY STUDY
ON
THE LIMON DEL YUNA AREA AGRICULTURAL DEVELOPMENT PROJECT

IN THE DOMINICAN REPUBLIC

AGREED UPON BETWEEN

INSTITUTO NACIONAL DE RECURSOS HIDRAULICOS (INDRHI)

AND

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

SANTO DOMINGO, AUGUST 30, 1995

Ing. Jesús María MATOS Y MATOS
Executive Director,
Instituto Nacional de Recursos
Hidráulicos (INDRHI)

藤田 孝

Mr. Takashi Fujita
Team Leader
JICA Study Team

吉田 悳

Mr. Satoshi Yoshida
JICA Tokyo Head Office

In accordance with the Scope of the Works for the Feasibility Study on the Limon del Yuna Area Agricultural Development Project (hereinafter referred to as "the Study"), the Government of Japan through Japan International Cooperation Agency (JICA) dispatched from August 22 to August 31, 1995 the Study Team headed by Mr. Takashi Fujita, Pacific Consultants International and accompanied by Mr. Satoshi Yoshida, JICA Tokyo Head Office for exposition of the Draft Final Report to the officials of the Government of the Dominican Republic concerned with the Study.

The explanation of the contents of the Draft Final Report was made by the Study Team on August 24 at the presence of the counterpart personnel and other officials of INDRHI (list of participants is as per Appendix 1) and this explanation was followed by presentation of comments and observations on the report from the Dominican side and their further explanation by the Study Team on August 24 and 25, 1995.

As a consequence of the said explanation as well as exchange of opinions on the Draft Final Report, the Study Team and the Dominican side agreed upon as follows:

1. The Dominican side received from JICA's Santo Domingo Office the Draft Final Report which is composed of twenty (20) copies of the Spanish report and five (5) copies of the English report on August 21, 1995.

2. The Dominican side agreed on the contents of the Draft Final Report which has been prepared in due compliance with the stipulations of the Scope of the Work and with the methodology set forth in the Inception Report.

3. Despite the agrement to the report expressed in the numeral 2 above, the Dominican side will make detailed analysis on the Draft Final Report and will provide the Study Team through JICA's Santo Domingo Office with their comments and observations on the report within one month after receipt of the Draft Final Report, namely, by September 20, 1995.

4. The Study Team shall make a revision of the Draft Final Report, if necessary, based on the comments and observations of the Dominican side and will submit the Final Report to the Dominican Government within two months after receipt of the comments and observations on the report.

5. The Dominican side requested the Study Team to donate vehicles, equipment and machinery (refer to Appendix 2 for details), which had been used by the Study Team during the course of their field works in the Dominican Republic, for the Department of Planning to conduct surveys and investigations relevant to the Study. In response to this request, the Study Team promised to convey it to the Government of Japan.

6. The Dominican side expressed that they are eager to obtain financial assistance from the Government of Japan as early as possible for implementation of the Limon del Yuna Agricultural Development Project. The Study Team answered that they also convey this desire of the Dominican Government to the Government

of Japan and suggested in relation with this matter that the Dominican Government make necessary arrangement including preparation of the official request for the financial assistance as timely as possible so that the implementation of the Project might be facilitated.

7. The Dominican side has no objection for the Final Report being open to the public immediately after the Final Report is received by INDRHI.

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MEETING FOR THE PRESENTATION OF THE FINAL DRAFT
REPORT OF THE LIMON DEL YUNA PROJECT

APPENDIX 1: List Of Participants

1. DOMINICAN SIDE	
Ing. Carlos Mayobanex Cabral	Enc. Dpto. Planificación
Ing. Valentín Cordero	Enc. Oficina Cooper. Intern.
Ing. José R. Rodríguez López	Enc. Dpto. de Proyectos
Ing. Freddy de León	Enc. Dpto. de Hidrología
María del Carmen Bautista	Asesora Dpto. Planificación
José Daniel Peña Geraldino	Asesor Dirección Ejecutiva
Ing. Orlando Añil	Asesor Dirección Ejecutiva
Agrim. Arturo Jiménez	Asesor Dirección Ejecutiva
Toru Takegama	Asesor Dirección Ejecutiva (Asuntos Japoneses)
Ing. Yutaka Iwasaki	Experto Japonés
Ing. Laureano A. Acosta	Enc. División de Agrología
Ing. Agustina García C.	Enc. División Calidad de Agua
Ing. Clever Guaroa de la Cruz	Enc. División Riego y Drenaje
Ing. José Fco. Guillen P.	Enc. División Operaciones
Lic. Félix Rodríguez	Enc. División Prog. y Presup.
Lic. Daniel Solano	Enc. Sección Capacitación
Ing. Salvador Pérez	Enc. Secc. Sist. Parcelaria
Ing. Indhira De Jesús	Evaluación Impacto Ambiental
Ing. Ramón Bolívar Batista	Tec. Aux. Div. Prog. y Presup.
Antonio Ortiz Mena	Enc. Sección Redes Hidrológicas
Ing. Romer Polanco	Enc. División de Geotécnia
2. JAPANESE SIDE	
• Study Team	
Takashi Fujita	Team Leader
Tamio Ota	Project Evaluation
• JICA	
Satoshi Yoshida	Tokyo Head Office
Miyoshi Nozomu	Santo Domingo Office

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Appendix 2: List of Vehicles, Equipment and Machinery Requested by the Dominican Side for Donation

Items	Model/Specifications	Quantity
Vehicle	Toyota Land Cruiser	2
Soil Analysis Equipment		1
Automatic Water Level Gauge		6
Rain Gange		1
Personal Computer with Display	486 DX2-66Mhz-70ns Hard disk: 426 MB RAM: 16 MB	1
Printer	Hewlett Packard Laserjet 4	1
Software WordPerfect	Version 6.1 for Windows	1
Software Lotus	Version 4.01 for Windows	1
Floppy Disk	Maxell 2 HD 3.5	80
Photo Copy Machine	Canon NP-2120	1

A.3 : LIST OF PERSONNEL CONCERNED WITH THE STUDY

1. Members of the Japanese Study Team and their Dominican Counterpart Personnel

Members of the Japanese Study Team	Fields of Specialization	Dominican Counterpart Personnel
Mr. Takashi Fujita	Team Leader/Rural Development	Ing. Valentín Cordero
Mr. Takashi Kitaguchi	Deputy Team Leader/ Irrigation and Drainage & Flood Mitiagation	Ing. Salvador Pérez Nina
Dr. Yasutaka Uchiyama	Farm Management & Crooping System	Ing. Ramón Bolívar Batista
Mr. Tamio Ota	Agro-economy & Project Evaluation	Lic. Félix Rodríguez María del Carmen Bautista
Mr. Yasuro Hagihara	Institutional Supporting Services & Rural Organization	Ing. Daniel Solano Pérez
Mr. Masahiro Tajima	Environment & Soil Conservation	Ing. Indrhira de Jesús Ing. Jorge Daniel
Mr. Shin Onoda	Structures Design & Cost Estimation	Ing. Teófilo Agustín Pacheco Ing. Pedro Méndez
Mr. Yujiro Itakura	Hydro-meteorology & Water Resources	Ing. Fidel Pérez Ing. Reynold Rybby Lewis
Mr. Mutsuo Asano	Geology	Ing. Romer Polanco
Dr. Yutaka Watanabe	Soils	Ing. Laureano A. Acosta
Mr. Shin-ichi Kono Mr. Koichi Morita	Topograhic Survey	Ing. Arturo Jiménez
Ms. Ruriko Tamate	Cordinator	

2. Other Dominican Personnel Concerned with the Study

Organization	Name	Position
Instituto Nacional de Recursos Hidráulicos (INDRHI)	Ing. José Tuburcio	Director, Department of Planning (Up to Nov. 1994)
	Ing. Carlos Mayobanex Cabral	Director, Department of Planning (From June 1995)
	Ing. José E. Rodríguez López	Director, Department of Projects
	Ing. Freddy León	Director, Department of Hydrology
	Ing. Francis González C.	Advisor to the Eexcutive Director
	Ing. José Daniel Peña G.	Advisor to the Eexcutive Director
	Ing. Orland Añil	Adviser to the Executive Director (Former Director, Department of Hydrology)
	Agrim. Arturo Jiménez	Adviser to the Executive Director
	Ing. Agustina García C.	Chief, Division of Water Quality
	Ing. Clever Guaroa de la Cruz	Chief, Division of Irrigation & Drainage
	Ing. José Rco. Guilen P.	Chief, Division of Operations
	Antonio Ortiz Mena	Chief, Section of Hydrological Network
	Ing. Ignacio S. Guzman	Project Manager, Constanza Irrigation Project Office
Instituto Agrario Dominicano (IAD)	Ing. Darío Rivas	Director, Department of Planning
Secretaria de Estado de Agricultura (SEA)	Ing. Milton Morales	Assistant, Department of External Resources