

**Table 4.2.1 Proposed Farming Practices for Main Crops in the Project Area**

<b>Crop: Plantain</b>	<b>With Project</b>
Variety	"Macho por Hembra", "Enano"
Planting Density/Planting Materials	Planting at 2.5 m between rows and 2 m between plants for a density of about 2,000 plants per ha. Use of Seedlings grown by tissue culture that are free from insects and diseases. Replanting every 5 years. Introduction of Inter-cropping in newly replanted areas.
Fertilizer (kg/ha)	N=160; P=110; and K= 200 kg/ha; divide the total amount of each nutrients in 3 applications per year; apply fertilizer the second, fourth, and sixth month after planting.
Labor (man-day/ha)	144
On-farm Water Management	Irrigation water applied on defined schedule based on crop water requirements, irrigation intervals at about 10 days. For plantain in the Project area is better to apply frequent irrigation even of small water depth, and not to irrigate at long intervals with large water depth. Avoid depletion of more than 35 % of soil available water, also avoid excess of soil moisture.
Insects & Diseases Control	Use of planting materials free from insects and nematodes; Extensive adoption of Integrated Pest Management, including: introduction of fungus and nematodes that function as biological control of Cosmopolites and Nematodes pest of plantain, proper disposal of stems, timely control of weeds, proper fertilization, and water application in order to have healthy plantations more resistant to damages. Use of insecticide-nematicides of commercial name "Mocap 10G" and/or "Furadan" at a rate of 15 kg/ha/year divided in 3 applications.
<b>Crop: Tomato</b>	
Variety	Hybrid Germ
Planting Density/ Planting Materials	Planting distance at about 0.85 m between rows and 0.3 m between plants, for a density of about 40,000 plants per ha. Transplanting method; Proper care of seedlings to avoid virus disease
Fertilizer (kg/ha)	N=200; P=150; and K= 150 kg/ha; divide half at planting and half at the second month.
Labor (man-day/ha)	120
On-farm Water Management	Irrigation water applied on defined schedule based on crop water requirements. Frequent application of small amount of water is more important than large amount applied at long intervals. The most critical period for water demand is during flowering; excess of water during flowering period may cause drop of flowers. Avoid deficits and excess of soil moisture. Water application can be reduced at ripening period.
Insects & Diseases Control	Extensive use of Integrated Pest Management will be introduced, including planting date, use of more resistant varieties, adequate care of seedlings, appropriate planting dates, weed control, etc. Use about 14 kg/ha of pesticides divided in 3 applications.
<b>Crop: Melon</b>	
Variety	"Honey Dew"
Planting Density/Planting Materials	1 kg/ha of seeds
Fertilizer (kg/ha)	N=210; P=180; and K= 210 kg/ha; Divide the total amount of each nutrients in 2 applications half at planting time and half one month after planting.
Labor (man-day/ha)	90
On-farm Water Management	Irrigation water applied on defined schedule based on crop water requirements. Avoid deficits and excess of soil moisture.
Insects & Diseases Control	Extensive use of Integrated Pest Management will be introduced, including use of more resistant varieties, adequate care of seedlings, appropriate planting dates, weed control, etc. Use about 20 kg/ha of pesticides divided in 5 applications.
<b>Crop: Papaya</b>	
Variety	"Cubana" and "Red Lady"
Planting Density/Planting Materials	Planting distance at 3 m between rows and 2 m between plants for a density of 1,600 plants per ha.
Fertilizer (kg/ha)	N=150; P=90; and K= 90 kg/ha per year; Divide the total amount of each nutrients in 2 applications, half at planting time and half 3 months after planting.
Labor (man-day/ha)	147
On-farm Water Management	Irrigation water applied on defined schedule based on crop water requirements. Apply shallow irrigation depth at frequent intervals; do not allow to deplete more than 40 % of soil available water.
Insects & Diseases Control	Use of variety most resistant to virus disease such as "Cubana"; this variety is also more resistant to damage during transportation. Adoption of Integrated Pest Management, including timely control of weeds, proper fertilization and water application in order to have healthy plantations. Use of 20 kg/ha of pesticides divided in 6 applications per year, mainly when plant are small, 1 to 5 month old.
<b>Crop: Pepper</b>	
Variety	"Cubanela"
Planting Density/ Planting Materials	Planting distance at 1m between rows and 0.6 m between plants for a density of about 16,700 plants per ha. Transplanting method; Proper care of seedlings to avoid virus disease in seedlings.
Fertilizer (kg/ha)	N=125; P=90; and K= 90 kg/ha; divide in 3 applications, at first, second, and third months after transplanting.
Labor (man-day/ha)	120
On-farm Water Management	Irrigation water applied on defined schedule based on crop water requirements. Avoid deficits and excess of soil moisture.
Insects & Diseases Control	Extensive use of Integrated Pest Management will be introduced, including planting date, use of more resistant varieties, adequate care of seedlings, appropriate planting dates, weed control, etc. Use about 10 kg/ha of pesticides divided in 5 applications.

**Table 4.2.2 Estimate of Annual Requirement of Farming Inputs in the Project Area**

Crop	Planted Area (ha)	Seedlings/Seeds			Plant Nutrients						Pesticides	
		Num.or (kg/ha)	Total (Num. or kg)		N		P		K		(kg/ha)	Total (ton)
					kg/ha	Total (ton)	kg/ha	Total (ton)	kg/ha	Total (ton)		
1 Plantain	4,550	2,000	9,100,000	seedlings	160	728	110	501	200	910	15	68
2 Tomato	890	1	890	Kg	200	178	150	134	150	134	14	12.5
3 Sweet potato	550	4,500	2,475,000	Kg of cuttings	75	41	75	41	75	41	6	3.3
4 Melon	410	1	410	Kg	210	86	180	74	210	86	20	8.2
5 Pepper	315	0.8	252	Kg	125	39	90	28	90	28	10	3.2
6 Papaya	240	0.5	120	Kg	150	36	90	22	90	22	20	4.8
7 Cassava	220	218	47,960	Kg of cuttings	90	20	60	13	60	13	75	16.5
8 Banana	170	2,000	340,000	seedlings	300	51	150	26	150	26	15	2.6
9 Pigeon pea	140	20	2,800	Kg	45	6	45	6	30	4	1	0.1
10 Corn	100	40	4,000	Kg	90	9	60	6	60	6	2	0.2
11 Bean	60	125	7,500	Kg	75	5	95	6	40	2	3	0.2
12 Eggplant	120	1	120	Kg	150	18	120	14	120	14	4	0.5
13 Rice	40	160	6,400	Kg	200	8	115	5	90	4	7	0.3
<b>TOTAL</b>	<b>7,805</b>					<b>1,225</b>		<b>875</b>		<b>1,290</b>		<b>120</b>

**Table 4.2.3 Estimate of Additional Tractors Requirement for Land Preparation With Project Condition**

**Estimated Monthly Area for Land Preparation Within the Project Area**

Crop	Area (ha)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Cassava	220							37	73	73	37		
Pigeon pea	140				70	70							
Tomato	250	146	104										21
Pepper	190	100											90
Melon 1	100	59	8										33
Melon 2	100			33	59	8							
Corn	100						25	50	25				
Bean	60	20	35	5									
Rice 1	20							7	11	2			
Rice 2	20	7	11	2									
Sweet Potato	450						75	150	150	125			
Eggplant	30										15	15	
Plantain (Replant 20 %)	910	25							75	110	250	225	200
Banana (Replant 20 %)	180										14	10	10
Papaya (Replant 50 %)	240		45								25	50	
	3010	357	203	40	129	78	100	244	334	310	341	300	354

**Assumptions**

- (i) Project Area includes part of three SEA's sub-zones, Vicente Noble, Tamayo, and Fundacion; there are a total of 13 tractors in those sub-zones.
- (ii) The total land area that those 13 tractor must cover is about 9,400 ha, including the Project Area and Outside of Project Area
- (iii) It is estimated that the 13 tractors work in the Project Area for about 70 % of working time, and 30 % of working time is Outside of Project Area
- (iv) The present cropping pattern in the whole area (within project area and outside project area) are assumed same.
- (v) The number of working days per month is assumed at 15 days/month, and actual number of working hours is 7.5 hours/day.
- (vi) The time required for land preparation for average tractor size of 80 HP is 4 hour/ha; Working efficiency is assumed at 0.65

$$\text{Area/Tractor/Month} = \frac{(\text{No. days/month}) * (\text{No. hours/day}) * (\text{Working Efficiency})}{(\text{Yield of tractors (ha/day)})}$$

$$\text{Area/Tractor/Month} = \frac{(15 \text{ days/month}) * (7.5 \text{ hours/day}) * (0.65)}{(4 \text{ hours/ha})} = 18.3 \text{ ha/tractor/month}$$

$$18.3 \text{ ha/tractor/month} * 0.7 = 12.8 \text{ ha/tractor/month within the project area}$$

$$18.3 \text{ ha/tractor/month} * 0.3 = 5.5 \text{ ha/tractor/month outside the project area}$$

Area that can be prepared in the Project Area with existing Tractors	166	166	166	166	166	166	166	166	166	166	166	166	166
Area that can not be prepared in the Project Area with existing Tractors	191	37	-126	-37	-88	-66	78	168	144	175	134	188	
No. of New tractors Required to Cover demand in Project Area	10	2	0	-2	-5	-4	4	9	8	10	7	10	

**Table 4.2.4 Labor Requirement and Family Labor Balance With Project Condition**

(1) Proposed Cropping Pattern		Unit: ha planted/month											
Crop	Area (ha)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Cassava	220	220	220	183	110	37		37	110	183	220	220	220
Pigeon pea	140				70	140	140	70					
Tomato	250	167	250	250	167	21							21
Tomato (inter-cropping)	640	428	640	640	428	54							54
Pepper	190	174	190	190	174	63							63
Pepper (inter-cropping)	125	114	125	125	114	41							41
Melon 1	100	92	100	67	8								33
Melon 2	100				40	100	60	40					
Melon 1 (inter-cropping)	105	97	105	70	8								35
Melon 2 (inter-cropping)	105				45	105	60	45					
Corn	100							25	75	100	100	75	25
Bean	60	20	55	60	40	5							
Rice 1	20							7	18	20	20	18	7
Rice 2	20	7	18	20	20	18	7						
Sweet Potato	450						75	225	375	450	375	225	75
Sweet Potato (inter-cropping)	100						17	50	83	100	83	50	17
Eggplant	30	28	30	30	28	10							10
Eggplant (inter-cropping)	90	84	90	90	84	30							30
Plantain (Replant 20%)	910	910	910	910	910	910	910	910	75	185	435	660	850
Plantain (Maintenance 80%)	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640	3,640
Banana (Replant 20%)	34	34	34	34	34	34	34	34	34	34	14	24	34
Banana (Maintenance 80%)	136	136	136	136	136	136	136	136	136	136	136	136	136
Papaya (Replant 50%)	120	120	120	120	120	120	120	120	120	120	120	25	75
Papaya (Maintenance 50%)	120	120	120	120	120	120	120	120	120	120	120	120	120

(2) Monthly Labor Requirement		Unit: man-day/month												TOTAL	per ha
Crop	Area (ha)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		
Cassava	220	3,099	2,735	1,952	858			548	2,428	3,362	3,387	3,090	2,854	24,583	112
Pigeon pea	140				1,134	2,172	2,228	1,190						6,724	48
Tomato	250	5,785	8,222	9,239	5,215	847							742	30,050	120
Tomato (inter-cropping)	640	7,630	10,788	17,237	11,716	2,162							1,001	50,534	79
Pepper	190	5,394	6,482	7,053	5,246	1,182	160						1,867	27,384	144
Pepper (inter-cropping)	125	1,871	2,263	2,690	2,216	765	84						518	10,407	83
Melon 1	100	2,622	2,663	2,326	294								1,056	9,001	90
Melon 2	100				1,328	2,796	2,674	2,166						8,964	90
Melon 1 (inter-cropping)	105	1,375	1,959	2,159	268								567	6,328	60
Melon 2 (inter-cropping)	105				729	1,449	2,144	2,010						6,332	60
Corn	100							450	1,211	1,349	1,217	985	355	5,367	56
Bean	60	646	1,555	1,236	687	83								4,207	70
Rice 1	20							356	672	431	558	492	82	2,591	130
Rice 2	20	356	672	431	558	492	82							2,591	130
Sweet Potato	450						1,590	4,170	5,925	7,020	6,360	4,605	1,920	31,590	70
Sweet Potato (inter-cropping)	100						187	414	462	721	896	845	435	3,960	40
Eggplant	30	952	685	607	418								446	3,108	104
Eggplant (inter-cropping)	90	2,860	2,055	1,821	1,254								1,350	9,340	236
Plantain (Replant 20%)	910	14,346	13,389	12,260	13,490	9,057	7,633	6,163	8,291	5,504	10,697	13,839	16,486	131,155	144
Plantain (Maintenance 80%)	3,640	14,888	14,888	43,134	49,977	35,764	44,590	34,689	53,617	43,425	26,536	38,184	20,129	430,821	116
Banana (Replant 20%)	34	516	519	454	442	338	314	245	207	154	551	517	657	4,914	145
Banana (Maintenance 80%)	136	556	556	1,612	1,867	1,374	1,666	1,296	1,003	1,622	991	1,427	752	15,722	116
Papaya (Replant 50%)	120	1,591	1,485	1,449	1,278	860	599	980	1,388	2,777	1,274	1,700	2,244	17,625	147
Papaya (Maintenance 50%)	120	2,184	1,680	1,580	1,452	1,380	1,579	492	300	1,388	1,388	1,388	1,388	16,199	135
<b>Total Monthly Labor Requirement</b>		<b>66,671</b>	<b>72,596</b>	<b>107,240</b>	<b>100,457</b>	<b>61,721</b>	<b>65,530</b>	<b>55,469</b>	<b>76,504</b>	<b>67,753</b>	<b>53,855</b>	<b>67,012</b>	<b>54,889</b>	<b>849,697</b>	
<b>Estimated Available Farm Household Labor</b>		<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>	<b>225,000</b>		
<b>Balance of Farm Household Labor</b>		<b>158,329</b>	<b>152,404</b>	<b>117,760</b>	<b>124,543</b>	<b>163,279</b>	<b>159,470</b>	<b>169,531</b>	<b>148,496</b>	<b>157,247</b>	<b>171,145</b>	<b>157,988</b>	<b>170,111</b>		

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions, (1/7)**

**Plantain Production**

**1) Without Project**

Item	Unit	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>				
Unit Yield	ton	3,730	13	48,490
<b>B) Production Cost</b>	ha			16,460
<b>1) Farm Inputs</b>				
- Seedlings	stumps	0.5	0	0
- Fertilizers	N kg	9.86	80	789
	P kg	8.5	50	425
	K kg	8.5	40	340
- Insecticides	kg	145	25	3,625
<b>2) Labor</b>	man-day	100	105	10,500
<b>3) Machinery Cost</b>				
- Land Preparation	ha	2,480	0	0
<b>4) Miscellaneous (5%)</b>				780
<b>C) Net Income</b>				32,030

**2) With Project**

Item	Unit Price	1st Year		2nd Year	
		Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
Unit Yield	3,730	21	78,330	24	89,520
<b>B) Production Cost</b>			30,000		19,830
<b>1) Farm Inputs</b>					
- Seedlings	2	2,000	4,000	200	400
- Fertilizers	9.86	160	1,578	160	1,578
	8.5	110	935	110	935
	8.5	200	1,700	200	1,700
- Insecticides	145	15	2,175	15	2,175
<b>2) Labor</b>	100	144	14,400	116	11,600
<b>3) Machinery Cost</b>					
- Land Preparation	2,480	1	2,480	0	0
<b>4) Miscellaneous (5%)</b>			2,730		1,840
<b>C) Net Income</b>					69,690

Note: From the 2nd to the 5th year the cost and benefit are assumed to be same.  
Replanting should be done at the end of 6th year.

**Banana Production**

**1) Without Project**

Item	Unit	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>				
Unit Yield	ton	1,157	24	27,770
<b>B) Production Cost</b>	ha			16,660
<b>1) Farm Inputs</b>				
- Seedlings	stump	0.5	0	0
- Fertilizers	N kg	9.86	90	887
	P kg	8.5	50	425
	K kg	8.5	50	425
- Insecticides	lit	145	25	3,625
<b>2) Labor</b>	man-day	100	105	10,500
<b>3) Machinery Cost</b>				
- Land Preparation	ha	2,480	0	0
<b>4) Miscellaneous (5%)</b>				793
<b>C) Net Income</b>				11,110

**2) With Project**

Item	Unit Price	1st Year		2nd Year	
		Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
Unit Yield	1,157	40	46,280	45	52,070
<b>B) Production Cost</b>			27,020		21,100
<b>1) Farm Inputs</b>					
- Seedlings	2	2000	4000	200	400
- Fertilizers	9.86	300	2,958	300	2,958
	8.5	150	1,275	150	1,275
	8.5	150	1,275	150	1,275
- Insecticides	145	15	2,175	15	2,175
<b>2) Labor</b>	100	144	14,400	115	11,500
<b>3) Machinery Cost</b>					
- Land Preparation	2,480	1	2,480		
<b>4) Miscellaneous (5%)</b>			2,460		1,920
<b>C) Net Income</b>			19,260		30,970

Note: From the 2nd to the 5th year the cost and benefit are assumed to be same.  
Replanting should be done at the end of 6th year.

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (2/7)**

**Papaya Production**

Item	Unit	1) Without Project					2) With Project				
		Unit Price	1st Year		2nd Year		Unit Price	1st Year		2nd Year	
			Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)		Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>											
Unit Yield	ton	3,138	44	138,070	44	138,070	3,138	48	150,620	52	163,180
<b>B) Production Cost</b>	ha			27,440		19,530			31,920		20,640
<b>1) Farm Inputs</b>											
- Seeds	kg	9,000	0.45	4,050	0	0	11,000	0.50	5,500	0	0
- Fertilizers	N kg	9.86	103	1,016	103	1,016	9.86	150	1,479	150	1,479
	P kg	8.5	55	468	55	468	8.5	90	765	90	765
	K kg	8.5	55	468	55	468	8.5	90	765	90	765
- Insecticides	lit	450	10	4,500	10	4,500	450	5	2,250	5	2,250
- Fungicides	kg	72	16	1,152	16	1,152	72	15	1,080		
<b>2) Labor</b>	man-day	100	120	12,000	110	11,000	100	147	14,700	135	13,500
<b>3) Machinery Cost</b>											
- Land Preparation	ha	2,480	1	2,480		0	2,480	1	2,480		0
<b>4) Miscellaneous (5%)</b>				1,307		930			2,902		1,876
<b>C) Net Income</b>				110,630		118,540			118,700		142,546

**Industrial Tomato Production**

Item	Unit	(1) Without Project			(2) With Project		
		Unit Price	Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	3,245	21	68,150		30	97,350
<b>B) Production Cost</b>				22,580			25,570
<b>1) Farm Inputs</b>							
- Seedlings	Kg	1,155	0.9	1,040	1,750	1	1,750
- Fertilizers	N kg	9.86	150	1,479		200	1,972
	P kg	8.5	75	638		150	1,275
	K kg	8.5	75	638		150	1,275
- Insecticides	lit	320	8	2,560		6	1,920
- Fungicides	kg	72	9.6	691		8	576
<b>2) Labor Cost</b>	man-day	100	110	11,000		120	12,000
<b>3) Machinery Cost</b>							
- Land Preparation	ha	2,480	1	2,480		1	2,480
<b>4) Miscellaneous (10%)</b>				2,053			2,325
<b>C) Net Income</b>	(Peso/ha)			45,570			71,780

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (3/7)**

**Muskmelon Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project	
			Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>						
Unit Yield	ton	2,640	30	79,200	40	105,600
<b>B) Production Cost</b>				31,010		35,870
1) Farm Inputs						
- Seeds	Kg	2250.0	0.7	1,575	1	2,250
- Fertilizers						
N	kg	9.85	180	1,775	210	2,071
P	kg	8.5	180	1,275	150	1,530
K	kg	8.5	180	1,530	210	1,785
- Insecticides	lit	790	10	7,900	10	7,900
- Fungicides	kg	650	10	6,500	10	6,500
2) Labor Cost	man-day	100	65	6,500	90	9,000
3) Machinery Cost						
- Land Preparation	ha	2,450	1	2,450	1	2,450
4) Miscellaneous (5%)				1,477	10%	3,352
<b>C) Net Income</b>	(Pesos/ha)			48,190		69,730

**Sweet Pepper Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	6,050	13	78,650		13	108,900
<b>B) Production Cost</b>				21,580			25,550
1) Farm Inputs							
- Seeds	kg	1240.0	1	1,240	1900	1.2	2,160
- Fertilizers							
N	kg	9.85	90	887		125	1,233
P	kg	8.5	60	510		90	765
K	kg	8.5	60	510		90	765
- Insecticides	lit	140	9.2	1,285		8	1,120
- Fungicides	kg	80	2.5	200		2.5	200
2) Labor Cost	man-day	100	125	12,500		145	14,500
3) Machinery Cost							
- Land Preparation	ha	2,450	1	2,450		1	2,450
4) Miscellaneous (10%)				1,962			2,322
<b>C) Net Income</b>	(Pesos/ha)			57,070			83,350

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (4/7)**

**Sweet Potato Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project	
			Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>						
Unit Yield	ton	4,087	12	49,040	17	69,480
<b>B) Production Cost</b>				<b>14,090</b>		<b>16,390</b>
1) Farm Inputs						
- Seedlings	ton	550	4.5	2,475	4.5	2,475
- Fertilizers						
N	kg	9.86	36	355	75	740
P	kg	8.5	36	306	75	638
K	kg	8.5	36	306	75	638
- Insecticides	lit	140	10	1,400	6	840
2) Labor Cost	man-day	100	55	5,500	70	7,000
3) Machinery Cost						
- Land Preparation	ha	2,480	1	2,480	1	2,480
4) Animal Power	day	100	6	600	8.0	800
5) Miscellaneous (5%)				671		781
<b>C) Net Income</b>		(Peso/ha)		<b>34,950</b>		<b>53,090</b>

**Cassava Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project	
			Quantity	Amount (Pesos/ha)	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>						
Unit Yield	ton	4,862	6.5	31,600	12	58,340
<b>B) Production Cost</b>				<b>16,580</b>		<b>18,810</b>
1) Farm Inputs						
- Seedlings	kg	1.0	218	218	218	218
- Fertilizers						
N	kg	9.86	38	375	90	887
P	kg	8.5	38	323	60	510
K	kg	8.5	38	323	60	510
- Insecticides	kg	7.1	75	533	100	710
2) Labor Cost	man-day	100	105	10,500	113	11,300
3) Machinery Cost						
- Land Preparation	ha	2,480	1	2,480	1	2,480
4) Animal Power	day	80	4	320	6.0	480
5) Miscellaneous (10%)				1,507		1,710
<b>C) Net Income</b>		(Peso/ha)		<b>15,020</b>		<b>39,530</b>



**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (5/7)**

**Pigeon Pea Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	9,092	1.5	13,640		3.0	27,280
<b>B) Production Cost</b>				9,570			9,640
1) Farm Inputs							
- Seeds	kg	20.0	11	220	40	20	800
- Fertilizers							
N	kg	9.86	15	148		45	444
P	kg	8.5	15	128		45	383
K	kg	8.5	15	128		30	255
- Insecticides	lit	320	1.6	512		1	320
2) Labor Cost	man-day	100	55	5,500		45	4,500
3) Machinery Cost							
- Land Preparation	ha	2,480	1	2,480		1	2,480
4) Miscellaneous (5%)				456			459
<b>C) Net Income</b>				4,070			17,640

**Eggplant Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	4,655	15	69,830		20	93,100
<b>B) Production Cost</b>				18,470			21,230
1) Farm Inputs							
- Seeds	kg	550.0	0.9	495	1000	1	1,000
- Fertilizers							
N	kg	9.86	105	1,035		150	1,479
P	kg	8.5	75	638		120	1,020
K	kg	8.5	75	638		120	1,020
- Insecticides	lit	350	6	2,100		4	1,400
2) Labor Cost	man-day	100	90	9,000		105	10,500
3) Machinery Cost							
- Land Preparation	ha	2,480	1	2,480		1	2,480
4) Animal Power	day	80	5	400		5	400
5) Miscellaneous (10%)				1,679			1,930
<b>C) Net Income</b>				51,360			71,870

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (6/7)**

**Rice Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	8,800	2.2	19,360		4.5	39,600
<b>B) Production Cost</b>				25,690			34,280
<b>1) Farm Inputs</b>							
- Seeds	kg	13	105	1,323	20	160	3,200
- Fertilizers							
N	kg	9.86	110	1,085		200	1,972
P	kg	8.5	75	638		115	978
K	kg	8.5	60	510		90	765
- Insecticides	lit	320	6	1,920		6	1,920
- Herbicides	lit	250	1.5	375		1.5	375
<b>2) Labor</b>	man-day	100	100	10,000		131	13,100
<b>3) Machinery Cost</b>							
- Land Preparation	ha	4,560	1	4,560		1	4,560
- Harvesting&Threshing	ton	900	3	2,700		4.5	4,050
<b>4) Animal Power</b>	day	80	3.0	240		3.0	240
<b>5) Miscellaneous (10%)</b>				2,335			3,116
<b>C) Net Income</b>				-6,330			5,320

**Bean Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	14,500	0.9	13,050		1.5	21,750
<b>B) Production Cost</b>				12,430			16,360
<b>1) Farm Inputs</b>							
- Seeds	kg	20	105	2,100	30	125	3,750
- Fertilizers							
N	kg	9.86	40	394		75	740
P	kg	8.5	40	340		95	808
K	kg	8.5	30	255		40	340
- Insecticides	lit	450	3	1,350		2	900
- Fungicides	kg	72	1	72		1	72
<b>2) Labor Cost</b>	man-day	100	45	4,500		60	6,000
<b>3) Machinery Cost</b>							
- Land Preparation	ha	2,480	1	2,480		1	2,480
- Threshing	ton	350	1	350		1.40	490
<b>4) Miscellaneous (5%)</b>				592			779
<b>C) Net Income</b>				620			5,390

**Table 4.2.5 Financial Crop Budget With and Without Project Conditions (7/7)**

**Corn Production**

Item	Unit	Unit Price	(1) Without Project		(2) With Project		
			Quantity	Amount (Pesos/ha)	Unit Price	Quantity	Amount (Pesos/ha)
<b>A) Gross Income</b>							
Unit Yield	ton	4,373	1.8	7,870		2.8	12,240
<b>B) Production Cost</b>				7,760			11,280
<b>1) Farm Inputs</b>							
- Seeds	kg	6.0	40	240	15	40	600
- Fertilizers							
N	kg	9.86	30	296		90	887
P	kg	8.5	15	128		60	510
K	kg	8.5	15	128		60	510
- Insecticides	lit	140	3	420		2	280
<b>2) Labor Cost</b>	man-day	100	30	3,000		45	4,500
<b>3) Machinery Cost</b>							
- Land Preparation	ha	2,480	1	2,480		1	2,480
- Threshing	ton	350	2.00	700		2.80	980
<b>4) Miscellaneous (5%)</b>				370			537
<b>C) Net Income</b>		(Peso/ha)		110			960

Table 4.4.1 Water Quality (EC, pH) in the Study Area

Code	Location	Date	EC (mS/cm)	pH	Details	Source
SI	Sabana Alta, SJ	Dec 23,97	0.56	8.2	End of San Juan ID	INDRHI
	El Cacheo, Mijo river	Dec 23,97	0.13	8.5	Mijo headworks	
	Arrojo Loro	Dec 23,97	0.58	8.1	Main drain of JJ Puello	
	Paso de Lima, SJ	Dec 23,97	0.17	8.2	Upstream of Sabaneta	
	El Rosario, SJ	Jun 29,93	0.65	7.4		
A1	El Puente, YDS	Dec 22,97	0.27	7.5	Downstream of SY dam	INDRHI
	Los Guiros, YDS	Dec 22,97	0.83	8.4	End of Azua ID	
	- do -	Mar 17,89	1.10	8.1		
	Quita Corasa, YDS	Jan 7,98	1.06	8.2		
	Villarparando, YDS	Jan 8,98	0.51	8.4	Downstream of headworks	
	Tabara river	Jan 8,98	0.43	8.4	Downstream of Tabara HW	
	Los Toros, Viafara river	Jan 8,98	0.35	8.4	Ysura conveyance canal	
BN1	Santana headworks, YDS	Jan 7,98	0.91	8.1		JICA Saline Soil
	- do -	1988	0.57 - 0.80	7.8 - 7.9		JICA Saline Soil
	- do -	Dec 29,98	0.50	7.6		Phase-2
	Palo Alto, YDS	Jan 7,98	1.36	7.9		
	- do -	Dec 29,98	0.47	7.9		Phase-2
	El Jobo, YDS	Jan 7,98	1.09	7.7	Upstream of the intake to Rincon	
	- do -	Dec 28,98	0.49	7.8		Phase-2
	Palo Alto, YDS	Mar 16,89	0.95	8.0		INDRHI
	Habanero, YDS	Jan 7,98	1.36	7.8	Downmost reach of YDS	
	- do -	Dec 29,98	0.56	7.8		Phase-2
	El Cacheo, YDS	Jan 7,98	0.95	7.2	Between No.9 and 11	
	- do -	Dec 29,98	0.54	7.8		Phase-2
	Rincoa lake (laguneta seco)	Jan 8,98	5.10	7.9		
	- do -	Dec 22,98	1.17	7.9		Phase-2
	Rincoa lake (northern shore)	Jan 8,98	7.20	8.3		
	Rincoa lake (Cablar)	Jan 8,98	8.40	8.9		
	- do -	1988	7.00	7.9 - 8.2		JICA Saline Soil
	- do -	Dec 22,98	0.93	8.0		Phase-2
	Rincon L, 0.0 m (surface)	Dec 30,98	0.83	6.6		Phase-2
	Rincon L, 1.0 m	Dec 30,98	0.82	7.9		Phase-2
	Rincon L, 2.0 m	Dec 30,98	0.82	7.9		Phase-2
	Rincon L, 3.0 m	Dec 30,98	0.81	7.9		Phase-2
	Rincon L, 4.0 m	Dec 30,98	0.80	8.0		Phase-2
	Cristobal Canal	Dec 30,98	0.77	7.9		Phase-2
	Arroyo Drain, Guara Guao	Jan 8,98	2.00	7.9	Main drain at Santana	
	- do -	1988	1.30 - 1.60	7.6 - 7.8		JICA Saline Soil
	- do - (upstream)	1988	1.10 - 1.20	7.6 - 7.8		JICA Saline Soil
	- do -	Dec 30,98	0.90	7.8		Phase-2
	Spring, Las Marias	Jan 8,98	0.54	7.4		
	- do -	1988	0.59	7.5		JICA Saline Soil
	Enriquillo lake	Jan 8,98	>100.00	8.0		
	Las Marias river, Neiba	Jan 8,98	2.00	8.2	Drain of northern Neiba Plain	
	- do -	1988	2.70 - 5.00	7.8		JICA Saline Soil
- do -	Dec 30,98	1.20	7.7		Phase-2	
Ramillo channel	Jan 8,98	14.80	8.2	Drain of central Neiba Plain		
- do -	1988	3.00 - 3.60	7.8		JICA Saline Soil	
- do -	Dec 30,98	1.20	8.0		Phase-2	
Bermes river	Jan 8,98	11.40	7.6	Drain of southern Neiba Plain		
- do -	Dec 30,98	14.73	7.4		Phase-2	
Groundwater, Galvan Neiba	1988	0.60	7.1		JICA Saline Soil	
Groundwater, Neiba Plain	1988	1.80	7.7		JICA Saline Soil	
Majagua, Colotrado, Manguito	1988	0.27 - 0.33	7.6 - 7.7	Rivers north of Neiba Valley	JICA Saline Soil	
Enriquillo Lake	Oct 28,93	88.2 - 98.5	8.2 - 8.3		INDRHI	

NOTE: EC; Electric conductivity  
YDS; Yaque del Sur River  
SJ; San Juan River

Table 4.5.1 Preliminary Comparison of Irrigation Development Alternatives

	Irrigation Water Management Improvement Approach	Irrigation Facilities Improvement Approach	Villarpando Headworks Improvement Approach	River Water Management Reinforcement Approach	Integrated Irrigation Improvement Approach	Integrated River Water Management Approach for Irrigation	Comprehensive Irrigation Management Approach
Approach	A	B	C	D	E = A + B	F = C + D	G = E + F
Input Amount	Small	Large	Middle	Middle	Large	Middle	Large
Technology	Reasonable Operation rules and manuals,	Reasonable Ordinary civil works, Maintenance manuals	Reasonable Ordinary civil and metal technology	Reasonable Telemetering system & operation manual	Reasonable	Reasonable	Reasonable
Social influence	Small	Large Influenced by Land acquisition	Small	Small	Large Influenced by Land acquisition	Small	Large
Possibility of Attainment on Efficient Use of Irrigation Water	Low	Middle	Low	Low	Middle+	Middle	High

Table 4.5.2 Project Design Matrix of Irrigation Project

Comprehensive Irrigation Water Management Project

Project Area - Cropping area situated in the downstream of Santana headworks and served by the Yaque del Sur river, except CEA area Target group - farmers

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><b>Overall Goal</b> Increase of water availability and crop production</p>	<p>In Year 2010, 90 % of the project area is irrigated.</p>	<p>Yaque del Sur Irrigation district and Barahona Regional Office of Ministry of Agriculture</p>	<p>Government policy in crop production is not changed. Agricultural support and extension services are executed.</p>
<p><b>Project Purpose</b> Water is efficiently used.</p>	<p>Irrigation efficiency is 47 %</p>	<p>Records of water distribution and cropping area</p>	
<p><b>Outputs</b> A-1. Farmers positively participate in O&amp;M and pay water charge having a sense of solidarity and cooperation. A-2. Operation staffs properly execute water management. B-1. Water can be distributed smoothly. B-2. Maintenance is properly executed.</p>	<p>A-1. More than 80% of farmers join to WUA and more than 80% pay water charge. A-2. Water distribution schedule is properly made and water is supplied within 20 % error in comparison with the scheduled amount. B-1. Within 15% error in the time required for water delivery compared with the design. B-2. Operation rate of maintenance equipment is over 70%.</p>	<p>Member list of WUA and records of payment. A- Monitorix and field inspection B- Field monitorix. 1. Maintenance records and field inspection 2. Maintenance records and field test.</p>	<p>Priority of water allocation = 1. Drinking, 2. Irrigation, 3. Power generation - if not changed. The year is not a severe drought year. Other irrigation systems are also properly operated.</p>
<p><b>Operation of water diversion can be easily made at Villar Pardo.</b> <b>Water management is timely and precisely executed in consideration of strength, flow, supply, and demands under the promise of activities of item C.</b></p>	<p>C. Gates can be smoothly operated. D. River flow is not lowered by 10 % of water demands at Santana.</p>	<p>0. Maintenance records and field test. 0. Gate operation records and discharge records of both Villar Pardo and Santana and water diversion schedule at Santana.</p>	
<p><b>Activities</b> A-1. To carry out the activities for farmers to understand the project and their duty and right in the project. A-2. To prepare Bylaw, water rules &amp; distribution manual. A-3. To organize farmers and establish water users organization. A-4. To prepare training programs and provide training. A-5. To purchase vehicles for operation activities. A-6. To check and instruct farmers and technical staffs to keep rules in their field activities. B-1. To improve irrigation facilities. B-2. To provide regulation points. B-3. To purchase maintenance equipment. B-4. To prepare operation and maintenance manuals and provide training in accordance with the O&amp;M manuals. C-1. To provide advice gates to supply Yaque del Sur. C-2. To replace intake and sand flush gates with new gates. C-3. To provide training on O&amp;M.</p>	<p><b>Project Features and Inputs</b> Irrigation &amp; Drainage Facilities (See 4.5.3) Improvement of Villapardo &amp; Santana headworks Main canal: 21km in length Night storage ponds 10 numbers for the proposed gravity system and 11 numbers for existing pump irrigation system. laterals : 45 Water Users Organization (WUO) Name: Yaque del Sur Downstream Irrigation Committee (Consejo Comunal) Total member: 4,300. 14 sub-committees (10 sub-committees for the main system, 3 sub-committees for the area served by the Santana). Two associations for the gravity systems and pump systems, respectively.</p>	<p>Project Implementation Period (See 4.5.1) Manpower (See 4.5.2) Escalator organization (Project manager), a construction management engineer, construction supervisors, surveyors, design engineers, a civil work engineer and an electric engineer. An institutional expert, organizers and the assistants, O&amp;M experts, local government staff, extension officers, leading farmers, Consultants, Experts A team leader, a construction management engineer, design engineers, an institutional expert, O&amp;M expert, a river water</p>	<p>Farmers who are interested (the rate is about 40%) is selected. Local government positively cooperate the Project to establish WUO. Farmers do not oppose the land acquisition.</p>
<p><b>Outcomes</b> C-1. To establish a new water management office. C-2. To purchase office instrument and vehicles. C-3. To introduce a telemonitoring system. D-4. To make a training program and train staffs for river water management. D-5. To establish demand-oriented water management.</p>	<p>O&amp;M equipment (See 4.5.3). dump truck, backhoe, motorgrader for INDRM. light truck, mini van, motorcycle, bicycle, copy machine, personal computers, etc for WUO</p>	<p>Project cost (See 4.5.1) Irrigation &amp; drainage development only: ROS 3000000 in total O&amp;M cost (Table 4.5.5) Irrigation &amp; drainage only: ROS 8 million/year.</p>	<p>Farmers participate to the project.</p>

A: approach A, B: approach B, C: approach C, D: approach D

Table 4.5.3 Estimate of Irrigation Water Requirements with Project Condition

Crop	Net Planting area (ha)	Monthly Data												Total
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
<b>Sweet Pea (CPA-matured area)</b>	1,140	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
CU (mm/day)	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
CU (mm/month)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Effective rainfall (mm)	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Net Requirement (MCH)	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Planting area (ha)	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
<b>Spinach</b>	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
<b>Beans</b>	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
<b>Tomato</b>	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
<b>Cassava</b>	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
<b>Other crops</b>	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Average to CU (mm/day)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
CU (mm/month)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Effective rainfall (mm)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Net Requirement (MCH)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67

**Table 4.5.4 Irrigable Area by Development Stage (1/3)**

**(1) Ysura Head Race (AZUA)**

Irrigation area = 1,100 ha

Irrigable area Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain	310	310	310	310	470	470	273	470
Banana	43	43	43	43	65	65	38	65
Papaya	24	24	24	24	37	37	21	37
Corn&Sorghum	0	145	0	145	0	220	0	128
Cassava	0	60	0	60	0	92	0	53
Pigeon Pea	0	26	0	26	0	78	0	23
Sweet Potato	14	0	14	0	21	0	12	0
Beans	279	0	279	0	423	0	246	0
Tobacco	12	0	12	0	18	0	10	0
Others	0	6	0	6	0	9	0	5
Sub-total	682	614	682	614	1,034	971	600	781
Total (Intensity)	1,296 (117.8%)		1,296 (117.8%)		2,005 #DIV/0!		1,381 (125.5%)	

**(2) Al (Yaque del Sur, AZUA)**

Irrigation area = 2,366 ha

Irrigable area Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain	600	600	455	455	847	847	480	480
Banana	160	160	121	121	160	160	128	128
Papaya	52	52	39	39	73	73	42	42
Corn/Sorghum	0	312	0	236	0	440	0	249
Cassava	0	130	0	98	0	183	0	104
Pigeon Pea	0	55	0	42	0	78	0	44
Sweet Potato	30	0	23	0	42	0	24	0
Beans	600	0	455	0	847	0	480	0
Tobacco	25	0	19	0	35	0	20	0
Rice	0	5	0	4	0	7	0	4
Others	0.2	8.1	0.2	6.2	0.3	11.5	0.2	6.5
Sub-total	1,467	1,322	1,112	1,001	2,004	1,800	1,174	1,058
Total (Intensity)	2,789 (117.9%)		2,113 (89.3%)		3,804 (160.8%)		2,232 (94.3%)	

**(3) Azua + Extension (AZUA)**

Irrigation area = 8,870 ha

Irrigable area Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain	2,893	2,893	2,893	2,893	3,407	3,407	2,382	2,382
Banana	543	543	543	543	543	543	447	447
Papaya	51	51	51	51	60	60	42	42
Tomato	2,958	0	2,958	0	3,482	0	2,435	0
Corn/Sorghum	1,268	0	1,268	0	1,492	0	1,043	0
Rice	0	45	0	45	0	45	0	37
Others	576	932	576	932	678	1,098	474	767
Sub-total	8,289	4,464	8,289	4,464	9,662	5,153	6,823	3,675
Total (Intensity)	12,753 (143.8%)		12,753 (143.8%)		14,815 (167.0%)		10,498 (118.4%)	

Note: Registered Registered irrigation area (planned irrigation area)

Present: Irrigable area with present irrigation efficiencies without any development

Full: Irrigable area with proposed irrigation efficiencies for all the areas (Master

Part: Irrigable area with proposed irrigation efficiencies for Feasibility Study area: Aguacatico, Amiana Gomez, and Bifara



**Table 4.5.4 Irrigable Area by Development Stage (2/3)**

**(4) Amiama Gomes, Biafara (AZUA) Irrigation area = 2,160 ha**

Irrigable area Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain/Bnana	0	0	0	0	1,080	1,080	1,080	1,080
Papaya	0	0	0	0	42	42	42	42
Corn/Sorghum	0	0	0	0	0	215	0	215
Cassava	0	0	0	0	0	65	0	65
Pigeon Pea	0	0	0	0	0	86	0	86
Sweet Potato 1	0	0	0	0	65	0	65	0
Sweet Potato 2	0	0	0	0	0	65	0	65
Tomato	0	0	0	0	45	0	45	0
Tobacco	0	0	0	0	68	0	68	0
Vegetables	0	0	0	0	215	215	215	215
Sub-total	0	0	0	0	1,515	1,768	1,515	1,768
Total (Intensity)	0		0		3,283 (152.0%)		3,283 (152.0%)	

**(5) Aguaticio (BARAHONA) Irrigation area = 750 ha**

Irrigable area Crop	Registered 0 ha		Present 0 ha		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain/Banana	0	0	0	0	443	443	443	443
Fruit trees	0	0	0	0	225	225	225	225
Corn/Sorghum 1	0	0	0	0	0	18	0	18
Corn/Sorghum 2	0	0	0	0	18	0	18	0
Pigeon Pea	0	0	0	0	0	88	0	88
Melon	0	0	0	0	12	0	12	0
Tomato	0	0	0	0	18	0	18	0
Vegetables	0	0	0	0	24	18	24	18
Sub-total	0	0	0	0	740	792	740	792
Total (Intensity)	0		0		1,532 (204.3%)		1,532 (204.3%)	

**(6) B1 (BARAHONA) Irrigation area = 2,791 ha**

Irrigable area Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Plantain	1,890	1,890	1,436	1,436	2,080	2,080	1,436	1,436
Banana	470	470	357	357	470	470	357	357
Coconut	80	80	61	61	88	88	61	61
Corn/Sorghum	0	40	0	30	0	44	0	30
Rice	0	10	0	8	0	10	0	8
Beans	20	0	15	0	22	0	15	0
	0	0						
	0	0						
Others	60	85	46	64	66	93	46	64
Sub-total	2,520	2,575	1,915	1,956	2,726	2,785	1,915	1,956
Total (Intensity)	5,095 (182.6%)		3,871 (138.7%)		5,511 (197.5%)		3,871 (138.7%)	

Note: Registered Registered irrigation area (planned irrigation area)

Present: Irrigable area with present irrigation efficiencies without any development

Full: Irrigable area with proposed irrigation efficiencies for all the areas (Master

Part: Irrigable area with proposed irrigation efficiencies for Feasibility Study area  
Aguaticio, Amiama Gomez, and Biafara

**Table 4.5.4 Irrigable Area by Development Stage (3/3)**

**(7) B1(BARAHONA)**

Irrigation area = 12,000 ha

Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Sugarcane	7,660	7,660	5,813	5,813	3,240	3,240	5,813	5,813
Plantain	85	85	64	64	2,786	2,786	64	64
Banana	21	21	21	21	21	21	21	21
Rice	0	13	0	10	0	13	0	10
Beans	30	0	23	0	983	0	23	0
Corn/Sorghum	0	80	0	61	0	2,622	0	61
Others	81	122	61	93	2,655	3,999	61	93
Sub-total	7,877	7,981	5,982	6,062	9,685	12,681	5,982	6,062
Total (Intensity)	15,858 (132.2%)		12,044 (100.4%)		22,366 (186.4%)		12,044 (100.4%)	

**(8) B3-B6(BARAHONA)**

Irrigation area = 7,458 ha

Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Sugarcane	1,140	1,140	867	867	760	760	-	-
Plantain	3,765	3,765	2,861	2,861	5,133	5,133	-	-
Banana	949	949	722	722	949	949	-	-
Coconut	185	185	141	141	250	250	-	-
Corn/Sorghum	0	58	0	44	0	75	-	-
Rice	0	23	0	19	0	23	-	-
Beans	42	0	32	0	58	0	-	-
Others	135	190	102	144	185	251	-	-
Sub-total	6,216	6,310	4,725	4,798	7,335	7,441	-	-
Total (Intensity)	12,526 (168.0%)		9,523 (127.7%)		14,776 (198.1%)		-	

**(9) B7&B8 (BARAHONA)**

Irrigation area = 7,126 ha

Crop	Registered		Present		Full		Part	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Sugarcane	-	-	867	867	867	867	867	867
Plantain	-	-	2,558	2,558	5,327	5,327	4,187	4,187
Banana	-	-	103	103	211	211	166	166
Papaya	-	-	137	137	282	282	221	221
Sweet Potato	-	-	0	257	0	528	0	415
Tomato	-	-	143	0	293	0	231	0
Cassava	-	-	0	125	0	258	0	203
Pepper&eggplant	-	-	125	0	258	0	203	0
Melon1	-	-	57	0	117	0	92	0
Melon2	-	-	0	57	0	117	0	92
Pigeon Pea	-	-	80	0	164	0	129	0
Corn	-	-	0	57	0	117	0	92
Beans	-	-	34	0	70	0	55	0
Rice2	-	-	20	0	20	0	20	0
Rice1	-	-	0	20	0	20	0	20
Sub-total	-	-	4,124	4,181	7,609	7,727	6,171	6,263
Total (Intensity)	-		8,305 (116.5%)		15,336 (215.2%)		12,435 (174.5%)	

Note: Registered Registered irrigation area (planned irrigation area)

Present: Irrigable area with present irrigation efficiencies without any development

Full: Irrigable area with proposed irrigation efficiencies for all the areas (Master

Part: Irrigable area with proposed irrigation efficiencies for Feasibility Study area: Aguacatico, Amiana Gomez, and Biafara

**Table 4.6.1 Proposed Rural Water Supply System**

Name of Water Supply System	Bombita	Los Robres	Altagracia
Water Source	Proposed Main Canal at Night Storage Pond No. 5	Yaque del Sur River	Proposed Main Canal at Night Storage Pond No. 7
Designed beneficiary (Estimated Population in 2018)	2,000	500	1,600
Nos. of Families	465	116	372
Beneficiaries per faucet	4.3	4.3	4.3
Averaged daily water requirement	125 lit/day/person	125 lit/day/person	125 lit/day/person
Max. daily water requirement	190 lit/day/person 380 m <sup>3</sup> /day	190 lit/day/person 95 m <sup>3</sup> /day	190 lit/day/person 304 m <sup>3</sup> /day
Design Discharge lit/sec	4.4 lit/sec	1.1 lit/sec	3.52 lit/sec
LWL of pond / river at intake	11.80	10.50	8.00
HWL of pond / river at intake	13.30	15.50	9.50
Intake pump, Design discharge	260 lit/min	66 lit/min	210 lit/min
Design head	2.4 m	7.4 m	6.1 m
Treatment Plant	Settling basin + Filtration gallery + Chlorination	Settling basin + Filtration gallery + Chlorination	Settling basin + Filtration gallery + Chlorination
Filtration Gallery	10m(L) x 7.6m(W) x 2.9m(D)	5m(L) x 3.8m(W) x 2.9m(D)	8m(L) x 7.6m(W) x 2.9m(D)
Discharge pump, Design discharge	260 lit/min	66 lit/min	210 lit/min
Design head	14.1 m	19.4 m	13.1 m
Discharge pipe, Length	280 m	350 m	1,300 m
Elevated water tank, Capacity	200 m <sup>3</sup>	48 m <sup>3</sup>	150 m <sup>3</sup>
Height	13.1 m	11.4 m	13.5 m
Distribution pipe	ϕ 4", ϕ 2"	ϕ 2"	ϕ 4", ϕ 2"

Table 6.2.1 Summary of Project Costs

Project	Cost [DR\$ 1000]		
	F/C	L/C	Total
<b>(1) Agriculture and Agricultural Support Services Plan</b>			
A: Direct Construction Cost			
- Project for Strengthening Research and Extension Service	2,206	23,163	25,370
- Project for Strengthening Credit Services	1,015	18,411	19,426
- Agricultural Cooperative Model Project and Market Information System Project	3,334	7,035	10,370
<b>Total of (A)</b>	<b>6,556</b>	<b>48,610</b>	<b>55,165</b>
B - Operation and Maintenance Equipment			
C - Consulting Service	983	7,291	8,275
D - Administrative Cost	328	2,430	2,758
<b>Total (A) + (B) + (C) + (D)</b>	<b>7,867</b>	<b>58,331</b>	<b>66,198</b>
E - Physical Contingency	787	5,833	6,620
<b>Total of (1)</b>	<b>8,653</b>	<b>64,165</b>	<b>72,818</b>
<b>(2) Overall Water Management Plan</b>			
A: Direct Construction Cost			
- Yaque del Sur River Water Management Center Project	160,444	40,111	200,555
<b>Total of (A)</b>	<b>160,444</b>	<b>40,111</b>	<b>200,555</b>
B - Operation and Maintenance Equipment			
C - Consulting Service	4,813	1,203	6,017
D - Administrative Cost	3,209	802	4,011
E - Physical Contingency	16,847	4,212	21,058
<b>Total of (2)</b>	<b>185,313</b>	<b>46,328</b>	<b>231,641</b>
<b>(3) Irrigation Development and Water Management in the Field Improvement Plan</b>			
A: Direct Construction Cost			
- Preparatory Works	17,972	6,610	24,582
- Villarpando HW	11,472	4,389	15,861
- Main Canal System (canal work)	62,731	24,410	87,141
- Main Canal structures	17,427	5,791	23,218
- Regulation Ponds	53,374	12,886	66,260
- Lateral Canal	174,077	65,026	239,103
- Siphon	24,400	12,395	36,795
- Santana Headworks	11,607	6,655	18,262
- Drainage (lateral level, total 7 km)	4,348	665	5,013
<b>Total of (A)</b>	<b>377,408</b>	<b>138,827</b>	<b>516,235</b>
B - Operation and Maintenance Equipment	897	897	1,794
C - Consulting Service	56,611	20,824	77,435
D - Administrative Cost	18,870	6,941	25,812
E - Land Acquisition and Compensation		18,249	18,249
F - Physical Contingency	45,379	18,574	63,952
<b>Total of (3)</b>	<b>499,165</b>	<b>204,312</b>	<b>703,477</b>
<b>(4) Rural Infrastructure Improvement Plan</b>			
A: Direct Construction Cost			
- Rural water supply	9,189	5,730	14,919
- Project for community center	8,832	2,208	11,040
<b>Total of (A)</b>	<b>18,021</b>	<b>7,938</b>	<b>25,959</b>
B - Operation and Maintenance Equipment			
C - Consulting Service	2,703	1,191	3,894
D - Administrative Cost	901	397	1,298
E - Physical Contingency	2,163	953	3,115
<b>Total of (4)</b>	<b>23,788</b>	<b>10,478</b>	<b>34,266</b>
<b>(5) Environmental Conservation Plan</b>			
A: Direct Construction Cost			
- Greenbelt formation project for waterfront conservation		609	609
- Environmental monitoring program in Rincon Lagoon	1,390	882	2,272
<b>Total of (A)</b>	<b>1,390</b>	<b>1,491</b>	<b>2,881</b>
B - Operation and Maintenance Equipment			
C - Consulting Service	209	224	432
D - Administrative Cost	70	75	144
E - Physical Contingency	167	179	346
<b>Total of (5)</b>	<b>1,835</b>	<b>1,967</b>	<b>3,802</b>
<b>Total of Direct Cost; (1)+(2)+(3)+(4)+(5)</b>	<b>718,754</b>	<b>327,251</b>	<b>1,046,005</b>

**Table 6.2.2 Adaptive Research Program  
Detailed Costs**

	Unit	Quantity						Unit Cost (DR\$000)	Base Cost					Total	Foreign Currency (DR\$000)	Local Currency (DR\$000)
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6		Year 1	Year 2	Year 3	Year 4	Year 5			
<b>I. Line of Research</b>																
<b>A. Integrated Pest Management</b>																
1. Researcher	person-month			30	30		38.75			2,821	2,821					2,790
2. Research Materials	Lumpsum									1,395	1,395					1,395
3. Local travel costs	Lumpsum									775	775					155
4. Research publication & dissemination	No.			3	3		46.50			93	93					130
<b>Subtotal</b>						6				2,403	2,403					279
<b>Consultant Overhead</b>										418	418					837
<b>B. On farm-water Management</b>										1,077	1,077					2,155
1. Researcher	person-month			12	12		38.75			465	465					930
2. Research Assistant	person-month			12	12		23.25			279	279					558
3. Research Materials	Lumpsum									54	54					104
4. Local travel costs	Lumpsum									47	47					93
5. Research publication & dissemination	No.			2	2		46.50			93	93					186
<b>Subtotal</b>						4				938	938					1,876
<b>Consultant Overhead</b>										140	140					279
<b>C. New Crops Trials</b>										2,155	2,155					4,309
1. Researcher	person-month			24	24		38.75			930	930					1,860
2. Research Assistant	person-month			24	24		23.25			558	558					1,116
3. Research Materials	Lumpsum									109	109					217
4. Local travel costs	Lumpsum									93	93					186
5. Research publication & dissemination	No.			4	4		46.50			186	186					372
<b>Subtotal</b>						8				1,876	1,876					3,751
<b>Consultant Overhead</b>										279	279					558
<b>III. Palo Alto Exp. Station Rehabilitation</b>										341	341					682
1. Land leveling, farm irrig. canal, farm drain, etc.	lumpsum					0	1.00			166	166					332
2. Pump for irrigation water supply	No.			1	1		77.50			78	78					156
3. Building refurbishing	lumpsum					1				78	78					156
<b>TOTAL</b>										6,384	6,384					12,447
																685
																1,162

**Table 6.2.3 Extension and Training Program  
Detailed Costs**

	Unit	Quantity					Unit Cost (DR\$000)	Base Cost					Total	Foreign Currency (DR\$000)	Local Currency (DR\$000)	
		Year 1	Year 2	Year 3	Year 4	Year 5		Year 1	Year 2	Year 3	Year 4	Year 5				
<b>I. Investment Costs</b>																
<b>A. Equipment</b>																
1. Training Equipment <sup>1</sup>	No.	1						1,470							521	174
2. Repair of training center	Lumpsum							2,765							775	775
<b>B. Training</b>																
1. Short courses	No.	0	0	4	4	0	88.04						626		1,251	704
2. Workshops	No.	0	0	5	5	0	36.74						352		704	367
3. Seminars	No.	0	0	3	3	0	11.01						33		66	66
4. Field Trip	No.	0	0	6	6	0	9.46						57		113	113
<b>C. Demonstration Plots</b>																
1. Supply of farm materials	No.	0	0	10	10	0	9.30						93		186	130
<b>D. Vehicles</b>																
1. Vehicle (ATV)	No.	1					310.00	310							310	
<b>E. Extension Services</b>																
Salaries (incentives)	person/month	0	12	12	12	12	15.50	2,139	2,046	2,046	2,046	2,139	2,139	2,139	8,370	744
1. Extension worker Coordinator	person/month	0	240	240	240	240	7.75	1,860	1,860	1,860	1,860	1,860	1,860	1,860	7,440	744
2. Extension Worker	year							93					93		196	186
3. External Evaluation																
<b>II. Recurrent Costs</b>																
1. Transport (fuel & Lubricants)	lumpsum							333	333	333	333	333	333	333	1,330	265
2. Communication (fax, phone)	lumpsum							221	221	221	221	221	221	221	884	62
3. Extension Materials	lumpsum							16	16	16	16	16	16	16	62	52
4. Subscriptions & Publications	lumpsum							47	47	47	47	47	47	47	186	139
<b>TOTAL</b>			0	3,942	3,097	3,097	3,097	3,097	3,097	3,097	3,097	3,097	3,097	3,097	12,918	1,671

Notes:

1. See table 4.3.6 for details

Table 6.2.4 Credit Support Program  
Detailed Costs

	Unit	Quantity					Total	Unit Cost (DR\$000)	Base Cost					Total	Foreign Currency (DR\$000)	Local Currency (DR\$000)
		Year 1	Year 2	Year 3	Year 4	Year 5			Year 1	Year 2	Year 3	Year 4	Year 5			
I. Investment Costs																
A. CADAstral SURVEY																
B. Equipment	lumpsum No.							4,100	3,422	3,329	3,329	3,329	3,422	17,603		9,200
1. Computers	No.	2					36.75	150						150		
2. Printers	No.	1					18.00	78						78		78
3. Fax Machine	No.	1					7.75	19						19		19
4. Photocopier	No.	1					46.50	47						47		47
C. Vehicles	No. No.															
1. Vehicle (AWD)	No.	2					310.00	620						620		620
D. Salaries	person-month															
1. Secretary	person-month	12	12	12	12	12	7.75	1,469	1,562	1,469	1,469	1,562	7,533		465	
2. Unit Coordinator	person-month	12	12	12	12	12	46.50	93	93	93	93	93	465		2,790	
3. Legal Specialist	person-month	24	24	24	24	24	31.00	744	744	744	744	744	3,720		3,720	
4. Driver	person-month	12	12	12	12	12	6.20	74	74	74	74	74	372		372	
5. External Evaluation	year								93				93	186		186
II. Recurement Costs																
A. Operation and Maintenance																
1. Local travel costs	lumpsum Month							364	364	364	364	364	364	1,821		
2. Supplies	lumpsum Month							70	70	70	70	70	70	349		105
3. Communications	lumpsum Month							47	47	47	47	47	47	233		233
4. Vehicle Op. & Maintain.	lumpsum Month							155	155	155	155	155	155	775		775
		12	12	12	12	12	7.75	93	93	93	93	93	465		465	
<b>TOTAL</b>								<b>4,464</b>	<b>3,787</b>	<b>3,694</b>	<b>3,694</b>	<b>3,694</b>	<b>3,787</b>	<b>19,425</b>	<b>1,014</b>	<b>18,410</b>

**Table 6.2.5 Market support  
Detailed Costs**

	Unit	Quantity					Unit Cost (DR\$000)	Base Cost					Total	Foreign Currency (DR\$000)	Local Currency (DR\$000)	
		Year 1	Year 2	Year 3	Year 4	Year 5		Year 1	Year 2	Year 3	Year 4	Year 5				
<b>I. Investment Costs</b>																
<b>A. Equipment</b>																
1. Computer	No.				1		38.75						195			39
3. UPS	No.				1		4.65						5			5
2. Scales	No.				3		18.60						56			56
3. Fax Machine	No.				1		7.75						8			8
4. Photocopier	No.				1		46.50						47			47
5. Office furniture (desk, cabinet)	Lumpsum												42			42
<b>B. Vehicles</b>																
1. Truck	No.				1		387.50						388			388
<b>C. Storage Facilities</b>																
1. Construction of Storage House	Lumpsum						325.50						326			326
<b>D. Salaries</b>																
1. Market Specialist	person-month				12		38.75						558			465
2. Truck driver	person-month				12		7.75						93			93
<b>II. Starting Fund</b>																
1. Input Procurement	Lumpsum				12		4.65						3,931			2,325
2. Office rent	Month												3,875			56
<b>TOTAL</b>																
													5,397			2,091
																3,306



**Table 6.2.6 Market Information Systems  
Detailed Costs**

	Unit	Quantity					Unit Cost (DR\$000)	Base Cost					Total	Foreign Currency (DR\$000)	Local Currency (DR\$000)	
		Year 1	Year 2	Year 3	Year 4	Year 5		Year 1	Year 2	Year 3	Year 4	Year 5				
<b>I. Investment Costs</b>																
A. Equipment																
1. Computers	No.	3				3	43.40	1,345	477	620	558	555	620	3,701		
2. Printers	No.	3				3	18.60	130	130					477	130	
3. Fax Machine	No.	3				3	7.75	23	23					58	58	
4. Photocopier	No.	3				3	48.50	140	140					23	23	
5. Scanner	No.	1				1	21.70	22	22					140	140	
6. Overhead Projector	No.	1				1	23.25	23	23					22	22	
7. Data Show	No.	1				1	83.70	84	84					23	23	
B. Vehicles	No.															
1. Vehicle (4WD)	No.	1				1	310.00	310	310					310	310	
C. Salaries																
Secretary	permonth	12	12	12	12	60	7.75	558	558	558	558	558	620	2,914		485
Manager	permonth	12	12	12	12	60	23.85	279	279	279	279	279	279	1,395		1,395
System Operators	permonth	24	24	24	24	120	7.75	186	186	186	186	186	186	930		930
External Evaluation	year							62	62				62	124		124
II. Recurrent Costs																
A. Operation and Maintenance																
1. Local travel costs	lumpsum							341	341	233	233	233	233	1,271		
2. Supplies & Maintain.	Month							47	47	93	93	93	93	419	293	120
3. Communications	Month							31	31	31	31	31	31	155	47	108
4. Training	lumpsum							155	155					155		155
5. Subscriptions & Publications	lumpsum							78	78	78	78	78	78	388	116	272
<b>TOTAL</b>								<b>1,886.4</b>	<b>1,886.4</b>	<b>652.5</b>	<b>791</b>	<b>791</b>	<b>853</b>	<b>4,972</b>	<b>1,244</b>	<b>3,729</b>

Notes:

Table 6.2.7 Cost for Proposed Water Management Systems (1/4)

## 1. Yaque del Sur Water Management Center

(Unit: DR\$1000)

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total	Remarks
				Priority-I		Priority-II		Priority-III		Total			
				Phase-1	Phase-2	Phase-1	Phase-2	Phase-1	Phase-2				
qty	cost	qty	cost	qty	cost	qty	cost	qty	cost				
<b>Telemeter system</b>													
	Supervisory & data processing equipment	LS	4,719	1	4,719							4,719	
	Data display terminal	LS	276	1	276							276	
	Laser printer	nos	138	1	138							138	
	Color hard copy unit	nos	332	1	332							332	
	Mimic display panel	LS	5,743	0	0	1	5,743					5,743	
	ITV Observation Equipment	LS	1,835						1	1,835		1,835	
	Radio equipment	70MHz band 10W	LS	69	1	69						69	
	Antena equipment	LS	110	1	110							110	
	Isolation transformer	LS	96	1	96							96	
	UPS (back-up power supply)	nos	138	1	138							138	
	Engine Generator	30 KVA	nos	2,006	1	2,006						2,006	
<b>Voice communication system</b>													
	Base radio system	150 MHz 25W	nos	96	4	384						384	
	Antenna system	LS	927	1	927							927	
<b>Civil works</b>													
	Land preparation	LS	138	1	138							138	
	Building and related facilities	400 m <sup>2</sup>	LS	8	400	3,200						3,200	
<b>Operational facilities &amp; equipment</b>													
	(Warning vehicles)												
	Vehicles	4WD with radio equipment	nos	345		5	1,725	3	1,035	2	690	3,450	included in ITEM N.
	Motorcycle		nos	27		10	270	5	135	5	135	540	
	Mobile radio for motorcycle		set	27		10	270	5	135	5	135	540	
<b>Training facilities &amp; program</b>													
	Building and related facilities	m <sup>2</sup>	8						200	1,600		1,600	
	Audio visual equipment	LS	138						1	138		138	
	Personal computer	set	41						5	205		205	
	Office facilities	LS	415						1	415		415	
	Lodging facilities	LS	138						1	138		138	
	Overseas training program	LS	1,383						1	1,383		1,383	
	Bus	20 passengers	nos	691					2	1,382		1,382	
<b>Miscellaneous</b>													
	Installation works	LS	2,726	1	2,726							2,726	
	Installation works and materials	LS	1,065	1	1,065							1,065	
<b>Total</b>					16,324		8,008		1,305		8,116	33,753	33,753

## 2. Villarpando Headworks Control

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total	Remarks
				Priority-I		Priority-II		Priority-III		Total			
				Phase-1	Phase-2	Phase-1	Phase-2	Phase-1	Phase-2				
qty	cost	qty	cost	qty	cost	qty	cost	qty	cost				
<b>Sensor/measuring devices</b>													
	Water level gauge	crystal quartz pressure type	1,439	1	1,439	2	2,878					4,317	
	Raingauge		96	0	0	1	96					96	
	Gate opening gauge	intake gate (0.5m)	996						6	5,976		5,976	
	Current meter (manual)	digital (0.3 m/s ~ 2.5 m/s)	179	1	179	1	179					358	
<b>Telemeter system</b>													
	Remote terminal equipment (telemeter)		788	0	0	1	788					788	
	Radio equipment	70MHz band 10W	69	0	0	1	69					69	
	Antena equipment		110	0	0	1	110					110	
	Power supply equipment		359	0	0	1	359					359	
<b>Civil works</b>													
	Building & land preparation		138	1	138	0	0					138	
<b>Miscellaneous</b>													
	Installation works	LS	2,131	0.33	710	0.67	1,421					2,131	
	Installation materials	LS	5,715	0.33	1,906	0.67	3,810					5,715	
<b>Total</b>					4,371		9,710				5,976	20,057	20,057

Table 62.7 Cost for Proposed Water Management Systems (2/4)  
3. Sabana Yegua Dam Control & Upstream Rain gauge Station

(Unit: DR\$1000)

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total		Remarks										
				Priority-I				Priority-II		Priority-III		qty	cost											
				Phase-1 qty	cost	Phase-2 qty	cost	qty	cost	qty	cost													
<b>Sensor/measuring devices</b>																								
	Raingauge at the dam		96	0	0	1	96																	
	Raingauge in the catchment		96					1	96															
	Water level gauge	crystal quartz pressure type	1,439	0	0	1	1,439																	
	ITV Observation Equipment		2,324							1	2,324													
<b>Telemeter system</b>																								
	Remote terminal equipment (control)		539		0	1	539																	
	Remote terminal equipment (station)		498					1	498															
	Antenna equipment		110		0	1	110	1	110															
	Power supply		359		0	1	359																	
	Solar power supply		221					1	221															
	2nd Repeater station at Los Guiros		0																					Los Guiros
	Repeater equipment		539	1	539																			
	Radio equipment	70MHz band 10W	69	1	69			1	69															
	Antenna Equipment		83	1	83																			
	Solar power supply		124	1	124																			
	Repeater equipment for voice communication		0																					
	Repeater radio equipment	150 MHz 25W	LS	138	1	138																		
	Repeater antenna for voice system		LS	96	1	96																		
	Solar power supply for voice repeater system		LS	262	1	262																		
<b>Voice communication system</b>																								
	Radio equipment	150 MHz 25W	nos	96	1	96																		
	Antenna system		LS	124	1	124																		
	Civil works		0																					
	Building & land preparation		138	1	138			1	138															
	Lighting for the monitoring camera		69							1	69													
<b>Miscellaneous</b>																								
	Installation works		LS	0	179	1	1,314																	
	Installation materials		LS	0	41	1	2,878																	
<b>Total</b>							1,839		6,735			1,132		2,393										12,149

4. Sabaneta Dam Control & Upstream Rain gauge Station

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total		Remarks										
				Priority-I				Priority-II		Priority-III		qty	cost											
				Phase-1 qty	cost	Phase-2 qty	cost	qty	cost	qty	cost													
<b>Sensor/measuring devices</b>																								
	Raingauge at the dam		96	0	0	1	96																	
	Raingauge in the catchment		96					1	96															
	Water level gauge	crystal quartz pressure type	1,439	0	0	1	1,439																	
	ITV Observation Equipment		2,324							1	2,324													
<b>Telemeter system</b>																								
	Remote terminal equipment (telemeter)		512	0	0	1	512																	
	Remote terminal equipment (station)		498					1	498															
	Radio equipment		69	0	0	1	69	1	69															
	Antenna equipment		110	0	0	1	110	1	110															
	Power supply		359	0	0	1	359																	
	Solar power supply		221					1	221															
	Repeater station (near San Juan, 1st station)		0																					San Juan
	Repeater equipment		539	0	0	1	539																	
	Radio equipment		69	0	0	1	69																	
	Antenna equipment		83	0	0	1	83																	
	Power supply		124	0	0	1	124																	
	Repeater equipment for voice communication		0																					
	Repeater radio equipment	150 MHz 25W	LS	138	1	138																		
	Repeater antenna for voice system		LS	96	1	96																		
	Solar power supply for voice repeater system		LS	262	1	262																		
<b>Voice communication system</b>																								
	Radio equipment	150 MHz 25W	nos	96	1	96																		
	Antenna system		LS	124	1	124																		
	Civil works		0																					
	Building & land preparation		138	0	0	1	138	1	138															
	Lighting for the monitoring camera		69							1	69													
<b>Miscellaneous</b>																								
	Installation works		LS	0	179	1	1,411																	
	Installation materials		LS	0	41	1	2,975																	
<b>Total</b>							936		3,924			1,132		2,393										12,385

Table 6.2.7 Cost for Proposed Water Management Systems (3/4)  
5. Sabana Alta Hydrometric and Raingauge Station

[Unit: DR\$1000]

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total	Remarks					
				Priority-I				Priority-II		Priority-III								
				Phase-1 qty	cost	Phase-2 qty	cost	qty	cost	qty	cost							
<b>Sensor/measuring devices</b>																		
	Water level gauge		1,439	1	1,439								1,439					
	Rain gauge		96					1	96				96					
<b>Telemeter system</b>																		
	Remote terminal equipment (telemeter)		512	1	512								512					
	Radio equipment	70MHz band 10W	69	1	69								69					
	Antenna equipment		110	1	110								110					
	Power supply		359	1	359								359					
<b>Voice communication system</b>																		
	Radio equipment for voice	150 MHz 25W	nos	96						1	96		96					
	Antenna system for voice		LS	124						1	124		124					
<b>Civil works</b>																		
	Building & land preparation			138	1	138							138					
<b>Miscellaneous</b>																		
	Installation works		LS	996	1	996							996					
	Installation materials		LS	1,785	1	1,785							1,785					
<b>Total</b>													5,408	0	96	220	5,724	5,724

6. Los Guiros Hydrometric and Raingauge Station

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total	Remarks					
				Priority-I				Priority-II		Priority-III								
				Phase-1 qty	cost	Phase-2 qty	cost	qty	cost	qty	cost							
<b>Sensor/measuring devices</b>																		
	Water level gauge		1,439	1	1,439								1,439					
	Rain gauge		96					1	96				96					
<b>Telemeter system</b>																		
	Remote terminal equipment (telemeter)		512	1	512								512					
	Radio equipment		69	1	69								69					
	Antenna equipment		110	1	110								110					
	Power supply		359	1	359								359					
<b>Voice communication system</b>																		
	Radio equipment for voice	150 MHz 25W	nos	96						1	96		96					
	Antenna system for voice		LS	124						1	124		124					
<b>Civil works</b>																		
	Building & land preparation			138	1	138							138					
<b>Miscellaneous</b>																		
	Installation works		LS	996	1	996							996					
	Installation materials		LS	1,785	1	1,785							1,785					
<b>Total</b>													5,408	0	96	220	5,724	5,724

7. Santana Branch Office & Headworks Control

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total	Remarks			
				Priority-I				Priority-II		Priority-III						
				Phase-1 qty	cost	Phase-2 qty	cost	qty	cost	qty	cost					
<b>Sensor/measuring devices</b>																
	Water level gauge	crystal quartz pressure type	1,439							2	2,878		2,878			
	Rain gauge		96							1	96		96			
	Gate opening gauge	intake gate (0.5m)	996								9	8,964	8,964			
	Current meter (manual)	digital (0.3 m/s ~ 2.5 m/s)	179							2	358		358			
<b>Telemeter system</b>																
	Remote terminal equipment (telemeter)		1,771							1	1,771		1,771			
	Radio equipment	70MHz band 10W	69							1	69		69			
	Antenna equipment		110							1	110		110			
	Power supply		359							1	359		359			
	Repeater Station (near Vicente Noble 3rd station)		0													
	Repeater equipment		539							1	539		539			
	Radio equipment		69							1	69		69			
	Antenna equipment		83							1	83		83			
	Solar power supply		124							1	124		124			
	Repeater equipment for voice communication		0													
	Repeater radio equipment	150 MHz 25W	LS	138						1	138		138			
	Repeater antenna for voice system		LS	96						1	96		96			
	Solar power supply for voice repeater system		LS	262						1	262		262			
<b>Voice communication system</b>																
	Radio equipment for voice	150 MHz 25W	nos	96						1	96		96			
	Antenna system for voice		LS	124						1	124		124			
<b>Civil works</b>																
	Building & land preparation	200 m2		8						200	1,600		1,600			
<b>Miscellaneous</b>																
	Installation works		LS	2,463						1	2,463		2,463			
	Installation materials		LS	2,380						1	2,380		2,380			
<b>Total</b>													13,615	8,964	22,579	22,579

Table 6.2.7 Cost for Proposed Water Management Systems (4/4)

8. Rincon Lagoon Monitoring Station

[Unit: DR\$1000]

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total		Remarks
				Priority-I				Priority-II		Priority-III		qty	cost	
				Phase-1		Phase-2		qty	cost	qty	cost			
qty	cost	qty	cost	qty	cost	qty	cost	qty	cost					
<b>Sensor/measuring devices</b>														
	Water level gauge		1,439					1	1,439				1,439	
	Raingauge		96					1	96				96	
	Automatic Water Quality Gauge Equipment		12,192							1	12,192		12,192	
<b>Telemeter system</b>														
	Remote terminal equipment (telemeter)		802					1	802				802	
	Radio equipment		69					1	69				69	
	Antenna equipment		110					1	110				110	
	Power supply		691					1	691				691	
	Engine Generator 30 kVA	nos	2,006					1	2,006				2,006	Included in S Yega
<b>Civil works</b>														
	Foundation structures 5 m x 5 m	LS	1,383					1	1,383				1,383	
<b>Miscellaneous</b>														
	Boat with engines		276					1	276				276	
	Installation works	LS	1,425					1	1,425				1,425	
	Installation materials	LS	2,787					1	2,787				2,787	
<b>Total</b>									11,064		12,192		23,256	

9. Palo Alto Hydrometric and Raingauge Station

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total		Remarks
				Priority-I				Priority-II		Priority-III		qty	cost	
				Phase-1		Phase-2		qty	cost	qty	cost			
qty	cost	qty	cost	qty	cost	qty	cost	qty	cost	qty	cost			
<b>Sensor/measuring devices</b>														
	Water level gauge	nos	1,439							1	1,439		1,439	
	Raingauge	nos	96							1	96		96	
<b>Telemeter system</b>														
	Remote terminal equipment (telemeter)	LS	512							1	512		512	
	Radio equipment	LS	69							1	69		69	
	Antenna equipment	LS	110							1	110		110	
	Power supply	LS	359							1	359		359	
<b>Voice communication system</b>														
	Radio equipment for voice 150 MHz 25W	nos	96							1	96		96	
	Antenna system for voice	LS	124							1	124		124	
<b>Civil works</b>														
	Building & fencing	LS	138							1	138		138	
	Installation works	LS	1,024							1	1,024		1,024	
	Installation materials	LS	1,785							1	1,785		1,785	
<b>Total</b>											5,752		5,752	5,752

10. San Juan Hydrometric and Raingauge Station

No	Item	Unit	Unit Cost (DR\$)	Cost (DR\$)								Total		Remarks	
				Priority-I				Priority-II		Priority-III		qty	cost		
				Phase-1		Phase-2		qty	cost	qty	cost				
qty	cost	qty	cost	qty	cost	qty	cost	qty	cost	qty	cost				
<b>Sensor/measuring devices</b>															
	Water level gauge	Pressure bubb type	nos	1,439	0	0	1	1,439					0	1,439	
	Raingauge	Self-recording type	nos	96	0	0	1	96					0	96	
<b>Telemeter system</b>															
	Remote terminal equipment (telemeter)		LS	512	0	0	1	512					0	512	
	Radio equipment		LS	69	0	0	1	69					0	69	
	Antenna equipment		LS	110	0	0	1	110					0	110	
	Power supply		LS	359	0	0	1	359					0	359	
<b>Voice communication system</b>															
	Radio equipment for voice 150 MHz 25W		nos	96	0	0			0	0			0	0	
	Antenna system for voice		LS	124	0	0			0	0			0	0	
<b>Civil works</b>															
	Building & fencing		LS	138	0	0	1	138					0	138	
	Installation works		LS	1,024			1	1,024			1	1,024	2,048		
	Installation materials		LS	1,785			1	1,785			1	1,785	3,570		
<b>Total</b>					0	0	5,592				2,809		8,341	8,341	

**Table 6.2.8 Labor Wages**

DESCRIPTION		UNIT	AMOUNT	REMARKS
Labor	Peon	RD\$/day	135	
Especial labor	Albanilería	"	290	
Foreman	Capataz	"	380	
Carpenter assistance	Carpintero ayudante	"	200	
Carpenter	Carpintero	"	230	
Senior carpenter	Maestro carpintero	"	290	
Senior mason	Maestro constructor	"	290	
mason	Asistente constructor	"	230	
Reinforcement	Varilleros	"	290	
Welder	Soldador	"	290	
Driver (light equipment)	Chofer (equipo ligero)	"	230	
Driver (heavy equipment)	Chofer (equipo pesado)	"	290	
Driver (general)	Chofer (general)	"	215	
Mechanic	Mecánico	"	230	
Assistant mechanic	Mecánico auxiliar (Ayudate mecanica)	"	200	
Senior mechanic	Mayor mecánico (Maestro mecanica)	"	290	
Electrician	Electricista	"	215	
Watchman	Vigilante	"	135	
Operator (mixing plant)	Operador (hornigon planta)	"	290	
Engineer A	Ingeniero, mayor (>15 años)	RD\$/Month	29,500	senior (>15 years)
Engineer B	Ingeniero, medio (8-14 años)	"	20,000	middle (8-14 years)
Engineer C	Ingeniero, menor (3-7 años)	"	11,800	junior (3-7 years)
Specialist		"	38,750	researcher, coordinator, etc.
Extension Worker Coordinator		"	15,500	
Extension Worker		"	7,750	
Surveyor	Agrimensor	"	9,900	
Surveyor, assistant	Agrimensor, ayudante,	"	5,000	
Accountant	Contador	"	9,600	
Office clerk	Empleado de oficina	"	3,800	
Secretary	Secretaria	"	7,750	
Secretary, assistant	Secretaria, ayudante,	"	4,200	
Computer operator	Mecanografa	"	7,750	
Office boy	Mensajero de oficina	"	3,500	
Store keeper	Guardian	"	3,500	
Maid	Criada	"	3,000	
Cook	Cocinera	"	4,000	
Radio operator	Operador de la radio	"	5,000	
Canal supervisor	Supervisor del canal	"	4,700	
Pump operator	Operador de bomba	"	4,700	
Canal operator	Distribuidor de agua	"	3,900	
Gate operator	Compuerto	"	3,900	
Dredging operator	Operador de draga	"	7,500	
Assistant dredging operator	Ayudante de draga	"	4,700	
Mechanic (heavy machine)	Mecánico (maquina pesada)	"	8,000	
Mechanic (light machine)	Mecánico (maquina ligera)	"	6,500	
Assistant mechanic	Mecánico auxiliar	"	5,500	

Table 6.2.9 MATERIAL COST

[Unit : DR\$]

DESCRIPTION		UNIT	AMOUNT	REMARKS
Cement	Cemento	kg	1,892.00	42.5kg bag
Cement admixture	Aditivo de cemento	litre	29.10	cx - kraten
Fine aggregate	Agregado fino	m3	264.00	
Coarse Aggregate	Agregado tosco (Agregado grueso)	m3	234.00	
Gravel	Gravilla	m3	220.00	
Crushed stone	Piedra aplastada (Piedra de encacha)	m3	150.00	
Boulder	Canto rodado, (Cascajo)	m3	150.00	
Reinforcing bar (3/8")	Acero (3/8")	kg	6.70	
Reinforcing bar (1/2")	Acero (1/2")	kg	6.70	
Reinforcing bar (3/4")	Acero (3/4")	kg	6.70	
L-shape steel	Acero de la forma L	kg	8.16	
I-shape steel	Acero de la forma I	kg	8.16	
Steel plate (t=3-5mm)	Plato de acero (t=3-5mm)	kg	7.28	
Wooden form	Forma de madera (encontrado)	p2	20.00	
Steel wire	Alambre de acero	kg	4.54	
Galvanized steel wire	Alambre de acero galvanizado	kg	20.00	
Nail	Clavo	kg	10.00	
Plywood	Contrachapado, (Playwood)	sheet	315	Size; 4x8x1/2"
Plywood	Contrachapado, (Playwood)	sheet	527	Size; 4x8x3/4"
Square lumber (high quality)	Madera cuadrada (madera pulida)	m2	161.46	
Square lumber (low quality)	Madera cuadrada (madera bruta)	m2	161.46	
Gasoline	Gasolina	gal	27.9	
Diesel oil	Aceite del diesel	"	12.9	
Lubrication oil	Aceite de la lubricacion	"	120	
Motor oil	Aceite de motor	"	120	
Concrete pipe D=10"	Tubería de homigon D=10"	m		No Fabrican
" D=12"	" D=12"	"	152.00	l = 1200 mm
" D=15"	" D=15"	"	207.00	
" D=18"	" D=18"	"	261.00	
" D=21"	" D=21"	"	616.50	Reinforced
" D=24"	" D=24"	"	900.00	"
" D=36"	" D=36"	"	1,680.00	"
" D=48"	" D=48"	"	2,540.00	"
" D=60"	" D=60"	"	4,300.00	"
Galvanized steel pipe, f=200	Tubería galvanizada, f=200mm,	m	650.00	
Galvanized steel pipe, f=100	Tubería galvanizada, f=100mm,	m	350.00	
Galvanized steel pipe, f=75	Tubería galvanizada, f=75mm,	m	270.00	
Galvanized steel pipe, f=50	Tubería galvanizada, f=50mm,	m	130.00	
PVC pipe, f=300mm	Tubería PVC, f=300mm,	m	325.00	
PVC pipe, f=150mm	Tubería PVC, f=150mm,	m	153.00	
PVC pipe, f=75mm	Tubería PVC, f=75mm,	m	60.00	
PVC pipe, f=50mm	Tubería PVC, f=50mm,	m	30.00	

**Table 6.2.10 Unit Cost**

Work Items	Unit	Unit Cost [DR\$]		Total
		F/C	L/C	
<b>Earth Work</b>				
embankment [w/hauling]	m3	126	4	130
embankment [mon power]	m3		48	48
clearing&stripping	m2	9	1	10
excavation [Bul 211]	m3	25	2	27
excavation [m. power;common soil]	m3		61	61
excavation [B.hoe 0.6m3]	m3	32	1	33
excavation [m.power;hard rock]	m3		348	348
excavation [machine;hard rock]	m3	360		360
backfilling	m3		48	48
canal side shaping by hands	m2		8	8
disposal of materials	m3	31	2	33
embankment [excav. material]	m3	57	4	61
Clay embankment	m3	122	9	131
<b>Concrete Work</b>				
Base Concrete	m3	826	610	1,436
Joint filler	m	10	10	20
Reinforcement Bar	kg	6	3	9
Form Work	m2		103	103
Concrete [210kg/m2]	m3	1,035	818	1,853
PVC water stop [15cm]	m	180	20	200
Demolishment of Concrete	m3	200	200	400
Dale bar	m	2	1	3
<b>Stone Work</b>				
Wet Masonry	m3	100	524	624
Dry Masonry	m3	24	445	469
Crushed Stone	m3	67	249	316
Gabion	m3	132	399	531
<b>Other Work</b>				
Supply and installation RC pipe (12"=0.3m)	m	600	35	635
Supply and installation RC pipe (24"=0.6m)	m	1,075	54	1,129
Supply and installation RCpipe (36"=0.9m)	m	1,996	100	2,095
Supply and installation RCpipe (48"=1.2m)	m	3,046	152	3,198
Supply and installation RCpipe (60"=1.50m)	m	5,119	256	5,375



Table 6.2.11 Direct Construction Cost for Irrigation and Drainage (1/2)

RefNo	Work Items	Unit	Quantity	Unit Cost (DR\$)		Cost (DR\$ 1000)		Total
				F/G	L/G	F/G	L/G	
<b>A - Direct Construction Cost</b>								
<b>A1 Preparatory Works</b>		L.S.				<b>17,972</b>	<b>6,611</b>	<b>24,583</b>
<b>A2 Main Canal System (canal work)</b>								
<b>a) Earth works</b>								
e-1	Excavation [B.hoe 0.6m3]	m3	79,573	32	1	2,514	73	2,593
e-2	Embankment [w/hauling]	m3	265,085	126	4	33,401	1,060	34,461
e-4	Clearing&stripping	m2	322,811	9	1	2,903	323	3,226
e-12	Canal side shaping by hands	m2	126,197		8		1,010	1,010
s-3	Road Metaling	m3	7,283	67	249	488	1,813	2,301
e-3	Embankment (man power)	m3			48			
Sub-TOTAL						<b>39,307</b>	<b>4,285</b>	<b>43,591</b>
<b>b) Concrete works</b>								
c-11	Lining Concrete w. F-work (s=1:1.5)	m3	12,188	1,068	935	13,015	11,394	24,409
c-13	Lining Concrete w. F-work,Rbar (4ume)	m3	3,874	1,215	1,681	4,707	6,512	11,219
c-3	Reinforcement Bar	kg		6	3			
c-9	Canal lining	km		841,101	282,003			
c-8	Demolishment of Concrete	m3		200	200			
Sub-TOTAL						<b>17,722</b>	<b>17,908</b>	<b>35,628</b>
<b>c) M-0 Miscellaneous works</b>								
		L.S.				<b>5,703</b>	<b>2,219</b>	<b>7,922</b>
<b>Total</b>						<b>82,731</b>	<b>24,410</b>	<b>87,141</b>
<b>A3 Main Canal structures</b>								
a)	Check		20			8,060	1,433	9,494
b)	Turnout		15			1,545	359	1,905
c)	Culvert		30			2,578	1,855	4,433
d)	Drop		14			895	654	1,579
e)	Drain Cross		37			2,764	933	3,697
<b>f) M-0 Miscellaneous Works</b>								
		L.S.				<b>1,584</b>	<b>526</b>	<b>2,111</b>
<b>Total</b>						<b>17,427</b>	<b>5,791</b>	<b>23,218</b>
<b>A4 Regulation Ponds</b>								
<b>a) Earth works</b>								
E-1	Excavation [But 214]	m3	160,757	25	2	4,019	322	4,340
E-14	Embankment (excav. material)	m3	118,828	57	4	6,773	475	7,249
E-4	Clearing&stripping	m2	8,743	9	1	79	9	87
e-15	Clay embankment	m3	94,812	122	9	11,567	853	12,420
C-11	Lining Concrete w. F-work (s=1:1.5)	m3	7,585	1,068	935	8,101	7,092	15,193
sub-total						<b>30,539</b>	<b>8,751</b>	<b>39,290</b>
<b>b) Structures</b>								
	Inlet	nos.	21			1,582	558	2,140
	Outlet	nos.	21			14,862	1,375	16,237
	Spillway	nos.	21			823	515	1,339
	Miscellaneous Works					5,568	1,687	7,255
sub-total						<b>22,836</b>	<b>4,135</b>	<b>26,971</b>
<b>Total</b>						<b>53,374</b>	<b>12,886</b>	<b>66,260</b>
<b>A5 Lateral Canal</b>								
<b>a) Earth works</b>								
	excavation [B.hoe 0.6m3]	m3	84					
	excavation [B.hoe 0.6m3]	m3	152,427	32	1	4,878	152	5,030
	embankment [w/hauling]	m3	387,854	128	4	48,844	1,551	50,395
	clearing&stripping	m2	935,893	9	1	8,423	938	9,359
	canal side shaping by hands	m2	202,724		8		1,622	1,622
	Lining Concrete	m3	26,213	1,068	935	25,206	22,067	47,273
	other works	L.S.				<b>2,336</b>	<b>17,178</b>	<b>19,514</b>
sub-total						<b>89,687</b>	<b>43,506</b>	<b>133,193</b>
<b>b) Structures</b>								
	Check	nos.	155			32,601	4,982	37,582
	Turnout	nos.	189			22,458	4,933	27,389
	Culvert	nos.	159			4,560	2,058	6,618
	Drop	nos.	56			880	913	1,793
	Drain Cross	nos.	108			8,068	2,723	10,791
sub-total		nos.	667			<b>68,565</b>	<b>15,608</b>	<b>84,173</b>
<b>c) M-0 Miscellaneous Works</b>								
		L.S.				<b>15,825</b>	<b>5,911</b>	<b>21,737</b>
<b>Total</b>						<b>174,077</b>	<b>65,026</b>	<b>239,102</b>
<b>A6 Villarpando HW</b>								
<b>a) Concrete works</b>								
e-7	Excavation [B.hoe 0.6m3]	m3	9,131	32	1	292	9	301
e-11	Backfilling	m3	2,712		48		130	130
c-3	Base Concrete	m3	121	828	810	100	74	174
c-6	Concrete [210kg/cm2]	m3	2,057	1,035	818	2,129	1,683	3,812
c-4	Form Work	m2	3,049		103		314	314
Other works						<b>1,334</b>	<b>750</b>	<b>2,084</b>
sub-total						<b>3,855</b>	<b>2,950</b>	<b>6,815</b>

Table 6.2.11 Direct Construction Cost for Irrigation and Drainage (2/2)

Ref.No	Work Items	Unit	Quantity	Unit Cost (DR₱)		Cost (DR₱ 1000)		Total
				F/G	L/G	F/G	L/G	
<b>b) Mechanical Works</b>								
m-10	Radial gate c/m (w.4m, R7.2m, 20t)	nos	1	3,288,800	365,200	3,287	565	3,652
m-11	Roller Gate B190*H250 c/m - 2.5t	nos	3	385,100	42,900	1,153	129	1,287
m-20	Roller Gate B190*H250 replacement	nos	3	501,930	55,770	1,506	167	1,673
	sub-total					5,951	681	6,612
<b>c) Temporary works</b>		LS				1,668	768	2,434
<b>Total</b>						<b>11,472</b>	<b>4,389</b>	<b>15,881</b>
<b>A7 Siphon</b>								
<b>7-1) Siphon 1</b>								
<b>a) Concrete/Earth</b>								
e-7	Excavation (B.hoe 0.6m3)	m3	39,730	32	1	1,271	40	1,311
e-11	Backfilling	m3	25,113		48		1,205	1,205
c-1	Base Concrete	m3	524	828	610	430	318	745
c-6	Concrete [210kg/cm2]	m3	5,382	1,035	818	5,570	4,402	9,972
c-4	Form Work	m2	9,598		103		989	989
O-5	supply and installation RCpipe (60"=1.50m)	m	1,245	5,119	256	6,373	319	6,692
	Other works	LS				3,241	1,619	4,860
	sub-total					16,858	8,892	25,778
<b>b) Temporary works</b>						5,419	1,629	7,047
<b>Total of Siphon 1</b>						<b>22,305</b>	<b>10,521</b>	<b>32,825</b>
<b>7-2) Siphon 2</b>								
<b>a) Concrete/Earth</b>								
e-7	Excavation (B.hoe 0.6m3)	m3	13,590	32	1	371	12	382
e-11	Backfilling	m3	7,629		48		368	368
c-1	Base Concrete	m3	132	828	610	109	81	190
c-6	Concrete [210kg/cm2]	m3	853	1,035	818	883	638	1,581
c-4	Form Work	m2	2,759		103		284	284
	Others					542	283	805
	sub-total					1,905	1,703	3,608
<b>b) Temporary works</b>						190	170	361
<b>Total of Siphon 2</b>						<b>2,095</b>	<b>1,874</b>	<b>3,969</b>
<b>Total of Siphon 1&amp;2</b>						<b>24,400</b>	<b>12,395</b>	<b>36,795</b>
<b>A8 Santana Headworks</b>								
<b>a) ( Temporary diversion</b>								
e-7	Excavation (B.hoe 0.6m3)	m3	17,780	32	1	569	18	587
c-8	Demo/ishment of Concrete	m3	919	200	200	184	184	368
s-4	Gabion	m3	257	132	399	38	115	152
e-11	Backfilling	m3	6,337		48		304	304
a-2	Embankment (w/houling)	m3	1,000	126	4	128	4	130
c-6	Concrete [210kg/cm2]	m3	2,945	1,035	818	3,051	2,411	5,463
	Others					2,059	1,542	3,601
	sub-total					6,027	4,577	10,605
<b>b) Mechanical Works</b>								
m-13	Roller Gate B280*H280 c/m -4.0t	nos	2	617,760	68,640	1,238	137	1,373
m-7	Gate B175*H175 (c/m, 1.5t)	nos	9	231,680	25,740	2,085	232	2,317
m-12	Trashrack-L (1.75*6.3m)	nos	9	3,568	3,568	32	32	64
	sub-total					3,353	401	3,754
<b>Temporary Works</b>						2,227	1,076	3,904
<b>3) Temporary Work and others</b>								
<b>Total</b>						<b>11,807</b>	<b>6,655</b>	<b>18,262</b>
<b>A9 Drainage (lateral level, total 7 km)</b>						4,348	885	5,012
<b>TOTAL</b>						<b>377,407</b>	<b>138,828</b>	<b>518,233</b>
<b>B - Operation and Maintenance Equipment</b>						897	897	1,794
<b>C - Consulting Service</b>						56,811	20,824	77,435
<b>D - Administrative Cost</b>						18,870	6,941	25,812
<b>E- Land Acquisition and Compensation</b>							15,071	15,071
<b>sub-Total (A) + (B) + (C) + (D)</b>						<b>453,785</b>	<b>182,559</b>	<b>636,345</b>
<b>E - Physical Contingency</b>						45,379	18,256	63,634
<b>Total</b>						<b>499,164</b>	<b>200,815</b>	<b>699,979</b>

**Table 6.2.12 Direct Construction Cost of Rural Infrastructure**

	Unit	Quantity	Unit Cost [DR\$]		Amount [RD\$ 1000]	
			F/C	L/C	F/C	L/C
<b>Water Supply System</b>						
<b>1 Earth Works</b>						
- Excavation	m3	2,986	32	1	95.6	3.0
- Backfill	m3	1,469		48		70.5
- Stone Masonry	m3	7	100	524	0.7	3.7
- Miscellaneous	LS				19.3	15.4
<b>2 Concrete Works</b>						
- Concrete	m3	1,946	1,035	818	2,014.1	1,591.8
- Form	m2	11,778		103		1,213.1
- R.Bar	kg	85,251	6	3	511.5	255.8
- Miscellaneous	LS				505.1	612.1
<b>3 Pipe Installation and related works</b>						
- PVC Pipe, 4"	m	886	198	50	175.4	44.3
- PVC Pipe, 2"	m	5,470	76	18	415.7	98.5
<b>4 Related Works</b>						
- Filtration Sand	m3	490	134	498	65.7	244.0
- Gate	nos	9	1,011	1,011	9.1	9.1
- Metal works	LS	3			103.4	51.7
- Building	LS	99	6,400	1,600	633.6	158.4
- Trashrack	LS	3			17.8	17.8
- House connection	set	953	1,038	1,038	989.2	989.2
- Miscellaneous	LS				324.4	72.2
<b>5 Pump</b>						
- Q264, H2.4,	nos.	2	97,000		194.0	
- Q264, H14.1	nos.	2	118,000		236.0	
- Q66, H7.4,	nos.	2	55,000		110.0	
- Q66, H19.4	nos.	2	118,000		236.0	
- Q211, H6.1,	nos.	2	110,000		220.0	
- Q211, H13.1	nos.	2	118,000		236.0	
- Related Facilities	LS				246.4	
<b>6 Electric Facility</b>						
- Panel	set	3	97,000		291.0	
- T.Line & pole	m	3	399,000	100,000	1,317.2	280.0
- Transformer	nos	3	97,000		291.0	
- Measuring Facility	set	3	83,000		249.0	
- Miscellaneous	LS				83.1	
<b>Total</b>					<b>9,190.3</b>	<b>5,730.6</b>
<b>Communication Center</b>						
<b>1 Vicente Noble</b>		540	6,400	1,600	3,456.0	864.0
<b>2 Fundacion</b>		420	6,400	1,600	2,688.0	672.0
<b>3 El Peñon</b>		420	6,400	1,600	2,688.0	672.0
<b>Total</b>					<b>8,832</b>	<b>2,208</b>

**Table 6.2.13 Breakdown of Direct Cost for Environmental Conservation (1/2)**

**(a) Green Belt Formation for Waterfront Conservation**

**(i) Personnel Expenditure**

Work Item	man*day						
	engineer A	engineer B	engineer C	Surveyor	Surveyor assist.	Labor	Driver
<b>1 Preparatory Work</b>							
- Survey	1		1	5	10		1
- Detailed Design	1	2	4				
- Selection of Constructor	1	1	1				
<b>2 Construction</b>							
- Seedling carry		3				9	3
- Land preparation			1	3	6	10	1
- Planting		1	5			90	3
- Fence collocation			2			20	2
<b>TOTAL</b>	<b>3</b>	<b>7</b>	<b>14</b>	<b>8</b>	<b>16</b>	<b>129</b>	<b>10</b>

**(ii) Seedling of Bamboo and Shade Tree**

- production cost of each bamboo or tree = RD\$10.

- number of seedlings required = bamboo 3600 nos.

= shade tree 50nos.

$$\text{RD\$10} \times (3600+50) = \text{RD\$36,500.}$$

**(iii) Fertilizer**

- quantity of fertilizer required = 5 oz. per seedling.

- fertilizer = RD\$200/cwt.(1600 oz).

$$(3600+50) \times 5\text{oz} / 1600\text{oz} \times \text{RD\$200} = \text{RD\$2,281.}$$

**(iv) Other Facilities**

-Construction of the maintenance road (gravel)

$$1200\text{m long} \times 3 \text{ m wide} \times \text{RD\$125/m}^2 = \text{RD\$450,000}$$

-Construction of step (2 places, concrete)

$$3 \text{ m height} \times 2 \text{ m wide}$$

$$\text{construction cost: RD\$14,000/place} \times 2 = \text{RD\$28,000}$$

- Bench (20)

$$\text{A steel bench: RD\$2,500} \times 20 = \text{RD\$50,000}$$

**Table 6.2.13 Breakdown of Direct Cost for Environmental Conservation (2/2)**

**(b) Environmental Monitoring Program in Rincon Lagoon**

**(i) Personnel Expenditure (Unit: man\*day)**

Work Item	Specialist	engineer A	engineer B	engineer C	Surveyor	Surveyor assist.	Labor	Driver
<b>1 Preparatory Work</b>								
- Assembly meeting	2	16						
- Committee meeting	2	16						
<b>2 General Study (3 times)</b>								
- Survey for natural condition	24		48	48				
- Topological survey		3	9		30	60		21
- Water quality and quantity			6	6			24	12
- Analysis and reporting	3	3	12	24				
- Committee meeting	3	21						
<b>3 Periodical Study (55 times)</b>								
- Survey for natural condition			440	440				
- Topological survey				55	55	55		55
- Water quality and quantity			55	55			220	110
- Analysis and reporting	55	55	110	110				
<b>4 Periodical committee meeting</b>	10	80						
<b>5 Analysis and evaluation</b>	5	20	18	28				
<b>TOTAL</b>	<b>104</b>	<b>214</b>	<b>693</b>	<b>766</b>	<b>85</b>	<b>115</b>	<b>244</b>	<b>198</b>

**(ii) Water Quality Analysis (Unit ; RD\$)**

Item	Cost unit	No. sampling place	sampling frequency (times)	cost
pH	50	5	58	14,500
EC	70	5	58	20,300
COD	210	5	58	60,900
DO	210	5	58	60,900
NH4-N	210	5	55	57,750
NH3-N	210	5	55	57,750
Total Phosphate	210	5	55	57,750
No. Colon Bacillus	150	5	55	41,250
<b>TOTAL</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>371,100</b>

**(iii) Equipment (unit: US\$)**

Equipment	Cost unit	Quantity	Cost
Boat with motor	2,700	2	5,400
4 wheeled vehicle	20,000	2	40,000
Motor bike (off road)	7,000	5	35,000
Power telescope	1,000	2	2,000
Binoculars	300	5	1,500
Computer	3,700	2	7,400
Survey equipment (transit)	4,000	2	8,000
<b>TOTAL</b>	<b>-</b>	<b>-</b>	<b>99,300</b>

Note; Cost for the personnel expenditure and the water quality analysis (DR\$ 1,762,540 in total ) in the Monitoring Program are consumed through 10 years. A half of the cost consumed in construction is considered as the project direct cost and the rest is as O&M cost.



**Table 6.3.1 Operation and Maintenance Cost**

		[unit: DR\$ 1000]		
		Administration cost	Maintenance of facilities	total
1	Overall water management plan	2,484	4,439	6,923
2	Irrigation development and water management in the field improvement plan			
	- improvement project of Villarpando Intake weir		16	16
	- improvement project for irrigation facilities including Santana intake weir	5,227	1,429	6,656
	- Project of strengthening water user's organization			
4	Rural infrastructure improvement plan	605	108	713
	- Rural water supply project			
	- Project for community center development			
5	Environmental conservation plan			
	Greenbelt formation project for waterfront conservation			
	- Environmental monitoring program in Rincon Lagoon	176		176
Total		8,492	5,993	14,484

Note: The amount mention above are at full operation stage.

Table 6.4.1 Replacement Cost

[unit: DR\$1000]

Description	Useful life [year]	Metal works	Equipment	total
1 Overall water management plan				
- outside of house	10		20,000	20,000
- outdoor	25		25,000	25,000
2 Irrigation development and water management in the field improvement plan				
- improvement project of Villarpando Intake weir (gate)	20	6226		6,226
- improvement project for irrigation facilities including Santana intake weir (gate & pump)	20	11,525	880	12,405
- Project of strengthening water user's organization				
4 Rural infrastructure improvement plan				
- pump etc	20		2,393	2,393
- gate	20	209		209
Total		17960	48273	66232



Table 7.1.1. Standard Conversion Factor

Year	Official Exchange Rate		Imports Value		Exports Value		Imports Tax		Exports Tax		Average Import Tax		Average Export Tax		Standard Conversion Factor				
	1	(RDS/ US\$)	2	US\$ MILLION	3	RDS MILLION	4	US\$ MILLION	5	RDS MILLION	6	RDS MILLION	7	RDS MILLION		8	(6/3)	9	(7/5)
1990		8.43	1,792.80		15,113.30		734.50		6,191.84		2,442.90		5.20		0.16		0.00084		0.90
1991		12.42	1,728.80		21,471.70		658.30		8,176.09		3,379.20		3.10		0.18		0.00038		0.88
1992		12.50	2,174.60		27,182.50		562.40		7,030.00		6,386.10		2.20		0.23		0.00031		0.84
1993		12.50	2,118.40		26,480.00		511.00		6,387.50		6,695.20		1.20		0.25		0.00019		0.83
1994		12.62	2,283.80		28,321.56		644.00		8,127.28		6,062.60		1.00		0.21		0.00012		0.86
1995		12.87	2,588.00		33,307.56		766.70		9,867.43		6,504.80		3.90		0.20		0.00040		0.87
1996		12.90	3,561.40		45,942.06		933.00		12,035.70		6,942.00		4.40		0.15		0.00037		0.89
1997		14.01	4,134.80		57,928.55		996.90		13,966.57		9,006.90		2.00		0.16		0.00014		0.89
AVE		12.28	2,547.83		32,030.90		725.85		8,972.80		5,989.96		2.88		0.19		0.00034		0.87

**Table 7.1.2 Crop Budget With and Without Project Conditions**

(unit:DR\$/ha)

	Without Project Condition			With Project Condition		
	Gross Income	Production Cost	Net Income	Gross Income	Production Cost	Net Income
<b>Economic Crop Budget</b>						
Plantain	62,730	9,800	52,930	82,246	13,790	68,456
Tomato	68,150	14,910	53,240	97,359	17,090	80,269
Sweet Potato	49,040	9,860	39,180	69,480	11,210	58,270
Cassava	31,600	9,950	21,650	58,340	11,570	46,770
Rice	19,360	16,680	2,680	39,600	20,340	19,260
Bean	13,050	8,710	4,340	21,750	11,710	10,040
Pigeon Peas	13,640	5,960	7,680	27,280	6,450	20,830
Eggplant	69,830	12,250	57,580	93,100	14,010	79,090
Corn	7,870	4,820	3,050	12,240	6,990	5,250
Melon	79,200	24,180	55,020	105,600	28,210	77,390
Sweet Pepper	78,650	13,400	65,250	108,900	15,990	92,910
Papaya	131,795	15,485	116,310	156,900	16,800	140,100
Banana	27,770	9,980	17,790	40,724	14,192	26,532

Table 7.1.3 Irrigation Benefit in the Full Stage

	(unit:DR\$/ha)									
	Without Project Condition					With Project Condition				
	Net income per ha	Cultivated area (ha)	Total net income (RD\$)	Net income per ha	Cultivated area (ha)	Total net income (RD\$)	Irrigation benefit (DR\$)	Total net income (RD\$)	Irrigation benefit (DR\$)	Total net income (RD\$)
Plantain	52,930	3,430	181,549,900	68,456	4,550	311,474,800		311,474,800		311,474,800
Tomato	53,240	120	6,388,800	80,260	250	20,065,000		20,065,000		20,065,000
Sweet Potato	39,180	20	783,600	58,270	450	26,221,500		26,221,500		26,221,500
Cassava	21,650	160	3,464,000	46,770	220	10,289,400		10,289,400		10,289,400
Rice	2,680	20	53,600	19,260	40	770,400		770,400		770,400
Bean	4,340	50	217,000	10,040	60	602,400		602,400		602,400
Pigeon Peas	7,680	10	76,800	20,830	140	2,916,200		2,916,200		2,916,200
Eggplant	57,580	15	863,700	79,090	30	2,372,700		2,372,700		2,372,700
Corn	3,050	70	213,500	5,250	100	525,000		525,000		525,000
Melon	55,020	115	6,327,300	77,390	200	15,478,000		15,478,000		15,478,000
Sweet Pepper	65,250	140	9,135,000	92,910	190	17,652,900		17,652,900		17,652,900
Papaya	116,310	110	12,794,100	140,100	240	33,624,000		33,624,000		33,624,000
Banana	17,790	170	3,024,300	26,532	170	4,510,440		4,510,440		4,510,440
Total		4,430	224,891,600		6,640	446,502,740		446,502,740		221,611,140

Table 7.1.4 Rural Water Supply Benefit

Year	Population			Family				Benefit (RD\$/lit.)
	Bombita	Los Robres	Altagracia	Bombita	Los Robres	Altagracia	Total	
1	1,133	358	876	263	83	204	550	
2	1,167	362	902	271	84	210	565	
3	1,202	367	929	280	85	216	581	
4	1,238	372	957	288	86	222	597	
5	1,275	377	985	297	88	229	613	3,736,666
6	1,313	381	1,015	305	89	236	630	5,934,564
7	1,353	386	1,045	315	90	243	648	6,098,400
8	1,393	391	1,077	324	91	250	665	6,266,966
9	1,435	397	1,109	334	92	258	684	6,440,402
10	1,478	402	1,142	344	93	266	703	6,618,852
11	1,523	407	1,177	354	95	274	722	6,802,463
12	1,568	412	1,212	365	96	282	742	6,991,388
13	1,615	418	1,248	376	97	290	763	7,185,785
14	1,664	423	1,286	387	98	299	784	7,385,813
15	1,714	428	1,324	399	100	308	806	7,591,640
16	1,765	434	1,364	411	101	317	829	7,803,438
17	1,818	440	1,405	423	102	327	852	8,021,382
18	1,873	445	1,447	436	104	337	876	8,245,654
19	1,929	451	1,490	449	105	347	900	8,476,442
20	1,987	457	1,535	462	106	357	925	8,713,937
21	2,046	463	1,581	476	108	368	951	8,713,937
22	2,108	469	1,629	490	109	379	978	8,713,937
23	2,171	475	1,678	505	110	390	1,005	8,713,937
24	2,236	481	1,728	520	112	402	1,034	8,713,937
25	2,303	488	1,780	536	113	414	1,063	8,713,937
26	2,372	494	1,833	552	115	426	1,093	8,713,937
27	2,443	500	1,888	568	116	439	1,124	8,713,937
28	2,517	507	1,945	585	118	452	1,155	8,713,937
29	2,592	513	2,003	603	119	466	1,188	8,713,937
30	2,670	520	2,063	621	121	480	1,222	8,713,937
31	2,750	527	2,125	640	123	494	1,256	8,713,937
32	2,833	534	2,189	659	124	509	1,292	8,713,937
33	2,918	541	2,254	679	126	524	1,329	8,713,937
34	3,005	548	2,322	699	127	540	1,366	8,713,937
35	3,095	555	2,392	720	129	556	1,405	8,713,937
36	3,188	562	2,464	741	131	573	1,445	8,713,937
37	3,284	569	2,537	764	132	590	1,486	8,713,937
38	3,382	577	2,614	787	134	608	1,528	8,713,937
39	3,484	584	2,692	810	136	626	1,572	8,713,937
40	3,588	592	2,773	834	138	645	1,617	8,713,937
41	3,696	599	2,856	860	139	664	1,663	8,713,937
42	3,807	607	2,942	885	141	684	1,711	8,713,937
43	3,921	615	3,030	912	143	705	1,760	8,713,937
44	4,039	623	3,121	939	145	726	1,810	8,713,937
45	4,160	631	3,214	967	147	748	1,862	8,713,937
46	4,285	639	3,311	996	149	770	1,915	8,713,937
47	4,413	648	3,410	1,026	151	793	1,970	8,713,937
48	4,545	656	3,512	1,057	153	817	2,027	8,713,937
49	4,682	665	3,618	1,089	155	841	2,085	8,713,937
50	4,822	673	3,726	1,121	157	867	2,145	8,713,937

Table 7.1.5 Cost and Benefit Flow

Year	Capital Cost			O&M Cost			Replacement Cost			Total Cost	Benefit			Net Cash Flow
	Water Management Center Project	Rural Water Supply Project	Yaque del sur Water Management Center Project	Water Management Center Project	Rural Water Supply Project	Irrigation Project	Water Management Center Project	Rural Water Supply Project	Irrigation Project		Rural Water Supply Project	Irrigation Project	Rural Water Supply Project	
1	422									47,516				-47,516
2	8,025									65,303				-65,303
3	10,828			88	309					166,702				-166,702
4	9,166		20,233	383	1,337					209,143			12,797	-196,346
5	5,804		10,198	677	2,366					143,214			58,076	-81,401
6				866	3,027		262			4,297			111,344	112,822
7				866	3,027		404			4,302			157,144	158,777
8				866	3,027		614			4,307			180,072	181,863
9				866	3,027		419			4,312			196,370	198,325
10				866	3,027		425			4,318			215,038	217,160
11				866	3,027		431			4,324			221,611	223,906
12				866	3,027		436			4,329			221,611	224,084
13				866	3,027		442			4,335			221,611	224,267
14				866	3,027		448			4,341			221,611	224,456
15				866	3,027		455		2,830	7,178			221,611	224,649
16				866	3,027		461			4,354			221,611	225,053
17				866	3,027		468			4,361			221,611	225,264
18				866	3,027		475			4,368			221,611	225,482
19				866	3,027		482			4,375			221,611	225,705
20				866	3,027		489			4,382			221,611	225,943
21				866	3,027		489			4,382			221,611	225,943
22				866	3,027		489			4,382			221,611	225,943
23				866	3,027		489			4,382			221,611	225,943
24				866	3,027		489			4,382			221,611	225,943
25				866	3,027		489		2,830	13,210			221,611	217,115
26				866	3,027		489			4,382		2,575	221,611	225,943
27				866	3,027		489			4,382			221,611	225,943
28				866	3,027		489			4,382			221,611	225,943
29				866	3,027		489		3,538	4,382			221,611	222,405
30				866	3,027		489			7,920			221,611	222,405
31				866	3,027		489		3,538	7,920			221,611	222,405
32				866	3,027		489			7,920			221,611	222,405
33				866	3,027		489			4,382			221,611	225,943
34				866	3,027		489			4,382			221,611	225,943
35				866	3,027		489			4,382			221,611	225,943
36				866	3,027		489			4,382			221,611	225,943
37				866	3,027		489			4,382			221,611	225,943
38				866	3,027		489			4,382			221,611	225,943
39				866	3,027		489			4,382			221,611	225,943
40				866	3,027		489			4,382			221,611	225,943
41				866	3,027		489			4,382			221,611	225,943
42				866	3,027		489			4,382			221,611	225,943
43				866	3,027		489			4,382			221,611	225,943
44				866	3,027		489			4,382			221,611	225,943
45				866	3,027		489		2,830	4,382			221,611	223,113
46				866	3,027		489			4,382			221,611	225,943
47				866	3,027		489			4,382			221,611	225,943
48				866	3,027		489			4,382			221,611	225,943
49				866	3,027		489			4,382			221,611	225,943
50				866	3,027		489			10,380		2,575	221,611	219,945

IRR: 23.0%

Table 7.1.6 Farm Budget With Project Condition for Three Farm Size Groups in the Project Area

Farm Size		Small	Medium	Large	
Item	(Unit)				
(1) Family Size	No.	5	5	4	
(2) Range of Farm Size (1)	(ha)	0.3 to 1.0	1.1 to 2.0	More than 2.0	
(3) Average Farm Size (1)	(ha)	0.61	1.3	4.3	
(4) Average Crop Production (2)	(ton)				
1	Plantain	9.39	20.02	66.21	
2	Tomato	2.76	5.89	19.48	
3	Sweet potato	0.96	2.06	6.80	
4	Melon	1.71	3.64	12.04	
5	Pepper	0.59	1.26	4.18	
6	Papaya	1.30	2.77	9.17	
7	Cassava	0.27	0.58	1.91	
8	Banana	0.53	1.13	3.73	
9	Pigeon pea	0.04	0.09	0.31	
10	Corn	0.03	0.06	0.20	
11	Bean	0.01	0.02	0.06	
12	Eggplant	0.24	0.52	1.72	
13	Rice	0.02	0.04	0.14	
(5) Agricultural Income	(RD \$)	64,013	136,422	451,243	
1	Plantain	35,035	74,666	246,971	
2	Tomato	8,967	19,110	63,209	
3	Sweet potato	3,942	8,400	27,785	
4	Melon	4,509	9,610	31,786	
5	Pepper	3,587	7,645	25,287	
6	Papaya	4,081	8,697	28,768	
7	Cassava	1,317	2,806	9,283	
8	Banana	612	1,303	4,311	
9	Pigeon pea	399	851	2,815	
10	Corn	127	271	895	
11	Bean	133	283	935	
12	Eggplant	1,136	2,421	8,007	
13	Rice	169	360	1,192	
(6) Non-Agricultural Income (3)	(RD \$)	11,500	11,500	0	
(7) Total Income (5)+(6)	(RD \$)	75,513	147,922	451,243	
(8) Production Costs	(RD \$)	8,997	25,147	96,030	
	Farm Materials	7,650	16,400	53,910	
	Paid Labor	0	5,916	32,612	
	Other costs	1,347	2,831	9,512	
			(%)	(%)	
(9) Living Expenditure (4)	(RD \$)	44,616	100	74,035	100
	Food	24,960	55.9	34,450	46.5
	Alcohol Beverages	2,275	5.1	4,940	6.7
	Water supply	260	0.6	390	0.5
	Housing	3,900	8.7	7,800	10.5
	Clothing	2,340	5.2	3,900	5.3
	Health care/Medicine	2,925	6.6	8,060	10.9
	Education	1,950	4.4	2,860	3.9
	Electricity	1,183	2.7	1,560	2.1
	Cooking Gas	1,118	2.5	1,235	1.7
	Transportation	1,105	2.5	3,250	4.4
	Gifts	1,300	2.9	2,340	3.2
	Others	1,300	2.9	3,250	4.4
(10) Total Expenditure (8+9)	(RD \$)	53,613		99,182	241,305
(11) Balance (7-10)	(RD \$/year)	21,900		48,740	209,940

Notes: (1) Based on INDRHI's data, the percentage distribution of farm size in the Project Area is estimated at about 51.6 % small farms, 35.8 % medium farms, and 12.6 % large farms  
 (2) Target Yield With Project Condition.  
 (3) Non agricultural Income With Project is assumed same as Without Project conditions  
 (4) Living Expenditure under With Project Condition was estimated by increasing Living Expenditure under Present condition by 30 % (1.3 times)

**Table 7.3.1 Results of Environmental Assessment (1/2)**

Project Name	Result of EIA
Irrigation Water Management Improvement Project	As the result of the study showing in (3) 7.3.3, the set up of the WUO will bring the change of the social characteristics and structure, and this social change will bring a positive impact for farmer's lifestyle and society. The water use condition will be better as a result of the set up of the WUO. Few negative impacts are foreseen.
Irrigation Facilities Improvement Project	Agricultural production will increase as a result of better water supply and the increase of the harvesting area from 4,430 ha to 7,805 ha. It will make the rural economy and farmer's activities more active. Concerning soil salinization, since the whole project area is already irrigated, drastic increase of salinization area by the project implementation will not occur. It is possible that in some areas, for example in Canoa area, salinization problems would decrease as a result of better water supply to the land. In the southern part of the project area, where the altitude is low, collocation of gates to prevent backwater from sea is necessary. Turbidity of river water occurs during the construction work at Santana Headworks, but it is a temporary and small impact. Countermeasures for expected impacts concerning water born diseases, and land use change are shown in (2) 7.3.3.
Villarpando Headworks Improvement Project	Water use condition will become better as a result of better management of water distribution. The water volume to distribute for Azua area will not change. Agricultural production will increase as a result of better water supply. It will make the rural economy and farmer's activities more active. Turbidity of river water occurs during the construction work at the Headworks, but it is a temporary and small impact.
River Water Management Reinforcement Project	Water use condition will become better as a result of better management of water distribution. The irrigation efficiency will change from about 30% to about 48%. Agricultural production will increase as a result of better water supply. It will make the rural economy and farmer's activity more active.
Project of Overall Water Management in Yaque del Sur River Basin	Water use condition will become better as a result of better management of water distribution. Agricultural production will increase as a result better water supply. It will make the rural economy and farmer's activity more active. Change in vegetation and land use will occur by the construction of the water management center at Canoa, Villarpando. But the center occupies a small area and the impact will be reduced by creation of wooded area around the center.
Project for Strengthening Agriculture Support Service	As the result of the research and extension project, the volume of pesticide use per hector in each crop and the total volume used in whole project area will reduce. The volume of fertilizer use per hector in each crop will increase for the purpose of increasing the production. But the efficiency of agrochemical use will become higher as the result of the extension and research project. It is possible that eutrophication of river water will be brought as a result of the increase of fertilizer use.
Rural Water Supply Project	In the project area, lack of water supply is a critical problem. In the project area, the number of beneficial household by this project in the target year (2018) is 960. Some cases of water born diseases such as diarrhea will be reduced. This project will bring positive impacts for rural life. The carry of water is now a task for women and children. Their burden will be reduced. The local people now buy water. So household condition will be improved by the project implementation.

**Table 7.3.1 Results of Environmental Assessment (2/2)**

Project Name	Result of EIA
Community Hall Construction Project	The community hall supports social activities and social participation of the local people. The project will make social life and structure more active. Since the construction of the hall will cause land use change, appropriate compensation to the land owners is necessary.
Green Belt Formation for Waterfront Conservation	The creation of green area and recreation facility will make local people's life rich. While forest area will increase, agricultural lands along the river would reduce. In case that tree planting carries out in existing agricultural land, appropriate compensation to the land owners is necessary.
Environmental Monitoring Program in Rincon Lagoon	This is only environmental monitoring project, so it does not cause fiscal impact to the environment. The result of the monitoring will be useful for the conservation of wildlife and water environment in Rincon Lagoon.



**Table 7.3.2 Results of Case studies for Water User' Organization Project on Social Change**

Study Item	Sun Juan (Junta de Regante Presa Sabaneta)	Azua (Junta de Regante YSURA)
Outline of WUO	Area: 13,045ha No. of user: 3,404 established in 1994	Area: 7,555ha No. of user: 4,683 established in 1987
Parentage of Water Charge Payment	95/96 96/97 97/98 46% 52% 60%	95/96 96/97 97/98 49% 58% 72%
Function of Organization 1) and Election	The Association works better than that of Azua to distribute water. Users pay charge for its administration. There is election in each 2 years in all level of organization.	In the level of the Irrigation committee and Association, there is a election in each 2 years. In the level of Committee and Nucleus, the election can be held every year.
Meeting	Members of Committee have a meeting in every 2 weeks. In the level of Association and Irrigation Committee, meeting is held in same frequency. In the meeting, they sometimes discuss about agricultural technique. Normally in drought season, meetings are held more frequently.	Normally in the level of Nucleus and Association, a meeting is held once a month. But in drought season, it is held once a week or more. Members of Irrigation Committee meet every morning in the office.
Water Management and Collaborated Work	The key of intake gates is kept by a water distributor of each nucleus. The gates are managed by him. Cleaning of canals and management roads is done by all users several times in a year.	The key of intake gates is kept by a water distributor of each nucleus. The gates are managed by him. For example, in the Lateral 2 there are 33 distributors in Nucleus level. Cleaning of canals and management roads is done by all users 2 times in a year.
System to Resolve Problems	Problems of water distribution in the tertiary canal level, they are resolved by discussion between nucleuses. If problem in lateral or main canal level, discussion in higher level, Committee or Association, is held.	Problems of water distribution in the tertiary canal level, they are resolved by discussion between nucleuses. If problem in lateral or main canal level, discussion in Irrigation Committee is normally held.
Comparison of Water Management Condition between Before and After Set up the WUO	<ul style="list-style-type: none"> <li>- Before set up the WUO, water distribution was sometimes determined by not democratic way, using bribe and influenced by political power. After the set up, the distribution has been determined through discussion among users. The water distribution is done fairly not depending on economical and political power of users.</li> <li>- Before set up the WUO, problems of robbery of water, conflict with violence between users, and bribery were usually happened. Now no or less such problems happen. The rural society has become more stable.</li> <li>- Before set up the WUO, for example in the Lateral 2 of Azua, only a distributor from the INDRHY managed. After the set up, since 33 distributors of nucleus take care the intake gates, water management has been able to done more efficiently.</li> <li>- Claim to government, such as INDRHY, is done more powerful than before, as a consequence of the organization.</li> </ul>	

Note: 1) The smallest unit of WUO is Nucleus which consist of 10 to 15 users, then Committee is formed of several nucleus. After that several committees form an Association. Finally several associations form Irrigation Committee (Junta Directiva). The field survey was conducted in the lateral 3 area in San Juan and in the lateral 2 area in Azua.

## Figures



Fig. 3.2.1 Distribution of Soil Series and Associations  
in the Project Area

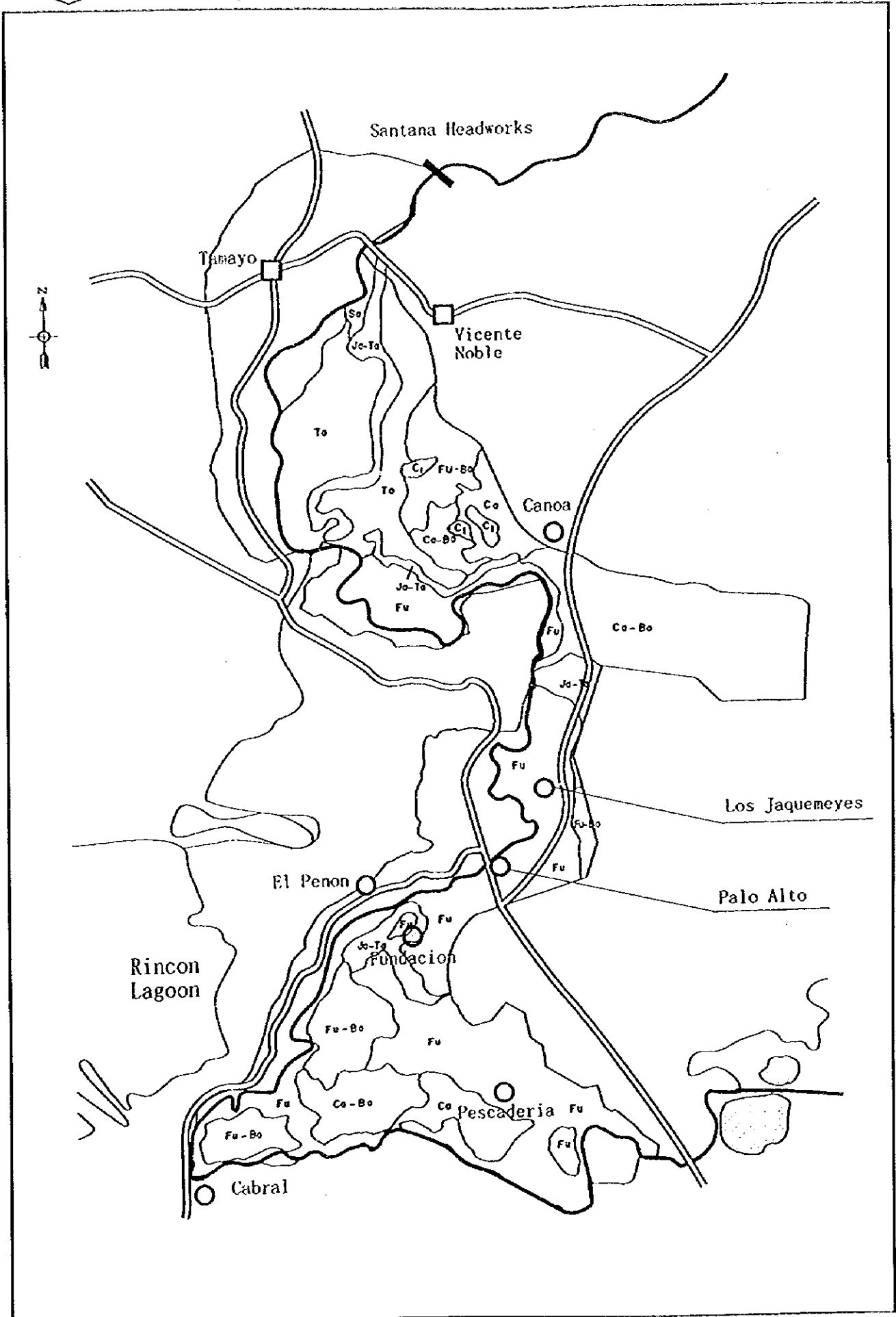




Fig .3.3.1 Present Land Use in the Project Area

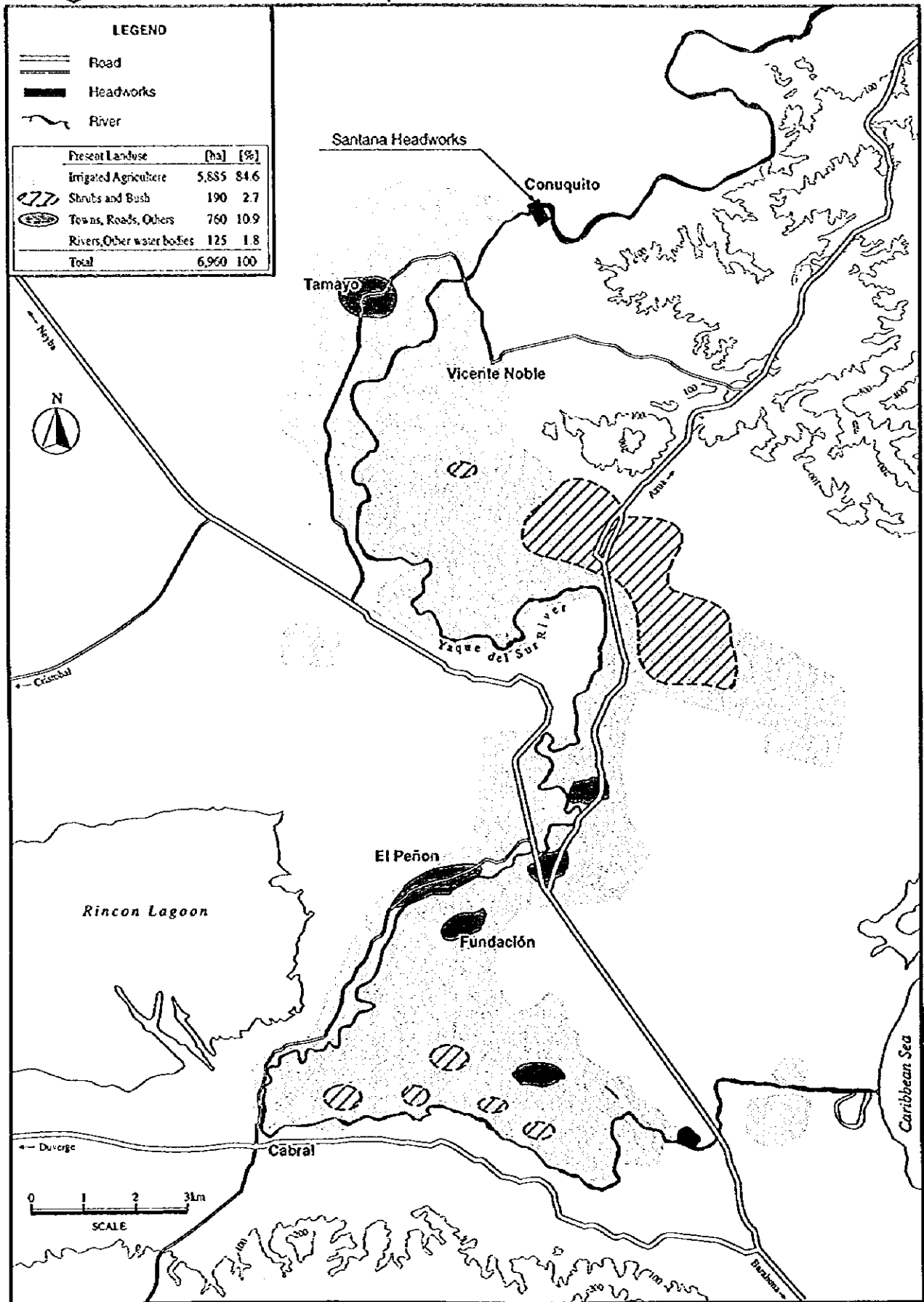
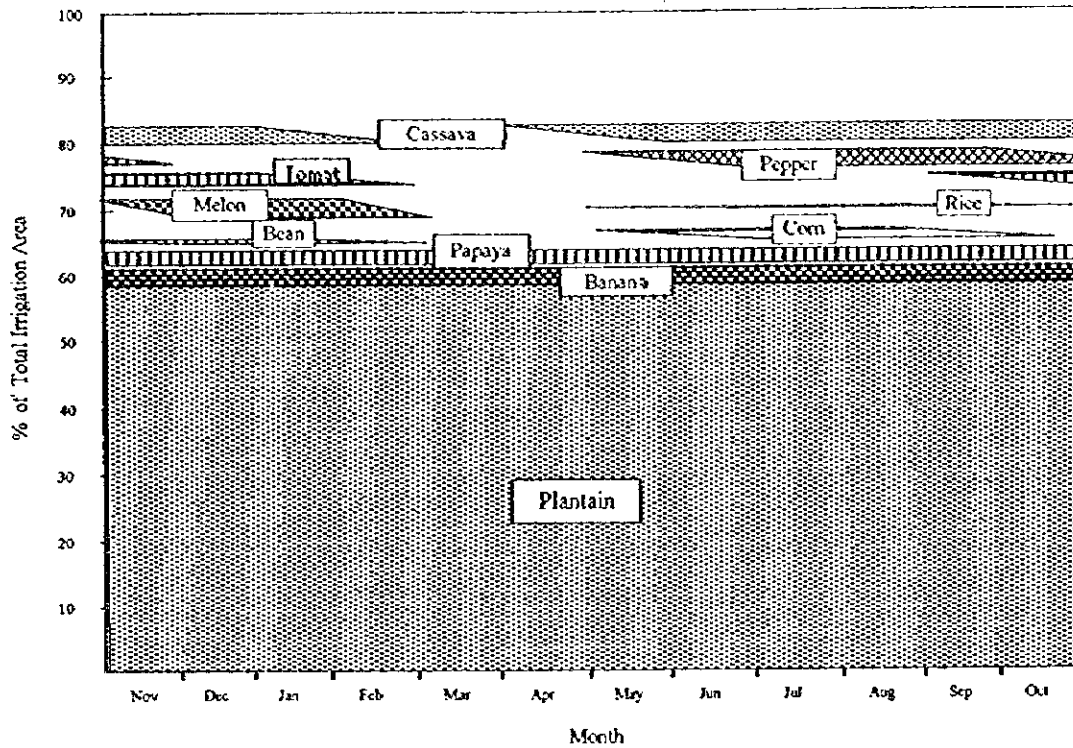


Fig. 3.3.2 Present Cropping Pattern  
in the Project Area



Present Cropping Pattern in the Project Area

Crop Name	Cropping Area (ha)	Planting Date		Planting Duration Days	Crop Duration Days
		Day	Month		
Plantain	3,430	1			365
Banana	180	1			365
Cassava	170	21	5	60	270
Pepper	150	1	5	60	150
Tomato	120	1	10	45	90
Melon	115	1	11	45	90
Papaya	110				365
Corn	80	1	5	60	120
Bean	50	1	11	45	90
Rice	25	1	5	60	150
Total	4,430				

Fig. 3.3.3 Problem Tree in Agricultural Production

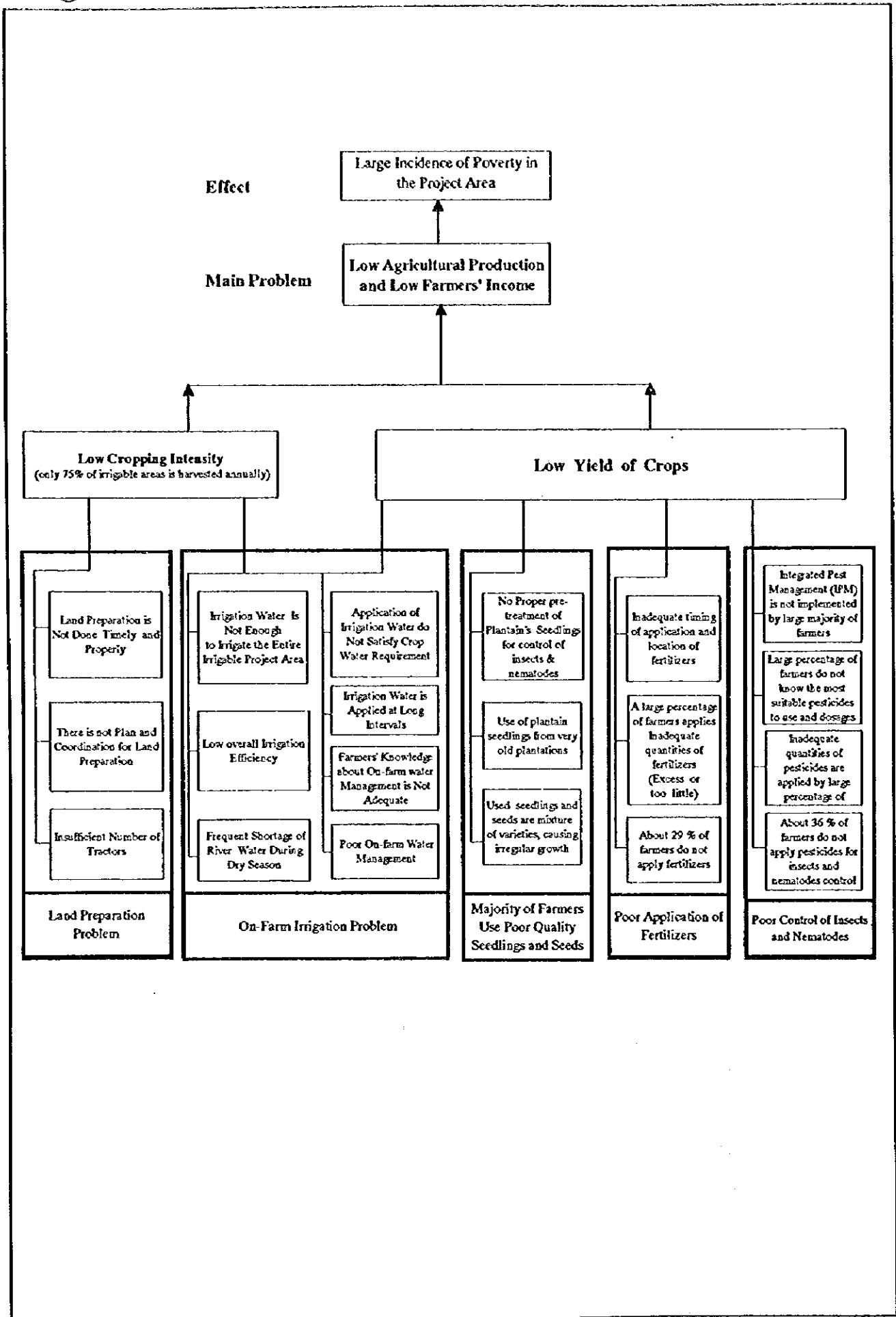
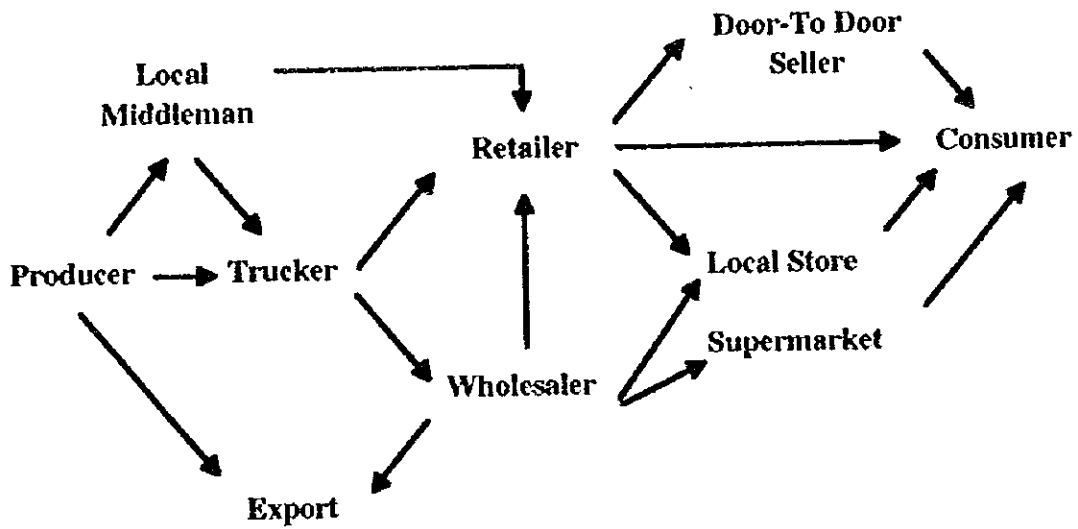
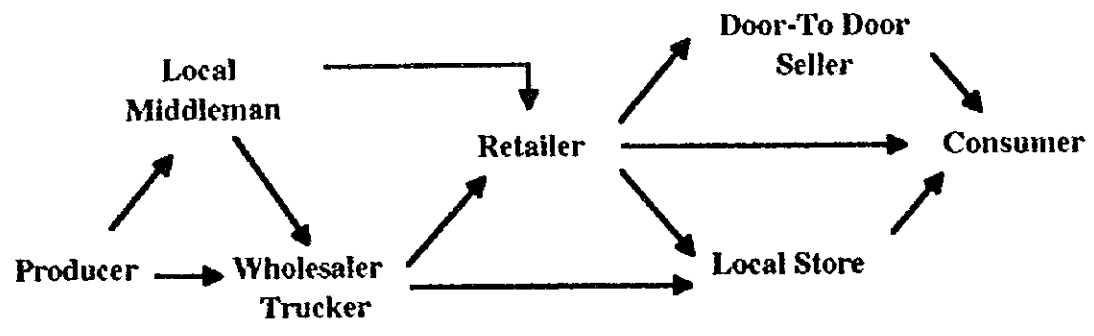


Fig. 3.4.1 Marketing System for Plantain in the Study Area



Source : Secretaría de Estado de Agricultura, Subsecretaría Técnica de Planificación Sectorial, 1977 validated by Jica Study Team, 1999.

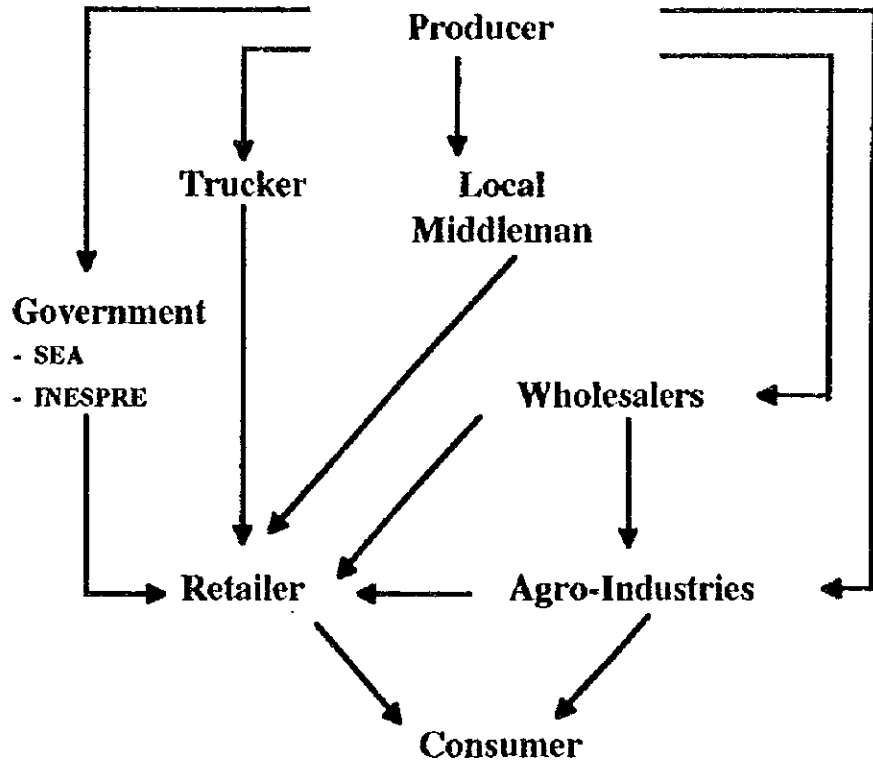
Fig. 3.4.2 Marketing System for Banana  
in the Study Area



Source : Secretaría de Estado de Agricultura, Subsecretaría Técnica de Planificación Sectorial, 1977 validated by JICA Study Team, 1999.

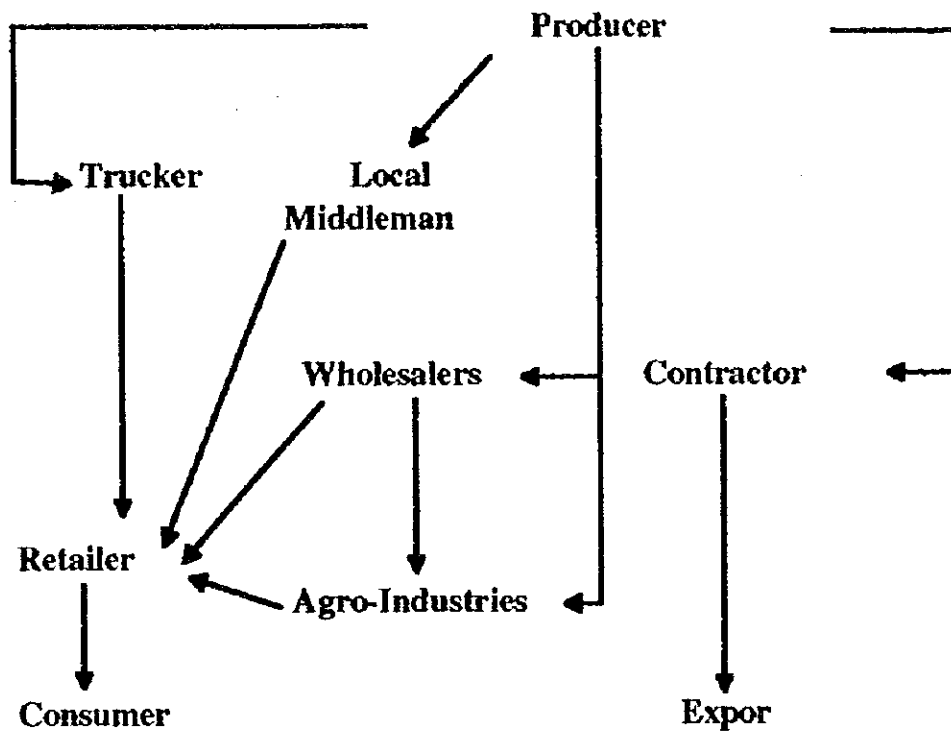


Fig. 3.4.3 Marketing System for Beans and Corn  
in the Study Area



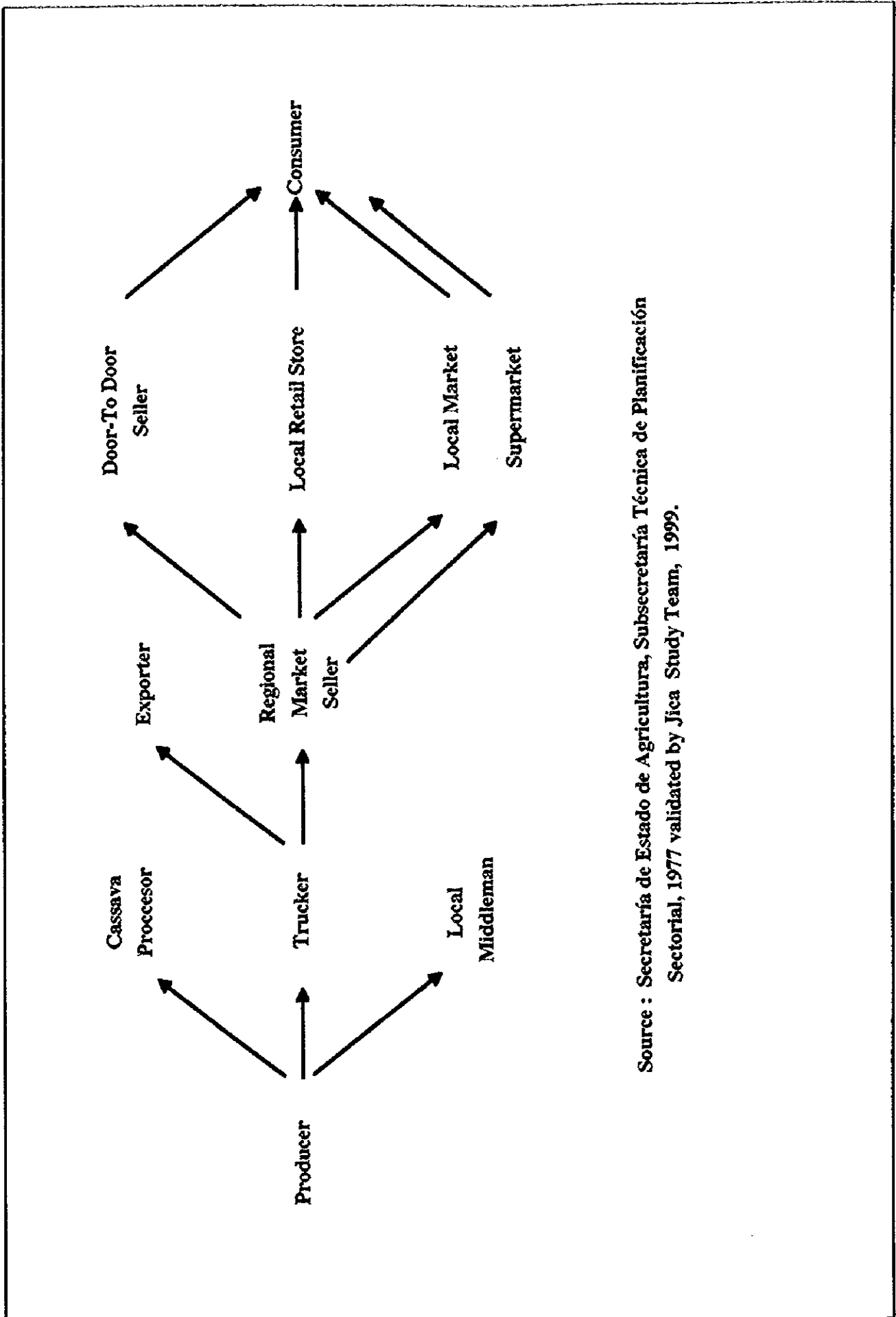
Source : Secretaría de Estado de Agricultura, Subsecretaría Técnica de Planificación Sectorial, 1977 validated by Jica Study Team, 1999.

Fig. 3.4.4 Marketing System for Papaya and Melon  
in the Study Area



Source: Secretaría de Estado de Agricultura, Subsecretaría Técnica de Planificación Sectorial, 1977 validated by Jica Study Team, 1999.

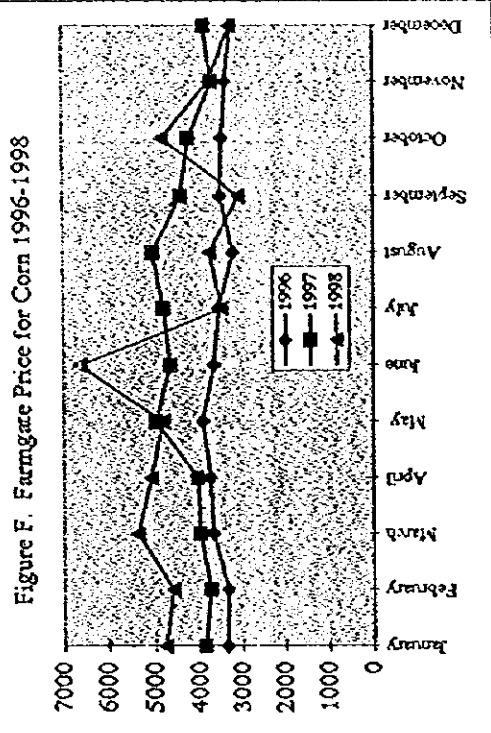
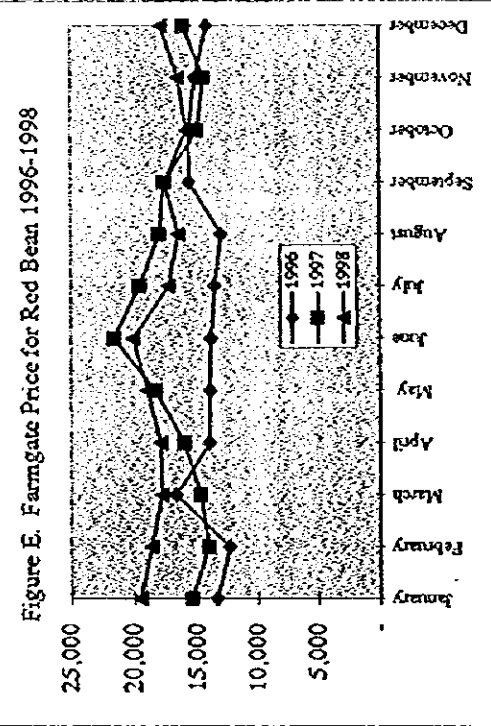
Fig. 3.4.5 Marketing System for Cassava  
in the Study Area



Source : Secretaría de Estado de Agricultura, Subsecretaría Técnica de Planificación Sectorial, 1977 validated by Jica Study Team, 1999.

Farmgate Red Bean, 1996-1998			Farmgate Corn, 1996-1998		
RDS/MT	Farmgate	Farmgate	RDS/MT	Farmgate	Farmgate
	1996	1997	1996	1997	1998
January	13,405	15,481	3352	3879	4774
February	12,376	14,080	3339	3743	4598
March	16,709	14,755	3683	3988	5368
April	14,010	16,102	3740	4043	5082
May	13,950	18,401	3906	4958	4813
June	13,860	21,560	3658	4647	6600
July	13,564	19,580	3540	4798	3465
August	13,030	18,066	3212	5032	3751
September	15,621	17,641	3502	4413	3080
October	15,664	14,960	3456	4223	4818
November	15,161	14,400	3375	3689	3751
December	14,168	16,102	3247	3860	3273

Source: Secretaria de Estado de Agricultura (SEA), Dirección Regional Agropecuaria, Zone Sur (1996 - 1998).



Farmgate Rice, 1996-1998			Farmgate Cassava, 1996-1998			
RDS/MT	Farmgate	Farmgate	RDS/MT	Farmgate	Farmgate	
	1996	1997	1998	1996	1997	1998
January	7,522	8,208	11,550	2,343	2,750	4,857
February	8,164	9,507	10,400	2,353	3,101	5,903
March	7,993	10,393	9,350	2,383	3,422	5,355
April	8,624	8,371	9,630	2,508	4,200	5,390
May	7,700	8,177	9,900	2,772	4,415	5,390
June	6,545	8,960	9,625	2,794	4,490	4,704
July	8,450	7,949	10,450	3,080	4,580	4,434
August	6,529	9,203	8,800	2,668	4,469	3,384
September	8,951	9,066	11,000	2,730	4,867	3,069
October	8,149	9,313	11,000	2,863	4,469	2,640
November	8,143	9,059	11,000	2,625	4,127	3,520
December	9,291	8,670	8,800	2,840	3,894	3,586

Source: Secretaría de Estado de Agricultura (SEA), Dirección Regional Agropecuaria, Zone Sur (1996 - 1998).

Figure C. Farmgate Price for Rice, 1996-1998

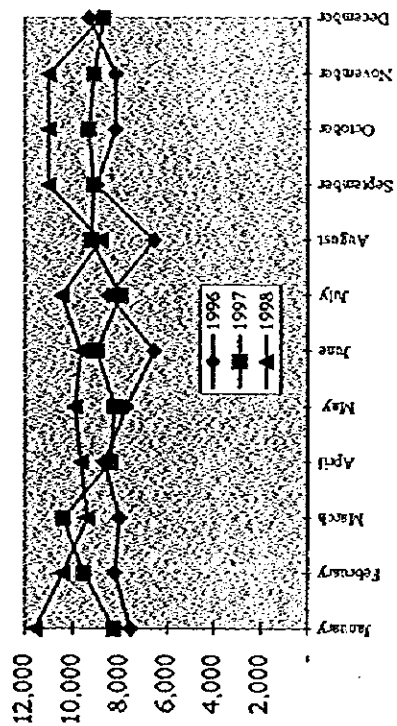
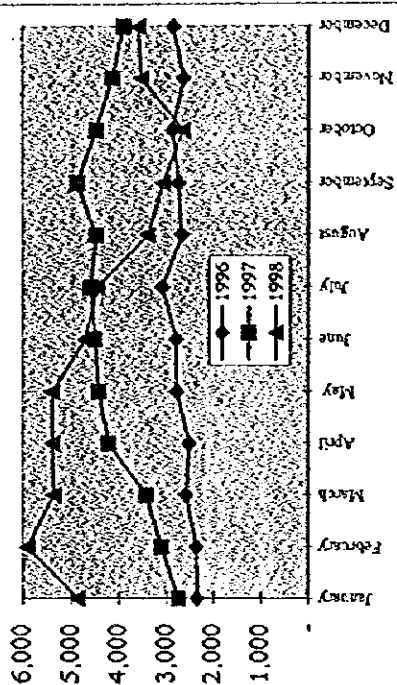


Figure D. Farmgate Price for Cassava 1996-1998



Farmgate Plantain , 1996-1998			Farmgate Banana , 1996-1998		
RDS/MILLAR			RDS/RACIMO		
Farmgate	Farmgate	Farmgate	Farmgate	Farmgate	Farmgate
1996	1997	1998	1996	1997	1998
January	1045	746	1543	27	28
February	984	698	1393	24	25
March	703	549	1013	22	25
April	633	649	1122	18	28
May	667	737	1122	20	25
June	627	678	1089	19	25
July	608	1250	1151	22	27
August	579	1420	989	23	32
September	553	1351	910	18	33
October	547	1400	982	16	43
November	515	1467	1280	20	39
December	653	1264	3862	18	36

Source: Secretaria de Estado de Agricultura (SEA), Dirección Regional Agropecuaria, Zone Sur (1996 - 1998).

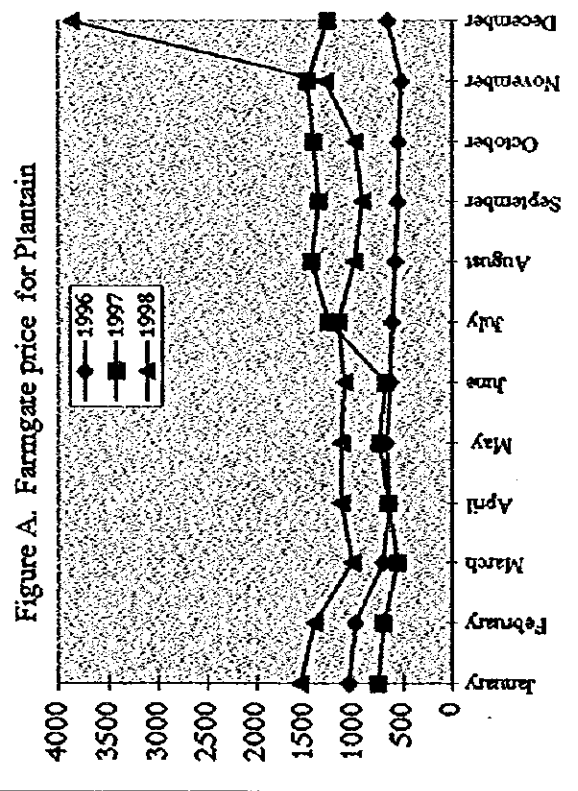


Figure A. Farmgate price for Plantain

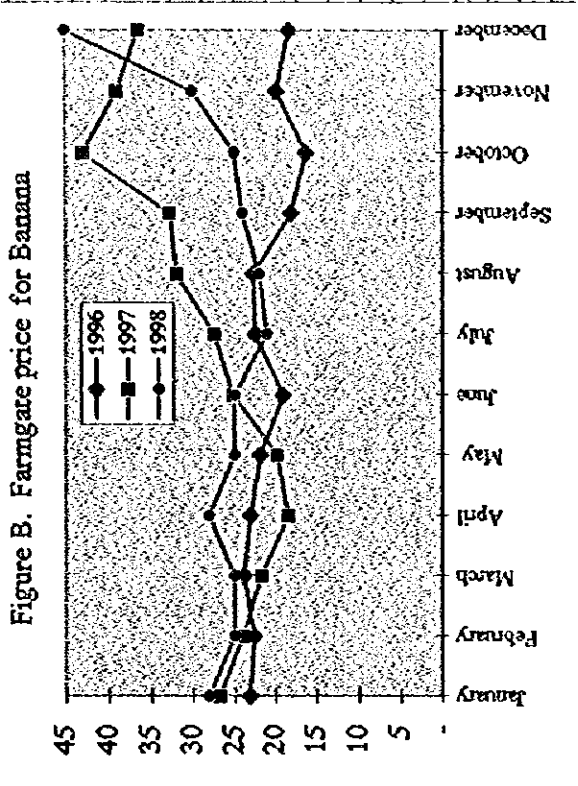
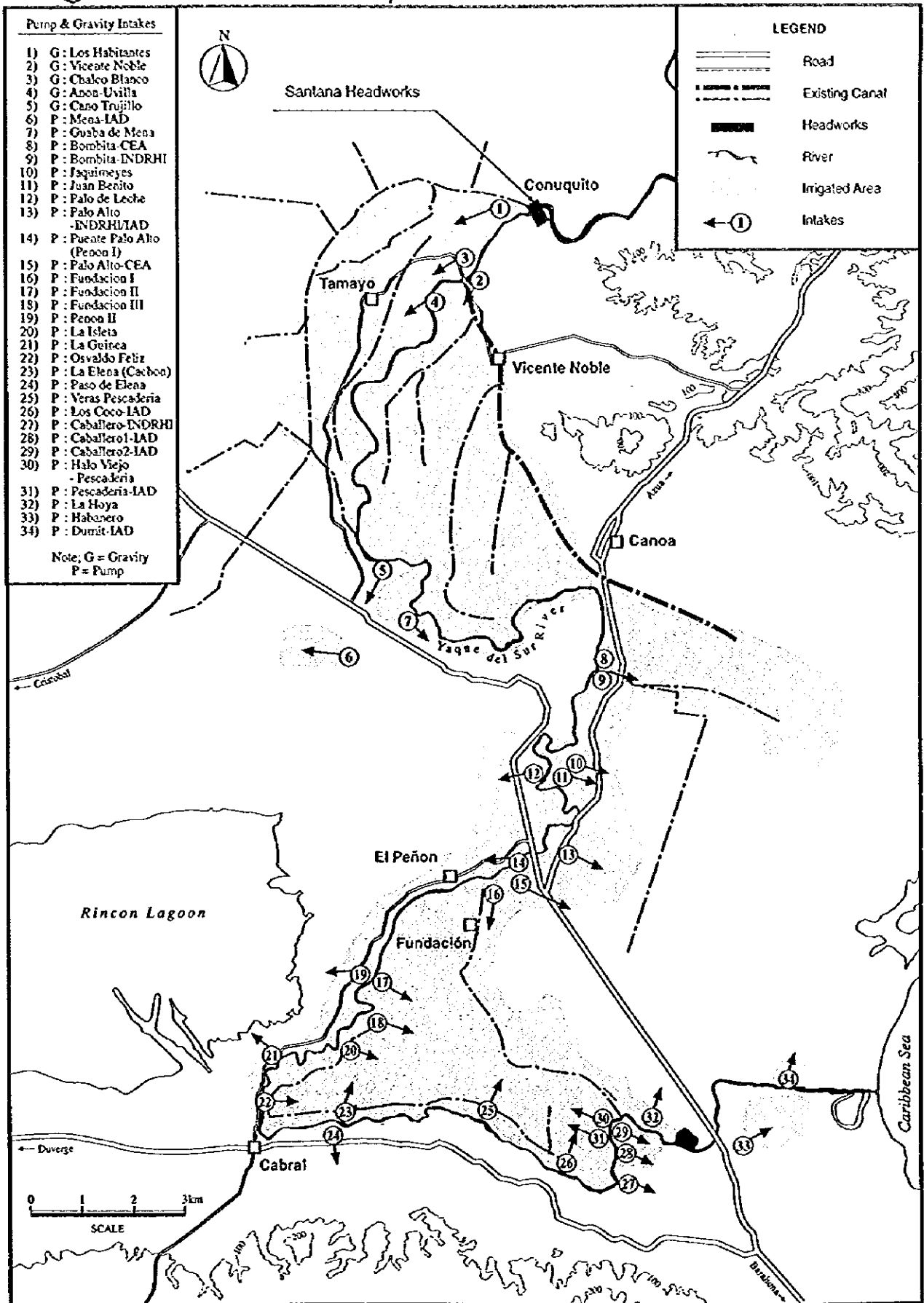


Figure B. Farmgate price for Banana



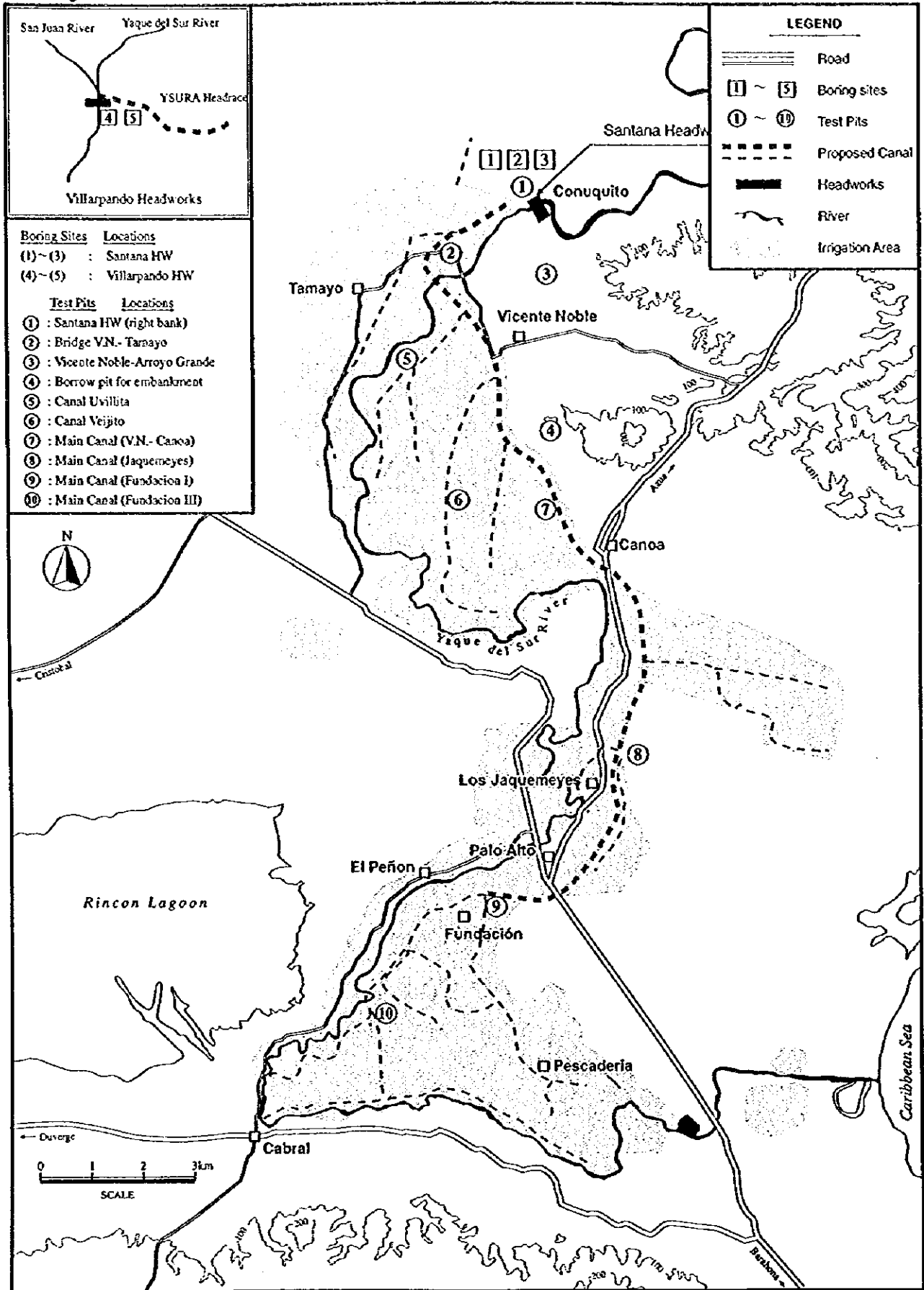
Fig .3.5.1 Existing Irrigation Systems and Intakes in the Study Area



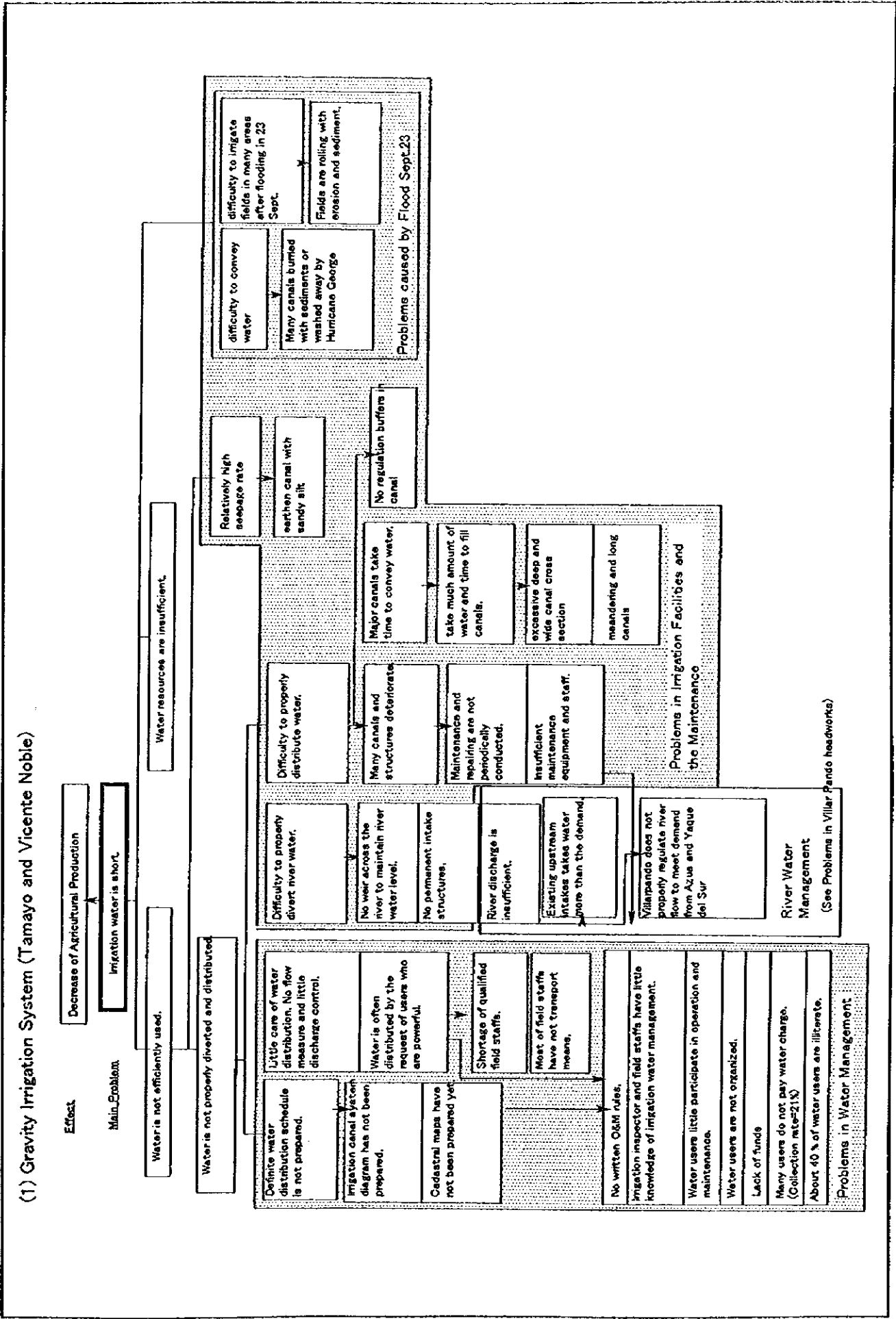


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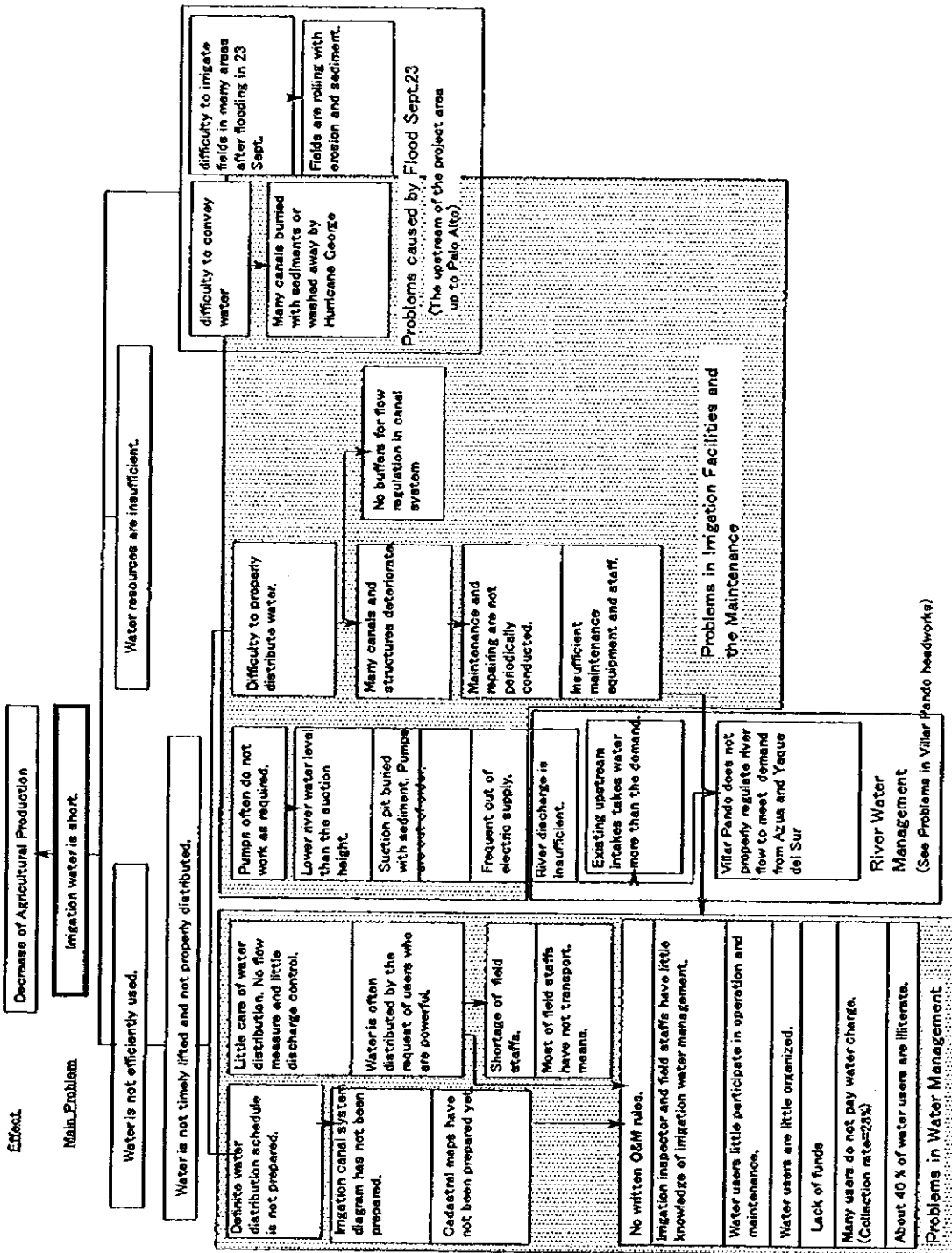
Fig.3.5.2 Location of Geological Core-Boring and Soil Mechanical Investigation







(2) Pump Irrigation System



(3) Villarpando headworks

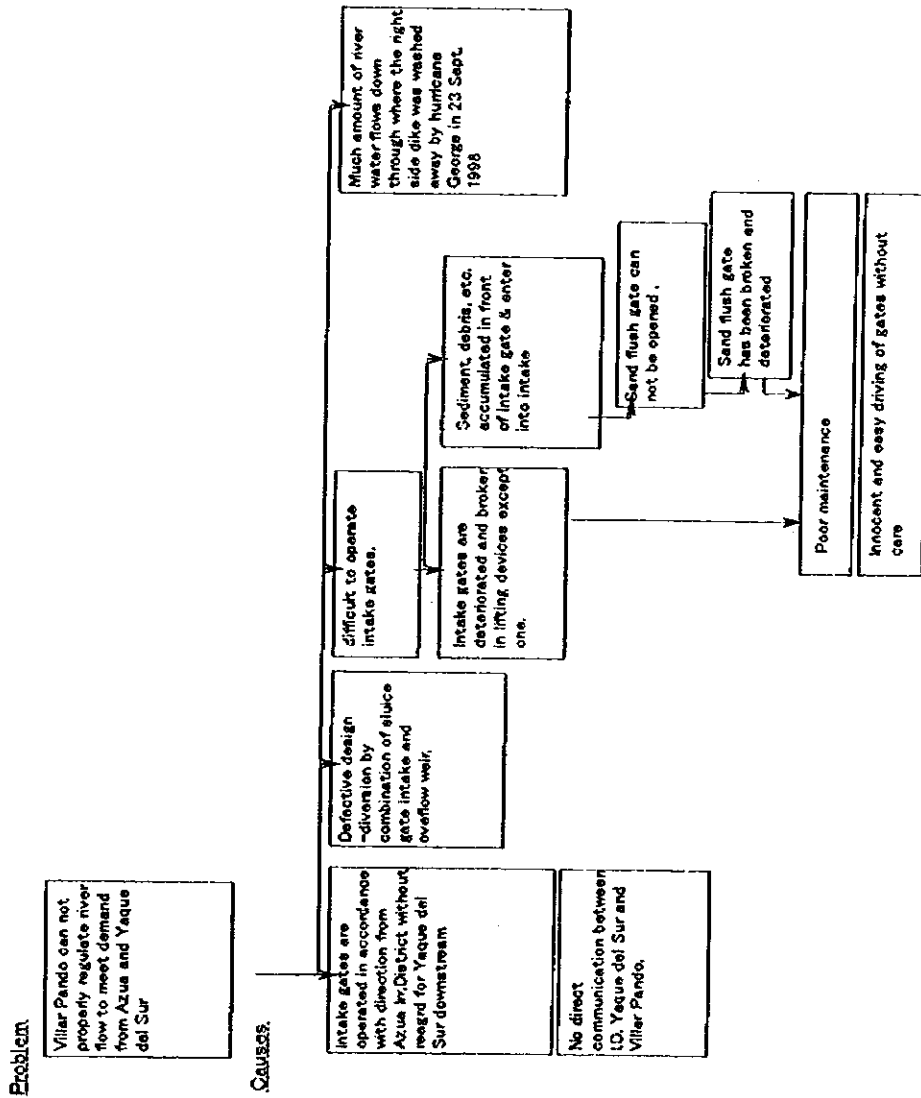
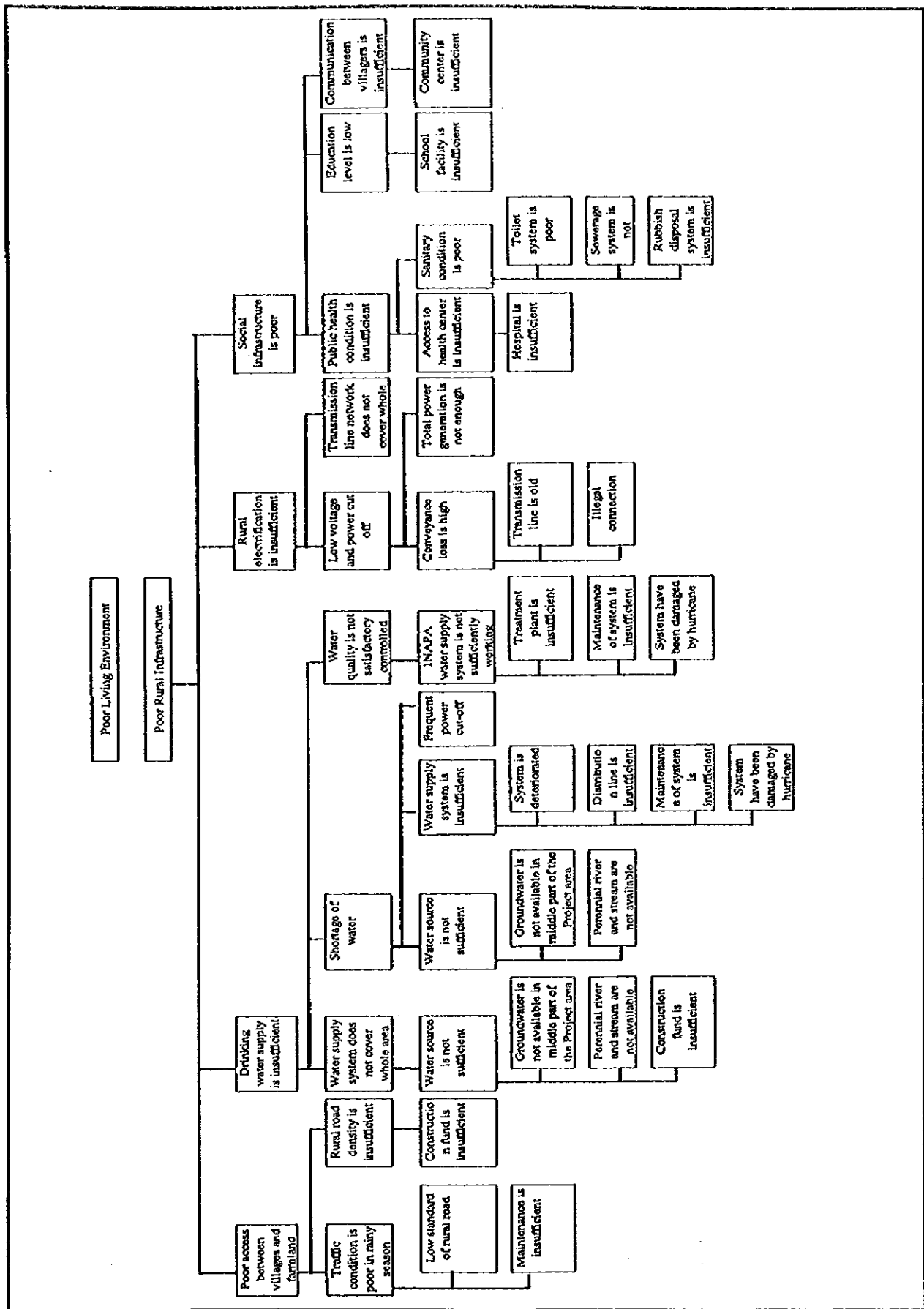


Fig 3.6.1 Problem Tree of Rural Infrastructure Improvement



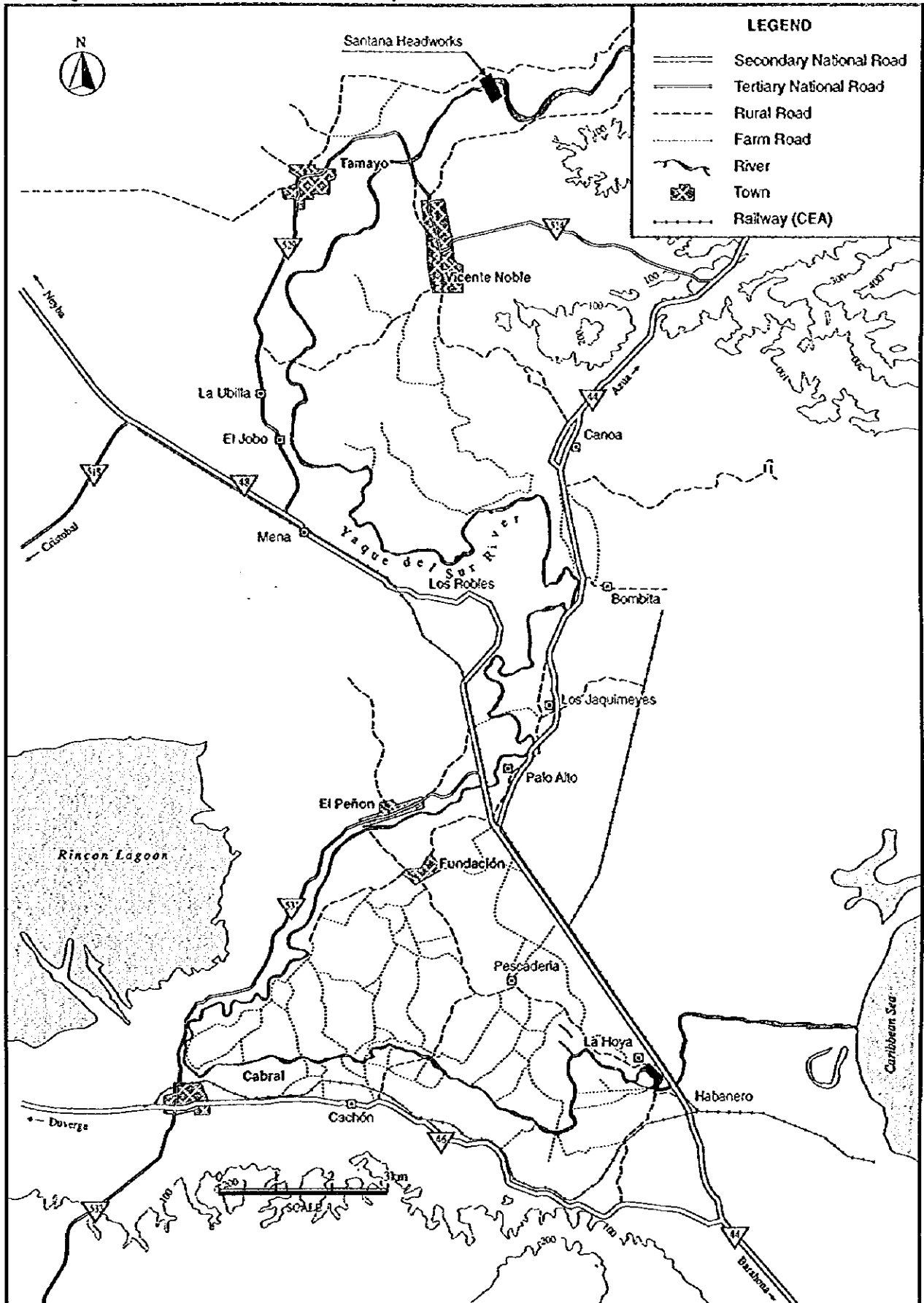


Fig.3.6.3 Water Supply Status in the Project Area

