5. 2 Village Water Supply Development Plan

5. 2. 1 Alternative Sources of Water for Domestic Use

a) Water Sources

Four (4) type of water sources can be applied in the Study Area, namely, deep well, shallow well, water which can be stored in the proposed reservoir, and surface runoff at the Inagawan River or its tributaries. The general characteristics of the water sources are described below.

1) Deep Well

Since water from the deep well is stable and clean throughout the year, it is good for drinking purposes and others. Also, there is no need to install water treatment facility when the deep well is applied.

However, the water quantity in the Study Area is limited up to 75 cu.m per day as mentioned in Appendix E.3. For the utilization of water using a deep well, a submerged pumping facility shall be required with necessary electric charges. However, due to the cleanliness of the water, a treatment facility will not be needed. Depending on the capacity of the delivery tank, the operation of the facility will be easy, using only the "ON-OFF" operation. (refer to Appendix E.3)

2) Shallow Well

Water from shallow wells is the most common water supply system in the Philippines. However, the use of shallow wells brings about some problems and constraints, such as water pollution, drying up of well during the dry season, etc. The Study Area is located at a higher land-like terraces hills with many eroded and deep valleys. Because of this topographical conditions, the shallow wells dries up during the dry season.

Shallow wells can be proposed at the alluvial plains where the groundwater table is high. In these areas, shallow wells have water,

even during the dry season. However, since the area is not located at the alluvial plain area, water is not stable during the dry season. Also, the labor required for hauling water will not be reduced due to the use of hand pump.

3) Water Stored in the Proposed Reservoir

Water can also be taken from the proposed reservoir for irrigation, by gravity system. This is the cheapest system among the other two (2) water sources already mentioned for the beneficiaries. After the construction of the feeder pipe line from the reservoir to the beneficiary area, only minor maintenance activities will be needed for the operation of the pipe line.

Depending on the reservoir capacity, however, water shortage will occur once in five (5) years. Also, without any treatment measures, water quality of the stored water will not very safe for drinking purposes. At least, a sedimentation tank and a chlorination facility should be installed, if this water system is proposed.

The treatment facility is usually operated by the water users association. The operation of the sedimentation tank is not so difficult. However, the operation of a chlorination facility is rather difficult, because a concentrate of more than 0.1 ppm of extricate chlorined should be maintained at the exit of the stop valve. For the storage of chlorine, careful attention is very necessary to prevent poison liquid. Hence, a storage facility should be proposed to be constructed to prevent the occurrence of poisonous materials. Hypochlorous acid can also be used for raw water treatment. This treatment is easier to operate the use of chlorine.

For the operation of the facility, a permanent person/staff should be employed. This system is applied at a bigger scale if the system used is like Level III.

This kind of operation which will need higher technique will rather be difficult for the beneficiaries at present. Any miss operation may

harm the beneficiaries' health because of high concentration of chlorine.

4) Surface Water at the Inagawan River or its Tributaries

The water at the Inagawan River or its tributaries is one of the possible water sources for the village water supply system in the Study Area.

However, as mentioned in Appendix C, the river discharge of Inagawan River fluctuates due to unstable rainfall. Also, water quality is not suitable for drinking. Specifically, during the dry season from January to April, the discharge of the Inagwan River is limited and is not even enough to serve water for the CIS located at the downstream of the Study Area. During this period the surface discharge of the Inagawan tributaries also dries up.

Also, during the flooding period, the water becomes silted coming from the drainage area. This king of water should be treated before delivery to the beneficiaries. The siltation of the river will eventually cause the blockage of the pipe system.

Another constraints is the elevation of the river bed where the water will be taken which is only about 20 m MSL. This is lower than that (about 40 m) of the surrounding area. A pump facility to lift up water is necessary to be constructed at the intake site. The operation and maintenance cost will therefore be higher than the other methods. Since the pump station is far from the beneficiary site, the operation and maintenance on optimum time is rather difficult without the presence of a permanent skilled personnel and communication system.

5) Conclusion

The water source system to be recommended in the beneficiary area should consider the following factors: easy operation and maintenance, lower cost, and less need for high technique/skill. Judging from characteristics of the above four (4) water sources, the deep well is the most suitable water sources among the proposed water

sources due to its cheaper and easier operation and maintenance, and less personnel and technique required. The system proposed will not require a treatment facility, hence, cost of facility is lower.

b) Water Quality

During the field survey period, water quality tests were carried out by the JICA Study Team. The test were executed twice, during the dry season and wet season. The water, taken from nine (9) shallow wells and four (4) springs, were analyzed by a portable field kit. The analysis conducted were water temperature, pH, Cu (copper), Fe (Iron), Zn (Zinc), NO2 (Nitrogen dioxide), GB (general bacteria), CGB (coliform group bacteria).

There are six (6) springs located at the depressions at the Tagumpay area. Two (2) of these springs are located near the home lot area while the other one at a center of a farm lot area (Farm lot No. 73). The maximum yield of water among springs is only 0.2 lit/sec. The water quality of the springs are usually not good during the day time, because some people wash and bath by the spring water, including animals. Therefore, people get water for drinking only early morning when there are fewer human activities. (refer to Table 5.2.1 and Figure 5.2.1)

According to the results of the water quality test conducted in February, CGB were found in all springs where water were sampled from stagnant water in the springs. Although zinc and iron were also detected, the density of the element is within allowable limit under the quality standard of drinking water in the Philippines. (refer to Table 5.2.1 and Figure 5.2.1)

During the wet season, the results of the water quality test shows no CGB. The water is suitable for drinking. Other elements found did not exceed the allowable limits of the drinking water standards of Philippines. (refer to Table 5.2.2)

5. 2. 2 Village Water Supply Development Plan

a) Water Distribution System

In order to reduce labor requirement for the hauling water for domestic purposed, the Level-II water system, where a public faucet for every six (6) house lots will be proposed, to distribute water to the farmer's house. The Level II water system will help contribute in the reduction of works load of the farmer's family members in hauling water, especially the woman and children. Level III system will be developed in the future when the beneficiaries will have gained enough income to be able to shoulder the higher O&M cost of the facilities.

b) Water Demand per Capita

For Level-II water system, the water demand per capita of 60 lit/day/person will be assumed in estimating the future demand. A distribution loss of 25 % (5 % loss within the pipe line system and 20 % operation loss) will be applied in the design of the pipe line system, thus bringing the water consumption rate at 87.5 lit/day/person.

c) Tagumpay Area

1) Proposed number of beneficiaries

The projected population, 20 years after the implementation of the system will be applied to design the water supply system. Based on the present population of 1,733 (=321 houses×5.4 person/house) at Tagumpay Area, the projected population of 3,500 is calculated (using the annual growth rate of 3.58 %). Other persons residing within the area under off-farming, is assumed to be about 20 % of the estimated population. The proposed number of beneficiaries, therefore, will reach 4,200 twenty, (20) years after the implementation of project.

2) Total demand

Based on the above figures the proposed total water demand is calculated at 368 cu.m/day.

3) Necessary number of water supply system (block)

Five (5) water supply blocks (system) will be proposed for the beneficiaries due to water sources constraints having a yield of only 75 cu.m/day.

4) Water demand for each system

For the beneficiaries of about 840 persons, using the recommended system, the total water demand for each water system was estimated as follows:

Average daily demand (Da)	: 74 cu.m/day
Maximum daily demand (Dm)	: 96 cu.m/day (=1.3×Da)
Peak hour demand (Dp)	: 185 cu.m/day (=2.5×Da)

d) Other Villages

1) Proposed number of beneficiaries

The proposed umber of beneficiaries in the other villages is estimated to be about 150 families. Using the same assumption as the above, the projected population of the other villages will be about 2,000 (1,964 person) in the same year.

2) Total demand

According to the above figure, the total demand of 175 cu.m/day is calculated.

3) Necessary number of water supply system (block)

Based on the same reason, three (3) systems are proposed to be constructed.

4) Water demand for each system

For the beneficiaries of about 670 persons using the same system, the total water demand for each system was estimated as follows:

Average daily demand (Da)	:	57 cu.m/day
Maximum daily demand (Dm)	:	74 cu.m/day (=1.3×Da)
Peak hour demand (Dp)	:	143 cu.m/day (=2.5×Da)

5. 2. 3 Proposed Facilities

a) Typical Block Alignment at Tagumpay Area

Based on the results of the test well in the Study Area, there is a problem in the quantity of water from the deep well. The expected amount of water from the deep wells is only about 75 cu.m/day per well. Therefore, the recommended number of deep well must at least be five (5). The wells will separately be aligned at about 300 to 400 m far to avoid interference with each other. (refer to Appendix E.3)

The beneficial area is divided into five (5) blocks, considering the same acreage of block. (refer to Figure 5.2.2)

b) Pipe Line Alignment

Based on the block alignment, the pipe line will be aligned as the well shall be located within the home lot area to avoid interference of wells, and it will not encounter any right-of-way problem and because it is easier to operate and maintain. (refer to Figure 5.2.3)

The distance of some wells is less than 300 m. The pipe line will be aligned under the village roads for easy maintenance and operation. The total pipe line length is 3,750 m. (refer to Figure 5.2.3)

c) Proposed Facilities

Deep wells with submerged pump, elevated delivery tank, pipe lines and communal faucets are proposed in the beneficiary area.

1) Deep well with submerged pump

(Tagumpay Area)

A deep well with a diameter of 100 mm will be needed. The diameter of the submerged pump with a capacity of 0.067 cu.m/min (=96 cu.m/day) and a 2.2 kw motor, will be 32 mm with a total head of 70 m. The proposed well depth is 50 m. A head loss of ten (10) m from the well to the delivery tank is assumed. The tank will be located 10 m higher than the ground surface. Consequently, a total head of 70 m will be necessary.

(Other Village)

A deep well with a diameter of 100 mm will be needed. The diameter of the submerged pump with a capacity of 0.051 cu.m/min (=74 cu.m/day) and a 1.5 kw motor, will be 32 mm with a total head of 70 m. The proposed well depth is 50 m. Due to the same reasons, the total lifting head of 70 m of pump is proposed.

2) Elevated delivery tank

(Tagumpay Area)

The delivery tank will have a capacity of two (2) hours volume between the peak hour demand and the average day demand, which is 7.4 cu.m (=(185-96)/24×2). The tank will have the same width and length of 2.0m, and an effective depth of 1.85 m for a smooth delivery of water. The total depth of the tank will be 2.4 m including 30 % of the effective depth (h) of water storage, equivalent to 55 cm, for clearance. The actual height of the tank would be planned later based on the exact location and ground elevation. The bottom of the tank will be about 10 m above the ground surface level.

(Other Villages)

Using the same procedure as that of the Tagumpay Area, the tank capacity will be 5.8 cu.m, long while the width will be 2.0 m with an effective depth of 1.45 m. The total depth of the tank will be 1.9 m including the 45 cm clearance.

3) Feeder Pipe Line

In Blocks 2 and 3, the delivery tank and the deep well will separately be located to avoid interference with each other. The feeder pipe will have to be designed between the well and the delivery tank. The proposed length are 120 m in Block 2 and 90 m in Block 3. The Steel Gas Pipe (SGP) of 40 mm in diameter will be proposed considering the economic velocity of discharge in the pipe, which is about 1.0 m/sec, and higher water pressure for lifting up water by pump.

$V = Q/A = 0.001117/0.00126 = 0.88$ m/sec

Where: V - mean velocity (m/sec)

Q - design discharge (cu.m/sec) = 0.001117 cu.m/sec

A - flow area of pipe (sq.m) = 0.00126 sq.m in 40 mm pipe of diameter

4) Distribution Pipe line

(Tagumpay Area)

The capacity of the pipe line is designed to meet the peak hour demand of 185 cu. m/day, equivalent to 2.14 lit/sec at the maximum. The proposed pipe diameter will be determined based on the design discharge. The pipe lines will be buried at about 1.0 m below the village road surface to avoid some damages brought about by passing vehicles and others. The other necessary structures such as air valve, stop valve, drains, etc. will also be proposed.

The pipe diameter is determined by the William-Hezen formula with C (roughness coefficient factor) of 150(Vinyl Chloride pipe). The formula is as follows:

$$HL = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{-1.85}$$

Where : HL - Friction loss per pipe liner meter (m)
C - roughness coefficient factor
D - Diameter of pipe (m)
Q - Discharge (cu. m/sec)

$$THL = HL \times L \times 1.1$$

Where : THL - Total head loss (m)
L - Pipe liner length (m)
1.1 - fraction for other head loss caused by the bend, structures, etc.

The actual effective head of the distribution pipe line will be kept at more than 10 m above the ground surface. The friction loss of 5 m in the delivery pipe, branching off from the distribution pipe line to the communal faucet is assumed. An effective water head of 5 m (0.5 kg./sq. cm) at the exit of the stop valve will be expected during the hourly peak water demand time. During normal times, the effective head at the exit of the stop valve is more than that of the peak water demand time. The proposed pipe diameters are from 25 to 100 mm. (refer to Table 5.2.4)

(Other Village)

The capacity and diameter of the pipe lines will be determined in the same way as that of Tagumpay area. The design discharge of 143 cu. m/day (equivalent to 1.66 lit/sec) will be calculated. The necessary structures and the formula in the design of the pipe line will also be the same as that of the Tagumpay area.

5) Communal faucet

(Tagumpay area)

Three (3) stop valves will be designed and the proposed pressure at the exit of a faucet will be 0.5 kg/sq. cm. The proposed discharge is calculated as:

Total water demand = 87.5 lit/day × 4,200 = 368 cu. m/day
Water demand for each household : 368/321 = 1.15 cu. m/day
Average daily demand by faucet : 1.15 × 6 = 6.9 cu. m/day
(equivalent to 0.080 lit/sec)
Daily maximum demand by faucet : 0.080 × 1.3 = 0.104 lit/sec
Daily peak demand by faucet: 0.080 × 2.5 = 0.200 lit/sec

(Other Village)

Also the same as that of the Tagumpay area.

Total water demand = 87.5 lit/day × 4,200 = 368 cu. m/day
Water demand for each household : 368/321 = 1.15 cu. m/day
Average daily demand by faucet : 1.15 × 6 = 6.9 cu. m/day
(equivalent to 0.080 lit/sec)
Daily maximum demand by faucet : 0.080 × 1.3 = 0.104 lit/sec
Daily peak demand by faucet: 0.080 × 2.5 = 0.200 lit/sec

Table 5.2.1 Results of Water Quality Test

(at Wells and Springs in Dry Season in Tagumpay Home Lot Area)

Well No.	Location	Depth (ft)	Construction Fund	Water Quality 1st Test pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	RE (mg/lit)	GB	CGB	2nd Test CGB
1	HL- 20	20	Private	7.0	-	5.0	-	-	-	3	dct	
2	HL- 31	20	Private	7.8	-	3.0	3.0	-	-	91	dct	
3	HL- 39	40	Private	7.0	-	0.5	0.5	-	-	81	dct	
4	HL-157	na	Private	7.0	-	-	0.7	-	-	-	-	dct
5	HL-321	20	Private	7.5	-	0.3	0.3	-	-	21	-	-
6	HL-299	30	Private	7.5	-	0.8	5.0	-	-	2	-	dct
7	FL- 1	25	Private	6.5	-	0.2	0.5	-	-	11	dct	
8	FL- 25	60	Private	6.5	-	8.0	6.0	0.1	-	22	dct	
9			Private	7.0	-	0.2	0.8	-	-	2	-	dct

Spring No.	Location	Yeild (lit/sec)	Water Quality 1st Test pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	RE (mg/lit)	GB	CGB	2nd Test CGB
1	FL- 45	0.22	7.5	-	-	-	-	-	75	dct	
2	FL- 66	0.07	7.0	-	0.5	0.4	-	-	9	dct	
3	FL- 73	0.02	5.8	-	-	-	-	-	20	dct	

Note: 1st in Jan. 28 and 2nd in Feb 10, 1994

Table 5.2.2 Results of Water Quality Test

(at Wells and Springs in Wet Season in Tagumpay Home Lot Area)

Well No.	Location	Depth (ft)	Water Quality Date: Aug/18/1994 Water Temperature (°C)	pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	GB	CGB	Date: Aug/30/1994 Water Temperature (°C)	pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	GB	CGB
1	HL- 20	20	27.5	6.3	-	3.0	1.0	0.05	6	-	28.0	6.5	-	3.0	1.5	-	4	-
2	HL- 31	20	28.0	7.0	-	2.0	1.0	-	100	-	28.0	7.0	-	2.0	7.0	-	5	dct
3	HL- 39	40	29.0	7.0	-	3.0	1.0	-	100	-	27.5	7.0	-	0.5	0.7	-	100	dct
4	HL-157	20	30.0	7.5	-	-	0.5	-	100	dct	29.0	7.5	-	-	2.0	-	100	dct
5	HL-321	20	32.0	7.0	-	0.5	1.5	-	3	dct	30.0	7.0	-	0.5	1.0	-	9	-
6	HL-299	30	27.5	7.0	-	0.2	3.0	-	100	-	28.0	7.0	-	0.1	5.0	-	100	-
7	FL- 1	25	29.0	6.0	-	1.0	1.5	-	2	-	29.5	6.5				-	8	-
8	FL- 25	60	29.0	6.0	-	8.0	7.0	0.7	100	-	28.5	6.0	-	8.0	4.0	1.0	9	dct
9	HL-322	60									30.0	6.5	-	0.7	10.0	-	4	-

Spring No.	Location	Yeild (lit/sec)	Water Quality Date: Aug/18/1994 Water Temperature (°C)	pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	GB	CGB	Date: Aug/30/1994 Water Temperature (°C)	pH	Cu (mg/lit)	Fe (mg/lit)	Zn (mg/lit)	NO2 (mg/lit)	GB	CGB
1	FL- 45	0.32	29.0	7.0	-	0.5	0.5	0.05	100	-	28.0	7.0						
2	FL- 66		28.0	7.0	-	2.0	0.5	-	100	-	27.0	7.0	-	2.0	0.5	-		
3	FL- 73		30.0	5.7	-	0.2	0.3	-	100	-	27.0	5.7	-	-	-	-		
4	FL- 70		32.0	6.2	-	0.2	-	-	100	-	27.0	6.5	-	0.2	-	-		

note: 'dct' is detect

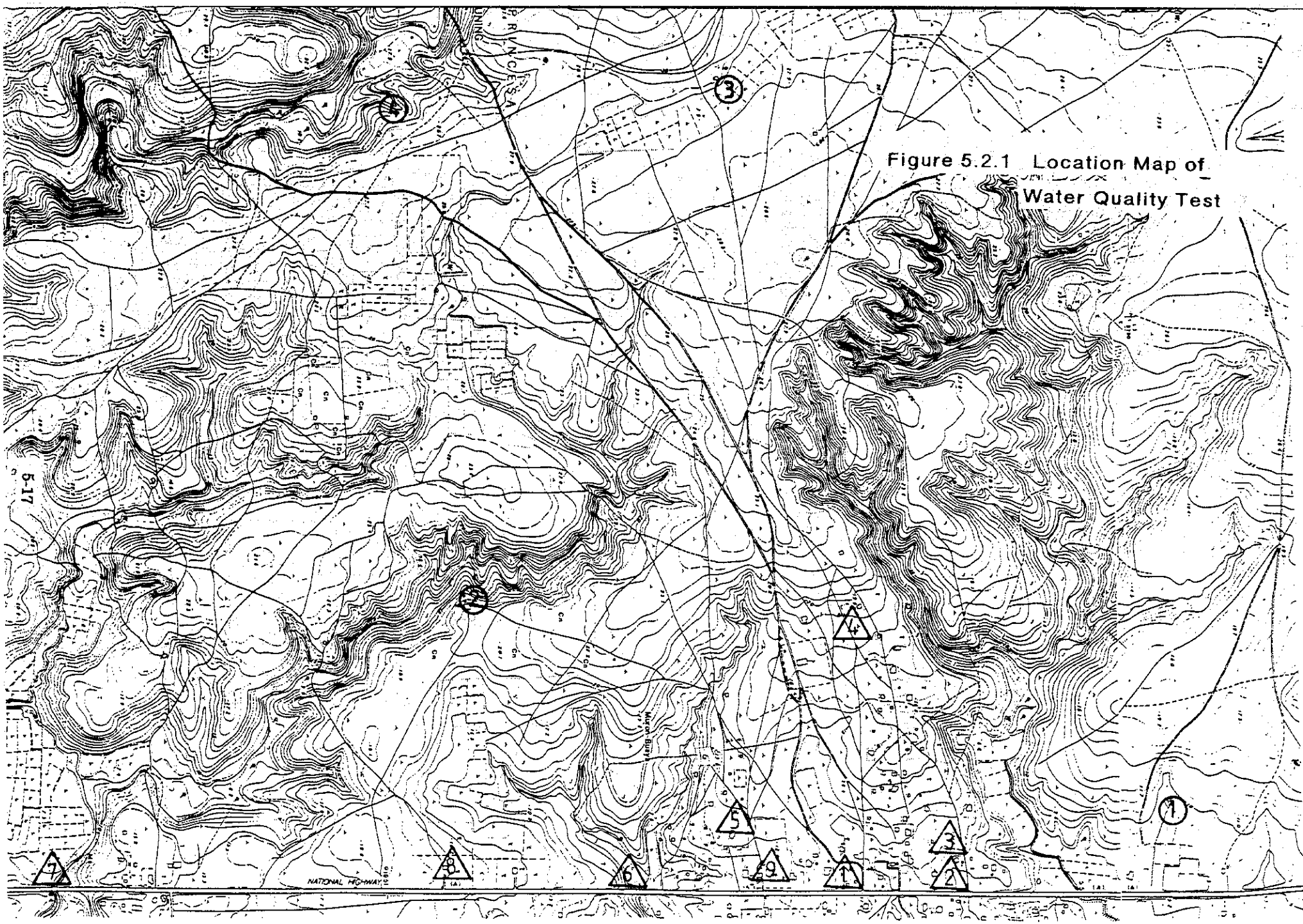
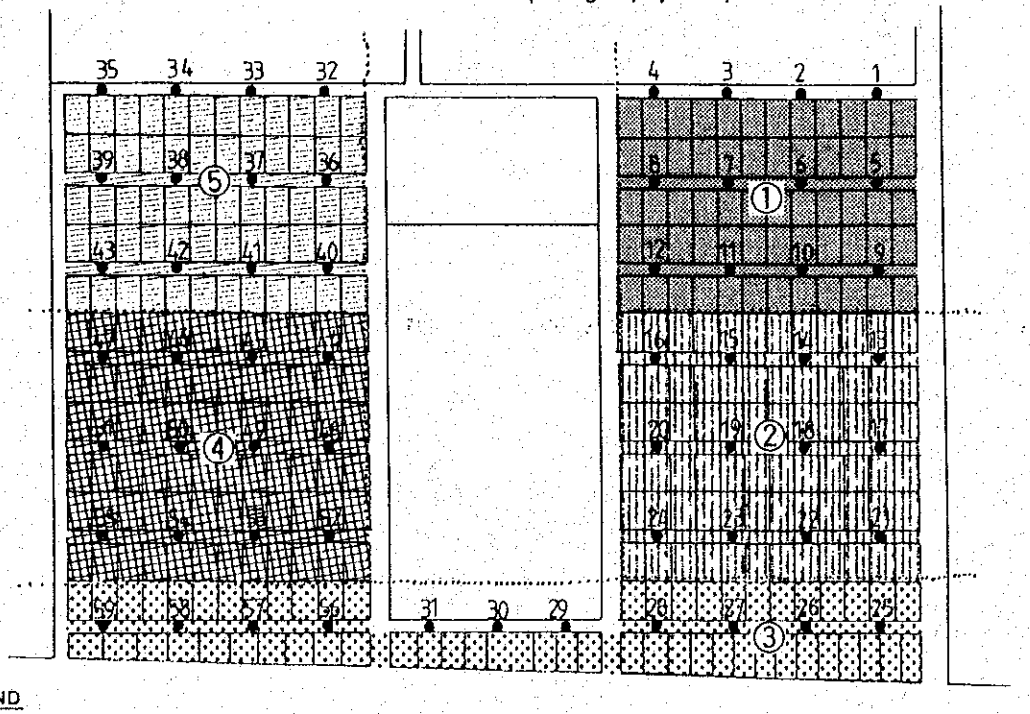


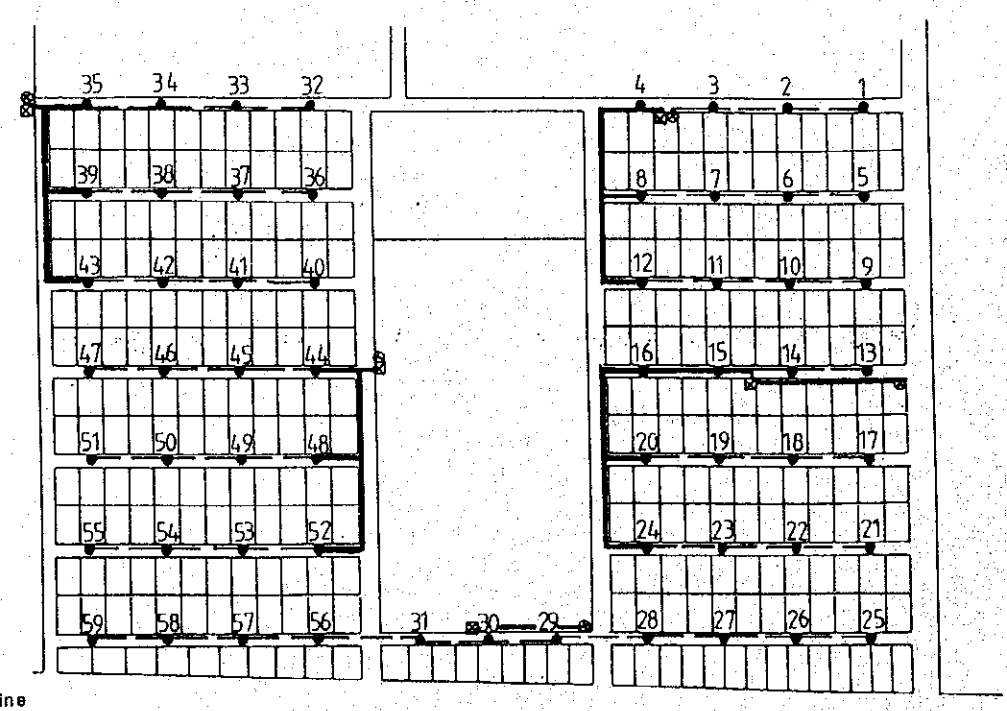
Figure 5.2.1 Location Map of Water Quality Test

Figure 5.2.2 Proposed Village Water Services Block
(in Tagumpay Area)



LEGEND
- Boundary of Block
- ① Block No.

Figure 5.2.3 Proposed Pipe Line Alignment
(in Tagumpay Area)



LEGEND
- Deep Well
- Delivery Tank
- Distribution Line
- Public Faucet

Figure 5.2.4 Hydraulic Calculation of Distribution Pipe Line

(on Village Water Supply System in Tagumpay Area)

(1/3)

1 Block

STA	L	Q	D	Head Loss /100m	Head Loss	WL	GL	Actual Head
	(m)	(lit/) sec)	(mm)	(m)	(m)	(m)	(m)	(m)
No.0	0					29.60	20.5	9.10
+2	2	2.0	75	0.307	0.01	29.59	20.5	9.09
PF-4	10	2.0	75	0.307	0.03	29.56	18.5	11.06
+42	32	2.0	75	0.307	0.11	29.45	18.9	10.55
+2						29.59		
PF-3	50	0.3	25	1.936	1.06	28.53	13.0	15.53
PF-2	60	0.2	25	0.914	0.60	27.93	16.2	11.73
PF-1	60	0.1	25	0.254	0.17	27.76	15.0	12.76
+42						29.45		
+112	70	1.6	75	0.203	0.16	29.29	17.1	12.19
PF-8	32	0.8	40	1.205	0.42	28.87	17.0	11.87
PF-7	60	0.6	40	0.708	0.47	28.40	16.3	12.10
PF-6	60	0.4	25	3.297	2.18	26.22	10.0	16.22
PF-5	60	0.2	25	0.914	0.60	25.62	10.0	15.62
+112						29.29		
+182	70	0.8	50	0.406	0.31	28.98	16.0	12.98
PF-12	32	0.8	50	0.406	0.14	28.84	17.1	11.74
PF-11	60	0.6	50	0.239	0.16	28.68	17.0	11.68
PF-10	60	0.4	25	3.297	2.18	26.50	16.5	10.00
PF-9	60	0.2	25	0.914	0.60	25.90	14.0	11.90
Total	778							

2 Block

STA	L	Q	D	Head Loss /100m	Head Loss	WL	GL	Actual Head
	(m)	(lit/) sec)	(mm)	(m)	(m)	(m)	(m)	(m)
No.0	0					27.20	15.0	12.20
+2	2	2.4	75	0.431	0.01	27.19	7.0	20.19
PF-14	30	0.4	25	3.297	1.09	26.10	8.5	17.60
PF-13	60	0.2	25	0.914	0.60	25.50	7.0	18.50
+2						27.19		
PF-15	30	2.0	75	0.307	0.10	27.09	17.0	10.09
PF-16	60	1.8	75	0.253	0.17	26.92	15.9	11.02
+124	32	1.6	75	0.203	0.07	26.85	6.0	20.85
+194	70	1.6	50	1.465	1.13	25.72	15.0	10.72
PF-20	32	0.8	50	0.406	0.14	25.58	15.8	9.78
PF-19	60	0.6	40	0.708	0.47	25.11	15.0	10.11
PF-18	60	0.4	25	3.297	2.18	22.93	13.0	9.93
PF-17	60	0.2	25	0.914	0.60	22.33	6.0	16.33
+194						25.72		
+264	70	0.8	50	0.406	0.31	25.41	5.0	20.41
PF-24	32	0.8	40	1.205	0.42	24.99	13.7	11.29
PF-23	60	0.6	40	0.708	0.47	24.52	12.5	12.02
PF-22	60	0.4	25	3.297	2.18	22.34	12.1	10.24
PF-21	60	0.2	25	0.914	0.60	21.74	8.5	13.24
Total	778							

(2/3)

3 Block

STA	L	Q	D	Head Loss /100m	Head Loss	WL	GL	Actual Head
	(m)	(lit/) sec)	(mm)	(m)	(m)	(m)	(m)	(m)
No.0	0					24.50	13.2	11.30
+2	2	2.2	75	0.367	0.01	24.49	10.9	13.59
PF-30	10	1.0	50	0.614	0.07	24.42	14.1	10.32
PF-29	50	0.9	50	0.505	0.28	24.14	11.9	12.24
PF-28	70	0.8	50	0.406	0.31	23.83	11.4	12.43
PF-27	60	0.6	40	0.708	0.47	23.36	11.6	11.76
PF-26	50	0.4	25	3.297	2.18	21.18	11.1	10.08
PF-25	60	0.2	25	0.914	0.60	20.58	9.0	11.58
+2						24.49		
PF-31	45	0.9	40	1.498	0.74	23.75	12.9	10.85
PF-56	75	0.8	40	1.205	0.99	22.76	12.0	10.76
PF-57	60	0.6	40	0.708	0.47	22.29	11.0	11.29
PF-58	60	0.4	25	3.297	2.18	20.11	9.2	10.91
PF-59	60	0.2	25	0.914	0.60	19.51	8.0	11.51
Total	612							

4 Block

STA	L	Q	D	Head Loss /100m	Head Loss	WL	GL	Actual Head
	(m)	(lit/) sec)	(mm)	(m)	(m)	(m)	(m)	(m)
No.0	0					26.50	16.0	10.50
+20	20	2.4	100	0.106	0.02	26.48	16.4	10.08
PF-44	32	0.8	50	0.406	0.14	26.34	15.2	11.14
PF-45	60	0.6	50	0.239	0.16	26.18	13.0	13.18
PF-46	60	0.4	40	0.334	0.22	25.96	12.2	13.76
PF-47	60	0.2	40	0.093	0.06	25.90	16.0	9.90
+20						26.48		
+90	70	1.6	75	0.203	0.16	26.32	15.1	11.22
PF-48	32	0.8	50	0.406	0.14	26.18	14.6	11.58
PF-49	60	0.6	40	0.708	0.47	25.71	12.2	13.51
PF-50	60	0.4	40	0.334	0.22	25.49	12.0	13.49
PF-51	60	0.2	25	0.914	0.60	24.89	14.7	10.19
+90						26.32		
+160	70	0.8	50	0.406	0.31	26.01	14.2	11.81
PF-52	32	0.8	40	1.205	0.42	25.59	13.8	11.79
PF-53	60	0.6	40	0.708	0.47	25.12	12.6	12.52
PF-54	60	0.4	25	3.297	2.18	22.94	10.0	12.94
PF-55	60	0.2	25	0.914	0.60	22.34	12.0	10.34
Total	796							

Figure 5.2.4 Cont'd

(3/3)

5 Block

STA	L (m)	Q (lit/sec)	D (mm)	Head Loss /100m (m)	Head Loss (m)	WL (m)	GL (m)	Actual Head (m)
No.0	0					33.80	22.9	10.90
+10	10	2.0	50	2.214	0.24	33.56	23.1	10.46
PF-35	32	0.4	40	0.334	0.12	33.44	23.0	10.44
PF-34	60	0.3	40	0.196	0.13	33.31	22.0	11.31
PF-33	60	0.2	25	0.914	0.60	32.71	19.9	12.81
PF-32	60	0.1	25	0.254	0.17	32.54	16.0	16.54
+10						33.56		
+80	70	1.6	50	1.465	1.13	32.43	22.2	10.23
PF-39	32	0.8	40	1.205	0.42	32.01	22.0	10.01
PF-38	60	0.6	40	0.708	0.47	31.54	20.0	11.54
PF-37	60	0.4	25	3.297	2.18	29.36	16.0	13.36
PF-36	60	0.2	25	0.914	0.60	28.76	14.0	14.76
+80						32.43		
+150	70	0.8	40	1.205	0.93	31.50	18.5	13.00
PF-43	32	0.8	40	1.205	0.42	31.08	20.0	11.08
PF-42	60	0.6	40	0.708	0.47	30.61	16.5	14.11
PF-41	60	0.4	25	3.297	2.18	28.43	12.0	16.43
PF-40	60	0.2	25	0.914	0.60	27.83	15.8	12.03
Total	786							

Pipe Length by Diameter (m)

	Block No.					
Dia (mm)	1	2	3	4	5	Total
125	-	-	-	-	-	0
100	-		-	20	-	20
75	114	124	2	70	-	310
50	162	172	130	194	80	738
40	92	152	240	332	346	1,162
25	410	330	240	180	360	1,520
T	778	778	612	796	786	3,750

CHAPTER 6. FARMER'S ORGANIZATION DEVELOPMENT

CHAPTER 6. FARMER'S ORGANIZATION DEVELOPMENT

6.1 Objective

Farmers organization relevant to farmer's specific activity shall be organized and/or strengthened even prior to the implementation of the project, to promote the effective participation of the farmer beneficiaries in the operation and maintenance of the projects and facilities to be provided in the Settlement Area and to assist farmers improve/increase their income.

The basic objective of the Farmers Organization Plan is the development of he farmer beneficiaries at the Tagumpay Settlement Area and its outlying areas into viable, organized, selfreliant and productive community, sharing resources for their mutual benefits.

The DAR, with the assistance of concerned agencies/entities, like, NIA, LWUA, LGU, NGO, etc., shall provide the necessary training, skills, techniques needed to promote the effective participation of the farmer beneficiaries in the operation and maintenance of the facilities. Specifically, for the priority project areas identified for immediate implementation, the following farmers organization will be organized:

1. Irrigators Association (IA) for irrigation system
2. Water Users Association (WUA) for the village water supply system
3. Multi-purpose Cooperative for dealing with marketing crops, inputs and the post harvest facilities etc.

Specifically, the NIA will be tapped to organize and train the leaders/members of the IA as it has already established a system for developing the IAs, the LWUA for the WUA and the NGO to be selected by DAR for the multi-purpose cooperative.

The assistance to be provided to the farmers are basic organization and training, as follows:

1. Establishing and/or strengthening of the specific organizations

2. Training of leaders and members on organization management skills and basic skills
3. Assisting in the preparation and establishment of the organization's structural units
4. Establishing the linkages of the organizations/associations within the Study Area and other concerned agencies/entities.

The DAR, as the lead implementing agency will coordinate the general activities of the farmer's organization in the Study Area and will function as intermediary and/or coordinator of the various agencies and organizations involved with farmer organizations to avoid confusion and duplication.

6.2 Irrigators Association

The Irrigators Association (IA) shall be organized in the Study Area before the implementation of the project, to operate and maintain the irrigation facilities, to supervise the equitable distribution of water to the farmers and to collect the necessary irrigation charges/fees.

The members of the association will be the farmer beneficiaries within the limits and coverage of the irrigation service area. The DAR will tap the services of the NIA in the organization of the farmers and the various training needed to develop their capabilities to manage and maintain the irrigation system. The organization and training of IAs will be implemented prior to the start of the construction of the irrigation facilities and will take about two years. Specifically, the main focus of the IA are the planning, implementation and evaluation of: (refer to Figure 6.2.1)

1. Operation and maintenance activities on :
   - preparation of cropping calendar and pattern
   - delivery and distribution of irrigation water
   - cleaning and repair of the irrigation facilities
   - collection of irrigation charges/fees

2. Activities to strengthen the IAs
   - training to improve leadership, communications, problem solving and decision making skills
   - training to improve financial management capability
   - other training programs to improve and sustain the IA

6. 3 Water Users Association (WUA)

The WUA will be organized to operate and maintain the village water supply to be provided in the Study Area and to collect the necessary water fees/charges. It shall be composed of farmers/households who will directly benefit from the system. To ensure the success and continuity of the association, necessary training and skills development will be provided to the leaders/members. The DAR may tap the LWUA or the LGU to provide proper orientation and skills training to the WUA. The WUA maybe organized during construction stage. (refer to Figure 6.3.1)

6. 4 Multi-purpose Cooperative

Since there are existing auto savings groups and cooperatives in the Study Area, these groups will be reorganized, strengthened and assisted to be able to manage and operate the facilities to be provided, specifically the post harvest facilities. The existing organization shall be encouraged to form one federation of farmers organization, a multi-purpose cooperative, to particularly take care of the post harvest facilities and to undertake other activities which shall include but not limited to marketing of agricultural products, purchase of inputs, provision of credit and others.

The responsibility of organizing and developing the farmer beneficiaries into viable partners will be the NGO to be contracted by DAR. The DAR together with the NGO will implement the cooperative development of the farmer beneficiaries. (refer to Figure 6.4.1)

The activities to prepare the farmers to become fully organized and be prepared to accept responsibilities to operate, maintain and manage the post harvest facilities and others will take three years and would include the following:

1. First year : Organization and reorganization
2. Second year : Capability building and entrepreneurial training
3. Third year : Capability building and enterprise development

Figure 6.2.1 Typical Organization Chart of Irrigators Association

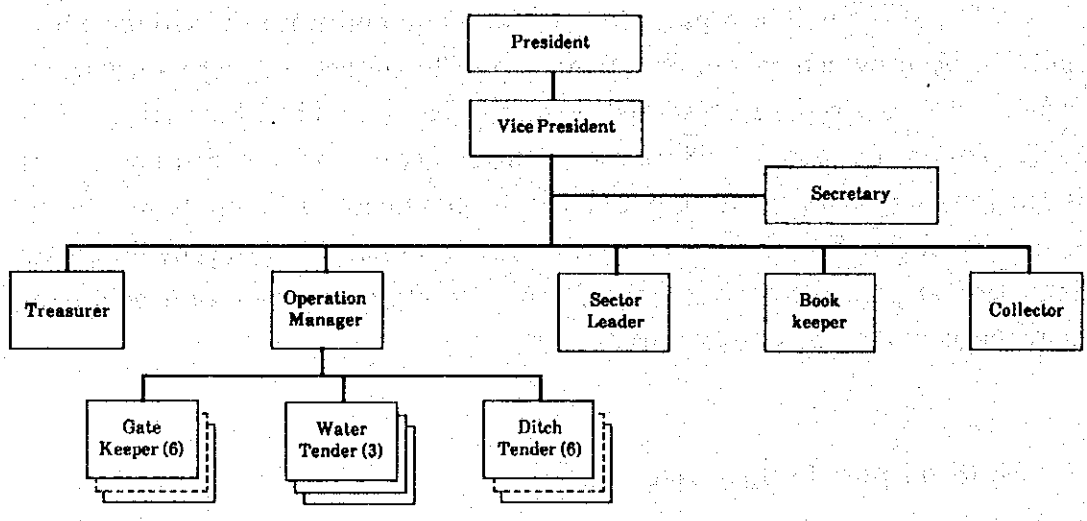


Figure 6.3.1 Typical Organization Chart of Water Users Association

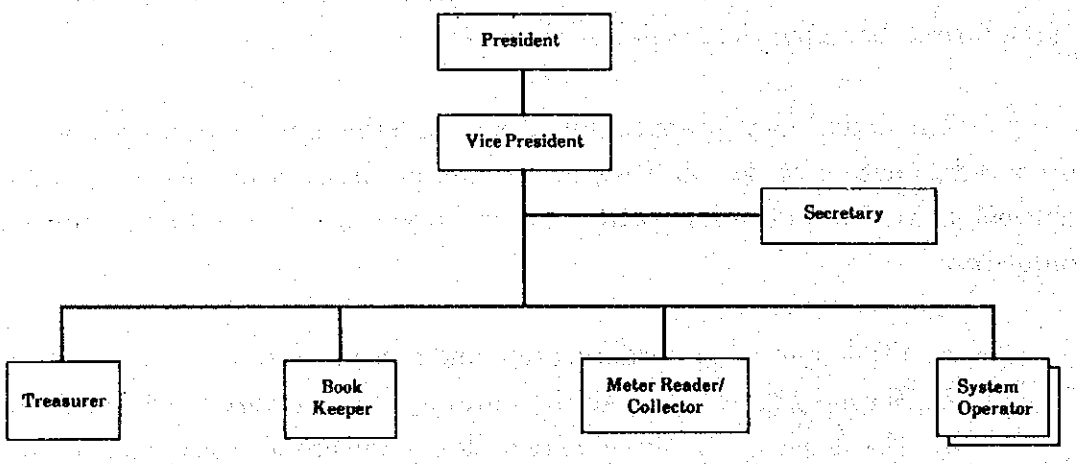
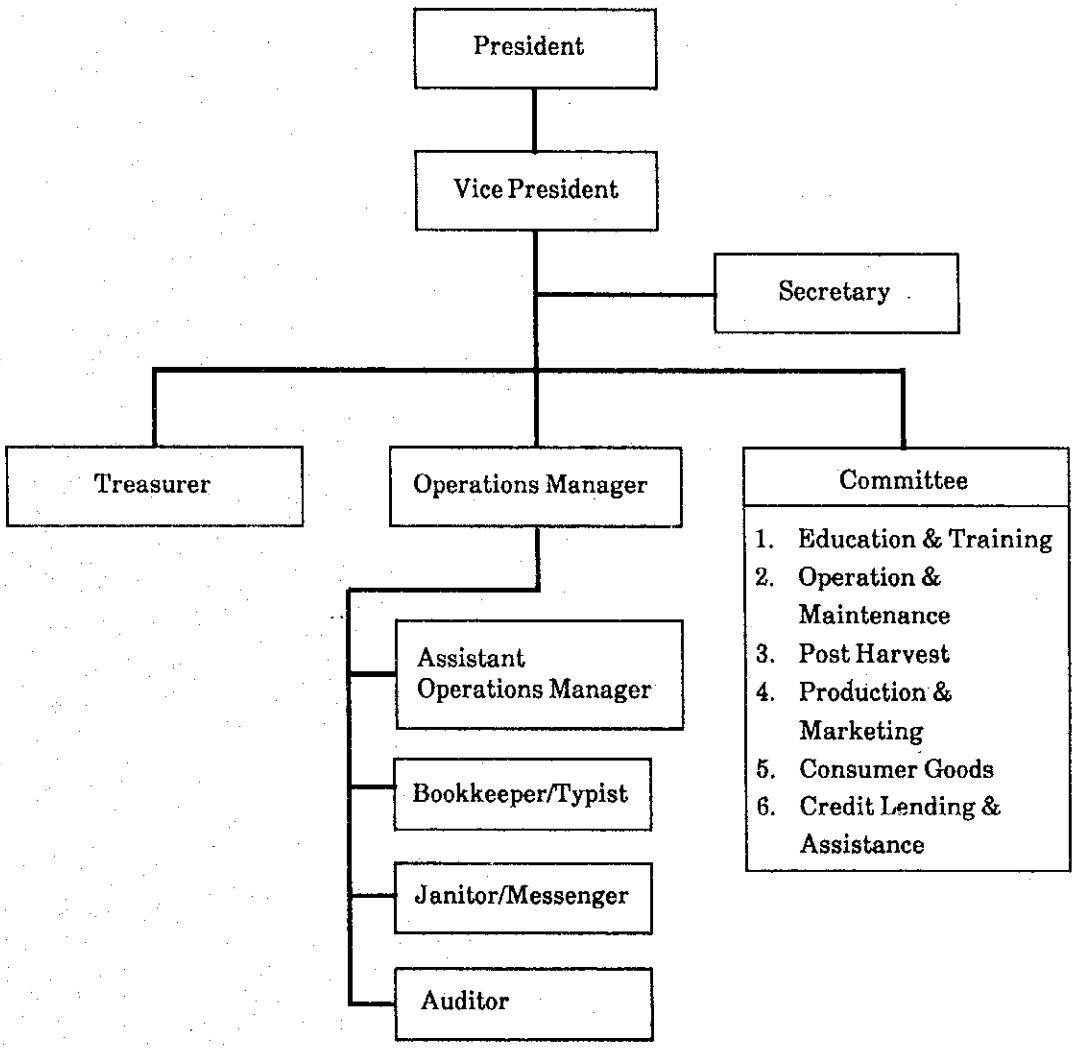


Figure 6.4.1 Typical Organization Chart of Multi-Purpose Cooperative



APPENDIX 7. COST ESTIMATE

7.1 Unit Cost

Basic unit prices of major labor and construction materials, and unit construction costs of major works are adopted from the current unit prices and unit costs of NIA as of January 1994. (refer to Tables 7.1.1 to 7.1.3)

Foreign and local currency portion on major construction materials are separated based on NEDA's information as follows;

Materials	Foreign (%)	Local (%)
Aggregate	80	20
Lumber	40	60
Reinforcing bar/ Nail/ Hardware	90	10
Cement	80	20
Asphalt/ Bituminous	80	20
Fuel	80	20
R.C. products	70	30
Steel plate/ Angle/ Pipe	90	10
Equipment	80	20

The exchange rate employed for the cost estimate is US$1.00 = P26.00 = ¥ 100.00.

Table 7.1.1 Basic Unit Cost

As of January 1994

Item	Description	Unit	Unit Cost	Remarks
			(Peso)	
Labour	Common Labour	day	110.90	
	Steelman	day	173.89	
	Carpenter	day	215.71	
	Foreman	day	234.92	
	Mason	day	200.12	
	L.E.Operator	day	200.12	light equipment
	H.E.Operator	day	224.78	heavy equipment
	Driver Mechanic	day	207.31	
Material	Cement	bag	211.60	40 Kg/bag
	Sand	cu.m	438.80	5 km hauling
	Gravel	cu.m	448.05	5 km hauling
	Boulder	cu.m	462.55	5 km hauling
	Diesel Fuel	l	13.15	
	Tie Wire	kg	43.65	
	Form Lumber	cu.m	38.50	
	CWN	kg.m	35.65	common wire nail
	Plywood	pc	856.05	
	RSB	kg	25.65	reinforce steel bar
	4' THK CHB	pc	8.65	4' thick concrete hole block

Source : NIA Palawan Provicial Office

Table 7.1.2 Unit Cost for Construction Works

As of January 1994

	Works	Description		Unit	Unit Cost (Peso)	Remarks
(1)	Earth works	Structure	W/dewatering	cu.m	66.95	
		Excavation		cu.m	44.35	By manpower
				cu.m	62.30	Mechanized aspect
		Common Excavation		cu.m	36.95	By manpower
		Side Borrow		cu.m	36.95	By manpower
		Haul Borrow		cu.m	162.80	5 Km hauling
		Road Surfacing		cu.m	169.95	5 Km hauling
		Clearing & Grubbing		sq.m	11.65	By manpower
		Main Farm Ditch /Drainage Ditch		m	27.75	By manpower
		Supplemental Farm Ditch		m	18.50	By manpower
(2)	Embankment /Backfill works	Backfill	Structure	cu.m	36.95	By manpower
		Filter drain		cu.m	611.85	
		Gravel blanket		cu.m	488.70	
		Dry boulder riprap		cu.m	518.00	
		Cofferdam		cu.m	49.45	
(3)	Concrete works	Concrete	Class A	cu.m	5844.40	3000 PSI/RSB 40 kg PSI:pond per square inch /Diversion work
			ditto	cu.m	6538.50	3000 PSI/RSB 40 kg /Canal,Road work
			Class B	cu.m	2615.35	Plain concrete
		4'thick CHB	Lining	sq.m	496.05	
(4)	Pipe works	RCP	ϕ 18' × 1.00m	pcs	1203.70	
			ϕ 24' × 1.00m	pcs	1989.75	

Source : NIA Palawan Provicial Office

Table 7.1.3 Unit Cost Ceiling for Construction Works

Works	Description	Unit	Unit Cost (Peso) As of January 1994	Remarks
(1) Earthworks				
1.Clearing & Grubbing				
1-1	Dense vegetation	sq.m	26.90	1480 trees/ha or more
1-2	Meduium vegetation	sq.m	16.30	990-1480 trees/ha
1-3	Light vegetation	sq.m	11.00	less than 990 trees /ha
1-4	No vegetation	sq.m	5.70	
2.Canal Excavation				
2-1	Common (Manual)	cu.m	46.10	
2-2	Common Excavation (Using dozer)	cu.m	27.25	for excavation & stockpile
2-3	Common Excavation (Using dozer)	cu.m	42.35	excavated materials to be used for embankment within 200 m
2-4	Common Excavation (Using backhoe)	cu.m	35.15	
2-5	Bouldery	cu.m	95.35	
2-6	Indurated	cu.m	94.85	
2-7	Rock	cu.m	332.10	
3.Structure Excavation				
3-1	Canal Structures Common (Manual)	cu.m	73.75	
3-2	Canal Structures Common (Mech.)	cu.m	43.70	
3-3	Dam (Common)	cu.m	90.45	
3-4	Bouldery	cu.m	100.55	
3-5	Indurated	cu.m	121.15	
3-6	Rock	cu.m	347.90	
4.Structure Backfill				
4-1	Canal Structures (Manual)	cu.m	49.20	
4-2	Canal Structures (Mech.)	cu.m	38.15	
4-3	Dam	cu.m	77.80	
5.Road Surfacing Materials				
5-1	Quarying,Loading Spreading,Watering	cu.m	72.55	
5-2	Hauling			
	AHD=1 km	cu.m	34.50	
	AHD=3 km	cu.m	52.65	
	AHD=5 km	cu.m	74.20	
	AHD=7 km	cu.m	95.70	

Source: NIA Cental Office

Table 7.1.3 Cont'd

Works	Description	Unit	Unit Cost (Peso)	Remarks
6. Embankment Construction & Compaction				
6-1	Spreading, Watering and Compaction	cu.m	31.30	
6-2	Borrow Materials at Quarry and Load	cu.m	42.75	
6-3	Hauling			
	AHD=1 km	cu.m	40.65	
	AHD=2 km	cu.m	51.40	
	AHD=3 km	cu.m	66.35	
	AHD=4 km	cu.m	81.30	
	AHD=5 km	cu.m	96.20	
7. Side Borrow		cu.m	38.15	
8. Hauling for Embankment				
	AHD=1 km	cu.m	51.35	
	AHD=2 km	cu.m	62.10	
	AHD=3 km	cu.m	77.05	
	AHD=4 km	cu.m	92.00	
	AHD=5 km	cu.m	106.95	
9. Hauling for Waste				
	AHD=1 km	cu.m	47.83	
	AHD=2 km	cu.m	57.25	
	AHD=3 km	cu.m	70.35	
	AHD=4 km	cu.m	83.40	
	AHD=5 km	cu.m	96.50	
10. Gravel Blanket		cu.m	660.70	73.75+1.31G
11. Filter Drain		cu.m	734.45	147.50+1.31G
12. Boulder Riprap		cu.m	894.64	260.45+1.25B+0.125G
(2) Concrete Works				
13. 3,000 PSI Concrte				
13-1	Canal Structure	cu.m	6555.16	1067.16+11.25C+0.625S+1.25G+1.25P+31.25L
13-2	Bridge Structure	cu.m	7949.01	1042.01+11.25C+0.625S+1.25G+0.94P+75.00L
13-3	Dam Structure	cu.m	5484.50	879.16+11.25C+0.625S+1.25G+0.50P+25.00L
14. 2,400 PSI Concrte				
14-1	Dam Structure	cu.m	4139.02	638.95+10.00C+0.625S+1.25G+0.125P+11.50L
14-2	Canal Lining	cu.m	3810.44	619.50+10.00C+0.625S+1.25G+6.25L

Source: NIA Central Office

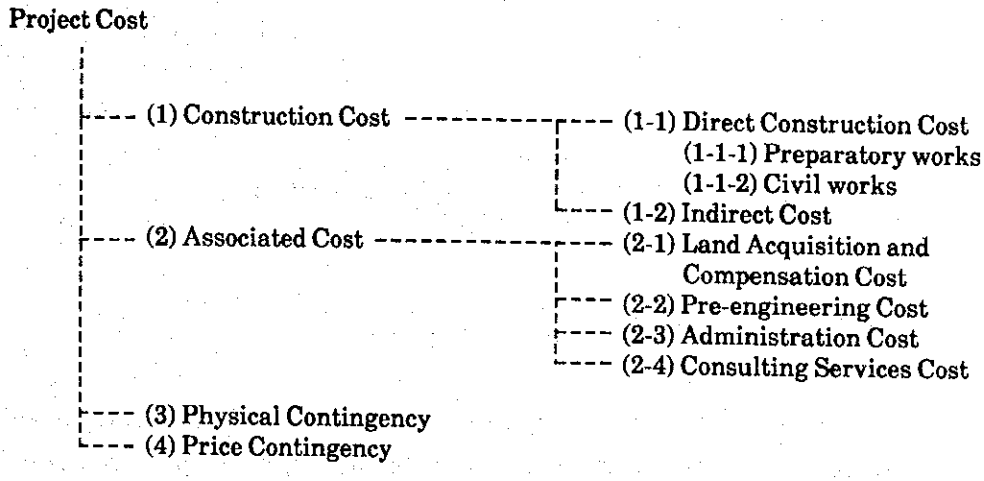
Table 7.1.3 Cont'd

Works	Description	Unit	Unit Cost (Peso)	Remarks
(3) Masonry Works				
15. Rubble Masonry		cu.m	3137.38	404.19+5.62C+0.310S +0.625G+1.19B+15L
16. Grouted Riprap		cu.m	2321.77	383.60+5.25C+0.440S +0.125G+1.250B
(4) Pipe Works				
17. Supply and Delivery				
17-1	18'Dia .RCP	pc	553.93	1.25RPC
17-2	24'Dia .RCP	pc	796.90	1.25RPC
17-3	30'Dia .RCP	pc	939.15	1.25RPC
17-4	36'Dia .RCP	pc	1112.06	1.25RPC
17-5	42'Dia .RCP	pc	1336.80	1.25RPC
18. Installation				
18-1	18'Dia .RCP	pc	443.14	73.62+0.49C+0.025S +0.050G+4.56R+3L
18-2	24'Dia .RCP	pc	637.52	108.91+0.81C+0.044S +0.087G+5.65R+4L
18-3	30'Dia .RCP	pc	751.32	131.00+0.95C+0.050S +0.100G+6.24R+5L
18-4	36'Dia .RCP	pc	889.65	131.00+1.19C+0.062S +0.125G+7.51R+6L
18-5	42'Dia .RCP	pc	1069.44	180.56+1.41C+0.075S +0.157G+8.49R+7L
(5) Metal Works and Misc. Works				
19. Reinforcing Steel Bars				
19-1	Furnish & Stockpile	kg	32.06	1.25R
19-2	Cut,bend & place	kg	4.50	

Source: NIA Central Office

7.2 Composition of Project Cost

The project cost is estimated with the following components;



a) Preparatory Work Cost

The cost for preparatory works includes costs for temporary works (access roads, coffer dam, diversion channels, water supply, electric wiring, protection facilities for environmental pollution, contractor's camp facilities, drainage facilities, etc.), preparation of shop drawings, laboratory tests, etc.

b) Civil Work Cost

The civil work cost covers costs for building and installation of facilities and devices comprising of labor, construction materials, fuel and depreciation of equipment costs.

c) Indirect Cost

The indirect cost includes the over-head, profit, mobilization and demobilization cost, and tax. According to DPWH's information, Order No.30 series of 1991, these costs excluding tax are as follows;

Direct Construction Cost	OCM	Indirect Cost (%)		
		Profit	MOB/DEMOB	Total
Up to 1.0 M.P	13	15	2	30
Above 1.0 M.P to 5.0 M.P	12	14	2	28
Above 5.0 M.P to 10.0 M.P	12	13	2	27
Above 10.0 M.P to 20.0 M.P	11	12	Separate Pay Item	23
Above 20.0 M.P to 50.0 M.P	11	11		22
Above 50.0 M.P	10	10		20

Note: OCM : Overhead Construction Management
MOB/DEMOB : Mobilization and Demobilization
M.P : Million pesos

d) Land Acquisition and Compensation Cost

The costs for land acquisition of facilities and reservoir, resettlement works and cost for damage to improvements will be included under this item.

e) Pre-engineering Cost

The Pre-engineering cost means necessary costs for topo-survey, meteorological and hydrological observation, geological investigation, etc. to be conducted prior to and/or during the detailed design stage.

f) Administration Cost

The administration cost contains salaries and wages of offices, miscellaneous costs for administration, fuel and light expenses, water charge, etc. during the implementation period. 10 % of the total construction cost is generally adopted as administration cost.

g) Consulting Services Cost

The expenditure for detailed design for facilities, preparation of tender documents and supervision works during implementation stage will be required especially for water resources works as consulting cost.

h) Physical Contingency

Physical contingency will be estimated with 3 to 7% of the base cost which is the sum of construction cost and associated cost in accordance with NEDA's guideline.

i) Price Contingency

Price escalation will be estimated at 1% per annum for the foreign currency portion and 5 % per annum for the local currency portion as suggested by NEDA.

7.3 Project Cost

The project costs based on the estimate conditions described above are summarized in Table 7.3.1.

Table 7.3.1 Summary of Project Cost (Stage-I)

Description	Total Cost ('000 peso) Total	F/C	L/C	Remarks
1. Construction Cost				
1.1 Water Resources	203,280	131,476	71,804	
1.2 Irrigation and Drainage Facilities	36,923	24,301	12,622	
1.3 Farm to Market Roads (Main 1-4)	19,562	12,905	6,657	
1.4 Social Infrastructures	12,218	8,424	3,794	
1.5 Post Harvest Facilities	16,949	11,866	5,083	
Sub-total	288,932	188,972	99,960	
2. Association Cost				
2.1 Pre-engineering Cost	14,447	8,668	5,779	5 % of 1.
2.2 Administration Cost	28,893	11,557	17,336	10 % of 1.
2.3 Consulting Services Cost	28,893	17,336	11,557	10 % of 1.
Sub-total	72,233	37,561	34,672	
Total (1. to 2.)	361,165	226,533	134,632	
3. Physical Contingency	25,282	15,857	9,424	7 % of 1.to2.
4. Price Contingency	28,880	7,272	21,608	3 % of 1.to3.F/C 15 % of 1.to3.L/C
Grand Total	415,327	249,662	165,664	

Table 7.3.2 Construction Cost for Site EuM Water Resources

Description	Unit	Quantities	Total Cost Unit Rate (Peso)	Total Cost Amount ('000 P)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount ('000 P)	Local Currency Unit Rate (Peso)	Local Currency Amount ('000 P)	Remarks
1. Damboby									
1.1 Excavation									
Clearing & Grubbing	sq.m	11300	11.00	124.3	0.00	0.0	11.00	124.3	
Excavation									
Common	cu.m	16700	90.45	1510.5	67.84	1132.9	22.61	377.6	
Bouldery	cu.m	6900	100.55	693.8	75.41	520.3	25.14	173.5	
Indurated	cu.m	16800	121.15	2035.3	90.86	1526.4	30.29	508.9	
Rock	cu.m	2200	347.90	765.4	243.53	535.8	104.37	229.6	
1.2 Embankment									
Core zone Spre. Compa.	cu.m	49400	31.30	1546.2	23.48	1159.9	7.82	386.3	
Borr. Haul.	cu.m	49400	83.40	4120.0	62.55	3090.0	20.85	1030.0	
Random zone Spre. Compa.	cu.m	32700	31.30	1023.5	23.48	767.8	7.82	255.7	
Borr. Haul.	cu.m	---	83.40	0.0	62.55	0.0	20.85	0.0	
Boulder Riprap	cu.m	4100	894.64	3668.0	635.20	2604.3	259.44	1063.7	
Filter Drain	cu.m	3000	734.45	2203.4	543.49	1630.5	190.96	572.9	
1.3 Foundation Treatment									
Curtain Grouting	m	1050	3000.00	3150.0	1920.00	2016.0	1080.00	1134.0	
Others	10	L.S %		315.0		201.6		113.4	
1.4 Intake Facility									
3,000 PSI	cu.m	2000	5484.50	10969.0	2690.36	5380.7	2794.14	5588.3	
Currugated Steel Pipe									
ϕ 2.00 m	m	220	20000	4400.0	16000	3520.0	4000.00	880.0	
Butterfly Valve ϕ500mm	unit	1	483000	483.0	386400	386.4	96600.00	96.6	
Sluice Valve ϕ500mm	unit	1	260000	260.0	208000	208.0	52000.00	52.0	
1.5 Miscellaneous Works	20	L.S	%1.1~1.4	7453.5		4936.1		2517.3	
Sub-total				44720.8		29616.8		15104.1	
2. Spillway									
2.1 Earth Works									
Clearing & Grubbing	sq.m	4500	11.00	49.5	0.00	0.0	11.00	49.5	
Excavation									
Common	cu.m	16900	90.45	1528.6	67.84	1146.5	22.61	382.1	
Bouldery	cu.m	1600	100.55	160.9	75.41	120.7	25.14	40.2	
Indurated	cu.m	8500	121.15	1029.8	90.86	772.3	30.29	257.5	
Rock	cu.m	2700	347.90	939.3	243.53	657.5	104.37	281.8	
Backfill Common	cu.m	1000	77.80	77.8	58.35	58.4	19.45	19.4	
Embankment									
Core Zone Spre. Compa.	cu.m	25200	31.30	788.8	23.48	591.7	7.82	197.1	
Borr. Haul.	cu.m	25200	83.40	2101.7	72.71	1832.3	10.69	269.4	
Boulder Riprap	cu.m	1600	894.64	1431.4	635.20	1016.3	259.44	415.1	
2.2 Concrete Works									
Dam Concrete	cu.m	2400	4139.02	9933.6	2690.36	6456.9	1448.66	3476.8	
Rubble Masonry	cu.m	3400	3137.38	10667.1	2133.42	7253.6	1003.96	3413.5	
3,000 PSI	cu.m	4200	5484.50	23034.9	3345.54	14051.3	2138.96	8983.6	
2.3 Gate Works									
Corrugated Steel Pipe									
ϕ 3.00 m	m	20	28600	572.0	22880	457.6	5720	114.4	
Gate $\square$ 3.5×3.5m	L.S	1	1040000	1040.0	832000	832.0	208000	208.0	
Gate $\square$ 2.5×2.5m	L.S	1	530000	530.0	424000	424.0	106000	106.0	
2.4 Miscellaneous Works	20	L.S	%2.1~2.3	10777.1		7134.2		3642.9	
Sub-total				64662.5		42805.2		21857.3	

Table 7.3.2 Cont'd

	Description	Unit	Quantities	Total Cost Unit Rate (Peso)	Total Cost Amount ('000 P)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount ('000 P)	Local Currency Unit Rate (Peso)	Local Currency Amount ('000 P)	Remarks
3.	Open Channel									
	3.1 Excavation									
	Clearing & Grubbing	sq.m	10700	11.00	117.7	0.00	0.0	11.00	117.7	
	Excavation	cu.m	71000							1.00
	Common	cu.m	28400	90.45	2568.8	67.84	1926.7	22.61	642.1	0.40
	Indurated	cu.m	35500	121.15	4300.8	90.86	3225.5	30.29	1075.3	0.50
	Rock	cu.m	7100	347.90	2470.1	243.53	1729.1	104.37	741.0	0.10
	3.2 Miscellaneous Works	20	L.S	%3.1	1891.5		1376.2		515.2	
	Sub-total				11348.9		8257.5		3091.4	
4.	Preparetory Works									
	4.1 Access Roads	Km	5	1000000	5000.0	500000	2500.0	500000	2500.0	
	4.2 Screening Plant	L.S	1	15000000	15000.0	7500000	7500.0	7500000	7500.0	
	4.3 Reservoir Clearing	ha	8	25000	200.0	12500	100.0	12500	100.0	
	4.4 Care of River 1	L.S	1	1000000	1000.0	500000	500.0	500000	500.0	
	4.5 Others	20	L.S	%1.~3.	24146.4		16135.9		8010.5	
	4.6 Mobilization & Construction Facilities	2	L.S	%1.~4.5	3321.6		2148.3		1173.3	
	Sub-total				48668.0		28884.2		19783.8	
	Total (1. to 4.)				169400.2		109563.7		59836.5	
5.	Indirect Cost(OCM & Profit.)	20		%1.~4.	33880.0		21912.7		11967.3	
	Total (1. to 5.)				203280.2		131476.5		71803.8	

Table 7.3.3 Construction Cost for Irrigation and Drainage Facilities

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate ('000 P)	Amount ('000 P)	Unit Rate ('000 P)	Amount ('000 P)	Unit Rate ('000 P)	Amount ('000 P)
1. Construction Cost									
1.1 Canal	2-1. Main Canal	sets	1	16167	16167	10735	10735	5432	5432
	3-1. Lateral-A	sets	1	1888	1888	1183	1183	705	705
	4-1. Lateral-B	sets	1	3159	3159	1980	1980	1179	1179
	5-1. Lateral-C	sets	1	782	782	504	504	278	278
	6-1. Lateral-D	sets	1	150	150	101	101	49	49
	7-1. Lateral-E	sets	1	1374	1374	978	978	396	396
1.2 Preparatory works		(30%)			7056		4644		2412
1.3 Indirect Cost		(20%)			6115		4025		2090
Sub Total					36691		24150		12541
1.5 Drainage	Main-A, B	sets	1	161	161	105	105	56	56
1.6 Preparatory works		(20%)			32		21		11
1.7 Indirect Cost		(20%)			39		25		13
Sub Total					232		151		80
Total					36923		24301		12621

Table 7.3.3a Construction Cost for Main Irrigation Canal

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
2-1. Main Canal									
2-2. Open channl		sets	1	13585111	13585111	9108544	9108544	4476567	4476567
2-3. Siphon		sets	1	1055397	1055397	674073	674073	381324	381324
1. Diversion	TYPE-1	sets	7	22438	157066	14162	99134	8276	57932
	TYPE-2	sets	0	11471	0	7069	0	4402	0
	TYPE-3	sets	2	9808	19616	6048	12096	3760	7520
2. Check	TYPE-1	sets	3	40026	120078	24905	74715	15121	45363
	TYPE-2	sets	1	35883	35883	22257	22257	13626	13626
	TYPE-3	sets	2	29923	59846	18508	37016	11415	22830
	TYPE-4	sets	0	20603	0	12776	0	7827	0
3. Road Crossing	ϕ 800	sets	8	35689	285512	21746	173968	13943	111544
	ϕ 600	sets	0	34024	0	20761	0	13263	0
	ϕ 450	sets	2	21157	42314	12694	25388	8463	16926
	ϕ 300	sets	0	9583	0	5647	0	3936	0
4. Drainage Crossing	ϕ 1000×2	sets	0	105627	0	67023	0	38604	0
	ϕ 1000	sets	0	71015	0	45299	0	25716	0
	ϕ 800	sets	0	57102	0	36633	0	20469	0
	ϕ 600	sets	9	44635	401715	28684	258156	15951	143559
5. Drop	TYPE-1	sets	9	45093	405837	27850	250650	17243	155187
	TYPE-2	sets	0	12885	0	8247	0	4638	0
Total					16168375		10735997		5432378

Table 7.3.3a Cont'd

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
2-2. Open channl (Main canal)									
1. Earth works									
Excavation	B.D.11t	cu.m	31996	27.26	872210	21.26	680234	6.00	191976
	B.H.O.6m3	cu.m	7316	35.15	257156	27.42	200604	7.73	56552
	Manpower	cu.m	656	46.10	30241	0.00	0	46.10	30241
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.O.6m3	cu.m	2100	38.15	80115	28.61	60081	9.54	20034
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	24000	100.26	2406240	75.19	1804560	25.07	601680
	B.H.O.6m3	cu.m	0	35.15	0	27.42	0	7.73	0
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	35884	70.35	2524438	52.76	1893239	17.59	631199
Bottom Facing		sq.m	4704	5.70	26812	0.00	0	5.70	26812
Slope Facing		sq.m	14112	5.70	80438	0.00	0	5.70	80438
Road Surfacing		cu.m	2352	72.55	170637	54.41	127972	18.14	42665
Clearing		sq.m	41550	11.00	457050	0.00	0	11.00	457050
2. Concrete Works									
2400PSI Concrete		cu.m	1753.02	3810.43	6679774	2476.78	4341854	1333.65	2337920
Total					13585111		9108544		4476567

Table 7.3.3a Cont'd

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
2-3. Shiphon (Main canal)									
1. Earth works									
Excavation	B.H.O.6m3	cu.m	2871	35.15	100914	27.42	78722	7.73	22192
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Backfill	B.H.O.6m3	cu.m	2425	38.15	92505	28.61	69373	9.54	23132
Embankment	B.H.O.6m3	cu.m	0	35.15	0	27.42	0	7.73	0
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	446	70.35	31389	52.76	23541	17.59	7848
Bottom Facing	Manpower	sq.m	522	5.70	2975	0.00	0	5.70	2975
Slope Facing	Manpower	sq.m	1211	5.70	6902	0.00	0	5.70	6902
2. Concrete Works									
3000PSI Concrete		cu.m	10	6555.16	64817	3867.54	38242	2687.62	26575
2400PSI Concrete		cu.m	15	3810.43	58086	2476.78	37756	1333.65	20330
RCP-ϕ1000		m	290	2406.24	697809	1470.48	426439	935.76	271370
Total					1055397		674073		381324

Table 7.3.3b Construction Cost for Lat-A Irrigation Canal

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
3-1. Lateral-A(Canal)									
3-2. Open channl		sets	1	848059	848059	545338	545338	302721	302721
3-3. Siphon		sets	1	678073	678073	411094	411094	266979	266979
1. Diversion	TYPE-1	sets	0	22438	0	14162	0	8276	0
	TYPE-2	sets	0	11471	0	7069	0	4402	0
	TYPE-3	sets	3	9808	29424	6048	18144	3760	11280
2. Check	TYPE-1	sets	0	40026	0	24905	0	15121	0
	TYPE-2	sets	0	35883	0	22257	0	13626	0
	TYPE-3	sets	0	29923	0	18508	0	11415	0
	TYPE-4	sets	2	20603	41206	12776	25552	7827	15654
3. Road Crossing	ϕ 800	sets	0	35689	0	21746	0	13943	0
	ϕ 600	sets	0	34024	0	20761	0	13263	0
	ϕ 450	sets	0	21157	0	12694	0	8463	0
	ϕ 300	sets	7	9583	67081	5647	39529	3936	27552
4. Drainage	ϕ 1000×2	sets	0	105627	0	67023	0	38604	0
Crossing	ϕ 1000	sets	0	71015	0	45299	0	25716	0
	ϕ 800	sets	0	57102	0	36633	0	20469	0
	ϕ 600	sets	1	44635	44635	28684	28684	15951	15951
5. Drop	TYPE-1	sets	0	45093	0	27850	0	17243	0
	TYPE-2	sets	14	12885	180390	8247	115458	4638	64932
Total					1888868		1183799		705069

Table 7.3.3b Cont'd

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
3-2. Open channl (Lateral-A)									
1. Earth works									
Excavation	B.D.11t	cu.m	3431	27.26	93529	21.26	72943	6.00	20586
	B.H.0.6m3	cu.m	2292	35.15	80563	27.42	62846	7.73	17717
	Manpower	cu.m	200	46.10	9220	0.00	0	46.10	9220
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.0.6m3	cu.m	0	38.15	0	28.61	0	9.54	0
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	924	100.26	92639	75.19	69475	25.07	23164
	B.H.0.6m3	cu.m	200	35.15	7030	27.42	5484	7.73	1546
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	5723	70.35	402612	52.76	301945	17.59	100667
Bottom Facing		sq.m	1134	5.70	6463	0.00	0	5.70	6463
Slope Facing		sq.m	3213	5.70	18314	0.00	0	5.70	18314
Road Surfacing		cu.m	600	72.55	43529	54.41	32645	18.14	10884
Clearing		sq.m	8560	11.00	94160	0.00	0	11.00	94160
2400PSI Concrete		cu.m	0	3810.43	0	2476.78	0	1333.65	0
Total					848059		545338		302721

Table 7.3.3b Cont'd

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
3-3. Shiphon (Lateral-A)									
1. Earth works									
Excavation	B.H.0.6m3	cu.m	1960	35.15	68893	27.42	53743	7.73	15150
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Backfill	B.H.0.6m3	cu.m	1841	38.15	70245	28.61	52679	9.54	17566
Embankment	B.H.0.6m3	cu.m	0	35.15	0	27.42	0	7.73	0
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	119	70.35	8349	52.76	6262	17.59	2087
Bottom Facing	Manpower	sq.m	637	5.70	3630	0.00	0	5.70	3630
Slope Facing	Manpower	sq.m	1535	5.70	8747	0.00	0	5.70	8747
2. Concrete Works									
3000PSI Concrete		cu.m	4	6555.16	28356	3867.54	16730	2687.62	11626
2400PSI Concrete		cu.m	13	3810.43	49154	2476.78	31950	1333.65	17204
RCP-ϕ450		m	330	997.06	329029	565.00	186450	432.06	142579
-ϕ300		m	160	697.94	111670	395.50	63280	302.44	48390
Total					678073		411094		266979

Table 7.3.3c Construction Cost for Lat-B Irrigation Canal

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
4-1. Lateral-B(Canal)									
4-2. Open channl		sets	1	2123035	2123035	1335888	1335888	787147	787147
4-3. Siphon		sets	1	403306	403306	243934	243934	159372	159372
1. Diversion	TYPE-1	sets	0	22438	0	14162	0	8276	0
	TYPE-2	sets	0	11471	0	7069	0	4402	0
	TYPE-3	sets	6	9808	58848	6048	36288	3760	22560
2. Check	TYPE-1	sets	0	40026	0	24905	0	15121	0
	TYPE-2	sets	0	35883	0	22257	0	13626	0
	TYPE-3	sets	0	29923	0	18508	0	11415	0
	TYPE-4	sets	3	20603	61809	12776	38328	7827	23481
3. Road Crossing	ϕ800	sets	0	35689	0	21746	0	13943	0
	ϕ600	sets	0	34024	0	20761	0	13263	0
	ϕ450	sets	0	21157	0	12694	0	8463	0
	ϕ300	sets	7	9583	67081	5647	39529	3936	27552
4. Drainage	ϕ1000×2	sets	0	105627	0	67023	0	38604	0
Crossing	ϕ1000	sets	0	71015	0	45299	0	25716	0
	ϕ800	sets	0	57102	0	36633	0	20469	0
	ϕ600	sets	10	44635	446350	28684	286840	15951	159510
5. Drop	TYPE-1	sets	0	45093	0	27850	0	17243	0
	TYPE-2	sets	0	12885	0	8247	0	4638	0
Total					3160429		1980807		1179622

Table 7.3.3c Cont'd

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
4-2. Open channl (Lateral-B)									
1. Earth works									
Excavation	B.D.11t	cu.m	9600	27.26	261696	21.26	204096	6.00	57600
	B.H.0.6m3	cu.m	6372	35.15	223975	27.42	174720	7.73	49255
	Manpower	cu.m	600	46.10	27660	0.00	0	46.10	27660
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.0.6m3	cu.m	0	38.15	0	28.61	0	9.54	0
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	0	100.26	0	75.19	0	25.07	0
	B.H.0.6m3	cu.m	600	35.15	21090	27.42	16452	7.73	4638
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	15972	70.35	1123629	52.76	842682	17.59	280947
Bottom Facing		sq.m	2376	5.70	13543	0.00	0	5.70	13543
Slope Facing		sq.m	6732	5.70	38372	0.00	0	5.70	38372
Road Surfacing		cu.m	1800	72.55	130590	54.41	97938	18.14	32652
Clearing		sq.m	25680	11.00	282480	0.00	0	11.00	282480
2400PSI Concrete		cu.m	0	3810.43	0	2476.78	0	1333.65	0
Total					2123035		1335888		787147

Table 7.3.3c Cont'd

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
4-3. Shiphon (Lateral-B)									
1. Earth works									
Excavation	B.H.0.6m3	cu.m	1080	35.15	37961	27.42	29613	7.73	8348
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Backfill	B.H.0.6m3	cu.m	1012	38.15	38622	28.61	28964	9.54	9658
Embankment	B.H.0.6m3	cu.m	0	35.15	0	27.42	0	7.73	0
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	68	70.35	4755	52.76	3566	17.59	1189
Bottom Facing	Manpower	sq.m	351	5.70	2000	0.00	0	5.70	2000
Slope Facing	Manpower	sq.m	846	5.70	4819	0.00	0	5.70	4819
2. Concrete Works									
3000PSI Concrete		cu.m	6	6555.16	39448	3867.54	23274	2687.62	16174
2400PSI Concrete		cu.m	7	3810.43	27434	2476.78	17832	1333.65	9602
RCP-ϕ 450		m	200	997.06	199412	565.00	113000	432.06	86412
-ϕ 300		m	70	697.94	48855	395.50	27685	302.44	21170
Total					403306		243934		159372

Table 7.3.3d Construction Cost for Lat-C Irrigation Canal

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
5-1. Lateral-C(Canal)									
5-2. Open channl		sets	1	407422	407422	267441	267441	139981	139981
5-3. Siphon		sets	0	0	0	0	0	0	0
1. Diversion	TYPE-1	sets	0	22438	0	14162	0	8276	0
	TYPE-2	sets	2	11471	22942	7069	14138	4402	8804
	TYPE-3	sets	2	9808	19616	6048	12096	3760	7520
2. Check	TYPE-1	sets	0	40026	0	24905	0	15121	0
	TYPE-2	sets	0	35883	0	22257	0	13626	0
	TYPE-3	sets	0	29923	0	18508	0	11415	0
	TYPE-4	sets	2	20603	41206	12776	25552	7827	15654
3. Road Crossing	ϕ 800	sets	0	35689	0	21746	0	13943	0
	ϕ 600	sets	0	34024	0	20761	0	13263	0
	ϕ 450	sets	0	21157	0	12694	0	8463	0
	ϕ 300	sets	3	9583	28749	5647	16941	3936	11808
4. Drainage	ϕ 1000×2	sets	0	105627	0	67023	0	38604	0
Crossing	ϕ 1000	sets	0	71015	0	45299	0	25716	0
	ϕ 800	sets	0	57102	0	36633	0	20469	0
	ϕ 600	sets	3	44635	133905	28684	86052	15951	47853
5. Drop	TYPE-1	sets	0	45093	0	27850	0	17243	0
	TYPE-2	sets	10	12885	128850	8247	82470	4638	46380
Total					782690		504690		278000

Table 7.3.3d Cont'd

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
5-2. Open channl (Lateral-C)									
1. Earth works									
Excavation	B.D.11t	cu.m	1391	27.26	37918	21.26	29572	6.00	8346
	B.H.0.6m3	cu.m	558	35.15	19613	27.42	15300	7.73	4313
	Manpower	cu.m	218	46.10	10049	0.00	0	46.10	10049
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.0.6m3	cu.m	178	38.15	6790	28.61	5092	9.54	1698
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	0	100.26	0	75.19	0	25.07	0
	B.H.0.6m3	cu.m	3149	35.15	110686	27.42	86345	7.73	24341
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	1811	70.35	127403	52.76	95548	17.59	31855
Bottom Facing		sq.m	961	5.70	5477	0.00	0	5.70	5477
Slope Facing		sq.m	3286	5.70	18730	0.00	0	5.70	18730
Road Surfacing		cu.m	654	72.55	47447	54.41	35584	18.14	11863
Clearing		sq.m	2119	11.00	23309	0.00	0	11.00	23309
2400PSI Concrete		cu.m	0	3810.43	0	2476.78	0	1333.65	0
Total					407422		267441		139981

Table 7.3.3e Construction Cost for Lat-D Irrigation Canal

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
6-1.Lateral-D(Canal)									
6-2.Open channl		sets	1	88127	88127	63008	63008	25119	25119
6-3.Siphon		sets	0	0	0	0	0	0	0
1.Diversion	TYPE-1	sets	0	22438	0	14162	0	8276	0
	TYPE-2	sets	0	11471	0	7069	0	4402	0
	TYPE-3	sets	2	9808	19616	6048	12096	3760	7520
2.Check	TYPE-1	sets	0	40026	0	24905	0	15121	0
	TYPE-2	sets	0	35883	0	22257	0	13626	0
	TYPE-3	sets	0	29923	0	18508	0	11415	0
	TYPE-4	sets	1	20603	20603	12776	12776	7827	7827
3.Road Crossing	φ800	sets	0	35689	0	21746	0	13943	0
	φ600	sets	0	34024	0	20761	0	13263	0
	φ450	sets	0	21157	0	12694	0	8463	0
	φ300	sets	1	9583	9583	5647	5647	3936	3936
4.Drainage	φ1000×2	sets	0	105627	0	67023	0	38604	0
Crossing	φ1000	sets	0	71015	0	45299	0	25716	0
	φ800	sets	0	57102	0	36633	0	20469	0
	φ600	sets	0	44635	0	28684	0	15951	0
5.Drop	TYPE-1	sets	0	45093	0	27850	0	17243	0
	TYPE-2	sets	1	12885	12885	8247	8247	4638	4638
Total					150814		101774		49040

Table 7.3.3e Cont'd

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
6-2.Open channl (Lateral-D)									
1.Earth works									
Excavation	B.D.11t	cu.m	343	27.26	9350	21.26	7292	6.00	2058
	B.H.0.6m3	cu.m	0	35.15	0	27.42	0	7.73	0
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.0.6m3	cu.m	0	38.15	0	28.61	0	9.54	0
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	0	100.26	0	75.19	0	25.07	0
	B.H.0.6m3	cu.m	1372	35.15	48225	27.42	37620	7.73	10605
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	343	70.35	24129	52.76	18096	17.59	6033
Bottom Facing		sq.m	294	5.70	1675	0.00	0	5.70	1675
Slope Facing		sq.m	833	5.70	4748	0.00	0	5.70	4748
Road Surfacing		cu.m	0	72.55	0	54.41	0	18.14	0
Clearing		sq.m	0	11.00	0	0.00	0	11.00	0
2400PSI Concrete		cu.m	0	3810.43	0	2476.78	0	1333.65	0
Total					88127		63008		25119

Table 7.3.3f Construction Cost for Lat-E Irrigation Canal

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
7-1. Lateral-E(Canal)									
7-2. Open channl		sets	1	1164020	1164020	848002	848002	316018	316018
7-3. Siphon		sets	0	0	0	0	0	0	0
1. Diversion	TYPE-1	sets	0	22438	0	14162	0	8276	0
	TYPE-2	sets	0	11471	0	7069	0	4402	0
	TYPE-3	sets	7	9808	68656	6048	42336	3760	26320
2. Check	TYPE-1	sets	0	40026	0	24905	0	15121	0
	TYPE-2	sets	0	35883	0	22257	0	13626	0
	TYPE-3	sets	1	29923	29923	18508	18508	11415	11415
	TYPE-4	sets	1	20603	20603	12776	12776	7827	7827
3. Road Crossing	ϕ 800	sets	0	35689	0	21746	0	13943	0
	ϕ 600	sets	0	34024	0	20761	0	13263	0
	ϕ 450	sets	1	21157	21157	12694	12694	8463	8463
	ϕ 300	sets	2	9583	19166	5647	11294	3936	7872
4. Drainage	ϕ 1000×2	sets	0	105627	0	67023	0	38604	0
Crossing	ϕ 1000	sets	0	71015	0	45299	0	25716	0
	ϕ 800	sets	0	57102	0	36633	0	20469	0
	ϕ 600	sets	0	44635	0	28684	0	15951	0
5. Drop	TYPE-1	sets	0	45093	0	27850	0	17243	0
	TYPE-2	sets	4	12885	51540	8247	32988	4638	18552
Total					1375065		978598		396467

Table 7.3.3f Cont'd

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
7-2. Open channl (Lateral-E)									
1. Earth works									
Excavation	B.D.11t	cu.m	7317	27.26	199461	21.26	155559	6.00	43902
	B.H.0.6m3	cu.m	2338	35.15	82179	27.42	64107	7.73	18072
	Manpower	cu.m	298	46.10	13737	0.00	0	46.10	13737
Backfill	B.D.11t	cu.m	0	38.15	0	28.61	0	9.54	0
	B.H.0.6m3	cu.m	58	38.15	2212	28.61	1659	9.54	553
	Manpower	cu.m	0	49.20	0	0.00	0	49.20	0
Embankment	B.D.11t	cu.m	0	100.26	0	75.19	0	25.07	0
	B.H.0.6m3	cu.m	2153	35.15	75677	27.42	59035	7.73	16642
	Manpower	cu.m	0	46.10	0	0.00	0	46.10	0
Spoiling		cu.m	9837	70.35	692032	52.76	519000	17.59	173032
Bottom Facing		sq.m	1349	5.70	7689	0.00	0	5.70	7689
Slope Facing		sq.m	4592	5.70	26174	0.00	0	5.70	26174
Road Surfacing		cu.m	894	72.55	64859	54.41	48642	18.14	16217
Clearing		sq.m	0	11.00	0	0.00	0	11.00	0
2400PSI Concrete		cu.m	0	3810.43	0	2476.78	0	1333.65	0
Total					1164020		848002		316018

Table 7.3.3g Direct Construction Cost for Main Drainage Canal A,B

Description		Unit	Q'ty	Total Cost		Foreign Currency		Local Currency	
				Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)	Unit Rate (Peso)	Amount (Peso)
8. Main Drainage-A, B									
8.1 Excavation	A-1	cu.m	238	35.15	8350	27.42	6514	7.73	1836
	A-2	cu.m	418	35.15	14678	27.42	11450	7.73	3228
	A-3	cu.m	230	35.15	8097	27.42	6317	7.73	1780
	B-1	cu.m	162	35.15	5694	27.42	4442	7.73	1252
	B-2	cu.m	274	35.15	9616	27.42	7502	7.73	2114
8.2 Spoiling	A-1	cu.m	238	70.35	16714	52.76	12535	17.59	4179
	A-2	cu.m	418	70.35	29377	52.76	22032	17.59	7345
	A-3	cu.m	230	70.35	16207	52.76	12155	17.59	4052
	B-1	cu.m	162	70.35	11396	52.76	8547	17.59	2849
	B-2	cu.m	274	70.35	19247	52.76	14435	17.59	4812
8.3 Slope Facing	A-1	sq.m	612	5.70	3488	0	0	5.70	3488
	A-2	sq.m	986	5.70	5620	0	0	5.70	5620
	A-3	sq.m	368	5.70	2097	0	0	5.70	2097
	B-1	sq.m	510	5.70	2906	0	0	5.70	2906
	B-2	sq.m	646	5.70	3682	0	0	5.70	3682
8.4 Bottom Facing	A-1	sq.m	180	5.70	1026	0	0	5.70	1026
	A-2	sq.m	348	5.70	1983	0	0	5.70	1983
	A-3	sq.m	160	5.70	912	0	0	5.70	912
	B-1	sq.m	90	5.70	513	0	0	5.70	513
	B-2	sq.m	228	5.70	1299	0	0	5.70	1299
Total					162902		105929		56973

Table 7.3.4 Construction Cost for Farm-to-Market Road

Description	Unit	Q'ty	Total Cost Unit Rate ('000 P)	Total Cost Amount ('000 P)	Foreign Currency Unit Rate ('000 P)	Foreign Currency Amount ('000 P)	Local Currency Unit Rate ('000 P)	Local Currency Amount ('000 P)
1. Construction Cost								
1.1 Farm to (Main Market Road 1~4)	sets	1		15776		10407		5369
1.2 Preparatory works	(3%)			526		347		179
1.3 Indirect Cost	(20%)			3260		2151		1110
Sub Total				19562		12905		6658
1.4 Farm to (Lateral Market Road 1~19)	sets	1		30927		20204		10723
1.5 Preparatory works	(3%)			1031		674		357
1.6 Indirect Cost	(20%)			6391		4175		2216
Sub Total				38349		25053		13297
Total				57911		37958		19955

Table 7.3.4a Direct Construction Cost for Main Farm-to-Market Road

Description		Unit	Q'ty	Total Cost Unit Rate (Peso)	Total Cost Amount (Peso)	Foreign Currency Unit Rate (Peso)	Foreign Currency Amount (Peso)	Local Currency Unit Rate (Peso)	Local Currency Amount (Peso)
2. Farm to Market Road (Main)									
2.1 Earth works									
Excavation	B.D.11t	cu.m	51920	27.26	1415339	21.26	1103819	6.00	311520
	Manpower	cu.m	6245	46.10	287894	0.00	0	46.10	287894
Embankment	B.D.11t	cu.m	18172	100.26	1821924	75.19	1366352	25.07	455572
Bottom Facing		sq.m	94400	5.70	538080	0.00	0	5.70	538080
Slope Facing		sq.m	25488	5.70	145281	0.00	0	5.70	145281
2.2 Road Surfacing									
Enbankment	(shoulder)	cu.m	4720	49.20	232224	0.00	0	49.20	232224
Quarying, Loading Spreading, Watering		cu.m	18880	72.55	1369743	54.41	1027260	18.14	342483
2.3 Drainage									
Side Dich	300B*300H	cu.m	3816	2321.77	8859873	1625.24	6201915	696.53	2657958
Road Crossing	φ1000×2	sets	2	105627	211254	67023	134046	38604	77208
	φ1000	sets	3	71015	213045	45299	135897	25716	77148
	φ800	sets	1	57102	57102	36633	36633	20469	20469
	φ600	sets	14	44635	624890	28684	401576	15951	223314
Total					15776649		10407498		5369151

Table 7.3.5 Construction Cost for Social Infrastructures

Description	Total Cost ('000 peso) Total	F/C	L/C	Remarks
1. Direct Construction Cost				
1.1 Village Water Supply	10,182	7,020	3,162	8 Blocks
Sub-total	10,182	7,020	3,162	
2. Indirect Cost (OCM & Profit.)	2,036	1,404	632	20 % of 1.
Total (1. to 2.)	12,218	8,424	3,794	

Table 7.3.5a Direct Construction Cost of Village Water Supply

Description	Unit	Quan-t'y	Total Cost Rate (peso)	Total Cost Amount ('000 P)	Foregin Cost Rate (peso)	Foregin Cost Amount ('000 P)	Local Cost Rate (peso)	Local Cost Amount ('000 P)	Remarks
1. Deep Well Works									
Mobilaization & Demobilization	LS			130.0		78.0		52.0	
Hole to hole set up	Tim-	4	165000	660.0	82500	330.0	82500	330.0	
Drilling/Casing Inst.	m	350	3250	1,137.5	2925	1,023.8	325	113.7	
Electric Line	km	1.5	223766	335.6	223766	335.6	0	0.0	
Sub-merged Pump 32 mm	set	5	103250	516.3	103250	516.3	0	0.0	
Casing VU 100mm	m	350	492	172.2	492	172.2	0	0.0	
Total				2,951.6		2,455.9		495.7	
2.Pipe Line Work									
2.1. Feedr Canal L=0.21 km									
Cut	m3	244	73.75	18.0	22.1	5.4	51.65	12.6	
Sandbed	m3	11	673	7.4	201.9	2.2	471.1	5.2	
Backfill									
Manual	m3	117	49.2	5.8	4.9	0.6	44.3	5.2	
Machine	m3	116	38.15	4.4	26.7	3.1	11.45	1.3	
Pipe									
SPGW 40 mm	m	210	628	131.9	565.2	118.7	62.8	13.2	
Jointing	LS	(10%)		13.2		11.9		1.3	of pipe
Sub-Total				180.7		141.9		38.8	
Appurt. Struts.	LS	(30%)		54.2		42.6		11.6	of 2.1
Total				234.9		184.5		50.4	
2.2. Distribution Line L=3.75 km									
Cut	m3	3,567	73.75	263.1	22.1	78.8	51.65	184.3	
Sandbed	m3	188	673	126.5	201.9	38.0	471.1	88.5	
Backfill									
Manual	m3	1,690	49.2	83.1	4.9	8.3	44.3	74.8	
Machine	m3	1,689	38.15	64.4	26.7	45.1	11.45	19.3	
Pipe									
VU 150mm	m	0	1130	0.0		0.0		0.0	
VU 125mm	m	0	783	0.0		0.0		0.0	
VU 100mm	m	20	485	9.7	460.8	9.2	24.2	0.5	
VU 75mm	m	310	323	100.1	306.9	95.1	16.1	5.0	
VU 50mm	m	738	159	117.3	151.1	111.5	7.9	5.8	
VU 40mm	m	1162	125	145.3	118.8	138.0	6.2	7.3	
VW 25mm	m	1520	156	237.1	148.2	225.3	7.8	11.8	
Jointing	LS	(10%)		61.0		57.9		3.1	of pipe
Sub-Total				1,207.6		807.2		400.4	
C. Faucet	pls	59							
Concrete (RFC)	m3	4.307	5844.4	25.2	1753.3	7.6	4091.1	17.6	
Valve dia 25 mm	pcs	118	2520	297.4	2394	282.5	126	14.9	
SGP 25 mm	m	220	156	34.3	148.2	32.6	7.8	1.7	
Sub-Total				356.9		322.7		34.2	
Appurt. Struts.	LS	(30%)		362.3		242.2		120.1	of pipe
Total				1,926.8		1,372.1		554.7	
Elevated Tank Works	plc	5	250000	1,250.0	75000	375.0	175000	875.0	
G.Total per 5 Blocks				6,363.3		4,387.5		1,975.8	
Per Block				1,272.7		877.5		395.2	
Cost for 8 Blocks				10,181.6		7,020.0		3,161.6	

Table 7.3.6 Construction Costs for Post harvest Facilities

Description	Unit	Quantities	Total Cost		Foreign Currency		Local Currency		Remarks
			Unit Rate (Peso)	Amount ('000 P)	Unit Rate (Peso)	Amount ('000 P)	Unit Rate (Peso)	Amount ('000 P)	
1. Warehouse	house	1	1578500	1578.5	315700	315.7	1262800	1262.8	25×14 m
2. Motor Pool	house	1	1578500	1578.5	315700	315.7	1262800	1262.8	25×14 m
3. Solar Dryer	yard	1	350000	350.0	70000	70.0	280000	280.0	20×30 m
4. Rice Thresher	unit	2	182000	364.0	163800	327.6	18200	36.4	1 t/hr
5. Rice Mill Unit	unit	1	3900000	3900.0	3510000	3510.0	390000	390.0	0.5 t/hr
6. Mechanical Dryer	unit	1	481000	481.0	432900	432.9	48100	48.1	2.4 t
7. Transportation Vehicle	unit	3	1040000	3120.0	936000	2808.0	104000	312.0	4 t
8. Portable Conveyer	unit	1	169000	169.0	152100	152.1	16900	16.9	Engine
9. Hand Tractor	unit	3	176800	530.4	159120	477.4	17680	53.0	6 ps air
10. Trailer	unit	3	70200	210.6	63180	189.5	7020	21.1	0.5 t
11. Miscellaneous	LS	15	%1.~10.	1842.3		1289.8		552.5	
Total (1. to 11.)				14124.3		9888.7		4235.6	
12. Indirect Cost(OCM & Profit.)	LS	20	%1.~11.	2824.9		1977.7		847.1	
Total (1. to 12.)				16949.2		11866.5		5082.7	

CHAPTER 8. PROJECT JUSTIFICATION

Table 8.1 Financial and Economic Farmgate Prices

	Financial	Economic
1. Seeds and Nursery		
Paddy	8.5/kg	8.5/kg
Maize	8.0	8.0
Watermelon	1250	1250
Squash	1200	1200
Mung Beans	30	30
Groundnut	40	40
Eggplant	4000	4000
Gabi	10	10
Tomato	4000	4000
Mango	25/piece	25/piece
Cashewnut	5/piece	5/piece
2. Crops		
Paddy	5.58/kg	5.49
Maize	4.95	3.79
Watermelon	8.21	8.21
Squash	3.57	3.57
Mung Beans	21.58	21.58
Groundnut	13.80	13.80
Eggplant	8.56	8.56
Gabi	7.64	7.64
Tomato	9.20	9.20
Mango	19.24	19.24
Cashewnut (unshelled)	22.55	25.50
3. Fertilizers and Agricultural Chemicals		
N	14.10/kg	14.92
P	14.80/kg	17.28
K	8.10/kg	8.71
Azodrin	315.00/lit	272.48
Lannate	280.00/lit	242.20
Thiodan	270.00/lit	233.55
Machete	330.00/lit	285.45
2-4D	180.00/lit	155.70
4. Labor		
Hired labor	75/man.day	45/man.day
Animal	120/day	72/day

Table 8.2 Price Structure of Paddy

	Unit	Economic Price
IBRD projection price in 2005 in 1990 constant price (5% broken white rice, FOB Bangkok)	US$/ton	267
Converted to 1994 constant price(x 1.0603) 1/	US$/ton	283
Export price, Thai 25-35% broken FOB, Bangkok 2/	US$/ton	226
Ocearn freight & insurance to Philippine port	US$/ton	20
Import price, CIF at Philippine port	US$/ton	246
Converted to Philippine pesos(1US$=32.4pesos) 3/	Pesos/ton	7970
Plus:Port handling charge 4/	Pesos/ton	115
Avergae cost of transport to selling center 5/	Pesos/ton	246
Less:Average cost of transportation, mill to selling center 6/	Pesos/ton	233
Rice price ex-mill, project area	Pesos/ton	8098
Paddy equivalent price(65% milling recovery)	Pesos/ton	5264
Less:Average cost of transportation, farm to mill	Pesos/ton	77
Milling cost 7/	Pesos/ton	262
Add:Value of by-product	Pesos/ton	560
Farmgate paddy price	Pesos/ton	5485

Note. 1/IBRD international price index
2/Derived by taking 20% discount from the price of 5% broken FOB, bangkok
3/Assuming a shadow exchange rate 32.4 pesos/US$ from the financial rate of 27.0 pesos/US$
4/0.82 of standard conversion factor was applied to the financial cost of 140 pesos/ton
5/0.777 of conversion factor for transportation was applied to the financial cost of 316 pesos/ton
6/0.777 of conversion factor was applied to 300 pesos/ton of the financial cost
7/0.82 of standard conversion factor was applied to 320 pesos/ton for miliing

Table 8.3 Price Structure of Corn

	Unit	Economic Price
Export Price, US No.2 Yellow FOB, Gulf 1/	US$/ton	90
Converted to 1994 constant price(x 1.0603) 2/	US$/ton	92
Ocean Freight and Insurance to Philippine Port	US$/ton	25
Import Price CIF, Philippine Port	US$/ton	117
Converted to Philippine pesos(1US$=32.4 pesos) 3/	Pesos/ton	3791
Plus:Port handling Charge 4/	Pesos/ton	123
Transportation Cost to selling center 5/	Pesos/ton	246
Cost of Transportation mill to Selling Center 6/	Pesos/ton	124
Milling and Packaging Cost 7/	Pesos/ton	164
Handling and Transport Cost Farm to Mill 8/	Pesos/ton	82
Farmgate Price	Pesos/ton	3790

Note. 1/IBRD projection price in 2005 in 1990 constant price
2/IBRD international price index
3/Assuming a shadow exchange rate 32.4 pesos/US$ from the financial rate of 27.0 pesos/US$
4/0.82 of SCF was applied to 150 pesos of the financial price
5/0.777 of conversion factor for transportation was applied to the financial cost of 316 pesos per ton
6/0.777 was applied to the financial price of 160 pesos
7/0.82 of SCF was applied to 200 pesos of financial cost
8/SCF of 0.82 was applied to the financial cost

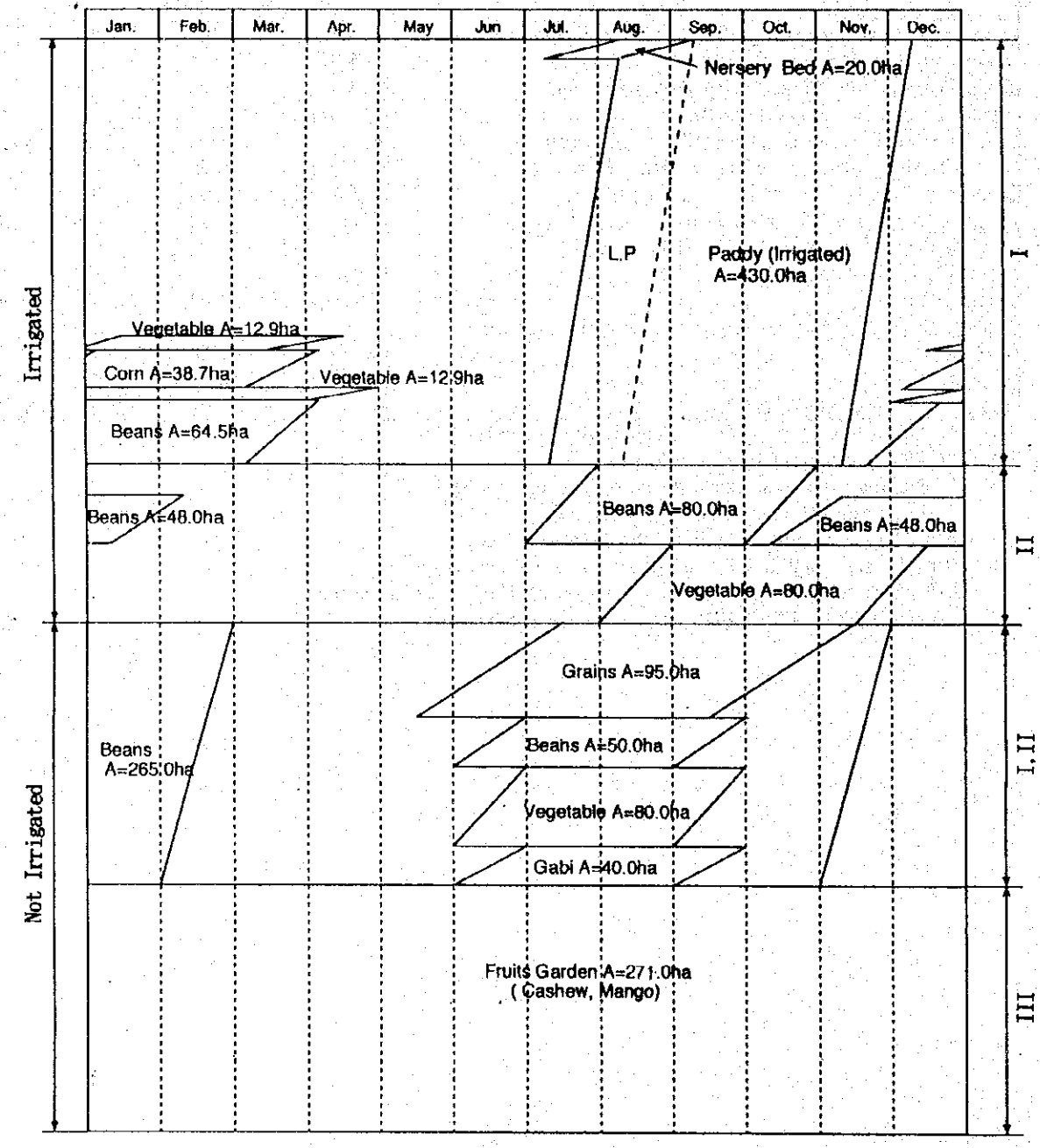
Table 8.4 Price Structure of Fertilizer

	Unit	Urea	TSP	M. of Potash
IBRD projection price in 2005 in 1990 constant price 1/	US$/ton	140	129	103
Converted to 1994 constant price(x 1.0603) 2/	US$/ton	148	137	109
Ocean Freight and Insurance to Philippine Port	US$/ton	25	66	25
Import Price CIF, Philippine Port	US$/ton	173	203	134
Converted to Philippine pesos(1US$=32.4 pesos) 3/	Pesos/ton	5605	6577	4341
Port handling, storage and processing charge 4/	Pesos/ton	250	283	148
Importers Cost	Pesos/ton	655	735	385
Transportation Cost from Manila Port to Palawan 5/	Pesos/ton	78	78	78
Average Cost of Transportation and Handling at Distribution Center 6/	Pesos/ton	98	98	98
Dealers Margin	Pesos/ton	100	100	100
Average Cost of Transportation from Distribution Center to Farm 5/	Pesos/ton	78	78	78
Farmgate Price	Pesos/ton	6864	7949	5228
Farmgate Price in Nutrient 7/	Pesos/kg	14.92	17.28	8.71

Note. 1/IBRD projection price in 2005 in 1990 constant price
2/IBRD international price index
3/Assuming a shadow exchange rate 32.4 pesos/US$ from the financial rate of 27.0 pesos/US$
4/0.82 of SCF was applied to the financial cost
5/0.777 was applied to 100 pesos of the financial cost
6/0.82 of SCF was applied to 120 pesos of the financial price
7/Urea(N=46%), TSP(P=46%), M. of Potash(K=60%)

Figure 8.1 Proposed Cropping Pattern

(130% cropping intensity)



Note. I:slope 0-3%
II:slope 3-8%
III:slope 8-15%
Areas in the figure are in gross.

Table 8.5 Incremental Benefits

		Wet Season (irrigated)			Wet Season (unirrigated)					
		Irrigated Paddy	Eggplant	Mung Beans	Rainfed Paddy	Upland Paddy	Maize	Mung Beans	Squash	Gabi
Without Project										
	Yield (ton/ha)	-	-	-	1.70	0.40	1.35	0.44	-	-
	Price (P/ton)	-	-	-	5485	5485	3790	21580	-	-
	GPV (P/ha)	-	-	-	9325	2194	5117	9495	-	-
	Production Cost (P/ha)	-	-	-	5010	1867	3717	5919	-	-
	NPV (P/ha)	-	-	-	4315	327	1400	3576	-	-
	Planted Area (ha)	-	-	-	48.2	74.8	281.0	15.0	-	-
	Total NPV (P1,000)	-	-	-	208	24	393	54	-	-
With Project										
	Yield (ton/ha)	4.00	10.00	1.00	-	-	2.00	0.75	19.00	3.50
	Price (P/ton)	5485	8560	21580	-	-	3790	21580	3570	7640
	GPV (P/ha)	21940	85600	21580	-	-	7580	16185	67830	26740
	Production Cost (P/ha)	10778	19941	12031	-	-	4585	8935	22817	8828
	NPV (P/ha)	11162	65659	9549	-	-	2995	7250	45013	17912
	Planted Area (ha)	387	72	115	-	-	86	45	72	36
	Total NPV (P1,000)	4320	4727	1098	-	-	258	326	3241	645
Incremental Benefit (P1,000)		4320	4727	1098	-208	-24	-136	273	3241	645

		Dry Season (irrigated)				Dry Season (unirrigated)	Total
		Maize	Mung Beans	Watermelon	Tomato	Mung Beans	
Without Project							
	Yield (ton/ha)	-	-	-	-	-	
	Price (P/ton)	-	-	-	-	-	
	GPV (P/ha)	-	-	-	-	-	
	Production Cost (P/ha)	-	-	-	-	-	
	NPV (P/ha)	-	-	-	-	-	
	Planted Area (ha)	-	-	-	-	-	
	Total NPV (P1,000)	-	-	-	-	-	679
With Project							
	Yield (ton/ha)	2.1	1.00	25.00	10.00	0.90	
	Price (P/ton)	3790	21580	8210	9200	21580	
	GPV (P/ha)	7959	21580	205250	92000	19422	
	Production Cost (P/ha)	5515	11567	28015	19733	8935	
	NPV (P/ha)	2444	10013	177235	72267	10487	
	Planted Area (ha)	35	58	12	12	238	
	Total NPV (P1,000)	86	581	2127	867	2496	20771
Incremental Benefit (P1,000)		86	581	2127	867	2496	20092

Table 8.6 Cost and Return for Cashew Nut with Annual Crops

Cashew+Annual With Project

	Unit	Unit Price (Pesos)	1st year Quant-ity	1st year Value (Pesos)	2nd year Quant-ity	2nd year Value (Pesos)	3rd year Quant-ity	3rd year Value (Pesos)	4th year Quant-ity	4th year Value (Pesos)	5th year Quant-ity	5th year Value (Pesos)
1. Production Cost												
a. Labor Cost												
Land clearing	MD	45	10	450	0	0	0	0	0	0	0	0
Plowing	MAD	72	15	1080	12	864	12	864	8	576	0	0
Harrowing	MAD	72	8	576	6	432	6	432	4	288	0	0
Planting												
Annual	MD	45	6	270	6	270	6	270	4	180	0	0
Cashew nut	MD	45	6	270	0	0	0	0	0	0	0	0
Cultivation	MD	45	6	270	4	180	4	180	4	180	0	0
Fertilizing	MD	45	7	315	6	270	6	270	5	225	2	90
Spraying x4	MD	45	4	180	5	225	6	270	6	270	4	180
Harvesting/hauling	MD	45	8	360	8	360	8	360	6	270	5	225
Sub-total				3771		2601		2646		1989		495
b. Inputs												
Seeds												
Annual	kg	30	13	390	13	390	13	390	13	390	13	390
Cashew nursery	piece	5	150	750	0	0	0	0	0	0	0	0
Fertilizer												
N	kg	14.92	58	865	58	865	50	746	50	746	28	418
P	kg	17.28	35	605	35	605	28	484	28	484	28	484
K	kg	8.71	35	305	35	305	28	244	28	244	28	244
Insecticides												
Brodan	lit	323.51	1	324	2	647	1	324	2	647	2	647
Hopcin	lit	233.55	2	467	1	234	2	467	2	467	2	467
Sevin 85S	kg	160.03	1	160	1	160	2	320	1	160	1	160
Sub-total				3866		3206		2974		3138		2810
Miscellaneous(30% of total)				3273		2489		2409		2197		1416
Total Cost				10910		8295		8029		7324		4721
2. Gross Income												
Mungbeans	kg	21.58	600	12948	650	14027	700	15106	750	16185	750	16185
Cashew nut	kg	25.50	0	0	0	0	0	0	140	3570	280	7140
Total				12948		14027		15106		19755		23325
3. Net Profit	Peso			2038		5732		7077		12431		18604
				7637		5807		5620		5127		3305
Area(ha) 170ha	pesos			346545		974413		1203068		2113253		3162697

mungbean
Wet 7250 pesos/ha *170ha = 1232500 peso

Year	Yield (kg/ha)	G. Income (25.50/kg)	Net Income (peso)	Cashew Area(170ha) (million)	Mungbean (170ha) (million)	Total (million)
6t	555	14153	5253	0.9	1.23	2.12
7	970	24735	14024	2.4	1.23	3.61
8	1380	35190	23129	3.9	1.23	5.16
9	1800	45900	32220	5.5	1.23	6.71
10	2220	56610	41621	7.1	1.23	8.31
11	2630	67065	50017	8.5	0	8.50
12	3050	77775	58558	10.0	0	9.95
13	3600	91800	69940	11.9	0	11.89
14	4020	102510	78291	13.3	0	13.31
15	4430	112965	86297	14.7	0	14.67
16	4990	127245	97525	16.6	0	16.58
17	5540	141270	108467	18.4	0	18.44
18	5960	151980	116298	19.8	0	19.77
19	6370	162435	123734	21.0	0	21.03
20	6930	176715	134272	22.8	0	22.83

Table 8.7 Cost and Return of Mangoes and Pineapples

Mango+Pineapple With Project

	Unit	Unit Price (Pesos)	1st year Quant-ity	1st year Value (Pesos)	2nd year Quant-ity	2nd year Value (Pesos)	3rd year Quant-ity	3rd year Value (Pesos)	4th year Quant-ity	4th year Value (Pesos)	5th year Quant-ity	5th year Value (Pesos)
A. Production Cost												
a. Labor Cost												
Tractor plowing	time	1725	2.0	3450	1.5	2588	1.5	2588	1.5	2588	1.5	2588
Tractor harrowing	time	1380	2.0	2760	1.5	2070	1.5	2070	1.5	2070	1.5	2070
Planting/layouting												
Mango	m.d	45	2	90								
Pineapple	m.d	45	20	900	20	900	20	900	20	900	20	900
Fertilizing												
Basal	m.d	45	10	450	8	360	8	360	8	360	8	360
Second	m.d	45	6	270	6	270	6	270	6	270	6	270
Third	m.d	45	6	270	6	270	6	270	6	270	6	270
Forth	m.d	45	8	360	8	360	8	360	8	360	8	360
Spraying x12	m.d	45	30	1350	30	1350	34	1530	36	1620	38	1710
Weeding	m.d	45	10	450	10	450	10	450	10	450	10	450
Harrowing	m.d	45	0	0	10	450	20	900	20	900	20	900
Sub-total				10350		9068		9698		9788		9878
b. Inputs												
Nursery												
Mango	piece	25	100	2500								
Pineapple slips	piece	3	8000	24000								
Fertilizer												
N	kg	14.92	70	1044	84	1253	112	1671	140	2089	168	2507
P	kg	17.28	70	1210	84	1452	112	1935	140	2419	168	2903
K	kg	8.71	70	610	84	732	112	976	140	1219	168	1463
Insecticides												
Brodan	lit	323.51	6	1941	6	1941	6	1941	8	2588	8	2588
Hopcin	lit	233.55	6	1401	6	1401	6	1401	8	1868	8	1868
Sub-total				32706		6779		7924		10184		11329
Miscellaneous(30% of total)				13082		2712		3170		4074		4532
Total Cost				43608		9038		10566		13579		15106
B. Gross Income												
Mango	kg	19.24	0	0	0	0	0	0	300	5772	900	17316
Pineapple												
60% class A	piece	15	0	0	3840	57600	3840	57600	3840	57600	3840	57600
25% class B	piece	10	0	0	1600	16000	1600	16000	1600	16000	1600	16000
15% class C	piece	5	0	0	960	4800	960	4800	960	4800	960	4800
Total				0		78400		78400		84172		95716
C. Net Profit	Peso			-43608		69362		67834		70593		80610
				32706		6779		7924		10184		11329
Area 73.9ha	pesos			-3222637		5125822		5012954		5216859		5957093

Table 8.8 Other Benefits

1. Livestock

a) Pig Raising-bred by 400 farm households

Breeding female-2 heads per husehold

Piglets production:

2 headsx10 pigletsx2x0.8=32 piglets — 24 piglets for selling; 8 piglets for fattening

Outputs:

Selling:24 pigletsx 690 pesosx0.82=13,579 pesos

Fattening:8 headsx90 kg/headx31 pesosx0.82=18,302 pesos

Selling:2 femalex100kgx31 pesos/kgx0.82/5 years=1,017 pesos

Total 32,898x460 H.H=15,133,080pesos

Inputs:

Breeding male:2 headsx3,500 pesosx0.82/5 years=1,148 pesos

Feeds:

Breeding male:2 headsx365 daysx3.5 kg/dayx2.5 pesos/kgx0.82x0.3=1,571

Raising:24 headsx50daysx0.7kg/dayx2.5 pesos/kg x0.82x0.3=516 pesos

Fattening:8 headsx350kgx2.5 pesos/kgx0.82x0.3=1,722 pesos

Labor:

0.5 hrsx365 daysx5.6 pesos/hr=1,022 pesos

Total 5,979x460H.H=2,750,340 pesos

Benefit:15,133,080-2,750,340=12,382740 pesos

b) Carabao Raising-breeding 720 head by 480 farm households

Outputs:

Milk:940kg/headx30 pesos/kgx0.82=23,124 pesos

Selling:450kg/headx43 pesos/kgx0.82/5 years=3,173 pesos

Total 26,297x720 head=18,933,840 pes

Inputs:

Cow & calf:((10,000 pesos/headx1)+(3,000 pesos/headx1)x0.82/6 years=1,776 pe

Feeds:2 kg/headx365daysx2.5 pesos/kgx0.82=1,497 pesos

20 kg/headx365daysx0.5 pesos/kgx0.82=2,993 pesos

Labor:0.5 hrsx365 daysx5.6 pesos/hr=1,022 pesos

Total 7,288 pesosx720 head=5,247,360

Benefit:18,933,840-5,247,360=13,686,480 pesos

c) Cattle

Output:500kg/headx65 pesos/kg x0.82=26,650 pesos

26,650x190 H.H=5,063,500 pesos

Input:

Young cattle;5,000 pesos/headx0.82=4,100 pesos

Feed:300daysx20kgx0.5=3,000 pesos

Labor:0.5x365daysx5.6 pesos/hr=1,022 pesos

Total 8,122x190 H.H=1,543,180 pesos

Benefit:5,063,500-1,543,180=3,520,320 pesos

Table 8.8 Cont'd

2) Farm Road
Saving Costs for transportation
without project
5,800 ton paddy /50kgx5.0 pesosx0.777=450,660 pesos

with project
5,800 ton paddy /50kgx0.08 pesosx0.777=7,210 pesos

Benefit:450,660-7,210=443,450 pesos

3) Village Water Supply
Saving Costs for transportation
without project
36 hrs/month/H.Hx13.8 pesos/hrx332 H.Hx12 months=1,979,251 pesos

with project
7 hrs/month/H.Hx13.8 pesos/hrx332 H.Hx12 months=384,854 pesos

Benefit:1,979,251-384,854=1,594,397 pesos

4) Improvement of Paddy Quality
with project
112 tons of paddyx4500xx0.82x1.20=495,936pesos

5) Tilapia
Output:80,000 m2x0.3 kg/m2=24 ton
24 tx60 pesos/kgx0.82=1,180,800 pesos

Input:
Yearlings:80,000 x0.2 pesos=16,000 pesos
Feed;2.5 pesos/kgx0.82x8,000kg=16,400 pesos
Labor;0.5hrx5.6 pesos/hrx365days=1,022 pesos

Benefit:1,180,800-33,422=1,148,400 pesos

Table 8.9 Project Costs

(Unit:1000 pesos)

Description	Financial			Economic		
	F/C	L/C	Total	F/C	L/C	Total
1.Construction Cost						
1.1 Water Resources	131,476	71,804	203,280	131,476	58,879	190,355
1.2 Irrigation & Drainange Facilities	24,301	12,622	36,923	24,301	10,350	34,651
1.3 farm to market Roads	12,905	6,657	19,562	12,905	5,459	18,364
1.4 Social Infrastructure	8,424	3,794	12,218	8,424	3,111	11,535
1.5 Post Harvest Facilities	11,866	5,083	16,949	11,866	4,168	16,034
Sub-Total	188,972	99,960	288,932	188,972	81,967	270,939
2.Association Cost						
2.1 Pre-engineering Cost	8,668	5,779	14,447	8,668	4,739	13,407
2.2.Administration Cost	11,557	17,336	28,893	11,557	14,216	25,773
2.3 Consulting Services Cost	17,336	11,557	28,893	17,336	9,477	26,813
Sub-Total	37,561	34,672	72,233	37,561	28,431	65,992
Total	226,533	134,632	361,165	226,533	110,398	336,931
3.Physical Contingency	15,857	9,424	25,282	15,857	7,728	23,585
4.Price Contingency	7,272	21,608	28,880	0	0	0
Grand Total	249,662	165,664	415,327	242,390	118,126	360,516

Table 8.10 O&M Costs

(unit:1,000 pesos)

		Year 1		Year 2		Year 3		Year 4~	
		Financial (pesos)	Economic (pesos)	Financial (pesos)	Economic (pesos)	Financial (pesos)	Economic (pesos)	Financial (pesos)	Economic (pesos)
DAR									
	Project management office								
	Wages	330.0	198.0	330.0	198.0	330.0	198.0		
	Tev. fuel & oil	200.0	160.4	200.0	160.4	200.0	160.4		
	Sundries	120.0	98.4	120.0	98.4	120.0	98.4		
	Institutional development								
	Contractual services	1800.0	1476.0	1500.0	1230.0	1000.0	820.0		
	Sundries	120.0	98.4	80.0	65.6	50.0	41.0		
	On-gfarm facilities		0.0	500.0	432.5	5800.0	5017.0		
	Sub-total	2570.0	2031.2	2730.0	2184.9	7500.0	6334.8	880.0	721.6
WUA	Allowance								
	President							6.0	3.6
	Vice-president							3.6	2.2
	Secretary							3.6	2.2
	Treasurer							3.6	2.2
	Bookkeeper							3.6	2.2
	Salary/wages								
	System operator							20.4	12.2
	Meter reader/collector							6.0	3.6
	Electricity							142.6	114.3
	Others							56.8	46.6
	Sub-total							246.2	189.6
IA	Allowance								
	President							3.0	1.8
	Vice-president							2.4	1.4
	Secretary							1.8	1.1
	Treasurer							1.8	1.1
	Operations manager							1.8	1.1
	Sector leader							1.8	1.1
	Bookkeeper							1.8	1.1
	Collector							2.4	1.4
	Salary/wages								
	Water tender							37.1	22.3
	Gate keeper							58.5	35.1
	Ditch tender							54.5	32.7
	Temporary labor							2.8	1.7
	Repair& others							50.9	44.0
	Supplies & materials							17.0	14.7
	Sub-total							237.5	160.5
Cooperative									
	Salary/wages								
	Management personnel							46.2	27.7
	Labor force							141.0	84.6
	Office supplies							1.2	1.0
	Light & water							95.9	76.9
	Repair & maintenance							103.5	89.6
	Diesel, oil & lubricant							39.4	31.6
	Miscellaneous							21.4	17.5
	Sub-total							448.6	329.0
LGU								394.0	323.1
Total		2570.0	2031.2	2730.0	2184.9	7500.0	6334.8	2206.3	1723.1

Table 8.11 Economic Internal Rate of Return (EIRR)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	Case - 1 NPV Int. = 0.15 Cost	Case - 1 NPV Int. = 0.15 Benefit	Case - 2 NPV Int. = 0.17 Cost	Case - 2 NPV Int. = 0.17 Benefit	Case - 3 NPV Int. = 0.20 Cost	Case - 3 NPV Int. = 0.20 Benefit
1	360.52	2.03	362.55	32.00	-330.55	362.6	32.0	362.6	32.0	362.6	32.0
2	0	2.18	2.18	48.50	46.32	1.6	36.7	1.6	35.4	1.5	33.7
3	0	6.33	6.33	50.70	44.37	4.2	33.3	4.0	31.7	3.7	29.3
4	0	1.72	1.72	53.70	51.98	1.0	30.7	0.9	28.7	0.8	25.9
5	0	1.72	1.72	56.40	54.68	0.9	28.0	0.8	25.7	0.7	22.7
6	0	1.72	1.72	55.80	54.08	0.7	24.1	0.7	21.8	0.6	18.7
7	0	1.72	1.72	58.80	57.08	0.6	22.1	0.6	19.6	0.5	16.4
8	0	1.72	1.72	60.90	59.18	0.6	19.9	0.5	17.3	0.4	14.2
9	0	1.72	1.72	63.20	61.48	0.5	18.0	0.4	15.4	0.3	12.2
10	0	1.72	1.72	67.60	65.88	0.4	16.7	0.4	14.1	0.3	10.9
11	0	1.72	1.72	67.80	66.08	0.4	14.6	0.3	12.1	0.2	9.1
12	0	1.72	1.72	69.20	67.48	0.3	12.9	0.3	10.5	0.2	7.8
13	0	1.72	1.72	71.20	69.48	0.3	11.6	0.2	9.2	0.2	6.7
14	0	1.72	1.72	72.60	70.88	0.2	10.3	0.2	8.1	0.1	5.7
15	0	1.72	1.72	74.00	72.28	0.2	9.1	0.2	7.0	0.1	4.8
16	0	1.72	1.72	75.90	74.18	0.2	8.1	0.1	6.2	0.1	4.1
17	0	1.72	1.72	77.70	75.98	0.2	7.2	0.1	5.4	0.1	3.5
18	0	1.72	1.72	79.10	77.38	0.1	6.4	0.1	4.7	0.1	3.0
19	0	1.72	1.72	80.30	78.58	0.1	5.6	0.1	4.1	0.1	2.5
20	0	1.72	1.72	82.10	80.38	0.1	5.0	0.1	3.6	0.0	2.1
21	0	1.72	1.72	82.10	80.38	0.1	4.4	0.1	3.0	0.0	1.8
22	0	1.72	1.72	82.10	80.38	0.1	3.8	0.1	2.6	0.0	1.5
23	0	1.72	1.72	82.10	80.38	0.1	3.3	0.0	2.2	0.0	1.2
24	0	1.72	1.72	82.10	80.38	0.1	2.9	0.0	1.9	0.0	1.0
25	0.83	1.72	2.55	82.10	79.55	0.1	2.5	0.1	1.6	0.0	0.9
26	0	1.72	1.72	82.10	80.38	0.0	2.2	0.0	1.4	0.0	0.7
27	0	1.72	1.72	82.10	80.38	0.0	1.9	0.0	1.2	0.0	0.6
28	0	1.72	1.72	82.10	80.38	0.0	1.6	0.0	1.0	0.0	0.5
29	0	1.72	1.72	82.10	80.38	0.0	1.4	0.0	0.9	0.0	0.4
30	0	1.72	1.72	82.10	80.38	0.0	1.2	0.0	0.7	0.0	0.3
31	0	1.72	1.72	82.10	80.38	0.0	1.1	0.0	0.6	0.0	0.3
32	0	1.72	1.72	82.10	80.38	0.0	0.9	0.0	0.5	0.0	0.2
33	0	1.72	1.72	82.10	80.38	0.0	0.8	0.0	0.5	0.0	0.2
34	0	1.72	1.72	82.10	80.38	0.0	0.7	0.0	0.4	0.0	0.2
35	0	1.72	1.72	82.10	80.38	0.0	0.6	0.0	0.3	0.0	0.1
36	0	1.72	1.72	82.10	80.38	0.0	0.5	0.0	0.3	0.0	0.1
37	0	1.72	1.72	82.10	80.38	0.0	0.5	0.0	0.2	0.0	0.1
38	0	1.72	1.72	82.10	80.38	0.0	0.4	0.0	0.2	0.0	0.1
39	0	1.72	1.72	82.10	80.38	0.0	0.4	0.0	0.2	0.0	0.1
40	0	1.72	1.72	82.10	80.38	0.0	0.3	0.0	0.2	0.0	0.1
41	0	1.72	1.72	82.10	80.38	0.0	0.3	0.0	0.1	0.0	0.0
42	0	1.72	1.72	82.10	80.38	0.0	0.2	0.0	0.1	0.0	0.0
43	0	1.72	1.72	82.10	80.38	0.0	0.2	0.0	0.1	0.0	0.0
44	0	1.72	1.72	82.10	80.38	0.0	0.2	0.0	0.1	0.0	0.0
45	0	1.72	1.72	82.10	80.38	0.0	0.2	0.0	0.1	0.0	0.0
46	0	1.72	1.72	82.10	80.38	0.0	0.1	0.0	0.1	0.0	0.0
47	0	1.72	1.72	82.10	80.38	0.0	0.1	0.0	0.1	0.0	0.0
48	0	1.72	1.72	82.10	80.38	0.0	0.1	0.0	0.0	0.0	0.0
49	0	1.72	1.72	82.10	80.38	0.0	0.1	0.0	0.0	0.0	0.0
50	0	1.72	1.72	82.10	80.38	0.0	0.1	0.0	0.0	0.0	0.0
Total	361.4					375.9	385.3	374.4	333.1	372.7	275.9

EIRR = 17.3

B/C Ratio at 15% 1.03

Table 8.12 Sensitivity Analysis (10% Increase of Project Cost)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	396.57	2.23	398.8	32.00	-366.8	398.8	32.0	398.8	32.0	398.8	32.0
2	0	2.39	2.39	48.50	46.11	1.8	36.7	1.7	35.4	1.7	33.7
3	0	6.96	6.96	50.70	43.74	4.6	33.3	4.3	31.7	4.0	29.3
4	0	1.89	1.89	53.70	51.81	1.1	30.7	1.0	28.7	0.9	25.9
5	0	1.89	1.89	56.40	54.51	0.9	28.0	0.9	25.7	0.8	22.7
6	0	1.89	1.89	55.80	53.91	0.8	24.1	0.7	21.8	0.6	18.7
7	0	1.89	1.89	58.80	56.91	0.7	22.1	0.6	19.6	0.5	16.4
8	0	1.89	1.89	60.90	59.01	0.6	19.9	0.5	17.3	0.4	14.2
9	0	1.89	1.89	63.20	61.31	0.5	18.0	0.5	15.4	0.4	12.2
10	0	1.89	1.89	67.60	65.71	0.5	16.7	0.4	14.1	0.3	10.9
11	0	1.89	1.89	67.80	65.91	0.4	14.6	0.3	12.1	0.3	9.1
12	0	1.89	1.89	69.20	67.31	0.4	12.9	0.3	10.5	0.2	7.8
13	0	1.89	1.89	71.20	69.31	0.3	11.6	0.2	9.2	0.2	6.7
14	0	1.89	1.89	72.60	70.71	0.3	10.3	0.2	8.1	0.1	5.7
15	0	1.89	1.89	74.00	72.11	0.2	9.1	0.2	7.0	0.1	4.8
16	0	1.89	1.89	75.90	74.01	0.2	8.1	0.2	6.2	0.1	4.1
17	0	1.89	1.89	77.70	75.81	0.2	7.2	0.1	5.4	0.1	3.5
18	0	1.89	1.89	79.10	77.21	0.2	6.4	0.1	4.7	0.1	3.0
19	0	1.89	1.89	80.30	78.41	0.1	5.6	0.1	4.1	0.1	2.5
20	0	1.89	1.89	82.10	80.21	0.1	5.0	0.1	3.6	0.0	2.1
21	0	1.89	1.89	82.10	80.21	0.1	4.4	0.1	3.0	0.0	1.8
22	0	1.89	1.89	82.10	80.21	0.1	3.8	0.1	2.6	0.0	1.5
23	0	1.89	1.89	82.10	80.21	0.1	3.3	0.1	2.2	0.0	1.2
24	0	1.89	1.89	82.10	80.21	0.1	2.9	0.0	1.9	0.0	1.0
25	0.83	1.89	2.72	82.10	79.38	0.1	2.5	0.1	1.6	0.0	0.9
26	0	1.89	1.89	82.10	80.21	0.0	2.2	0.0	1.4	0.0	0.7
27	0	1.89	1.89	82.10	80.21	0.0	1.9	0.0	1.2	0.0	0.6
28	0	1.89	1.89	82.10	80.21	0.0	1.6	0.0	1.0	0.0	0.5
29	0	1.89	1.89	82.10	80.21	0.0	1.4	0.0	0.9	0.0	0.4
30	0	1.89	1.89	82.10	80.21	0.0	1.2	0.0	0.7	0.0	0.3
31	0	1.89	1.89	82.10	80.21	0.0	1.1	0.0	0.6	0.0	0.3
32	0	1.89	1.89	82.10	80.21	0.0	0.9	0.0	0.5	0.0	0.2
33	0	1.89	1.89	82.10	80.21	0.0	0.8	0.0	0.5	0.0	0.2
34	0	1.89	1.89	82.10	80.21	0.0	0.7	0.0	0.4	0.0	0.2
35	0	1.89	1.89	82.10	80.21	0.0	0.6	0.0	0.3	0.0	0.1
36	0	1.89	1.89	82.10	80.21	0.0	0.5	0.0	0.3	0.0	0.1
37	0	1.89	1.89	82.10	80.21	0.0	0.5	0.0	0.2	0.0	0.1
38	0	1.89	1.89	82.10	80.21	0.0	0.4	0.0	0.2	0.0	0.1
39	0	1.89	1.89	82.10	80.21	0.0	0.4	0.0	0.2	0.0	0.1
40	0	1.89	1.89	82.10	80.21	0.0	0.3	0.0	0.2	0.0	0.1
41	0	1.89	1.89	82.10	80.21	0.0	0.3	0.0	0.1	0.0	0.0
42	0	1.89	1.89	82.10	80.21	0.0	0.2	0.0	0.1	0.0	0.0
43	0	1.89	1.89	82.10	80.21	0.0	0.2	0.0	0.1	0.0	0.0
44	0	1.89	1.89	82.10	80.21	0.0	0.2	0.0	0.1	0.0	0.0
45	0	1.89	1.89	82.10	80.21	0.0	0.2	0.0	0.1	0.0	0.0
46	0	1.89	1.89	82.10	80.21	0.0	0.1	0.0	0.1	0.0	0.0
47	0	1.89	1.89	82.10	80.21	0.0	0.1	0.0	0.1	0.0	0.0
48	0	1.89	1.89	82.10	80.21	0.0	0.1	0.0	0.0	0.0	0.0
49	0	1.89	1.89	82.10	80.21	0.0	0.1	0.0	0.0	0.0	0.0
50	0	1.89	1.89	82.10	80.21	0.0	0.1	0.0	0.0	0.0	0.0
Total	397.4					413.5	385.3	411.8	333.1	410.0	275.9
								EIRR =		15.8	

Table 8.13 Sensitivity Analysis (20% Increase of Project Cost)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	432.62	2.43	435.05	32.00	-403.05	435.1	32.0	435.1	32.0	435.1	32.0
2	0	2.61	2.61	48.50	45.89	2.0	36.7	1.9	35.4	1.8	33.7
3	0	7.6	7.6	50.70	43.1	5.0	33.3	4.7	31.7	4.4	29.3
4	0	2.06	2.06	53.70	51.64	1.2	30.7	1.1	28.7	1.0	25.9
5	0	2.06	2.06	56.40	54.34	1.0	28.0	0.9	25.7	0.8	22.7
6	0	2.06	2.06	55.80	53.74	0.9	24.1	0.8	21.8	0.7	18.7
7	0	2.06	2.06	58.80	56.74	0.8	22.1	0.7	19.6	0.6	16.4
8	0	2.06	2.06	60.90	58.84	0.7	19.9	0.6	17.3	0.5	14.2
9	0	2.06	2.06	63.20	61.14	0.6	18.0	0.5	15.4	0.4	12.2
10	0	2.06	2.06	67.60	65.54	0.5	16.7	0.4	14.1	0.3	10.9
11	0	2.06	2.06	67.80	65.74	0.4	14.6	0.4	12.1	0.3	9.1
12	0	2.06	2.06	69.20	67.14	0.4	12.9	0.3	10.5	0.2	7.8
13	0	2.06	2.06	71.20	69.14	0.3	11.6	0.3	9.2	0.2	6.7
14	0	2.06	2.06	72.60	70.54	0.3	10.3	0.2	8.1	0.2	5.7
15	0	2.06	2.06	74.00	71.94	0.3	9.1	0.2	7.0	0.1	4.8
16	0	2.06	2.06	75.90	73.84	0.2	8.1	0.2	6.2	0.1	4.1
17	0	2.06	2.06	77.70	75.64	0.2	7.2	0.1	5.4	0.1	3.5
18	0	2.06	2.06	79.10	77.04	0.2	6.4	0.1	4.7	0.1	3.0
19	0	2.06	2.06	80.30	78.24	0.1	5.6	0.1	4.1	0.1	2.5
20	0	2.06	2.06	82.10	80.04	0.1	5.0	0.1	3.6	0.1	2.1
21	0	2.06	2.06	82.10	80.04	0.1	4.4	0.1	3.0	0.0	1.8
22	0	2.06	2.06	82.10	80.04	0.1	3.8	0.1	2.6	0.0	1.5
23	0	2.06	2.06	82.10	80.04	0.1	3.3	0.1	2.2	0.0	1.2
24	0	2.06	2.06	82.10	80.04	0.1	2.9	0.0	1.9	0.0	1.0
25	0.83	2.06	2.89	82.10	79.21	0.1	2.5	0.1	1.6	0.0	0.9
26	0	2.06	2.06	82.10	80.04	0.1	2.2	0.0	1.4	0.0	0.7
27	0	2.06	2.06	82.10	80.04	0.0	1.9	0.0	1.2	0.0	0.6
28	0	2.06	2.06	82.10	80.04	0.0	1.6	0.0	1.0	0.0	0.5
29	0	2.06	2.06	82.10	80.04	0.0	1.4	0.0	0.9	0.0	0.4
30	0	2.06	2.06	82.10	80.04	0.0	1.2	0.0	0.7	0.0	0.3
31	0	2.06	2.06	82.10	80.04	0.0	1.1	0.0	0.6	0.0	0.3
32	0	2.06	2.06	82.10	80.04	0.0	0.9	0.0	0.5	0.0	0.2
33	0	2.06	2.06	82.10	80.04	0.0	0.8	0.0	0.5	0.0	0.2
34	0	2.06	2.06	82.10	80.04	0.0	0.7	0.0	0.4	0.0	0.2
35	0	2.06	2.06	82.10	80.04	0.0	0.6	0.0	0.3	0.0	0.1
36	0	2.06	2.06	82.10	80.04	0.0	0.5	0.0	0.3	0.0	0.1
37	0	2.06	2.06	82.10	80.04	0.0	0.5	0.0	0.2	0.0	0.1
38	0	2.06	2.06	82.10	80.04	0.0	0.4	0.0	0.2	0.0	0.1
39	0	2.06	2.06	82.10	80.04	0.0	0.4	0.0	0.2	0.0	0.1
40	0	2.06	2.06	82.10	80.04	0.0	0.3	0.0	0.2	0.0	0.1
41	0	2.06	2.06	82.10	80.04	0.0	0.3	0.0	0.1	0.0	0.0
42	0	2.06	2.06	82.10	80.04	0.0	0.2	0.0	0.1	0.0	0.0
43	0	2.06	2.06	82.10	80.04	0.0	0.2	0.0	0.1	0.0	0.0
44	0	2.06	2.06	82.10	80.04	0.0	0.2	0.0	0.1	0.0	0.0
45	0	2.06	2.06	82.10	80.04	0.0	0.2	0.0	0.1	0.0	0.0
46	0	2.06	2.06	82.10	80.04	0.0	0.1	0.0	0.1	0.0	0.0
47	0	2.06	2.06	82.10	80.04	0.0	0.1	0.0	0.1	0.0	0.0
48	0	2.06	2.06	82.10	80.04	0.0	0.1	0.0	0.0	0.0	0.0
49	0	2.06	2.06	82.10	80.04	0.0	0.1	0.0	0.0	0.0	0.0
50	0	2.06	2.06	82.10	80.04	0.0	0.1	0.0	0.0	0.0	0.0
Total	433.5					451.1	385.3	449.3	333.1	447.2	275.9
								EIRR =		14.5	

Table 8.14 Sensitivity Analysis (10% Decrease of Benefits)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	360.52	2.03	362.55	28.80	-333.75	362.6	28.8	362.6	28.8	362.6	28.8
2	0	2.18	2.18	43.65	41.47	1.6	33.0	1.6	31.9	1.5	30.3
3	0	6.33	6.33	45.63	39.30	4.2	30.0	4.0	28.5	3.7	26.4
4	0	1.72	1.72	48.33	46.61	1.0	27.6	0.9	25.8	0.8	23.3
5	0	1.72	1.72	50.76	49.04	0.9	25.2	0.8	23.2	0.7	20.4
6	0	1.72	1.72	50.22	48.50	0.7	21.7	0.7	19.6	0.6	16.8
7	0	1.72	1.72	52.92	51.20	0.6	19.9	0.6	17.6	0.5	14.8
8	0	1.72	1.72	54.81	53.09	0.6	17.9	0.5	15.6	0.4	12.7
9	0	1.72	1.72	56.88	55.16	0.5	16.2	0.4	13.8	0.3	11.0
10	0	1.72	1.72	60.84	59.12	0.4	15.0	0.4	12.7	0.3	9.8
11	0	1.72	1.72	61.02	59.30	0.4	13.1	0.3	10.8	0.2	8.2
12	0	1.72	1.72	62.28	60.56	0.3	11.6	0.3	9.5	0.2	7.0
13	0	1.72	1.72	64.00	62.28	0.3	10.4	0.2	8.3	0.2	6.0
14	0	1.72	1.72	65.34	63.62	0.2	9.2	0.2	7.3	0.1	5.1
15	0	1.72	1.72	66.60	64.88	0.2	8.2	0.2	6.3	0.1	4.3
16	0	1.72	1.72	68.31	66.59	0.2	7.3	0.1	5.5	0.1	3.7
17	0	1.72	1.72	69.93	68.21	0.2	6.5	0.1	4.8	0.1	3.2
18	0	1.72	1.72	71.19	69.47	0.1	5.8	0.1	4.2	0.1	2.7
19	0	1.72	1.72	72.27	70.55	0.1	5.1	0.1	3.7	0.1	2.3
20	0	1.72	1.72	73.89	72.17	0.1	4.5	0.1	3.2	0.0	1.9
21	0	1.72	1.72	73.89	72.17	0.1	3.9	0.1	2.7	0.0	1.6
22	0	1.72	1.72	73.89	72.17	0.1	3.4	0.1	2.3	0.0	1.3
23	0	1.72	1.72	73.89	72.17	0.1	3.0	0.0	2.0	0.0	1.1
24	0	1.72	1.72	73.89	72.17	0.1	2.6	0.0	1.7	0.0	0.9
25	0.83	1.72	2.55	73.89	71.34	0.1	2.2	0.1	1.5	0.0	0.8
26	0	1.72	1.72	73.89	72.17	0.0	2.0	0.0	1.2	0.0	0.6
27	0	1.72	1.72	73.89	72.17	0.0	1.7	0.0	1.1	0.0	0.5
28	0	1.72	1.72	73.89	72.17	0.0	1.5	0.0	0.9	0.0	0.4
29	0	1.72	1.72	73.89	72.17	0.0	1.3	0.0	0.8	0.0	0.4
30	0	1.72	1.72	73.89	72.17	0.0	1.1	0.0	0.7	0.0	0.3
31	0	1.72	1.72	73.89	72.17	0.0	1.0	0.0	0.6	0.0	0.3
32	0	1.72	1.72	73.89	72.17	0.0	0.8	0.0	0.5	0.0	0.2
33	0	1.72	1.72	73.89	72.17	0.0	0.7	0.0	0.4	0.0	0.2
34	0	1.72	1.72	73.89	72.17	0.0	0.6	0.0	0.4	0.0	0.2
35	0	1.72	1.72	73.89	72.17	0.0	0.6	0.0	0.3	0.0	0.1
36	0	1.72	1.72	73.89	72.17	0.0	0.5	0.0	0.3	0.0	0.1
37	0	1.72	1.72	73.89	72.17	0.0	0.4	0.0	0.2	0.0	0.1
38	0	1.72	1.72	73.89	72.17	0.0	0.4	0.0	0.2	0.0	0.1
39	0	1.72	1.72	73.89	72.17	0.0	0.3	0.0	0.2	0.0	0.1
40	0	1.72	1.72	73.89	72.17	0.0	0.3	0.0	0.1	0.0	0.1
41	0	1.72	1.72	73.89	72.17	0.0	0.2	0.0	0.1	0.0	0.0
42	0	1.72	1.72	73.89	72.17	0.0	0.2	0.0	0.1	0.0	0.0
43	0	1.72	1.72	73.89	72.17	0.0	0.2	0.0	0.1	0.0	0.0
44	0	1.72	1.72	73.89	72.17	0.0	0.2	0.0	0.1	0.0	0.0
45	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.1	0.0	0.0
46	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.1	0.0	0.0
47	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.0	0.0	0.0
48	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.0	0.0	0.0
49	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.0	0.0	0.0
50	0	1.72	1.72	73.89	72.17	0.0	0.1	0.0	0.0	0.0	0.0
Total	361.4					375.9	346.8	374.4	299.7	372.7	248.3
								EIRR =		15.6	

Table 8.15 Sensitivity Analysis (20% Decrease of Benefits)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	360.52	2.03	362.55	25.60	-336.95	362.6	25.6	362.6	25.6	362.6	25.6
2	0	2.18	2.18	38.80	36.62	1.6	29.3	1.6	28.3	1.5	26.9
3	0	6.33	6.33	40.56	34.23	4.2	26.7	4.0	25.3	3.7	23.5
4	0	1.72	1.72	42.96	41.24	1.0	24.6	0.9	22.9	0.8	20.7
5	0	1.72	1.72	45.12	43.4	0.9	22.4	0.8	20.6	0.7	18.1
6	0	1.72	1.72	44.64	42.92	0.7	19.3	0.7	17.4	0.6	14.9
7	0	1.72	1.72	47.04	45.32	0.6	17.7	0.6	15.7	0.5	13.1
8	0	1.72	1.72	48.72	47	0.6	15.9	0.5	13.9	0.4	11.3
9	0	1.72	1.72	50.56	48.84	0.5	14.4	0.4	12.3	0.3	9.8
10	0	1.72	1.72	54.08	52.36	0.4	13.4	0.4	11.3	0.3	8.7
11	0	1.72	1.72	54.24	52.52	0.4	11.7	0.3	9.6	0.2	7.3
12	0	1.72	1.72	55.36	53.64	0.3	10.3	0.3	8.4	0.2	6.2
13	0	1.72	1.72	56.96	55.24	0.3	9.3	0.2	7.4	0.2	5.3
14	0	1.72	1.72	58.08	56.36	0.2	8.2	0.2	6.4	0.1	4.5
15	0	1.72	1.72	59.20	57.48	0.2	7.3	0.2	5.6	0.1	3.8
16	0	1.72	1.72	60.72	59	0.2	6.5	0.1	4.9	0.1	3.3
17	0	1.72	1.72	62.16	60.44	0.2	5.8	0.1	4.3	0.1	2.8
18	0	1.72	1.72	63.28	61.56	0.1	5.1	0.1	3.7	0.1	2.4
19	0	1.72	1.72	64.24	62.52	0.1	4.5	0.1	3.3	0.1	2.0
20	0	1.72	1.72	65.68	63.96	0.1	4.0	0.1	2.8	0.0	1.7
21	0	1.72	1.72	65.68	63.96	0.1	3.5	0.1	2.4	0.0	1.4
22	0	1.72	1.72	65.68	63.96	0.1	3.0	0.1	2.1	0.0	1.2
23	0	1.72	1.72	65.68	63.96	0.1	2.6	0.0	1.8	0.0	1.0
24	0	1.72	1.72	65.68	63.96	0.1	2.3	0.0	1.5	0.0	0.8
25	0.83	1.72	2.55	65.68	63.13	0.1	2.0	0.1	1.3	0.0	0.7
26	0	1.72	1.72	65.68	63.96	0.0	1.7	0.0	1.1	0.0	0.6
27	0	1.72	1.72	65.68	63.96	0.0	1.5	0.0	0.9	0.0	0.5
28	0	1.72	1.72	65.68	63.96	0.0	1.3	0.0	0.8	0.0	0.4
29	0	1.72	1.72	65.68	63.96	0.0	1.1	0.0	0.7	0.0	0.3
30	0	1.72	1.72	65.68	63.96	0.0	1.0	0.0	0.6	0.0	0.3
31	0	1.72	1.72	65.68	63.96	0.0	0.9	0.0	0.5	0.0	0.2
32	0	1.72	1.72	65.68	63.96	0.0	0.8	0.0	0.4	0.0	0.2
33	0	1.72	1.72	65.68	63.96	0.0	0.7	0.0	0.4	0.0	0.2
34	0	1.72	1.72	65.68	63.96	0.0	0.6	0.0	0.3	0.0	0.1
35	0	1.72	1.72	65.68	63.96	0.0	0.5	0.0	0.3	0.0	0.1
36	0	1.72	1.72	65.68	63.96	0.0	0.4	0.0	0.2	0.0	0.1
37	0	1.72	1.72	65.68	63.96	0.0	0.4	0.0	0.2	0.0	0.1
38	0	1.72	1.72	65.68	63.96	0.0	0.3	0.0	0.2	0.0	0.1
39	0	1.72	1.72	65.68	63.96	0.0	0.3	0.0	0.1	0.0	0.1
40	0	1.72	1.72	65.68	63.96	0.0	0.2	0.0	0.1	0.0	0.0
41	0	1.72	1.72	65.68	63.96	0.0	0.2	0.0	0.1	0.0	0.0
42	0	1.72	1.72	65.68	63.96	0.0	0.2	0.0	0.1	0.0	0.0
43	0	1.72	1.72	65.68	63.96	0.0	0.2	0.0	0.1	0.0	0.0
44	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.1	0.0	0.0
45	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.1	0.0	0.0
46	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.0	0.0	0.0
47	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.0	0.0	0.0
48	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.0	0.0	0.0
49	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.0	0.0	0.0
50	0	1.72	1.72	65.68	63.96	0.0	0.1	0.0	0.0	0.0	0.0
Total	361.4					375.9	308.3	374.4	266.5	372.7	220.7
								EIRR =		13.9	

Table 8.16 Sensitivity Analysis

(10% Decrease of Benefits and 10% of Increase of Project Cost)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	396.57	2.23	398.8	28.80	-370	398.8	28.8	398.8	28.8	398.8	28.8
2	0	2.4	2.4	43.65	41.25	1.8	33.0	1.8	31.9	1.7	30.3
3	0	6.96	6.96	45.63	38.67	4.6	30.0	4.3	28.5	4.0	26.4
4	0	1.89	1.89	48.33	46.44	1.1	27.6	1.0	25.8	0.9	23.3
5	0	1.89	1.89	50.76	48.87	0.9	25.2	0.9	23.2	0.8	20.4
6	0	1.89	1.89	50.22	48.33	0.8	21.7	0.7	19.6	0.6	16.8
7	0	1.89	1.89	52.92	51.03	0.7	19.9	0.6	17.6	0.5	14.8
8	0	1.89	1.89	54.81	52.92	0.6	17.9	0.5	15.6	0.4	12.7
9	0	1.89	1.89	56.88	54.99	0.5	16.2	0.5	13.8	0.4	11.0
10	0	1.89	1.89	60.84	58.95	0.5	15.0	0.4	12.7	0.3	9.8
11	0	1.89	1.89	61.02	59.13	0.4	13.1	0.3	10.8	0.3	8.2
12	0	1.89	1.89	62.28	60.39	0.4	11.6	0.3	9.5	0.2	7.0
13	0	1.89	1.89	64.00	62.11	0.3	10.4	0.2	8.3	0.2	6.0
14	0	1.89	1.89	65.34	63.45	0.3	9.2	0.2	7.3	0.1	5.1
15	0	1.89	1.89	66.60	64.71	0.2	8.2	0.2	6.3	0.1	4.3
16	0	1.89	1.89	68.31	66.42	0.2	7.3	0.2	5.5	0.1	3.7
17	0	1.89	1.89	69.93	68.04	0.2	6.5	0.1	4.8	0.1	3.2
18	0	1.89	1.89	71.19	69.3	0.2	5.8	0.1	4.2	0.1	2.7
19	0	1.89	1.89	72.27	70.38	0.1	5.1	0.1	3.7	0.1	2.3
20	0	1.89	1.89	73.89	72	0.1	4.5	0.1	3.2	0.0	1.9
21	0	1.89	1.89	73.89	72	0.1	3.9	0.1	2.7	0.0	1.6
22	0	1.89	1.89	73.89	72	0.1	3.4	0.1	2.3	0.0	1.3
23	0	1.89	1.89	73.89	72	0.1	3.0	0.1	2.0	0.0	1.1
24	0	1.89	1.89	73.89	72	0.1	2.6	0.0	1.7	0.0	0.9
25	0.83	1.89	2.72	73.89	71.17	0.1	2.2	0.1	1.5	0.0	0.8
26	0	1.89	1.89	73.89	72	0.0	2.0	0.0	1.2	0.0	0.6
27	0	1.89	1.89	73.89	72	0.0	1.7	0.0	1.1	0.0	0.5
28	0	1.89	1.89	73.89	72	0.0	1.5	0.0	0.9	0.0	0.4
29	0	1.89	1.89	73.89	72	0.0	1.3	0.0	0.8	0.0	0.4
30	0	1.89	1.89	73.89	72	0.0	1.1	0.0	0.7	0.0	0.3
31	0	1.89	1.89	73.89	72	0.0	1.0	0.0	0.6	0.0	0.3
32	0	1.89	1.89	73.89	72	0.0	0.8	0.0	0.5	0.0	0.2
33	0	1.89	1.89	73.89	72	0.0	0.7	0.0	0.4	0.0	0.2
34	0	1.89	1.89	73.89	72	0.0	0.6	0.0	0.4	0.0	0.2
35	0	1.89	1.89	73.89	72	0.0	0.6	0.0	0.3	0.0	0.1
36	0	1.89	1.89	73.89	72	0.0	0.5	0.0	0.3	0.0	0.1
37	0	1.89	1.89	73.89	72	0.0	0.4	0.0	0.2	0.0	0.1
38	0	1.89	1.89	73.89	72	0.0	0.4	0.0	0.2	0.0	0.1
39	0	1.89	1.89	73.89	72	0.0	0.3	0.0	0.2	0.0	0.1
40	0	1.89	1.89	73.89	72	0.0	0.3	0.0	0.1	0.0	0.1
41	0	1.89	1.89	73.89	72	0.0	0.2	0.0	0.1	0.0	0.0
42	0	1.89	1.89	73.89	72	0.0	0.2	0.0	0.1	0.0	0.0
43	0	1.89	1.89	73.89	72	0.0	0.2	0.0	0.1	0.0	0.0
44	0	1.89	1.89	73.89	72	0.0	0.2	0.0	0.1	0.0	0.0
45	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.1	0.0	0.0
46	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.1	0.0	0.0
47	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.0	0.0	0.0
48	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.0	0.0	0.0
49	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.0	0.0	0.0
50	0	1.89	1.89	73.89	72	0.0	0.1	0.0	0.0	0.0	0.0
Total	397.4					413.5	346.8	411.9	299.7	410.0	248.3
								EIRR =		14.3	

Table 8.17 Sensitivity Analysis

(20% Decrease of Benefits and 20% of Increase of Project Cost)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	NPV Int.= 0.15		NPV Int.= 0.17		NPV Int.= 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	432.62	2.44	435.06	25.60	-409.46	435.1	25.6	435.1	25.6	435.1	25.6
2	0	2.62	2.62	38.80	36.18	2.0	29.3	1.9	28.3	1.8	26.9
3	0	7.6	7.6	40.56	32.96	5.0	26.7	4.7	25.3	4.4	23.5
4	0	2.06	2.06	42.96	40.9	1.2	24.6	1.1	22.9	1.0	20.7
5	0	2.06	2.06	45.12	43.06	1.0	22.4	0.9	20.6	0.8	18.1
6	0	2.06	2.06	44.64	42.58	0.9	19.3	0.8	17.4	0.7	14.9
7	0	2.06	2.06	47.04	44.98	0.8	17.7	0.7	15.7	0.6	13.1
8	0	2.06	2.06	48.72	46.66	0.7	15.9	0.6	13.9	0.5	11.3
9	0	2.06	2.06	50.56	48.5	0.6	14.4	0.5	12.3	0.4	9.8
10	0	2.06	2.06	54.08	52.02	0.5	13.4	0.4	11.3	0.3	8.7
11	0	2.06	2.06	54.24	52.18	0.4	11.7	0.4	9.6	0.3	7.3
12	0	2.06	2.06	55.36	53.3	0.4	10.3	0.3	8.4	0.2	6.2
13	0	2.06	2.06	56.96	54.9	0.3	9.3	0.3	7.4	0.2	5.3
14	0	2.06	2.06	58.08	56.02	0.3	8.2	0.2	6.4	0.2	4.5
15	0	2.06	2.06	59.20	57.14	0.3	7.3	0.2	5.6	0.1	3.8
16	0	2.06	2.06	60.72	58.66	0.2	6.5	0.2	4.9	0.1	3.3
17	0	2.06	2.06	62.16	60.1	0.2	5.8	0.1	4.3	0.1	2.8
18	0	2.06	2.06	63.28	61.22	0.2	5.1	0.1	3.7	0.1	2.4
19	0	2.06	2.06	64.24	62.18	0.1	4.5	0.1	3.3	0.1	2.0
20	0	2.06	2.06	65.68	63.62	0.1	4.0	0.1	2.8	0.1	1.7
21	0	2.06	2.06	65.68	63.62	0.1	3.5	0.1	2.4	0.0	1.4
22	0	2.06	2.06	65.68	63.62	0.1	3.0	0.1	2.1	0.0	1.2
23	0	2.06	2.06	65.68	63.62	0.1	2.6	0.1	1.8	0.0	1.0
24	0	2.06	2.06	65.68	63.62	0.1	2.3	0.0	1.5	0.0	0.8
25	0.83	2.06	2.89	65.68	62.79	0.1	2.0	0.1	1.3	0.0	0.7
26	0	2.06	2.06	65.68	63.62	0.1	1.7	0.0	1.1	0.0	0.6
27	0	2.06	2.06	65.68	63.62	0.0	1.5	0.0	0.9	0.0	0.5
28	0	2.06	2.06	65.68	63.62	0.0	1.3	0.0	0.8	0.0	0.4
29	0	2.06	2.06	65.68	63.62	0.0	1.1	0.0	0.7	0.0	0.3
30	0	2.06	2.06	65.68	63.62	0.0	1.0	0.0	0.6	0.0	0.3
31	0	2.06	2.06	65.68	63.62	0.0	0.9	0.0	0.5	0.0	0.2
32	0	2.06	2.06	65.68	63.62	0.0	0.8	0.0	0.4	0.0	0.2
33	0	2.06	2.06	65.68	63.62	0.0	0.7	0.0	0.4	0.0	0.2
34	0	2.06	2.06	65.68	63.62	0.0	0.6	0.0	0.3	0.0	0.1
35	0	2.06	2.06	65.68	63.62	0.0	0.5	0.0	0.3	0.0	0.1
36	0	2.06	2.06	65.68	63.62	0.0	0.4	0.0	0.2	0.0	0.1
37	0	2.06	2.06	65.68	63.62	0.0	0.4	0.0	0.2	0.0	0.1
38	0	2.06	2.06	65.68	63.62	0.0	0.3	0.0	0.2	0.0	0.1
39	0	2.06	2.06	65.68	63.62	0.0	0.3	0.0	0.1	0.0	0.1
40	0	2.06	2.06	65.68	63.62	0.0	0.2	0.0	0.1	0.0	0.0
41	0	2.06	2.06	65.68	63.62	0.0	0.2	0.0	0.1	0.0	0.0
42	0	2.06	2.06	65.68	63.62	0.0	0.2	0.0	0.1	0.0	0.0
43	0	2.06	2.06	65.68	63.62	0.0	0.2	0.0	0.1	0.0	0.0
44	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.1	0.0	0.0
45	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.1	0.0	0.0
46	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.0	0.0	0.0
47	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.0	0.0	0.0
48	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.0	0.0	0.0
49	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.0	0.0	0.0
50	0	2.06	2.06	65.68	63.62	0.0	0.1	0.0	0.0	0.0	0.0
Total	433.5					451.1	308.3	449.3	266.5	447.2	220.7
								EIRR =		11.7	

Table 8.18 Financial Analysis for Typical Farms

Farm Model-1 (Class I-Irrigated)

Stage-1 (cropping intensity 130%)

with Project
1. Crop Production

	Area (ha)	Yield (t/ha)	Production (ton)	Unit Price (pesos/ton)	Value (pesos/ton)	Production Cost (pesos/ha)	Net Income (pesos)
Wet Season Paddy	2.6	4.00	10.400	5580	58032	32237	25795
Dry Season Vegetables	0.8	1.00	0.800	21580	17264	5726	11538
Sub-total	3.4				75296	37963	37333

2. Livestock Income	5000
3. Off-farm Income	0
4. O & M Costs	810
5. Debt	5750
6. Family Expenditures	26800
7. Disposable Income	8973

Farm Model-2 (Class II)

Stage-1 (cropping intensity 130%)

with Project
1. Crop Production

	Area (ha)	Yield (t/ha)	Production (ton)	Unit Price (pesos/ton)	Value (pesos/ton)	Production Cost (pesos/ha)	Net Income (pesos)
Wet Season Vegetables	2.6	1.00	2.600	21580	56108	18762	37346
Dry Season Vegetables	0.8	1.00	0.800	21580	17264	5773	11491
Sub-total	3.4				73372	24534	48838

2. Livestock Income	5000
3. Off-farm Income	0
4. O & M Costs	810
5. Debt	5750
6. Family Expenditures	36140
7. Disposable Income	11138

continued

Farm Model-3 (Class I, II-not irrigated)

Stage-1 and Stage-2

with Project

1. Crop Production

	Area (ha)	Yield (t/ha)	Production (ton)	Unit Price (pesos/ton)	Value (pesos/ton)	Production Cost (pesos/ha)	Net Income (pesos)
Wet Season							
Maize	2.6	2.00	5.200	4950	25740	7015	18725
Dry Season							
Vegetables	2.6	0.90	2.340	21580	50497	13507	36990
Sub-total	5.2				76237	20522	55715

2. Livestock Income	3000
3. Off-farm Income	0
4. O & M Costs	810
5. Debt	5750
6. Family Expenditures	41220
7. Disposable Income	10935

Farm Model-4 (Class III-not irrigated)

Stage-1 and Stage-2

with Project

1. Crop Production

	Area (ha)	Yield (t/ha)	Production (ton)	Unit Price (pesos/ton)	Value (pesos/ton)	Production Cost (pesos/ha)	Net Income (pesos)
Wet Season							
Cashew Nut	2.6	3.05	7.930	25500	60645	13985	46660
Sub-total	2.6				60645	13985	46660

2. Livestock Income	3000
3. Off-farm Income	0
4. O & M Costs	810
5. Debt	5750
6. Family Expenditures	34520
7. Disposable Income	8580

Table 8.19 Cost and Return of Crops (Financial)

Crop:Rainfed Wet Paddy

	Unit	Unit Price (Pesos)	Without Project Quant-ity	Value (Pesos)	With Project Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Labor	day	75	35	2625	39	2925
Sub-total				2625		2925
b.Input Cost						
Seed	kg	8.5	52	442	52	442
Manure	kg	0.5	0	0	200	100
Fertilizer						
N	kg	14.10	15	212	20	282
P	kg	14.80	0	0	10	148
K	kg	8.10	0	0	0	0
Agri-Chemicals	kg	315.00	0	0	0.3	95
Water Charge				0		0
Sub-total				654		1067
Miscellaneous(10% of total)				364		998
Total Costs				3643		4989
2. Gross Income				9486		11160
a. Main Product	ton	5580	1.7	9486	2.00	11160
b. By-product	ton	0		0		0
3. Net Profit	Peso			5843		6171

Crop:Rainfed Upland Paddy(wet season)

	Unit	Unit Price (Pesos)	Without Project Quant-ity	Value (Pesos)	With Project Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Labor	day	75	10	750	30	2250
Sub-total				750		2250
b.Input Cost						
Seed	kg	8.5	60	510	60	510
Manure	kg	0.5	0	0	100	50
Fertilizer						
N	kg	14.10	0	0	20	282
P	kg	14.80	0	0	10	148
K	kg	8.10	0	0	0	0
Agri-Chemicals	kg	315.00	0	0	0	0
Water Charge				0		0
Sub-total				510		990
Miscellaneous(10% of total)				140		572
Total Costs				1400		3812
2. Gross Income				2232		5580
a. Main Product	ton	5580	0.4	2232	1.00	5580
b. By-product	ton	0		0		0
3. Net Profit	Peso			832		1768

Table 8.19 Cont'd

Crop: Irrigated Paddy (wet season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1. Production Cost						
a. Labor Cost						
Labor	day	75	57	4275	61	4575
Sub-total				4275		4575
b. Input Cost						
Seed	kg	18	45	810	45	810
Manure	kg	0.5	0	0	2000	1000
Fertilizer						
N	kg	14.10	30	423	60	846
P	kg	14.80	0	0	30	444
K	kg	8.10	0	0	30	243
Agri-Chemicals	kg	315.00	0	0	3.40	1071
Water Charge						558
Sub-total				1233		4972
Miscellaneous (10% of total)				612		2852
Total Costs				6120		12399
2. Gross Income				9821		22320
a. Main Product	ton	5580	1.76	9821	4.00	22320
b. By-product	ton	0		0		0
3. Net Profit	Peso			3701		9921

Table 8.19 Cont'd

Crop:Rainfed Corn(wet season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75	12	900	15	1125
Sub-total				900		1125
b.Input Cost						
Seed	kg	8	20	160	20	160
Manure	kg	0.5	0	0	500	250
Fertilizer						
N	kg	14.10	5	71	10	141
P	kg	14.80	0	0	8	118
K	kg	8.10	0	0	0	0
Agri-Chemicals	kg	315.00	0.1	32	0.3	95
Water Charge						0
Sub-total				262		764
Miscellaneous(30% of total)				498		810
Total Costs				1660		2698
2. Gross Income				6683		9900
a. Main Product	ton	4950	1.35	6683	2.00	9900
b. By-product	ton	0		0		0
3. Net Profit	Peso			5023		7202

Crop:Irrigated Corn(dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Labor	day	75	13	975	16	1200
Sub-total				975		1200
b.Input Cost						
Seed	kg	8	20	160	20	160
Manure	kg	0.5	0	0	500	250
Fertilizer						
N	kg	14.10	0	0	20	282
P	kg	14.80	0	0	10	148
K	kg	8.10	0	0	0	0
Agri-Chemicals	kg	315.00	0	0	0.2	63
Water Charge						837
Sub-total				160		1740
Miscellaneous(30% of total)				486		1260
Total Costs				1621		4200
2. Gross Income				6435		10395
a. Main Product	ton	4950	1.3	6435	2.10	10395
b. By-product	ton	0		0		0
3. Net Profit	Peso			4814		6195

Table 8.19 Cont'd

Crop:Rainfed Squash

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75	10	750	12	900
Sub-total				750		900
b.Input Cost						
Seed	kg	1200	4	4800	4	4800
Manure	kg	0.5	0	0	2000	1000
Fertilizer						
N	kg	14.10	0	0	96	1354
P	kg	14.80	0	0	88	1302
K	kg	8.10	0	0	58	470
Agri-Chemicals	kg	315.00	0	0	9.0	2835
Water Charge						0
Sub-total				4800		11761
Miscellaneous(20% of total)				1388		3165
Total Costs				6938		15826
2. Gross Income				53550		67830
a. Main Product	ton	3570	15	53550	19.00	67830
b. By-product	ton	0		0		0
3. Net Profit	Peso			46613		52004

Crop:Rainfed Gabi(taro) (wet season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75			15	1125
Sub-total						1125
b.Input Cost						
Seed	kg	6			62	372
Manure	kg	0.5			2000	1000
Fertilizer						
N	kg	14.10			70	987
P	kg	14.80			70	1036
K	kg	8.10			70	567
Agri-Chemicals	kg	315.00			0	0
Water Charge						0
Sub-total						3962
Miscellaneous(15% of total)						898
Total Costs						5985
2. Gross Income						26740
a. Main Product	ton	7640			3.50	26740
b. By-product	ton	0				0
3. Net Profit	Peso					20755

Table 8.19 Cont'd

Crop:Irrigated Tomato(dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75			62	4650
Hired Bullock Labor	day	120			10	1200
Sub-total						5850
b.Input Cost						
Seed	kg	4000			0.15	600
Manure	kg	0.5			3000	1500
Fertilizer						
N	kg	14.10			60	846
P	kg	14.80			130	1924
K	kg	8.10			96	778
Agri-Chemicals	kg	315.00			9	2835
Water Charge						837
Sub-total						9320
Miscellaneous(30% of total)						6501
Total Costs						21671
2. Gross Income						92000
a. Main Product	ton	9200			10.00	92000
b. By-product	ton	0			0.00	0
3. Net Profit	Peso					70329

Crop:Irrigated Watermelon(dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75			56	4200
Hired Bullock Labor	day	120			15	1800
Sub-total						6000
b.Input Cost						
Seed	kg	1250			2.5	3125
Manure	kg	0.5			3000	1500
Fertilizer						
N	kg	14.10			60	846
P	kg	14.80			120	1776
K	kg	8.10			60	486
Agri-Chemicals	kg	315.00			3	945
Water Charge						837
Sub-total						9515
Miscellaneous(40% of total)						10343
Total Costs						25858
2. Gross Income						205250
a. Main Product	ton	8210			25.00	205250
b. By-product	ton					0
3. Net Profit	Peso					179392

Table 8.19 Cont'd

Crop: Irrigated Mung Beans (dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1. Production Cost						
a. Labor Cost						
Hired Labor	day	75	10	750	15	1125
Sub-total				750		1125
b. Input Cost						
Seed	kg	30	25	750	25	750
Manure	kg	0.5	0	0	1000	500
Fertilizer						
N	kg	14.10	0	0	15	212
P	kg	14.80	0	0	40	592
K	kg	8.10	0	0	45	365
Agri-Chemicals	kg	315.00	0	0	2.0	630
Water Charge						837
Sub-total				750		3885
Miscellaneous (30% of total)				643		2147
Total Costs				2143		7157
2. Gross Income				16185		21580
a. Main Product	ton	21580	0.75	16185	1.00	21580
b. By-product	ton	0	0	0	0.00	0
3. Net Profit	Peso			14042		14423

Rainfed Mung Beans (dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1. Production Cost						
a. Labor Cost						
Hired Labor	day	75	10	750	12	900
Sub-total				750		900
b. Input Cost						
Seed	kg	30	25	750	25	750
Manure	kg	0.5	0	0	1000	500
Fertilizer						
N	kg	14.1	0	0	12	169
P	kg	14.8	0	0	30	444
K	kg	8.1	0	0	30	243
Agri-Chemicals	kg	315	0	0	2.0	630
Water Charge						0
Sub-total				750		2736
Miscellaneous (30% of total)				643		1558
Total Costs				2143		5195
2. Gross Income				15106		19422
a. Main Product	ton	21580	0.7	15106	0.90	19422
b. By-product	ton	0	0	0	0.00	0
3. Net Profit	Peso			12963		14227

Table 8.19 Cont'd

Crop:Rainfed Mung Beans(wet season)

	Unit	Unit Price (Pesos)	Without Project Quant-ity	Without Project Value (Pesos)	With Project Quant-ity	With Project Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75	10	750	12	900
Sub-total				750		900
b.Input Cost						
Seed	kg	30	25	750	25	750
Manure	kg	0.5	0	0	1000	500
Fertilizer						
N	kg	14.10	0	0	12	169
P	kg	14.80	0	0	30	444
K	kg	8.10	0	0	30	243
Agri-Chemicals	kg	315.00	0.1	32	2.0	630
Water Charge						0
Sub-total				782		2736
Miscellaneous(30% of total)				656		1558
Total Costs				2188		5195
2. Gross Income				9495		16185
a. Main Product	ton	21580	0.44	9495	0.75	16185
b. By-product	ton	0	0	0		0
3. Net Profit	Peso			7307		10990

Crop:Irrigated Mung Beans(wet season)

	Unit	Unit Price (Pesos)	Without Project Quant-ity	Without Project Value (Pesos)	With Project Quant-ity	With Project Value (Pesos)
1.Production Cost						
a.Labor Cost						
Hired Labor	day	75	12	900	15	1125
Sub-total				900		1125
b.Input Cost						
Seed	kg	40	25	1000	25	1000
Manure	kg	0.5	0	0	1000	500
Fertilizer						
N	kg	14.10	0	0	20	282
P	kg	14.80	0	0	40	592
K	kg	8.10	0	0	45	365
Agri-Chemicals	kg	315.00	0	0	2.0	630
Water Charge						558
Sub-total				1000		3927
Miscellaneous(30% of total)				814		2165
Total Costs				2714		7216
2. Gross Income				11869		21580
a. Main Product	ton	21580	0.55	11869	1.00	21580
b. By-product	ton	0	0	0		0
3. Net Profit	Peso			9155		14364

Table 8.19 Cont'd

Crop: Irrigated Eggplant (wet season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1. Production Cost						
a. Labor Cost						
Hired Labor	day	75			45	3375
Hired Bullock Labor	day	120			10	1200
Sub-total						4575
b. Input Cost						
Seed	kg	4000			0.2	800
Manure	kg	0.5			3000	1500
Fertilizer						
N	kg	14.10			124	1748
P	kg	14.80			56	829
K	kg	8.10			56	454
Agri-Chemicals	kg	315.00			4.0	1260
Water Charge						558
Sub-total						7149
Miscellaneous (30% of total)						5024
Total Costs						16748
2. Gross Income						85600
a. Main Product	ton	8560			10.00	85600
b. By-product	ton	0				0
3. Net Profit	Peso					68852

Crop: Irrigated Eggplant (dry season)

	Unit	Unit Price (Pesos)	Without Project		With Project	
			Quant-ity	Value (Pesos)	Quant-ity	Value (Pesos)
1. Production Cost						
a. Labor Cost						
Hired Labor	day	75			45	3375
Hired Bullock Labor	day	120			12	1440
Sub-total						4815
b. Input Cost						
Seed	kg	4000			0.2	800
Manure	kg	0.5			3000	1500
Fertilizer						
N	kg	14.10			124	1748
P	kg	14.80			56	829
K	kg	8.10			56	454
Agri-Chemicals	kg	315.00			4.0	1260
Water Charge						837
Sub-total						7428
Miscellaneous (30% of total)						5247
Total Costs						17490
2. Gross Income						119840
a. Main Product	ton	8560			14.00	119840
b. By-product	ton	0				0
3. Net Profit	Peso					102350

Table 8.19 Cont'd

Mango+Pineapple With Project

	Unit	Unit Price (Pesos)	1st year Quant-ity	1st year Value (Pesos)	2nd year Quant-ity	2nd year Value (Pesos)	3rd year Quant-ity	3rd year Value (Pesos)	4th year Quant-ity	4th year Value (Pesos)	5th year Quant-ity	5th year Value (Pesos)
1.Production Cost												
a.Labor Cost												
Tractor plowing	time	2000	2.0	4000	1.5	3000	1.5	3000	1.5	3000	1.5	3000
Tractor harrowing	time	1500	2.0	3000	1.5	2250	1.5	2250	1.5	2250	1.5	2250
Planting/layouting												
Mango	m.d	75	2	150								
Pineapple	m.d	75	20	1500	20	1500	20	1500	20	1500	20	1500
Fertilizing												
Basal	m.d	75	10	750	8	600	8	600	8	600	8	600
Second	m.d	75	6	450	6	450	6	450	6	450	6	450
Third	m.d	75	6	450	6	450	6	450	6	450	6	450
Forth	m.d	75	8	600	8	600	8	600	8	600	8	600
Spraying x12	m.d	75	30	2250	30	2250	34	2550	36	2700	38	2850
Weeding	m.d	75	10	750	10	750	10	750	10	750	10	750
Harrowing	m.d	75	0	0	10	750	20	1500	20	1500	20	1500
Sub-total				13900		12600		13650		13800		13950
b.Inputs												
Nursery												
Mango	piece	25	100	2500								
Pineapple slips	piece	3	8000	24000								
Fertilizer												
N	kg	14.10	70	987	84	1184	112	1579	140	1974	168	2369
P	kg	14.80	70	1036	84	1243	112	1658	140	2072	168	2486
K	kg	8.10	70	567	84	680	112	907	140	1134	168	1361
Insecticides												
Brodan	lit	394.52	6	2367	6	2367	6	2367	8	3156	8	3156
Hopcin	lit	270.00	6	1620	6	1620	6	1620	8	2160	8	2160
Water Charge				0		0		0		0		0
Sub-total				33077		7095		8131		10496		11532
Miscellaneous(30% of total)				13231		2838		3252		4198		4613
Total Cost				44103		9460		10841		13995		15376
2. Gross Income												
Mango	kg	19.24	0	0	0	0	0	0	300	5772	900	17316
Pineapple												
60% class A	piece	15	0	0	3840	57600	3840	57600	3840	57600	3840	57600
25% class B	piece	10	0	0	1600	16000	1600	16000	1600	16000	1600	16000
15% class C	piece	5	0	0	960	4800	960	4800	960	4800	960	4800
Total				0		78400		78400		84172		95716
3. Net Profit	Peso			-44103		68940		67559		70177		80340

Area 73.9ha pesos -3259211 5094666 4992610 5186080 5937126

Table 8.19 Cont'd

Cashew+Annual With Project

	Unit	Unit Price (Pesos)	1st year Quant-ity	1st year Value (Pesos)	2nd year Quant-ity	2nd year Value (Pesos)	3rd year Quant-ity	3rd year Value (Pesos)	4th year Quant-ity	4th year Value (Pesos)	5th year Quant-ity	5th year Value (Pesos)
1. Production Cost												
a. Labor Cost												
Land clearing	MD	75	10	750	0	0	0	0	0	0	0	0
Plowing	MAD	120	15	1800	12	1440	12	1440	8	960	0	0
Harrowing	MAD	120	8	960	6	720	6	720	4	480	0	0
Planting												
Annual	MD	75	6	450	6	450	6	450	4	300	0	0
Cashew nut	MD	75	6	450	0	0	0	0	0	0	0	0
Cultivation	MD	75	6	450	4	300	4	300	4	300	0	0
Fertilizing	MD	75	7	525	6	450	6	450	5	375	2	150
Spraying x4	MD	75	4	300	5	375	6	450	6	450	4	300
Harvesting/hauling	MD	75	8	600	8	600	8	600	6	450	5	375
Sub-total				6285		4335		4410		3315		825
b. Inputs												
Seeds												
Annual	kg	30	13	390	13	390	13	390	13	390	13	390
Cashew nursery	piece	5	150	750	0	0	0	0	0	0	0	0
Fertilizer												
N	kg	14.10	58	818	58	818	50	705	50	705	28	395
P	kg	14.80	35	518	35	518	28	414	28	414	28	414
K	kg	8.10	35	284	35	284	28	227	28	227	28	227
Insecticides												
Brodan	Lit	394.52	1	395	2	789	1	395	2	789	2	789
Hopcin	Lit	270.00	2	540	1	270	2	540	2	540	2	540
Sevin 85S	kg	185.00	1	185	1	185	2	370	1	185	1	185
Water Charge				0		0		0		0		0
Sub-total				3879		3253		3041		3260		2940
Miscellaneous(30% of total)				4356		3252		3193		2814		1614
Total Cost				14520		10840		10644		9379		5379
2. Gross Income												
Mungbeans	kg	21.58	600	12948	650	14027	700	15106	750	16185	750	16185
Cashew nut	kg	22.55	0	0	0	0	0	0	140	3157	280	6314
Total				12948		14027		15106		19342		22499
3. Net Profit	Peso			-1572		3187		4462		9963		17120
Area (ha)	170ha	pesos		-267240		541790		758540		1693710		2910400

Table 8.20 Incremental Agricultural Benefit

(Financial, Cropping Intensity of 130%)

		Wet Season (irrigated)				Wet Season (unirrigated)				
		Irrigated Paddy	Eggplant	Mung Beans	Rainfed Paddy	Upland Paddy	Maize	Mung Beans	Squash	Gabi
Without Project										
	Yield (ton/ha)	-	-	-	1.70	0.40	1.35	0.44	-	-
	Price (P/ton)	-	-	-	5580	5580	4950	21580	-	-
	GPV (P/ha)	-	-	-	9486	2232	6683	9495	-	-
	Production Cost (P/ha)	-	-	-	3643	1400	1660	2188	-	-
	NPV (P/ha)	-	-	-	5483	832	5023	7303	-	-
	Planted Area (ha)	-	-	-	48.2	74.5	281.0	15.0	-	-
	Total NPV (P1,000)	-	-	-	264	62	1411	110	-	-
With Project										
	Yield (ton/ha)	4.00	10.00	1.00	-	-	2.00	0.75	19.00	3.50
	Price (P/ton)	5580	8560	21580	-	-	4950	21580	3570	7640
	GPV (P/ha)	22320	85600	21580	-	-	9900	16185	67830	26740
	Production Cost (P/ha)	12399	16748	7216	-	-	2698	5195	15826	5985
	NPV (P/ha)	9921	68852	14364	-	-	7202	10990	52004	20755
	Planted Area (ha)	387	72	115	-	-	86	45	72	36
	Total NPV (P1,000)	3839	4957	1652	-	-	619	495	3744	747
Incremental Benefit (P1,000)		3839	4957	1652	-264	-62	-792	385	3744	747

		Dry Season (irrigated)				Dry Season (unirrigated)	
		Maize	Mung Beans	Watermelon	Tomato	Mung Beans	Total
Without Project							
	Yield (ton/ha)	-	-	-	-	-	
	Price (P/ton)	-	-	-	-	-	
	GPV (P/ha)	-	-	-	-	-	
	Production Cost (P/t	-	-	-	-	-	
	NPV (P/ha)	-	-	-	-	-	
	Planted Area (ha)	-	-	-	-	-	
	Total NPV (P1,000)	-	-	-	-	-	1848
With Project							
	Yield (ton/ha)	2.1	1.00	25.00	10.00	0.90	
	Price (P/ton)	4950	21580	8210	9200	21580	
	GPV (P/ha)	10395	21580	205250	92000	19422	
	Production Cost (P/ha)	4200	7157	25858	21671	5195	
	NPV (P/ha)	6195	14423	179392	70329	14227	
	Planted Area (ha)	35	58	12	12	238	
	Total NPV (P1,000)	217	837	2153	844	3386	23490
Incremental Benefit (P1,000)		217	837	2153	844	3386	21643

Table 8.21 Other Benefits (Financial, Cropping Intensity of 130%)

1. Livestock

a) Pig Raising-bred by 400 farm households

Breeding female-2 heads per husehold

Piglets production:

2 headsx10 pigletsx2x0.8=32 piglets — 24 piglets for selling; 8 piglets for fattening

Outputs:

Selling:24 pigletsx 690 pesosx=16,560 pesos

Fattening:8 headsx90 kg/headx31 pesosx=22,320 pesos

Selling:2 femalex100kgx31 pesos/kg/5 years=1,240 pesos

Total — 40,120x460 H.H=18,455,200pesos

Inputs:

Breeding male:2 headsx3,500 pesos/5 years=1,400pesos

Feeds:

Breeding male:2 headsx365 daysx3.5 kg/dayx2.5 pesos/kgx0.3=1,916 pesos

Raising:24 headsx50daysx0.7kg/dayx2.5 pesos/kg x0.3=630 pesos

Fattening:8 headsx350kgx2.5 pesos/kgx0.3=2,100 pesos

Labor:

0.5 hrsx365 daysx5.6 pesos/hr=1,022 pesos

Total — 6,046x460H.H=2,781,160 pesos

Benefit:18,455,200-2,781,160=15,674,040 pesos

b) Carabao Raising-breeding 720 head by 480 farm households

Outputs:

Milk:940kg/headx30 pesos/kg=28,200 pesos

Selling:450kg/headx43 pesos/kg/5 years=3,870 pesos

Total — 32,070x720 head=23,090,400 pesos

Inputs:

Cow & calf:((10,000 pesos/headx1)+(3,000 pesos/headx1)/6 years=2,166 pesos

Feeds:2 kg/headx365daysx2.5 pesos/kg=1,825 pesos

20 kg/headx365daysx0.5 pesos/kg=3,650 pesos

Labor:0.5 hrsx365 daysx5.6 pesos/hr=1,022 pesos

Total — 8,663 pesosx720 head=6,237,360 pesos

Benefit:23,090,400-6,237,360=16,853,040 pesos

c) Cattle

Output:500kg/headx65 pesos/kg =32,500 pesos

32,500x190 H.H=6,175,000pesos

Input:

Young cattle;5,000 pesos/head=5,000 pesos

Feed:300daysx20kgx0.5=3,000 pesos

Labor:0.5x365daysx5.6 pesos/hr=1,022 pesos

Total — 9,022x190 H.H=1,714,180 pesos

Benefit:6,175,000-1,714,180=4,460,820pesos

Table 8.21 Cont'd

2) Farm Road
Saving Costs for transportation
without project
6,070 ton paddy /50kgx5.0 pesos=607,000 pesos

with project
6,070 ton paddy /50kgx0.08 pesos=9,712 pesos

Benefit:607,000-9,712=597,288 pesos

3) Village Water Supply
Saving Costs for transportation
without project
36 hrs/month/H.Hx10.7 pesos/hrx332 H.Hx12 months=1,534,637 pesos

with project
7 hrs/month/H.Hx10.7 pesos/hrx332 H.Hx12 months=298,402 pesos

Benefit:1,534,637-298,402=1,236,235 pesos

4) Post Harvest
Benefit with project
Payment for Thresher(7% of production cost/ha)
9,921pesos/ha x 0.07 x 387ha=268,578 pesos

Paddy to be milled in the Project Area(1,548 ton -23 ton=1,025 ton)
Payment for milling: 1,025 ton x 2 pesos/kg=2,050,000 pesos

Payment for mechanical dryer(accounted 1/3 of paddy)
1,548 tonx 1/3 x 0.56 pesos/kg=288,960 pesos

Rental charge for power tiller(used only in the level land of 559ha)
1,200 pesos/ha x 559ha x 0.9=603,720 pesos

5) Tilapia
Output:80,000m2x0.3 kg/m2=24 ton
24 tx60 pesos/kg=1,440,000 pesos

Input:
Yearlings;80,000 x0.2 pesos=16,000 pesos
Feed;2.5 pesos/kgx8,000kg=20,000 pesos
Labor;3.6hrx5.6 pesos/hrx365days=7,358 pesos

Benefit:1,440,000-37,022=1,402,978 pesos

Table 8.22 FIRR (Overall Project, Financial, Cropping Intensity of 130%)

Year	Capital Cost	O & M Cost	Total	Benefit	Return	Present Worth by Discount Rate					
						Int. = 0.15		Int. = 0.17		Int. = 0.20	
						Cost	Benefit	Cost	Benefit	Cost	Benefit
1	415.33	2.57	417.9	42.30	-375.6	417.9	42.3	417.9	42.3	417.9	42.3
2	0	2.73	2.73	59.00	56.27	2.1	44.6	2.0	43.1	1.9	41.0
3	0	7.5	7.5	61.30	53.8	4.9	40.3	4.7	38.3	4.3	35.5
4	0	2.21	2.21	64.40	62.19	1.3	36.8	1.2	34.4	1.1	31.1
5	0	2.21	2.21	67.40	65.19	1.1	33.5	1.0	30.7	0.9	27.1
6	0	2.21	2.21	67.30	65.09	1.0	29.1	0.9	26.2	0.7	22.5
7	0	2.21	2.21	70.50	68.29	0.8	26.5	0.7	23.5	0.6	19.7
8	0	2.21	2.21	72.50	70.29	0.7	23.7	0.6	20.6	0.5	16.9
9	0	2.21	2.21	74.30	72.09	0.6	21.1	0.5	18.1	0.4	14.4
10	0	2.21	2.21	79.30	77.09	0.5	19.6	0.5	16.5	0.4	12.8
11	0	2.21	2.21	79.50	77.29	0.5	17.1	0.4	14.1	0.3	10.7
12	0	2.21	2.21	80.90	78.69	0.4	15.1	0.3	12.3	0.2	9.1
13	0	2.21	2.21	82.90	80.69	0.4	13.5	0.3	10.8	0.2	7.7
14	0	2.21	2.21	84.30	82.09	0.3	11.9	0.2	9.4	0.2	6.6
15	0	2.21	2.21	85.60	83.39	0.3	10.5	0.2	8.1	0.1	5.6
16	0	2.21	2.21	87.50	85.29	0.2	9.4	0.2	7.1	0.1	4.7
17	0	2.21	2.21	89.40	87.19	0.2	8.3	0.2	6.2	0.1	4.0
18	0	2.21	2.21	90.70	88.49	0.2	7.3	0.1	5.4	0.1	3.4
19	0	2.21	2.21	92.00	89.79	0.2	6.5	0.1	4.7	0.1	2.9
20	0	2.21	2.21	93.80	91.59	0.1	5.7	0.1	4.1	0.1	2.4
21	0	2.21	2.21	93.80	91.59	0.1	5.0	0.1	3.5	0.0	2.0
22	0	2.21	2.21	93.80	91.59	0.1	4.3	0.1	3.0	0.0	1.7
23	0	2.21	2.21	93.80	91.59	0.1	3.8	0.1	2.5	0.0	1.4
24	0	2.21	2.21	93.80	91.59	0.1	3.3	0.1	2.2	0.0	1.2
25	1.01	2.21	3.22	93.80	90.58	0.1	2.8	0.1	1.9	0.0	1.0
26	0	2.21	2.21	93.80	91.59	0.1	2.5	0.0	1.6	0.0	0.8
27	0	2.21	2.21	93.80	91.59	0.1	2.2	0.0	1.4	0.0	0.7
28	0	2.21	2.21	93.80	91.59	0.0	1.9	0.0	1.2	0.0	0.6
29	0	2.21	2.21	93.80	91.59	0.0	1.6	0.0	1.0	0.0	0.5
30	0	2.21	2.21	93.80	91.59	0.0	1.4	0.0	0.8	0.0	0.4
31	0	2.21	2.21	93.80	91.59	0.0	1.2	0.0	0.7	0.0	0.3
32	0	2.21	2.21	93.80	91.59	0.0	1.1	0.0	0.6	0.0	0.3
33	0	2.21	2.21	93.80	91.59	0.0	0.9	0.0	0.5	0.0	0.2
34	0	2.21	2.21	93.80	91.59	0.0	0.8	0.0	0.5	0.0	0.2
35	0	2.21	2.21	93.80	91.59	0.0	0.7	0.0	0.4	0.0	0.2
36	0	2.21	2.21	93.80	91.59	0.0	0.6	0.0	0.3	0.0	0.1
37	0	2.21	2.21	93.80	91.59	0.0	0.5	0.0	0.3	0.0	0.1
38	0	2.21	2.21	93.80	91.59	0.0	0.5	0.0	0.2	0.0	0.1
39	0	2.21	2.21	93.80	91.59	0.0	0.4	0.0	0.2	0.0	0.1
40	0	2.21	2.21	93.80	91.59	0.0	0.4	0.0	0.2	0.0	0.1
41	0	2.21	2.21	93.80	91.59	0.0	0.3	0.0	0.2	0.0	0.1
42	0	2.21	2.21	93.80	91.59	0.0	0.3	0.0	0.1	0.0	0.0
43	0	2.21	2.21	93.80	91.59	0.0	0.2	0.0	0.1	0.0	0.0
44	0	2.21	2.21	93.80	91.59	0.0	0.2	0.0	0.1	0.0	0.0
45	0	2.21	2.21	93.80	91.59	0.0	0.2	0.0	0.1	0.0	0.0
46	0	2.21	2.21	93.80	91.59	0.0	0.2	0.0	0.1	0.0	0.0
47	0	2.21	2.21	93.80	91.59	0.0	0.1	0.0	0.1	0.0	0.0
48	0	2.21	2.21	93.80	91.59	0.0	0.1	0.0	0.1	0.0	0.0
49	0	2.21	2.21	93.80	91.59	0.0	0.1	0.0	0.0	0.0	0.0
50	0	2.21	2.21	93.80	91.59	0.0	0.1	0.0	0.0	0.0	0.0
Total	416.3					434.6	460.5	432.7	399.5	430.5	332.5
								FIRR =		18.0 %	