# APPENDIX L. PROJECT JUSTIFICATION

## Table L.1 Farmgate Prices (Financial and Economic)

| | 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 L.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 milling

## Table L.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 L.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/ | | | | |
| Dealers Margin | Pesos/ton | 98 | 98 | 98 |
| Average Cost of Transportation from Distribution Center to Farm 5/ | Pesos/ton | 100 | 100 | 100 |
| Farmgate Price | Pesos/ton | 78 | 78 | 78 |
| 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%)

# Table L.5 Cost and Return of Crops (Economic)

Crop:Rainfed Wet Paddy

| | 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 | | | | | | |
| Labor | day | 45 | 47 | 2115 | 50 | 2250 |
| Bullock Labor | day | 72 | 24 | 1728 | 24 | 1728 |
| Sub-total | | | | 3843 | | 3978 |
| b. Input Cost | | | | | | |
| Seed | kg | 8.5 | 52 | 442 | 52 | 442 |
| Manure | kg | 0.5 | 0 | 0 | 200 | 100 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 15 | 224 | 20 | 298 |
| P | kg | 17.28 | 0 | 0 | 10 | 173 |
| K | kg | 8.71 | 0 | 0 | 0 | 0 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 0.3 | 82 |
| Sub-total | | | | 666 | | 1095 |
| Miscellaneous(10% of total) | | | | 501 | | 1268 |
| Total Costs | | | | 5010 | | 6341 |
| 2. Gross Income | | | | 9325 | | 10970 |
| a. Main Product | ton | 5485 | 1.7 | 9325 | 2.00 | 10970 |
| b. By-product | ton | 0 | | 0 | | 0 |
| 3. Net Profit | Peso | | | 4315 | | 4629 |

Crop:Rainfed Upland Paddy(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 | | | | | | |
| Labor | day | 45 | 10 | 450 | 27 | 1215 |
| Bullock Labor | day | 72 | 10 | 720 | 22 | 1584 |
| Sub-total | | | | 1170 | | 2799 |
| b. Input Cost | | | | | | |
| Seed | kg | 8.5 | 60 | 510 | 60 | 510 |
| Manure | kg | 0.5 | 0 | 0 | 100 | 50 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 20 | 298 |
| P | kg | 17.28 | 0 | 0 | 10 | 173 |
| K | kg | 8.71 | 0 | 0 | 0 | 0 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 0 | 0 |
| Sub-total | | | | 510 | | 1031 |
| Miscellaneous(10% of total) | | | | 187 | | 676 |
| Total Costs | | | | 1867 | | 4506 |
| 2. Gross Income | | | | 2194 | | 5485 |
| a. Main Product | ton | 5485 | 0.4 | 2194 | 1.00 | 5485 |
| b. By-product | ton | 0 | | 0 | | 0 |
| 3. Net Profit | Peso | | | 327 | | 979 |

Crop:Irrigated Paddy(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 | | | | | | |
| Labor | day | 45 | 46 | 2070 | 48 | 2160 |
| Bullock Labor | day | 72 | 24 | 1728 | 24 | 1728 |
| Sub-total | | | | 3798 | | 3888 |
| b. Input Cost | | | | | | |
| Seed | kg | 18 | 45 | 810 | 45 | 810 |
| Manure | kg | 0.5 | 0 | 0 | 2000 | 1000 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 30 | 448 | 60 | 895 |
| P | kg | 17.28 | 0 | 0 | 30 | 518 |
| K | kg | 8.71 | 0 | 0 | 30 | 261 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 3.40 | 926 |
| Sub-total | | | | 1258 | | 4411 |
| Miscellaneous(10% of total) | | | | 562 | | 2479 |
| Total Costs | | | | 5617 | | 10778 |
| 2. Gross Income | | | | 9654 | | 21940 |
| a. Main Product | ton | 5485 | 1.76 | 9654 | 4.00 | 21940 |
| b. By-product | ton | 0 | | 0 | | 0 |
| 3. Net Profit | Peso | | | 4036 | | 11162 |



Cont'd

# Table L.5 Cont'd

Crop:Rainfed Corn(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 | | | | | | |
| Labor | day | 45 | 28 | 1260 | 30 | 1350 |
| Bullock Labor | day | 72 | 15 | 1080 | 15 | 1080 |
| Sub-total | | | | 2340 | | 2430 |
| b.Input Cost | | | | | | |
| Seed | kg | 8 | 20 | 160 | 20 | 160 |
| Manure | kg | 0.5 | 0 | 0 | 500 | 250 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 5 | 75 | 10 | 149 |
| P | kg | 17.28 | 0 | 0 | 8 | 138 |
| K | kg | 8.71 | 0 | 0 | 0 | 0 |
| Agri-Chemicals | kg | 272.48 | 0.1 | 27 | 0.3 | 82 |
| Sub-total | | | | 262 | | 779 |
| Miscellaneous(30% of total) | | | | 1115 | | 1375 |
| Total Costs | | | | 3717 | | 4585 |
| 2. Gross Income | | | | 5117 | | 7580 |
| a. Main Product | ton | 3790 | 1.35 | 5117 | 2.00 | 7580 |
| b. By-product | ton | 0 | | 0 | | 0 |
| 3. Net Profit | Peso | | | 1400 | | 2995 |

Crop:Irrigated Corn(dry 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 | | | | | | |
| Labor | day | 45 | 20 | 900 | 25 | 1125 |
| Bullock Labor | day | 72 | 15 | 1080 | 25 | 1800 |
| Sub-total | | | | 1980 | | 2925 |
| b.Input Cost | | | | | | |
| Seed | kg | 8 | 20 | 160 | 20 | 160 |
| Manure | kg | 0.5 | 0 | 0 | 500 | 250 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 20 | 298 |
| P | kg | 17.28 | 0 | 0 | 10 | 173 |
| K | kg | 8.71 | 0 | 0 | 0 | 0 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 0.2 | 54 |
| Sub-total | | | | 160 | | 936 |
| Miscellaneous(30% of total) | | | | 917 | | 1655 |
| Total Costs | | | | 3057 | | 5515 |
| 2. Gross Income | | | | 4927 | | 7959 |
| a. Main Product | ton | 3790 | 1.3 | 4927 | 2.10 | 7959 |
| b. By-product | ton | 0 | | 0 | | 0 |
| 3. Net Profit | Peso | | | 1870 | | 2444 |

Crop:Rainfed Squash

| | 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 | | | | | | |
| Labor | day | 45 | | | 91 | 4095 |
| Bullock Labor | day | 72 | | | 34 | 2448 |
| Sub-total | | | | | | 6543 |
| b.Input Cost | | | | | | |
| Seed | kg | 1200 | | | 4 | 4800 |
| Manure | kg | 0.5 | | | 2000 | 1000 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 96 | 1432 |
| P | kg | 17.28 | | | 88 | 1521 |
| K | kg | 8.71 | | | 58 | 505 |
| Agri-Chemicals | kg | 272.46 | | | 9.0 | 2452 |
| Sub-total | | | | | | 11710 |
| Miscellaneous(20% of total) | | | | | | 4563 |
| Total Costs | | | | | | 22817 |
| 2. Gross Income | | | | | | 67830 |
| a. Main Product | ton | 3570 | | | 19.00 | 67830 |
| b. By-product | ton | 0 | | | | 0 |
| 3. Net Profit | Peso | | | | | 45013 |

Crop:Rainfed Gabi(taro) (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 | | | | | | |
| Labor | day | 45 | | | 52 | 2340 |
| Bullock Labor | day | 72 | | | 11 | 792 |
| Sub-total | | | | | | 3132 |
| b.Input Cost | | | | | | |
| Seed | kg | 6 | | | 62 | 372 |
| Manure | kg | 0.5 | | | 2000 | 1000 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 70 | 1044 |
| P | kg | 17.28 | | | 70 | 1210 |
| K | kg | 8.71 | | | 70 | 610 |
| Agri-Chemicals | kg | 272.48 | | | 1 | 136 |
| Sub-total | | | | | | 4372 |
| Miscellaneous(15% of total) | | | | | | 1324 |
| Total Costs | | | | | | 8828 |
| 2. Gross Income | | | | | | 26740 |
| a. Main Product | ton | 7640 | | | 3.50 | 26740 |
| b. By-product | ton | 0 | | | | 0 |
| 3. Net Profit | Peso | | | | | 17912 |

Cont'd

# Table L.5 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 | | | | | | |
| Labor | day | 45 | | | 79 | 3555 |
| Bullock Labor | day | 72 | | | 24 | 1728 |
| Sub-total | | | | | | 5283 |
| b. Input Cost | | | | | | |
| Seed | kg | 4000 | | | 0.15 | 600 |
| Manure | kg | 0.5 | | | 3000 | 1500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 60 | 895 |
| P | kg | 17.28 | | | 130 | 2246 |
| K | kg | 8.71 | | | 96 | 836 |
| Agri-Chemicals | kg | 272.48 | | | 9 | 2452 |
| Sub-total | | | | | | 8530 |
| Miscellaneous (30% of total) | | | | | | 5920 |
| Total Costs | | | | | | 19733 |
| 2. Gross Income | | | | | | 92000 |
| a. Main Product | ton | 9200 | | | 10.00 | 92000 |
| b. By-product | ton | 0 | | | 0.00 | 0 |
| 3. Net Profit | Peso | | | | | 72267 |

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 | | | | | | |
| Labor | day | 45 | | | 127 | 5715 |
| Bullock Labor | day | 72 | | | 30 | 2160 |
| Sub-total | | | | | | 7875 |
| b. Input Cost | | | | | | |
| Seed | kg | 1250 | | | 2.5 | 3125 |
| Manure | kg | 0.5 | | | 3000 | 1500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 60 | 895 |
| P | kg | 17.28 | | | 120 | 2074 |
| K | kg | 8.71 | | | 60 | 523 |
| Agri-Chemicals | kg | 272.48 | | | 3 | 817 |
| Sub-total | | | | | | 8934 |
| Miscellaneous (40% of total) | | | | | | 11206 |
| Total Costs | | | | | | 28015 |
| 2. Gross Income | | | | | | 205250 |
| a. Main Product | ton | 8210 | | | 25.00 | 205250 |
| b. By-product | ton | | | | | 0 |
| 3. Net Profit | Peso | | | | | 177235 |

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 | | | | | | |
| Labor | day | 45 | 52 | 2340 | 55 | 2475 |
| Bullock Labor | day | 72 | 35 | 2520 | 35 | 2520 |
| Sub-total | | | | 4860 | | 4995 |
| b. Input Cost | | | | | | |
| Seed | kg | 30 | 25 | 750 | 25 | 750 |
| Manure | kg | 0.5 | 0 | 0 | 1000 | 500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 15 | 224 |
| P | kg | 17.28 | 0 | 0 | 40 | 691 |
| K | kg | 8.71 | 0 | 0 | 45 | 392 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 2.0 | 545 |
| Sub-total | | | | 750 | | 3102 |
| Miscellaneous (30% of total) | | | | 2404 | | 3470 |
| Total Costs | | | | 8014 | | 11567 |
| 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 | | | 8171 | | 10013 |

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 | | | | | | |
| Labor | day | 45 | 30 | 1350 | 33 | 1485 |
| Bullock Labor | day | 72 | 28 | 2016 | 28 | 2016 |
| Sub-total | | | | 3366 | | 3501 |
| b. Input Cost | | | | | | |
| Seed | kg | 30 | 25 | 750 | 25 | 750 |
| Manure | kg | 0.5 | 0 | 0 | 1000 | 500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 12 | 179 |
| P | kg | 17.28 | 0 | 0 | 30 | 518 |
| K | kg | 8.71 | 0 | 0 | 30 | 261 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 2.0 | 545 |
| Sub-total | | | | 750 | | 2754 |
| Miscellaneous (30% of total) | | | | 1764 | | 2681 |
| Total Costs | | | | 5880 | | 8935 |
| 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 | | | 9226 | | 10487 |

Cont'd

# Table L.5 Cont'd

Crop:Irrigated Eggplant(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 | | | | | | |
| Labor | day | 45 | | | 115 | 5175 |
| Bullock Labor | day | 72 | | | 29 | 2088 |
| Sub-total | | | | | | 7263 |
| b.Input Cost | | | | | | |
| Seed | kg | 4000 | | | 0.2 | 800 |
| Manure | kg | 0.5 | | | 3000 | 1500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 124 | 1850 |
| P | kg | 17.28 | | | 56 | 968 |
| K | kg | 8.71 | | | 56 | 488 |
| Agri-Chemicals | kg | 272.48 | | | 4.0 | 1090 |
| Sub-total | | | | | | 6695 |
| Miscellaneous(30% of total) | | | | | | 5982 |
| Total Costs | | | | | | 19941 |
| 2. Gross Income | | | | | | 85600 |
| a. Main Product | ton | 8560 | | | 10.00 | 85600 |
| b. By-product | ton | 0 | | | | 0 |
| 3. Net Profit | Peso | | | | | 65659 |

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 | | | | | | |
| Labor | day | 45 | 30 | 1350 | 33 | 1485 |
| Bullock Labor | day | 72 | 28 | 2016 | 28 | 2016 |
| Sub-total | | | | 3366 | | 3501 |
| b.Input Cost | | | | | | |
| Seed | kg | 30 | 25 | 750 | 25 | 750 |
| Manure | kg | 0.5 | 0 | 0 | 1000 | 500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 12 | 179 |
| P | kg | 17.28 | 0 | 0 | 30 | 518 |
| K | kg | 8.71 | 0 | 0 | 30 | 261 |
| Agri-Chemicals | kg | 272.48 | 0.1 | 27 | 2.0 | 545 |
| Sub-total | | | | 777 | | 2754 |
| Miscellaneous(30% of total) | | | | 1776 | | 2681 |
| Total Costs | | | | 5919 | | 8935 |
| 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 | | | 3576 | | 7250 |

Crop:Irrigated Eggplant(dry 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 | | | | | | |
| Labor | day | 45 | | | 111 | 4995 |
| Bullock Labor | day | 72 | | | 29 | 2088 |
| Sub-total | | | | | | 7083 |
| b.Input Cost | | | | | | |
| Seed | kg | 4000 | | | 0.2 | 800 |
| Manure | kg | 0.5 | | | 3000 | 1500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | | | 124 | 1850 |
| P | kg | 17.28 | | | 56 | 968 |
| K | kg | 8.71 | | | 56 | 488 |
| Agri-Chemicals | kg | 272.48 | | | 4.0 | 1090 |
| Sub-total | | | | | | 6695 |
| Miscellaneous(30% of total) | | | | | | 5905 |
| Total Costs | | | | | | 19683 |
| 2. Gross Income | | | | | | 119840 |
| a. Main Product | ton | 8560 | | | 14.00 | 119840 |
| b. By-product | ton | 0 | | | | 0 |
| 3. Net Profit | Peso | | | | | 100157 |

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 | | | | | | |
| Labor | day | 45 | 52 | 2340 | 55 | 2475 |
| Bullock Labor | day | 72 | 35 | 2520 | 35 | 2520 |
| Sub-total | | | | 4860 | | 4995 |
| b.Input Cost | | | | | | |
| Seed | kg | 40 | 25 | 1000 | 25 | 1000 |
| Manure | kg | 0.5 | 0 | 0 | 1000 | 500 |
| Fertilizer | | | | | | |
| N | kg | 14.92 | 0 | 0 | 20 | 298 |
| P | kg | 17.28 | 0 | 0 | 40 | 691 |
| K | kg | 8.71 | 0 | 0 | 45 | 392 |
| Agri-Chemicals | kg | 272.48 | 0 | 0 | 2.0 | 545 |
| Sub-total | | | | 1000 | | 3427 |
| Miscellaneous(30% of total) | | | | 2511 | | 3609 |
| Total Costs | | | | 8371 | | 12031 |
| 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 | | | 3498 | | 9549 |

Cont'd

## Table L.5 Cont'd

Cashew Nuts + Upland Crop

| | 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 | | | | | | | | | | | | |
| -Crop | MD | 45 | 6 | 270 | 6 | 270 | 6 | 270 | 4 | 180 | 0 | 0 |
| -Cashew nuts | 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 x 4 | MD | 45 | 4 | 180 | 5 | 225 | 6 | 270 | 6 | 270 | 4 | 180 |
| Harvesting | MD | 45 | 8 | 360 | 8 | 360 | 8 | 360 | 6 | 270 | 5 | 225 |
| Sub-total | | | | 3771 | | 2601 | | 2646 | | 1989 | | 495 |
| b. Inputs | | | | | | | | | | | | |
| Seeds | | | | | | | | | | | | |
| -Crop | kg | 30 | 13 | 390 | 13 | 390 | 13 | 390 | 13 | 390 | 13 | 390 |
| -Cashew nut nursery | pc | 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 | | 2975 | | 3138 | | 2810 |
| Miscellaneous(30% of total) | | | | 3273 | | 2489 | | 2409 | | 2197 | | 1416 |
| Total Cost | | | | 10910.0 | | 8295.2 | | 8029.5 | | 7323.8 | | 4720.9 |
| 2. Gross Income | | | | | | | | | | | | |
| Mungbeans | kg | 21.58 | 600 | 12948 | 650 | 14027 | 700 | 15106 | 750 | 16185 | 750 | 16185 |
| Cashew Nuts | kg | 25.5 | 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 |
| Area 170 ha | pesos | | | 346460 | | 974423 | | 1203022 | | 2113321 | | 3162714 |

| Year | Yield (kg/ha) | Gross Income (pesos) | Net Income (pesos) | *Cashew* Total Income (million pesos) | *Mung beans* Total Income (million pesos) | Grand Total Income (million pesos) |
|---|---|---|---|---|---|---|
| 6 | 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 | 58658 | 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 |

Note: Price of Cashew P 25.50 pesos/kg
Mungbeans (wet season)
net income 7250 pesos/ha * 170 ha = 1,232,500 pesos

Cont'd

## Table L.5 Cont'd

Mango + Pineapple

| | Unit | Unit Price (Pesos) | 1st year Quantity | 1st year Value (Pesos) | 2nd year Quantity | 2nd year Value (Pesos) | 3rd year Quantity | 3rd year Value (Pesos) | 4th year Quantity | 4th year Value (Pesos) | 5th year Quantity | 5th year Value (Pesos) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. 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 | MD | 45 | 2 | 90 | | | | | | | | |
| -Pineapple. | MD | 45 | 20 | 900 | 20 | 900 | 20 | 900 | 20 | 900 | 20 | 900 |
| Fertilizing | | | | | | | | | | | | |
| -Basal | MD | 45 | 10 | 450 | 8 | 360 | 8 | 360 | 8 | 360 | 8 | 360 |
| -Second | MD | 45 | 6 | 270 | 6 | 270 | 6 | 270 | 6 | 270 | 6 | 270 |
| -Third | MD | 45 | 6 | 270 | 6 | 270 | 6 | 270 | 6 | 270 | 6 | 270 |
| -Forth | MD | 45 | 8 | 360 | 8 | 360 | 8 | 360 | 8 | 360 | 8 | 360 |
| Spraying x12 | MD | 45 | 30 | 1350 | 30 | 1350 | 34 | 1530 | 36 | 1620 | 38 | 1710 |
| Weeding | MD | 45 | 10 | 450 | 10 | 450 | 10 | 450 | 10 | 450 | 10 | 450 |
| Harrowing | MD | 45 | 0 | 0 | 10 | 450 | 20 | 900 | 20 | 900 | 20 | 900 |
| Sub-total | | | | 10350 | | 9068 | | 9698 | | 9788 | | 9878 |
| b. Inputs | | | | | | | | | | | | |
| Nursery | | | | | | | | | | | | |
| -Mango | pc | 25 | 100 | 2500 | | | | | | | | |
| -Pineapple slips | pc | 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 |
| 2. Gross Income | | | | | | | | | | | | |
| Mango | kg | 19.24 | 0 | 0 | 0 | 0 | 0 | 0 | 300 | 5772 | 900 | 17316 |
| Pineapple | | | | | | | | | | | | |
| 60% class A | pc | 15 | 0 | 0 | 3840 | 57600 | 3840 | 57600 | 3840 | 57600 | 3840 | 57600 |
| 25% class B | pc | 10 | 0 | 0 | 1600 | 16000 | 1600 | 16000 | 1600 | 16000 | 1600 | 16000 |
| 15% class C | pc | 5 | 0 | 0 | 960 | 4800 | 960 | 4800 | 960 | 4800 | 960 | 4800 |
| Total | | | | 0 | | 78400 | | 78400 | | 84172 | | 95716 |
| 3. Net Profit | Peso | | | -43608 | | 69362 | | 67834 | | 70593 | | 80610 |
| Area 73.9ha | | | | -3222637 | | 5125822 | | 5012954 | | 5216859 | | 5957093 |

# Table L.6 Incremental Benefit (Econoimic)
(Cropping Intensity 200%)

| | Wet Season(irrigated) | | | Wet Season(unirrigated) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Irrigated Paddy | Mung Beans | Eggplant | Rainfed Paddy | Upland Paddy | Maize | Mung Beans | Squash | Gobi |
| 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 | 1.00 | 10.00 | - | - | 2.00 | 0.75 | 19.00 | 3.50 |
| Price(P/ton) | 5485 | 21580 | 8560 | - | - | 3790 | 21580 | 3570 | 7640 |
| GPV(P/ha) | 21940 | 21580 | 85600 | - | - | 7580 | 16185 | 67830 | 26740 |
| Production Cost(P/ha) | 10778 | 12031 | 19941 | - | - | 4585 | 8935 | 22817 | 8828 |
| NPV(P/ha) | 11162 | 9549 | 65659 | - | - | 2995 | 7250 | 45013 | 17912 |
| Planted Area(ha) | 387 | 72 | 72 | - | - | 86 | 45 | 72 | 36 |
| Total NPV(P1,000) | 4320 | 688 | 4727 | - | - | 258 | 326 | 3241 | 645 |
| Incremental Benefit(P1,000) | 4320 | 688 | 4727 | -208 | -24 | -136 | 272 | 3241 | 645 |

| | Dry Season(irrigated) | | | | | Dry Season(unirrigated) | |
|---|---|---|---|---|---|---|---|
| | Tomato | Maize | Mung Beans | Watermelon | Eggplant | Mung Beans | Total |
| 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) | 10.00 | 2.10 | 1.00 | 25.00 | 14.00 | 0.90 | |
| Price(P/ton) | 9200 | 3790 | 21580 | 8210 | 8560 | 21580 | |
| GPV(P/ha) | 92000 | 7959 | 21580 | 205250 | 119840 | 19422 | |
| Production Cost(P/ha) | 19733 | 5515 | 11567 | 28015 | 19683 | 8935 | |
| NPV(P/ha) | 72267 | 2444 | 10013 | 177235 | 100157 | 10487 | |
| Planted Area(ha) | 39 | 116 | 266 | 39 | 72 | 239 | |
| Total NPV(P1,000) | 2818 | 284 | 2663 | 6912 | 7211 | 2506 | 36599 |
| Incremental Benefit(P1,000) | 2818 | 284 | 2663 | 6912 | 7211 | 2506 | 35920 |

# Table L.7 Other Benefits (Economic)

1. Livestock

a) Pig Raising-bred by 400 farm households

Breeding female-2 heads per household

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 pesos

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 — 5,979x450H.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 pesos

Inputs:

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

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 pesos

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

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) Post Harvest (Improvement of paddy quality)

Benefit with project

Payment for thresher(7% of production cost/ha)

9,921 pesos/ha x 0.07 x 387 hax0.82=220,383 pesos

Paddy to be milled in the Project Area(1,548ton-23ton=1,025ton)

Payment for milling:1,025 ton x 2 pesos/kgx0.82=1,681,000 pesos

Payment for mechanical dryer(accounted 1/3 of paddy)

1,548 ton x 1/3 x 0.56 pesos/kgx0.82=236,947 pesos

Rental chrge for power tiller(used only in the level land of 559ha)

1,200pesos/ha x 559ha x 0.9x0.82=495,050 pesos

Benefit:220,383+1,681,000+236,947+495,050=2,633,380 pesos

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/kgx80,000kg= 16,400 pesos

Labor;0.5hrx5.6 pesos/hrx365days=1,022 pesos

Benefit:1,180,800-16,000-16,400-1,022= 1,147,378 pesos

## Table L.8 Project Cost (Financial and Economic)

(Stage I)

| Description | Financial Cost | | | Economic Cost | | |
|---|---|---|---|---|---|---|
| | Total | F/C | L/C | Total | F/C | L/C |
| | | | | | | |
| 1.Construction Cost | | | | | | |
| 1.1 Water Resources F. | 203,280 | 131,476 | 71,804 | 190,355 | 131,476 | 58,879 |
| 1.2 Irri. & Drainange F. | 36,923 | 24,301 | 12,622 | 34,651 | 24,301 | 10,350 |
| 1.3 Farm-to-Market Roads | 19,562 | 12,905 | 6,657 | 18,364 | 12,905 | 5,459 |
| 1.4 Social Infra. | 12,218 | 8,424 | 3,794 | 11,535 | 8,424 | 3,111 |
| 1.5 Post Harvest F. | 16,949 | 11,866 | 5,083 | 16,034 | 11,866 | 4,168 |
| Sub-Total | 288,932 | 188,972 | 99,960 | 270,939 | 188,972 | 81,967 |
| 2.Association Cost | | | | | | |
| 2.1 Pre-engineering Cost | 14,447 | 8,668 | 5,779 | 13,407 | 8,668 | 4,739 |
| 2.2.Administration Cost | 28,893 | 11,557 | 17,336 | 25,773 | 11,557 | 14,216 |
| 2.3 Consulting Services Fee | 28,893 | 17,336 | 11,557 | 26,813 | 17,336 | 9,477 |
| Sub-Total | 72,233 | 37,561 | 34,672 | 65,992 | 37,561 | 28,431 |
| Total | 361,165 | 226,533 | 134,632 | 336,931 | 226,533 | 110,398 |
| 3.Physical Contingency | 25,281 | 15,857 | 9,424 | 23,585 | 15,857 | 7,728 |
| 4.Price Contingency | 28,880 | 7,272 | 21,608 | 0 | 0 | 0 |
| Grand Total | 415,326 | 249,662 | 165,664 | 360,516 | 242,390 | 118,126 |

Economic Cost of Project Costs (Overall)

(Stage II)

(Unit:1000 pesos)

| Description | Financial Cost | | | Economic Cost | | |
|---|---|---|---|---|---|---|
| | Total | F/C | L/C | Total | F/C | L/C |
| | | | | | | |
| 1.Construction Cost | | | | | | |
| 1.1 Water Resources F. | 525,090 | 355,960 | 169,130 | 494,647 | 355,960 | 138,687 |
| 1.2 Irri. & Drainange F. | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.3 Farm-to-Market Roads | 38,349 | 25,053 | 13,296 | 35,956 | 25,053 | 10,903 |
| 1.4 Social Infra. | 43,347 | 17,119 | 26,228 | 38,626 | 17,119 | 21,507 |
| 1.5 Post Harvest F. | 24,608 | 18,421 | 6,187 | 23,494 | 18,421 | 5,073 |
| Sub-Total | 631,394 | 416,553 | 214,841 | 592,723 | 416,553 | 176,170 |
| 2.Association Cost | | | | | | |
| 2.1 Pre-engineering Cost | 31,570 | 18,942 | 12,628 | 29,297 | 18,942 | 10,355 |
| 2.2.Administration Cost | 63,139 | 25,256 | 37,883 | 56,321 | 25,256 | 31,065 |
| 2.3 Consulting Services Fee | 63,139 | 37,883 | 25,256 | 58,594 | 37,884 | 20,710 |
| Sub-Total | 157,848 | 82,081 | 75,767 | 144,212 | 82,081 | 62,129 |
| Total | 789,243 | 498,634 | 290,608 | 736,934 | 498,634 | 238,300 |
| 3.Physical Contingency | 55,247 | 34,904 | 20,343 | 51,585 | 34,904 | 16,681 |
| 4.Price Contingency | 421,193 | 85,366 | 335,827 | 0 | 0 | 0 |
| Grand Total | 1,265,683 | 618,904 | 165,664 | 788,521 | 533,539 | 254,981 |

## Table L.9 Operation and Maintenance Costs

(Economic)

(unit:1,000 pesos)

| | Year 1 | | Year 2 | | Year 3 | | Year 4~ | |
|---|---|---|---|---|---|---|---|---|
| | F.C (pesos) | E.C (pesos) | F.C (pesos) | E.C (pesos) | F.C (pesos) | E.C (pesos) | F.C (pesos) | E.C (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-farm 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 | 189.0 |
| **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 |
| | | | | | | | 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 |

Note: F.C : Financial Cost E.C : Economic Cost

(Econimic Cost)

## Table L.10 Economic Internal Rate of Return

- Case of Overall - Crop Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 360.52 | 2.03 | 362.55 | 3.30 | -359.25 | 329.6 | 3.0 | 315.3 | 2.9 | 302.1 | 2.8 |
| 2 | 0 | 2.18 | 2.18 | 46.64 | 44.46 | 1.8 | 38.5 | 1.6 | 35.3 | 1.5 | 32.4 |
| 3 | 0 | 6.33 | 6.33 | 60.55 | 54.22 | 4.8 | 45.5 | 4.2 | 39.8 | 3.7 | 35.0 |
| 4 | 0 | 1.72 | 1.72 | 65.13 | 63.41 | 1.2 | 44.5 | 1.0 | 37.2 | 0.8 | 31.4 |
| 5 | 0 | 1.72 | 1.72 | 68.85 | 67.13 | 1.1 | 42.8 | 0.9 | 34.2 | 0.7 | 27.7 |
| 6 | 0 | 1.72 | 1.72 | 68.58 | 66.86 | 1.0 | 38.7 | 0.7 | 29.6 | 0.6 | 23.0 |
| 7 | 0 | 1.72 | 1.72 | 73.16 | 71.44 | 0.9 | 37.5 | 0.6 | 27.5 | 0.5 | 20.4 |
| 8 | 0 | 1.72 | 1.72 | 75.48 | 73.76 | 0.8 | 35.2 | 0.6 | 24.7 | 0.4 | 17.6 |
| 9 | 0 | 1.72 | 1.72 | 78.57 | 76.85 | 0.7 | 33.3 | 0.5 | 22.3 | 0.3 | 15.2 |
| 10 | 0 | 1.72 | 1.72 | 85.57 | 83.85 | 0.7 | 33.0 | 0.4 | 21.2 | 0.3 | 13.8 |
| 11 | 0 | 1.72 | 1.72 | 85.76 | 84.04 | 0.6 | 30.1 | 0.4 | 18.4 | 0.2 | 11.5 |
| 12 | 0 | 1.72 | 1.72 | 87.21 | 85.49 | 0.5 | 27.8 | 0.3 | 16.3 | 0.2 | 9.8 |
| 13 | 0 | 1.72 | 1.72 | 89.15 | 87.43 | 0.5 | 25.8 | 0.3 | 14.5 | 0.2 | 8.3 |
| 14 | 0 | 1.72 | 1.72 | 90.57 | 88.85 | 0.5 | 23.8 | 0.2 | 12.8 | 0.1 | 7.1 |
| 15 | 0 | 1.72 | 1.72 | 91.93 | 90.21 | 0.4 | 22.0 | 0.2 | 11.3 | 0.1 | 6.0 |
| 16 | 0 | 1.72 | 1.72 | 93.84 | 92.12 | 0.4 | 20.4 | 0.2 | 10.0 | 0.1 | 5.1 |
| 17 | 78.85 | 1.72 | 80.57 | 95.70 | 15.13 | 15.9 | 18.9 | 7.5 | 8.9 | 3.6 | 4.3 |
| 18 | 157.70 | 1.72 | 159.42 | 97.03 | -62.39 | 28.7 | 17.5 | 12.9 | 7.8 | 6.0 | 3.6 |
| 19 | 236.56 | 1.72 | 238.28 | 98.29 | -139.99 | 39.0 | 16.1 | 16.7 | 6.9 | 7.5 | 3.1 |
| 20 | 236.56 | 1.72 | 238.28 | 100.09 | -138.19 | 35.4 | 14.9 | 14.6 | 6.1 | 6.2 | 2.6 |
| 21 | 78.85 | 1.72 | 80.57 | 100.09 | 19.52 | 10.9 | 13.5 | 4.3 | 5.3 | 1.8 | 2.2 |
| 22 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 12.3 | 0.1 | 4.6 | 0.0 | 1.8 |
| 23 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 11.2 | 0.1 | 4.0 | 0.0 | 1.5 |
| 24 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 10.2 | 0.1 | 3.5 | 0.0 | 1.3 |
| 25 | 0.83 | 1.72 | 2.55 | 100.09 | 97.54 | 0.2 | 9.2 | 0.1 | 3.0 | 0.0 | 1.0 |
| 26 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 8.4 | 0.0 | 2.6 | 0.0 | 0.9 |
| 27 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 7.6 | 0.0 | 2.3 | 0.0 | 0.7 |
| 28 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.9 | 0.0 | 2.0 | 0.0 | 0.6 |
| 29 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.3 | 0.0 | 1.7 | 0.0 | 0.5 |
| 30 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.7 | 0.0 | 1.5 | 0.0 | 0.4 |
| 31 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.2 | 0.0 | 1.3 | 0.0 | 0.4 |
| 32 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.7 | 0.0 | 1.1 | 0.0 | 0.3 |
| 33 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.9 | 0.0 | 0.9 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.6 | 0.0 | 0.8 | 0.0 | 0.2 |
| 36 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.2 | 0.0 | 0.7 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 2.9 | 0.0 | 0.6 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.7 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.4 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1149.9 | | | | | 477.4 | 709.2 | 383.8 | 427.7 | 336.9 | 293.5 |

FIRR = 17.1 %

B/C Ratio at 15% 1.11

## Table L.11 EIRR on Sensitivity Analysis
### - Case of 10% Increase of Project Cost -

Crop Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.10 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 396.57 | 2.03 | 398.60 | 3.30 | -395.30 | 362.4 | 3.0 | 346.6 | 2.9 | 332.2 | 2.8 |
| 2 | 0 | 2.18 | 2.18 | 46.64 | 44.46 | 1.8 | 38.5 | 1.6 | 35.3 | 1.5 | 32.4 |
| 3 | 0 | 6.33 | 6.33 | 60.55 | 54.22 | 4.8 | 45.5 | 4.2 | 39.8 | 3.7 | 35.0 |
| 4 | 0 | 1.72 | 1.72 | 65.13 | 63.41 | 1.2 | 44.5 | 1.0 | 37.2 | 0.8 | 31.4 |
| 5 | 0 | 1.72 | 1.72 | 68.85 | 67.13 | 1.1 | 42.8 | 0.9 | 34.2 | 0.7 | 27.7 |
| 6 | 0 | 1.72 | 1.72 | 68.58 | 66.86 | 1.0 | 38.7 | 0.7 | 29.6 | 0.6 | 23.0 |
| 7 | 0 | 1.72 | 1.72 | 73.16 | 71.44 | 0.9 | 37.5 | 0.6 | 27.5 | 0.5 | 20.4 |
| 8 | 0 | 1.72 | 1.72 | 75.48 | 73.76 | 0.8 | 35.2 | 0.6 | 24.7 | 0.4 | 17.6 |
| 9 | 0 | 1.72 | 1.72 | 78.57 | 76.85 | 0.7 | 33.3 | 0.5 | 22.3 | 0.3 | 15.2 |
| 10 | 0 | 1.72 | 1.72 | 85.57 | 83.85 | 0.7 | 33.0 | 0.4 | 21.2 | 0.3 | 13.8 |
| 11 | 0 | 1.72 | 1.72 | 85.76 | 84.04 | 0.6 | 30.1 | 0.4 | 18.4 | 0.2 | 11.5 |
| 12 | 0 | 1.72 | 1.72 | 87.21 | 85.49 | 0.5 | 27.8 | 0.3 | 16.3 | 0.2 | 9.8 |
| 13 | 0 | 1.72 | 1.72 | 89.15 | 87.43 | 0.5 | 25.8 | 0.3 | 14.5 | 0.2 | 8.3 |
| 14 | 0 | 1.72 | 1.72 | 90.57 | 88.85 | 0.5 | 23.8 | 0.2 | 12.8 | 0.1 | 7.1 |
| 15 | 0 | 1.72 | 1.72 | 91.93 | 90.21 | 0.4 | 22.0 | 0.2 | 11.3 | 0.1 | 6.0 |
| 16 | 0 | 1.72 | 1.72 | 93.84 | 92.12 | 0.4 | 20.4 | 0.2 | 10.0 | 0.1 | 5.1 |
| 17 | 86.74 | 1.72 | 88.46 | 95.70 | 7.24 | 17.5 | 18.9 | 8.2 | 8.9 | 4.0 | 4.3 |
| 18 | 173.47 | 1.72 | 175.19 | 97.03 | -78.16 | 31.5 | 17.5 | 14.2 | 7.8 | 6.6 | 3.6 |
| 19 | 260.22 | 1.72 | 261.94 | 98.29 | -163.65 | 42.8 | 16.1 | 18.4 | 6.9 | 8.2 | 3.1 |
| 20 | 260.22 | 1.72 | 261.94 | 100.09 | -161.85 | 38.9 | 14.9 | 16.0 | 6.1 | 6.8 | 2.6 |
| 21 | 86.74 | 1.72 | 88.46 | 100.09 | 11.63 | 12.0 | 13.5 | 4.7 | 5.3 | 1.9 | 2.2 |
| 22 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 12.3 | 0.1 | 4.6 | 0.0 | 1.8 |
| 23 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 11.2 | 0.1 | 4.0 | 0.0 | 1.5 |
| 24 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 10.2 | 0.1 | 3.5 | 0.0 | 1.3 |
| 25 | 0.83 | 1.72 | 2.55 | 100.09 | 97.54 | 0.2 | 9.2 | 0.1 | 3.0 | 0.0 | 1.0 |
| 26 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 8.4 | 0.0 | 2.6 | 0.0 | 0.9 |
| 27 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 7.6 | 0.0 | 2.3 | 0.0 | 0.7 |
| 28 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.9 | 0.0 | 2.0 | 0.0 | 0.6 |
| 29 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.3 | 0.0 | 1.7 | 0.0 | 0.5 |
| 30 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.7 | 0.0 | 1.5 | 0.0 | 0.4 |
| 31 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.2 | 0.0 | 1.3 | 0.0 | 0.4 |
| 32 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.7 | 0.0 | 1.1 | 0.0 | 0.3 |
| 33 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.9 | 0.0 | 0.9 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.6 | 0.0 | 0.8 | 0.0 | 0.2 |
| 36 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.2 | 0.0 | 0.7 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 2.9 | 0.0 | 0.6 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.7 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.4 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1264.8 | | | | | 523.0 | 709.2 | 420.6 | 427.7 | 369.4 | 293.5 |

FIRR = 15.3 %

B/C Ratio at 15% 1.02

## Table L.12 EIRR on Sensitivity Analysis

- Case of 20% Increase of Project Cost - Crop Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.10 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 432.62 | 2.03 | 434.65 | 3.30 | -431.35 | 395.1 | 3.0 | 378.0 | 2.9 | 362.2 | 2.8 |
| 2 | 0 | 2.18 | 2.18 | 46.64 | 44.46 | 1.8 | 38.5 | 1.6 | 35.3 | 1.5 | 32.4 |
| 3 | 0 | 6.33 | 6.33 | 60.55 | 54.22 | 4.8 | 45.5 | 4.2 | 39.8 | 3.7 | 35.0 |
| 4 | 0 | 1.72 | 1.72 | 65.13 | 63.41 | 1.2 | 44.5 | 1.0 | 37.2 | 0.8 | 31.4 |
| 5 | 0 | 1.72 | 1.72 | 68.85 | 67.13 | 1.1 | 42.8 | 0.9 | 34.2 | 0.7 | 27.7 |
| 6 | 0 | 1.72 | 1.72 | 68.58 | 66.86 | 1.0 | 38.7 | 0.7 | 29.6 | 0.6 | 23.0 |
| 7 | 0 | 1.72 | 1.72 | 73.16 | 71.44 | 0.9 | 37.5 | 0.6 | 27.5 | 0.5 | 20.4 |
| 8 | 0 | 1.72 | 1.72 | 75.48 | 73.76 | 0.8 | 35.2 | 0.6 | 24.7 | 0.4 | 17.6 |
| 9 | 0 | 1.72 | 1.72 | 78.57 | 76.85 | 0.7 | 33.3 | 0.5 | 22.3 | 0.3 | 15.2 |
| 10 | 0 | 1.72 | 1.72 | 85.57 | 83.85 | 0.7 | 33.0 | 0.4 | 21.2 | 0.3 | 13.8 |
| 11 | 0 | 1.72 | 1.72 | 85.76 | 84.04 | 0.6 | 30.1 | 0.4 | 18.4 | 0.2 | 11.5 |
| 12 | 0 | 1.72 | 1.72 | 87.21 | 85.49 | 0.5 | 27.8 | 0.3 | 16.3 | 0.2 | 9.8 |
| 13 | 0 | 1.72 | 1.72 | 89.15 | 87.43 | 0.5 | 25.8 | 0.3 | 14.5 | 0.2 | 8.3 |
| 14 | 0 | 1.72 | 1.72 | 90.57 | 88.85 | 0.5 | 23.8 | 0.2 | 12.8 | 0.1 | 7.1 |
| 15 | 0 | 1.72 | 1.72 | 91.93 | 90.21 | 0.4 | 22.0 | 0.2 | 11.3 | 0.1 | 6.0 |
| 16 | 0 | 1.72 | 1.72 | 93.84 | 92.12 | 0.4 | 20.4 | 0.2 | 10.0 | 0.1 | 5.1 |
| 17 | 94.62 | 1.72 | 96.34 | 95.70 | -0.64 | 19.1 | 18.9 | 9.0 | 8.9 | 4.3 | 4.3 |
| 18 | 189.24 | 1.72 | 190.96 | 97.03 | -93.93 | 34.3 | 17.5 | 15.4 | 7.8 | 7.2 | 3.6 |
| 19 | 283.87 | 1.72 | 285.59 | 98.29 | -187.30 | 46.7 | 16.1 | 20.1 | 6.9 | 8.9 | 3.1 |
| 20 | 283.87 | 1.72 | 285.59 | 100.09 | -185.50 | 42.5 | 14.9 | 17.4 | 6.1 | 7.4 | 2.6 |
| 21 | 94.62 | 1.72 | 96.34 | 100.09 | 3.75 | 13.0 | 13.5 | 5.1 | 5.3 | 2.1 | 2.2 |
| 22 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 12.3 | 0.1 | 4.6 | 0.0 | 1.8 |
| 23 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 11.2 | 0.1 | 4.0 | 0.0 | 1.5 |
| 24 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.2 | 10.2 | 0.1 | 3.5 | 0.0 | 1.3 |
| 25 | 0.83 | 1.72 | 2.55 | 100.09 | 97.54 | 0.2 | 9.2 | 0.1 | 3.0 | 0.0 | 1.0 |
| 26 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 8.4 | 0.0 | 2.6 | 0.0 | 0.9 |
| 27 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 7.6 | 0.0 | 2.3 | 0.0 | 0.7 |
| 28 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.9 | 0.0 | 2.0 | 0.0 | 0.6 |
| 29 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 6.3 | 0.0 | 1.7 | 0.0 | 0.5 |
| 30 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.7 | 0.0 | 1.5 | 0.0 | 0.4 |
| 31 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 5.2 | 0.0 | 1.3 | 0.0 | 0.4 |
| 32 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.7 | 0.0 | 1.1 | 0.0 | 0.3 |
| 33 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.9 | 0.0 | 0.9 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.6 | 0.0 | 0.8 | 0.0 | 0.2 |
| 36 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 3.2 | 0.0 | 0.7 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.1 | 2.9 | 0.0 | 0.6 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.7 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.4 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 100.09 | 98.37 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1379.7 | | | | | 568.6 | 709.2 | 457.5 | 427.7 | 401.8 | 293.5 |

FIRR = 13.8 %

B/C Ratio at 15% 0.93

## Table L.13 EIRR on Sensitivity Analysis

**- Case of 10% Decrease of Benefit** - Crop Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.10 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 360.52 | 2.03 | 362.55 | 2.97 | -359.58 | 329.6 | 2.7 | 315.3 | 2.6 | 302.1 | 2.5 |
| 2 | 0 | 2.18 | 2.18 | 41.98 | 39.80 | 1.8 | 34.7 | 1.6 | 31.7 | 1.5 | 29.2 |
| 3 | 0 | 6.33 | 6.33 | 54.50 | 48.17 | 4.8 | 40.9 | 4.2 | 35.8 | 3.7 | 31.5 |
| 4 | 0 | 1.72 | 1.72 | 58.62 | 56.90 | 1.2 | 40.0 | 1.0 | 33.5 | 0.8 | 28.3 |
| 5 | 0 | 1.72 | 1.72 | 61.97 | 60.25 | 1.1 | 38.5 | 0.9 | 30.8 | 0.7 | 24.9 |
| 6 | 0 | 1.72 | 1.72 | 61.72 | 60.00 | 1.0 | 34.8 | 0.7 | 26.7 | 0.6 | 20.7 |
| 7 | 0 | 1.72 | 1.72 | 65.84 | 64.12 | 0.9 | 33.8 | 0.6 | 24.8 | 0.5 | 18.4 |
| 8 | 0 | 1.72 | 1.72 | 67.93 | 66.21 | 0.8 | 31.7 | 0.6 | 22.2 | 0.4 | 15.8 |
| 9 | 0 | 1.72 | 1.72 | 70.71 | 68.99 | 0.7 | 30.0 | 0.5 | 20.1 | 0.3 | 13.7 |
| 10 | 0 | 1.72 | 1.72 | 77.01 | 75.29 | 0.7 | 29.7 | 0.4 | 19.0 | 0.3 | 12.4 |
| 11 | 0 | 1.72 | 1.72 | 77.18 | 75.46 | 0.6 | 27.1 | 0.4 | 16.6 | 0.2 | 10.4 |
| 12 | 0 | 1.72 | 1.72 | 78.49 | 76.77 | 0.5 | 25.0 | 0.3 | 14.7 | 0.2 | 8.8 |
| 13 | 0 | 1.72 | 1.72 | 80.24 | 78.52 | 0.5 | 23.2 | 0.3 | 13.0 | 0.2 | 7.5 |
| 14 | 0 | 1.72 | 1.72 | 81.51 | 79.79 | 0.5 | 21.5 | 0.2 | 11.5 | 0.1 | 6.3 |
| 15 | 0 | 1.72 | 1.72 | 82.74 | 81.02 | 0.4 | 19.8 | 0.2 | 10.2 | 0.1 | 5.4 |
| 16 | 0 | 1.72 | 1.72 | 84.46 | 82.74 | 0.4 | 18.4 | 0.2 | 9.0 | 0.1 | 4.6 |
| 17 | 78.85 | 1.72 | 80.57 | 86.13 | 5.56 | 15.9 | 17.0 | 7.5 | 8.0 | 3.6 | 3.9 |
| 18 | 157.7 | 1.72 | 159.42 | 87.33 | -72.09 | 28.7 | 15.7 | 12.9 | 7.1 | 6.0 | 3.3 |
| 19 | 236.56 | 1.72 | 238.28 | 88.46 | -149.82 | 39.0 | 14.5 | 16.7 | 6.2 | 7.5 | 2.8 |
| 20 | 236.56 | 1.72 | 238.28 | 90.08 | -148.20 | 35.4 | 13.4 | 14.6 | 5.5 | 6.2 | 2.3 |
| 21 | 78.85 | 1.72 | 80.57 | 90.08 | 9.51 | 10.9 | 12.2 | 4.3 | 4.8 | 1.8 | 2.0 |
| 22 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 11.1 | 0.1 | 4.2 | 0.0 | 1.6 |
| 23 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 10.1 | 0.1 | 3.6 | 0.0 | 1.4 |
| 24 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 9.1 | 0.1 | 3.1 | 0.0 | 1.1 |
| 25 | 0.83 | 1.72 | 2.55 | 90.08 | 87.53 | 0.2 | 8.3 | 0.1 | 2.7 | 0.0 | 0.9 |
| 26 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 7.6 | 0.0 | 2.4 | 0.0 | 0.8 |
| 27 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 6.9 | 0.0 | 2.1 | 0.0 | 0.7 |
| 28 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 6.2 | 0.0 | 1.8 | 0.0 | 0.5 |
| 29 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 5.7 | 0.0 | 1.6 | 0.0 | 0.5 |
| 30 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 5.2 | 0.0 | 1.4 | 0.0 | 0.4 |
| 31 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 4.7 | 0.0 | 1.2 | 0.0 | 0.3 |
| 32 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.3 |
| 33 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.9 | 0.0 | 0.9 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.5 | 0.0 | 0.8 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.2 | 0.0 | 0.7 | 0.0 | 0.2 |
| 36 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 2.9 | 0.0 | 0.6 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 2.6 | 0.0 | 0.5 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.4 | 0.0 | 0.4 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.6 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1149.9 | | | | | 477.4 | 638.6 | 383.8 | 385.2 | 336.9 | 264.4 |

FIRR = 15.1 %

B/C Ratio at 15% 1.00

## Table L.14 EIRR on Sensitivity Analysis

**- Case of 20% Decrease of Benefit -** Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.10 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 396.57 | 2.03 | 398.60 | 2.64 | -395.96 | 362.4 | 2.4 | 346.6 | 2.3 | 332.2 | 2.2 |
| 2 | 0 | 2.18 | 2.18 | 37.31 | 35.13 | 1.8 | 30.8 | 1.6 | 28.2 | 1.5 | 25.9 |
| 3 | 0 | 6.33 | 6.33 | 48.44 | 42.11 | 4.8 | 36.4 | 4.2 | 31.9 | 3.7 | 28.0 |
| 4 | 0 | 1.72 | 1.72 | 52.10 | 50.38 | 1.2 | 35.6 | 1.0 | 29.8 | 0.8 | 25.1 |
| 5 | 0 | 1.72 | 1.72 | 55.08 | 53.36 | 1.1 | 34.2 | 0.9 | 27.4 | 0.7 | 22.1 |
| 6 | 0 | 1.72 | 1.72 | 54.86 | 53.14 | 1.0 | 31.0 | 0.7 | 23.7 | 0.6 | 18.4 |
| 7 | 0 | 1.72 | 1.72 | 58.53 | 56.81 | 0.9 | 30.0 | 0.6 | 22.0 | 0.5 | 16.3 |
| 8 | 0 | 1.72 | 1.72 | 60.38 | 58.66 | 0.8 | 28.2 | 0.6 | 19.7 | 0.4 | 14.0 |
| 9 | 0 | 1.72 | 1.72 | 62.86 | 61.14 | 0.7 | 26.7 | 0.5 | 17.9 | 0.3 | 12.2 |
| 10 | 0 | 1.72 | 1.72 | 68.46 | 66.74 | 0.7 | 26.4 | 0.4 | 16.9 | 0.3 | 11.1 |
| 11 | 0 | 1.72 | 1.72 | 68.61 | 66.89 | 0.6 | 24.0 | 0.4 | 14.7 | 0.2 | 9.2 |
| 12 | 0 | 1.72 | 1.72 | 69.77 | 68.05 | 0.5 | 22.2 | 0.3 | 13.0 | 0.2 | 7.8 |
| 13 | 0 | 1.72 | 1.72 | 71.32 | 69.60 | 0.5 | 20.7 | 0.3 | 11.6 | 0.2 | 6.7 |
| 14 | 0 | 1.72 | 1.72 | 72.46 | 70.74 | 0.5 | 19.1 | 0.2 | 10.2 | 0.1 | 5.6 |
| 15 | 0 | 1.72 | 1.72 | 73.54 | 71.82 | 0.4 | 17.6 | 0.2 | 9.0 | 0.1 | 4.8 |
| 16 | 0 | 1.72 | 1.72 | 75.07 | 73.35 | 0.4 | 16.3 | 0.2 | 8.0 | 0.1 | 4.1 |
| 17 | 86.74 | 1.72 | 88.46 | 76.56 | -11.90 | 17.5 | 15.1 | 8.2 | 7.1 | 4.0 | 3.5 |
| 18 | 173.47 | 1.72 | 175.19 | 77.62 | -97.57 | 31.5 | 14.0 | 14.2 | 6.3 | 6.6 | 2.9 |
| 19 | 260.22 | 1.72 | 261.94 | 78.63 | -183.31 | 42.8 | 12.9 | 18.4 | 5.5 | 8.2 | 2.5 |
| 20 | 260.22 | 1.72 | 261.94 | 80.07 | -181.87 | 38.9 | 11.9 | 16.0 | 4.9 | 6.8 | 2.1 |
| 21 | 86.74 | 1.72 | 88.46 | 80.07 | -8.39 | 12.0 | 10.8 | 4.7 | 4.3 | 1.9 | 1.7 |
| 22 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 9.8 | 0.1 | 3.7 | 0.0 | 1.5 |
| 23 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 8.9 | 0.1 | 3.2 | 0.0 | 1.2 |
| 24 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 8.1 | 0.1 | 2.8 | 0.0 | 1.0 |
| 25 | 0.83 | 1.72 | 2.55 | 80.07 | 77.52 | 0.2 | 7.4 | 0.1 | 2.4 | 0.0 | 0.8 |
| 26 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 6.7 | 0.0 | 2.1 | 0.0 | 0.7 |
| 27 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 6.1 | 0.0 | 1.8 | 0.0 | 0.6 |
| 28 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 5.6 | 0.0 | 1.6 | 0.0 | 0.5 |
| 29 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 5.0 | 0.0 | 1.4 | 0.0 | 0.4 |
| 30 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 4.6 | 0.0 | 1.2 | 0.0 | 0.3 |
| 31 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 4.2 | 0.0 | 1.1 | 0.0 | 0.3 |
| 32 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 3.8 | 0.0 | 0.9 | 0.0 | 0.2 |
| 33 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 3.4 | 0.0 | 0.8 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 3.1 | 0.0 | 0.7 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 2.8 | 0.0 | 0.6 | 0.0 | 0.1 |
| 36 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 2.6 | 0.0 | 0.5 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 2.4 | 0.0 | 0.5 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 2.1 | 0.0 | 0.4 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.9 | 0.0 | 0.3 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.6 | 0.0 | 0.3 | 0.0 | 0.0 |
| 42 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.0 | 0.7 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1264.8 | | | | | 523.0 | 567.5 | 420.6 | 342.2 | 369.4 | 234.7 |

FIRR = 11.3 %

B/C Ratio at 15% 0.81

## Table L.15 EIRR on Sensitivity Analysis

- Case of 10% decrease of Benefit and 10 % Increase of Project Cost - Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.10 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 396.57 | 2.03 | 398.60 | 2.97 | -395.63 | 362.4 | 2.7 | 346.6 | 2.6 | 332.2 | 2.5 |
| 2 | 0 | 2.18 | 2.18 | 41.98 | 39.80 | 1.8 | 34.7 | 1.6 | 31.7 | 1.5 | 29.2 |
| 3 | 0 | 6.33 | 6.33 | 54.50 | 48.17 | 4.8 | 40.9 | 4.2 | 35.8 | 3.7 | 31.5 |
| 4 | 0 | 1.72 | 1.72 | 58.62 | 56.90 | 1.2 | 40.0 | 1.0 | 33.5 | 0.8 | 28.3 |
| 5 | 0 | 1.72 | 1.72 | 61.97 | 60.25 | 1.1 | 38.5 | 0.9 | 30.8 | 0.7 | 24.9 |
| 6 | 0 | 1.72 | 1.72 | 61.72 | 60.00 | 1.0 | 34.8 | 0.7 | 26.7 | 0.6 | 20.7 |
| 7 | 0 | 1.72 | 1.72 | 65.84 | 64.12 | 0.9 | 33.8 | 0.6 | 24.8 | 0.5 | 18.4 |
| 8 | 0 | 1.72 | 1.72 | 67.93 | 66.21 | 0.8 | 31.7 | 0.6 | 22.2 | 0.4 | 15.8 |
| 9 | 0 | 1.72 | 1.72 | 70.71 | 68.99 | 0.7 | 30.0 | 0.5 | 20.1 | 0.3 | 13.7 |
| 10 | 0 | 1.72 | 1.72 | 77.01 | 75.29 | 0.7 | 29.7 | 0.4 | 19.0 | 0.3 | 12.4 |
| 11 | 0 | 1.72 | 1.72 | 77.18 | 75.46 | 0.6 | 27.1 | 0.4 | 16.6 | 0.2 | 10.4 |
| 12 | 0 | 1.72 | 1.72 | 78.49 | 76.77 | 0.5 | 25.0 | 0.3 | 14.7 | 0.2 | 8.8 |
| 13 | 0 | 1.72 | 1.72 | 80.24 | 78.52 | 0.5 | 23.2 | 0.3 | 13.0 | 0.2 | 7.5 |
| 14 | 0 | 1.72 | 1.72 | 81.51 | 79.79 | 0.5 | 21.5 | 0.2 | 11.5 | 0.1 | 6.3 |
| 15 | 0 | 1.72 | 1.72 | 82.74 | 81.02 | 0.4 | 19.8 | 0.2 | 10.2 | 0.1 | 5.4 |
| 16 | 0 | 1.72 | 1.72 | 84.46 | 82.74 | 0.4 | 18.4 | 0.2 | 9.0 | 0.1 | 4.6 |
| 17 | 86.74 | 1.72 | 88.46 | 86.13 | -2.33 | 17.5 | 17.0 | 8.2 | 8.0 | 4.0 | 3.9 |
| 18 | 173.47 | 1.72 | 175.19 | 87.33 | -87.86 | 31.5 | 15.7 | 14.2 | 7.1 | 6.6 | 3.3 |
| 19 | 260.22 | 1.72 | 261.94 | 88.46 | -173.48 | 42.8 | 14.5 | 18.4 | 6.2 | 8.2 | 2.8 |
| 20 | 260.22 | 1.72 | 261.94 | 90.08 | -171.86 | 38.9 | 13.4 | 16.0 | 5.5 | 6.8 | 2.3 |
| 21 | 86.74 | 1.72 | 88.46 | 90.08 | 1.62 | 12.0 | 12.2 | 4.7 | 4.8 | 1.9 | 2.0 |
| 22 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 11.1 | 0.1 | 4.2 | 0.0 | 1.6 |
| 23 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 10.1 | 0.1 | 3.6 | 0.0 | 1.4 |
| 24 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.2 | 9.1 | 0.1 | 3.1 | 0.0 | 1.1 |
| 25 | 0.83 | 1.72 | 2.55 | 90.08 | 87.53 | 0.2 | 8.3 | 0.1 | 2.7 | 0.0 | 0.9 |
| 26 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 7.6 | 0.0 | 2.4 | 0.0 | 0.8 |
| 27 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 6.9 | 0.0 | 2.1 | 0.0 | 0.7 |
| 28 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 6.2 | 0.0 | 1.8 | 0.0 | 0.5 |
| 29 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 5.7 | 0.0 | 1.6 | 0.0 | 0.5 |
| 30 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 5.2 | 0.0 | 1.4 | 0.0 | 0.4 |
| 31 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 4.7 | 0.0 | 1.2 | 0.0 | 0.3 |
| 32 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.3 |
| 33 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.9 | 0.0 | 0.9 | 0.0 | 0.2 |
| 34 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.5 | 0.0 | 0.8 | 0.0 | 0.2 |
| 35 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 3.2 | 0.0 | 0.7 | 0.0 | 0.2 |
| 36 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 2.9 | 0.0 | 0.6 | 0.0 | 0.1 |
| 37 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.1 | 2.6 | 0.0 | 0.5 | 0.0 | 0.1 |
| 38 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.4 | 0.0 | 0.4 | 0.0 | 0.1 |
| 39 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 41 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.6 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.2 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 90.08 | 88.36 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1264.8 | | | | | 523.0 | 638.6 | 420.6 | 385.2 | 369.4 | 264.4 |

FIRR = 13.4 %

B/C Ratio at 15% 0.92

## Table L.16 EIRR on Sensitivity Analysis

**- Case of 20% decrease of Benefit and 20 % Increase of Project Cost -**

Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.05 | | Int.= 0.15 | | Int.= 0.25 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 432.62 | 2.03 | 434.65 | 2.64 | -432.01 | 414.0 | 2.5 | 378.0 | 2.3 | 347.7 | 2.1 |
| 2 | 0 | 2.18 | 2.18 | 37.31 | 35.13 | 2.0 | 33.8 | 1.6 | 28.2 | 1.4 | 23.9 |
| 3 | 0 | 6.33 | 6.33 | 48.44 | 42.11 | 5.5 | 41.8 | 4.2 | 31.9 | 3.2 | 24.8 |
| 4 | 0 | 1.72 | 1.72 | 52.10 | 50.38 | 1.4 | 42.9 | 1.0 | 29.8 | 0.7 | 21.3 |
| 5 | 0 | 1.72 | 1.72 | 55.08 | 53.36 | 1.3 | 43.2 | 0.9 | 27.4 | 0.6 | 18.0 |
| 6 | 0 | 1.72 | 1.72 | 54.86 | 53.14 | 1.3 | 40.9 | 0.7 | 23.7 | 0.5 | 14.4 |
| 7 | 0 | 1.72 | 1.72 | 58.53 | 56.81 | 1.2 | 41.6 | 0.6 | 22.0 | 0.4 | 12.3 |
| 8 | 0 | 1.72 | 1.72 | 60.38 | 58.66 | 1.2 | 40.9 | 0.6 | 19.7 | 0.3 | 10.1 |
| 9 | 0 | 1.72 | 1.72 | 62.86 | 61.14 | 1.1 | 40.5 | 0.5 | 17.9 | 0.2 | 8.4 |
| 10 | 0 | 1.72 | 1.72 | 68.46 | 66.74 | 1.1 | 42.0 | 0.4 | 16.9 | 0.2 | 7.4 |
| 11 | 0 | 1.72 | 1.72 | 68.61 | 66.89 | 1.0 | 40.1 | 0.4 | 14.7 | 0.1 | 5.9 |
| 12 | 0 | 1.72 | 1.72 | 69.77 | 68.05 | 1.0 | 38.9 | 0.3 | 13.0 | 0.1 | 4.8 |
| 13 | 0 | 1.72 | 1.72 | 71.32 | 69.60 | 0.9 | 37.8 | 0.3 | 11.6 | 0.1 | 3.9 |
| 14 | 0 | 1.72 | 1.72 | 72.46 | 70.74 | 0.9 | 36.6 | 0.2 | 10.2 | 0.1 | 3.2 |
| 15 | 0 | 1.72 | 1.72 | 73.54 | 71.82 | 0.8 | 35.4 | 0.2 | 9.0 | 0.1 | 2.6 |
| 16 | 0 | 1.72 | 1.72 | 75.07 | 73.35 | 0.8 | 34.4 | 0.2 | 8.0 | 0.0 | 2.1 |
| 17 | 94.62 | 1.72 | 96.34 | 76.56 | -19.78 | 42.0 | 33.4 | 9.0 | 7.1 | 2.2 | 1.7 |
| 18 | 189.24 | 1.72 | 190.96 | 77.62 | -113.34 | 79.3 | 32.3 | 15.4 | 6.3 | 3.4 | 1.4 |
| 19 | 283.87 | 1.72 | 285.59 | 78.63 | -206.96 | 113.0 | 31.1 | 20.1 | 5.5 | 4.1 | 1.1 |
| 20 | 283.87 | 1.72 | 285.59 | 80.07 | -205.52 | 107.6 | 30.2 | 17.4 | 4.9 | 3.3 | 0.9 |
| 21 | 94.62 | 1.72 | 96.34 | 80.07 | -16.27 | 34.6 | 28.7 | 5.1 | 4.3 | 0.9 | 0.7 |
| 22 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.6 | 27.4 | 0.1 | 3.7 | 0.0 | 0.6 |
| 23 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.6 | 26.1 | 0.1 | 3.2 | 0.0 | 0.5 |
| 24 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.5 | 24.8 | 0.1 | 2.8 | 0.0 | 0.4 |
| 25 | 0.83 | 1.72 | 2.55 | 80.07 | 77.52 | 0.8 | 23.6 | 0.1 | 2.4 | 0.0 | 0.3 |
| 26 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.5 | 22.5 | 0.0 | 2.1 | 0.0 | 0.2 |
| 27 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.5 | 21.4 | 0.0 | 1.8 | 0.0 | 0.2 |
| 28 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.4 | 20.4 | 0.0 | 1.6 | 0.0 | 0.2 |
| 29 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.4 | 19.5 | 0.0 | 1.4 | 0.0 | 0.1 |
| 30 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.4 | 18.5 | 0.0 | 1.2 | 0.0 | 0.1 |
| 31 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.4 | 17.6 | 0.0 | 1.1 | 0.0 | 0.1 |
| 32 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.4 | 16.8 | 0.0 | 0.9 | 0.0 | 0.1 |
| 33 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 16.0 | 0.0 | 0.8 | 0.0 | 0.1 |
| 34 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 15.2 | 0.0 | 0.7 | 0.0 | 0.0 |
| 35 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 14.5 | 0.0 | 0.6 | 0.0 | 0.0 |
| 36 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 13.8 | 0.0 | 0.5 | 0.0 | 0.0 |
| 37 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 13.2 | 0.0 | 0.5 | 0.0 | 0.0 |
| 38 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 12.5 | 0.0 | 0.4 | 0.0 | 0.0 |
| 39 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.3 | 11.9 | 0.0 | 0.3 | 0.0 | 0.0 |
| 40 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 11.4 | 0.0 | 0.3 | 0.0 | 0.0 |
| 41 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 10.8 | 0.0 | 0.3 | 0.0 | 0.0 |
| 42 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 10.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 43 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 9.8 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 9.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 8.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 46 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 8.5 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 8.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 7.7 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.2 | 7.3 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 1.72 | 1.72 | 80.07 | 78.35 | 0.1 | 7.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1379.7 | | | | | 821.7 | 1183.9 | 457.5 | 342.2 | 369.6 | 173.9 |

FIRR = 10.0 %

B/C Ratio at 15% 0.75

## Table L.17 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 |

Stage-2 (cropping intensity 200%)

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 | 2.6 | 1.00 | 2.600 | 21580 | 56108 | 18608 | 37500 |
| Sub-total | 5.2 | | | | 114140 | 50846 | 63294 |

| | |
|---|---|
| 2. Livestock Income | 3000 |
| 3. Off-farm Income | 0 |
| 4. O & M Costs | 810 |
| 5. Debt | 5750 |
| 6. Family Expenditures | 43000 |
| 7. Disposable Income | 16734 |

continued

## Table L.17 Cont'd

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 |

Stage-2 (cropping intensity 200%)

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 | 2.6 | 1.00 | 2.600 | 21580 | 56108 | 18762 | 37346 |
| Sub-total | 5.2 | | | | 112216 | 37523 | 74693 |

| | |
|---|---|
| 2. Livestock Income | 3000 |
| 3. Off-farm Income | 0 |
| 4. O & M Costs | 810 |
| 5. Debt | 5750 |
| 6. Family Expenditures | 50790 |
| 7. Disposable Income | 20343 |

continued

## Table L.17 Cont'd

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 L.18 Cost and Return of Crops (Financial)

Crop:Rainfed Wet Paddy

| | 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 | | | | | | |
| 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 | Without Project Value (Pesos) | With Project Quant-ity | With Project 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 |

Crop:Irrigated Paddy(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 | | | | | | |
| 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 L.18 Cont'd

Crop:Rainfed Corn(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 | 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 Quant-ity | Without Project Value (Pesos) | With Project Quant-ity | With Project 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 |

Crop:Rainfed Squash

| | 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 | 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 Quant-ity | Without Project Value (Pesos) | With Project Quant-ity | With Project 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 L.18 Cont'd

Crop:Irrigated Tomato(dry 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 | | | 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 Quant-ity | Without Project Value (Pesos) | With Project Quant-ity | With Project 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 |

Crop:Irrigated Mung Beans(dry 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 | 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 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 | 14.1 | 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 L.18 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 |

Crop:Irrigated Eggplant(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 | | | 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 Quant-ity | Without Project Value (Pesos) | With Project Quant-ity | With Project 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 L.18 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 |
| Dopcin | 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 L.18 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 | | 3250 | | 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 L.19 Incremental Benefit (Financial)
(Cropping intensity 200%)

| | Wet Season (irrigated) | | | Wet Season (unirrigated) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Irrigated Paddy | Mung Beans | Eggplant | 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) | - | - | - | 5843 | 832 | 5023 | 7307 | - | - |
| Planted Area (ha) | - | - | - | 48.2 | 74.8 | 281.0 | 15.0 | - | - |
| Total NPV (P1,000) | - | - | - | 282 | 62 | 1411 | 110 | - | - |
| With Project | | | | | | | | | |
| Yield (ton/ha) | 4.00 | 1.00 | 10.00 | - | - | 2.00 | 0.75 | 19.00 | 3.50 |
| Price (P/ton) | 5580 | 21580 | 8560 | - | - | 4950 | 21580 | 3570 | 7640 |
| GPV (P/ha) | 22320 | 21580 | 85600 | - | - | 9900 | 16185 | 67830 | 26740 |
| Production Cost (P/ha) | 12399 | 7216 | 16748 | - | - | 2698 | 5195 | 15826 | 5985 |
| NPV (P/ha) | 9921 | 14364 | 68852 | - | - | 7202 | 10990 | 52004 | 20755 |
| Planted Area (ha) | 387 | 72 | 72 | - | - | 86 | 45 | 72 | 36 |
| Total NPV (P1,000) | 3839 | 1034 | 4957 | - | - | 619 | 495 | 3744 | 747 |
| Incremental Benefit (P1,000) | 3839 | 1034 | 4957 | -282 | -62 | -792 | 272 | 3744 | 747 |

| | Dry Season (irrigated) | | | | | Dry Season (unirrigated) | |
|---|---|---|---|---|---|---|---|
| | Tomato | Maize | Mung Beans | Watermelon | Eggplant | Mung Beans | Total |
| 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) | - | - | - | - | - | - | 1865 |
| With Project | | | | | | | |
| Yield (ton/ha) | 10.00 | 2.10 | 1.00 | 25.00 | 14.00 | 0.90 | |
| Price (P/ton) | 9200 | 4950 | 21580 | 8210 | 8560 | 21580 | |
| GPV (P/ha) | 92000 | 10395 | 21580 | 205250 | 119840 | 19422 | |
| Production Cost (P/ha) | 21671 | 4200 | 7157 | 25858 | 17490 | 5195 | |
| NPV (P/ha) | 70329 | 6195 | 14423 | 179392 | 102350 | 14227 | |
| Planted Area (ha) | 39 | 116 | 266 | 39 | 72 | 239 | |
| Total NPV (P1,000) | 2743 | 719 | 3837 | 6996 | 7369 | 3400 | 40500 |
| Incremental Benefit (P1,000) | 2743 | 719 | 3837 | 6996 | 7369 | 3400 | 38635 |

# Table L.20 Other Benefits (Financial)

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

2) Farm Road
Saving Costs for transportation
without project
8.360 ton paddy /50kgx5.0 pesos=836.000 pesos

with project
8.360 ton paddy /50kgx0.08 pesos=13.376 pesos

Benefit:836.000-13.376=822.624 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) Post Harvest
Benefit with project
Payment for thresher(7% of production cost/ha)
9.921 pesos/ha x 0.07 x 387 ha=268.578 pesos

Paddy to be milled in the Project Area(1.548ton-23ton=1.025ton)
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 ton x 1/3 x 0.56 pesos/kg=288.960 pesos

Rental chrge for power tiller(used only in the level land of 569ha)
1.200pesos/ha x 569ha x 0.9=603.720 pesos

5) Tilapia
Output:290.000 m2x0.3 kg/m2=87 ton
87 tx60 pesos/kgx0.82=5.220.000 pesos

Input:
Yearlings:290.000 x0.2 pesos=58.000 pesos
Feed:2.5 pesos/kgx29.000kg=72.500 pesos
Labor:3.6hrx5.6 pesos/hrx365days=7.358 pesos

Benefit:5.220.000-137.858=5.082.142 pesos

## Table L.21 Financial Internal Rate of Return

- Case of Overall -Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.15 | | Int.= 0.17 | | Int.= 0.19 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 415.33 | 2.57 | 417.9 | 39.01 | -378.89 | 363.4 | 33.9 | 357.2 | 33.3 | 351.2 | 32.8 |
| 2 | 0 | 2.73 | 2.73 | 62.68 | 59.95 | 2.1 | 47.4 | 2.0 | 45.8 | 1.9 | 44.3 |
| 3 | 0 | 7.5 | 7.5 | 66.97 | 59.47 | 4.9 | 44.0 | 4.7 | 41.8 | 4.5 | 39.7 |
| 4 | 0 | 2.21 | 2.21 | 75.73 | 73.52 | 1.3 | 43.3 | 1.2 | 40.4 | 1.1 | 37.8 |
| 5 | 0 | 2.21 | 2.21 | 80.47 | 78.26 | 1.1 | 40.0 | 1.0 | 36.7 | 0.9 | 33.7 |
| 6 | 0 | 2.21 | 2.21 | 81.66 | 79.45 | 1.0 | 35.3 | 0.9 | 31.8 | 0.8 | 28.8 |
| 7 | 0 | 2.21 | 2.21 | 84.89 | 82.68 | 0.8 | 31.9 | 0.7 | 28.3 | 0.7 | 25.1 |
| 8 | 0 | 2.21 | 2.21 | 88.09 | 85.88 | 0.7 | 28.8 | 0.6 | 25.1 | 0.5 | 21.9 |
| 9 | 0 | 2.21 | 2.21 | 90.28 | 88.07 | 0.6 | 25.7 | 0.5 | 22.0 | 0.5 | 18.9 |
| 10 | 0 | 2.21 | 2.21 | 100.20 | 97.99 | 0.5 | 24.8 | 0.5 | 20.8 | 0.4 | 17.6 |
| 11 | 0 | 2.21 | 2.21 | 100.38 | 98.17 | 0.5 | 21.6 | 0.4 | 17.8 | 0.3 | 14.8 |
| 12 | 0 | 2.21 | 2.21 | 101.83 | 99.62 | 0.4 | 19.0 | 0.3 | 15.5 | 0.3 | 12.6 |
| 13 | 0 | 2.21 | 2.21 | 103.76 | 101.55 | 0.4 | 16.9 | 0.3 | 13.5 | 0.2 | 10.8 |
| 14 | 0 | 2.21 | 2.21 | 105.17 | 102.96 | 0.3 | 14.9 | 0.2 | 11.7 | 0.2 | 9.2 |
| 15 | 0 | 2.21 | 2.21 | 106.53 | 104.32 | 0.3 | 13.1 | 0.2 | 10.1 | 0.2 | 7.8 |
| 16 | 0 | 2.21 | 2.21 | 108.44 | 106.23 | 0.2 | 11.6 | 0.2 | 8.8 | 0.1 | 6.7 |
| 17 | 126.56 | 2.21 | 128.77 | 110.29 | -18.48 | 12.0 | 10.2 | 8.9 | 7.6 | 6.7 | 5.7 |
| 18 | 253.12 | 2.21 | 255.33 | 111.61 | -143.72 | 20.6 | 9.0 | 15.1 | 6.6 | 11.1 | 4.9 |
| 19 | 379.71 | 2.21 | 381.92 | 112.87 | -269.05 | 26.8 | 7.9 | 19.3 | 5.7 | 14.0 | 4.1 |
| 20 | 379.71 | 2.21 | 381.92 | 114.67 | -267.25 | 23.3 | 7.0 | 16.5 | 5.0 | 11.8 | 3.5 |
| 21 | 126.58 | 2.21 | 128.79 | 114.67 | -14.12 | 6.8 | 6.1 | 4.8 | 4.2 | 3.3 | 3.0 |
| 22 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 5.3 | 0.1 | 3.6 | 0.0 | 2.5 |
| 23 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.6 | 0.1 | 3.1 | 0.0 | 2.1 |
| 24 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.0 | 0.1 | 2.6 | 0.0 | 1.8 |
| 25 | 1.01 | 2.21 | 3.22 | 114.67 | 111.45 | 0.1 | 3.5 | 0.1 | 2.3 | 0.0 | 1.5 |
| 26 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.0 | 0.0 | 1.9 | 0.0 | 1.2 |
| 27 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 2.6 | 0.0 | 1.7 | 0.0 | 1.0 |
| 28 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.3 | 0.0 | 1.4 | 0.0 | 0.9 |
| 29 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.0 | 0.0 | 1.2 | 0.0 | 0.7 |
| 30 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.7 | 0.0 | 1.0 | 0.0 | 0.6 |
| 31 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.5 | 0.0 | 0.9 | 0.0 | 0.5 |
| 32 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.3 | 0.0 | 0.8 | 0.0 | 0.4 |
| 33 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.1 | 0.0 | 0.6 | 0.0 | 0.4 |
| 34 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.0 | 0.0 | 0.6 | 0.0 | 0.3 |
| 35 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.9 | 0.0 | 0.5 | 0.0 | 0.3 |
| 36 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.7 | 0.0 | 0.4 | 0.0 | 0.2 |
| 37 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.7 | 0.0 | 0.3 | 0.0 | 0.2 |
| 38 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.6 | 0.0 | 0.3 | 0.0 | 0.2 |
| 39 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.5 | 0.0 | 0.3 | 0.0 | 0.1 |
| 40 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.4 | 0.0 | 0.2 | 0.0 | 0.1 |
| 41 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.4 | 0.0 | 0.2 | 0.0 | 0.1 |
| 42 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.3 | 0.0 | 0.2 | 0.0 | 0.1 |
| 43 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.3 | 0.0 | 0.1 | 0.0 | 0.1 |
| 44 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 0.1 |
| 45 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 46 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 1682.0 | | | | | 468.9 | 532.3 | 436.1 | 457.3 | 411.0 | 399.3 |
| | | | | | | | | FIRR = | | 18.2 % | |

## Table L.22 FIRR on Sensitivity Analysis

- Case of 10% Increase of Project Cost -Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 456.86 | 2.57 | 459.43 | 39.01 | -420.42 | 417.7 | 35.5 | 399.5 | 33.9 | 382.9 | 32.5 |
| 2 | 0 | 2.73 | 2.73 | 62.68 | 59.95 | 2.3 | 51.8 | 2.1 | 47.4 | 1.9 | 43.5 |
| 3 | 0 | 7.50 | 7.5 | 66.97 | 59.47 | 5.6 | 50.3 | 4.9 | 44.0 | 4.3 | 38.8 |
| 4 | 0 | 2.21 | 2.21 | 75.73 | 73.52 | 1.5 | 51.7 | 1.3 | 43.3 | 1.1 | 36.5 |
| 5 | 0 | 2.21 | 2.21 | 80.47 | 78.26 | 1.4 | 50.0 | 1.1 | 40.0 | 0.9 | 32.3 |
| 6 | 0 | 2.21 | 2.21 | 81.66 | 79.45 | 1.2 | 46.1 | 1.0 | 35.3 | 0.7 | 27.3 |
| 7 | 0 | 2.21 | 2.21 | 84.89 | 82.68 | 1.1 | 43.6 | 0.8 | 31.9 | 0.6 | 23.7 |
| 8 | 0 | 2.21 | 2.21 | 88.09 | 85.88 | 1.0 | 41.1 | 0.7 | 28.8 | 0.5 | 20.5 |
| 9 | 0 | 2.21 | 2.21 | 90.28 | 88.07 | 0.9 | 38.3 | 0.6 | 25.7 | 0.4 | 17.5 |
| 10 | 0 | 2.21 | 2.21 | 100.20 | 97.99 | 0.9 | 38.6 | 0.5 | 24.8 | 0.4 | 16.2 |
| 11 | 0 | 2.21 | 2.21 | 100.38 | 98.17 | 0.8 | 35.2 | 0.5 | 21.6 | 0.3 | 13.5 |
| 12 | 0 | 2.21 | 2.21 | 101.83 | 99.62 | 0.7 | 32.4 | 0.4 | 19.0 | 0.2 | 11.4 |
| 13 | 0 | 2.21 | 2.21 | 103.76 | 101.55 | 0.6 | 30.1 | 0.4 | 16.9 | 0.2 | 9.7 |
| 14 | 0 | 2.21 | 2.21 | 105.17 | 102.96 | 0.6 | 27.7 | 0.3 | 14.9 | 0.2 | 8.2 |
| 15 | 0 | 2.21 | 2.21 | 106.53 | 104.32 | 0.5 | 25.5 | 0.3 | 13.1 | 0.1 | 6.9 |
| 16 | 0 | 2.21 | 2.21 | 108.44 | 106.23 | 0.5 | 23.6 | 0.2 | 11.6 | 0.1 | 5.9 |
| 17 | 139.22 | 2.21 | 141.43 | 110.29 | -31.14 | 28.0 | 21.8 | 13.1 | 10.2 | 6.4 | 5.0 |
| 18 | 278.43 | 2.21 | 280.64 | 111.61 | -169.03 | 50.5 | 20.1 | 22.7 | 9.0 | 10.5 | 4.2 |
| 19 | 417.68 | 2.21 | 419.89 | 112.87 | -307.02 | 68.7 | 18.5 | 29.5 | 7.9 | 13.1 | 3.5 |
| 20 | 417.68 | 2.21 | 419.89 | 114.67 | -305.22 | 62.4 | 17.0 | 25.7 | 7.0 | 11.0 | 3.0 |
| 21 | 139.24 | 2.21 | 141.45 | 114.67 | -26.78 | 19.1 | 15.5 | 7.5 | 6.1 | 3.1 | 2.5 |
| 22 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.3 | 14.1 | 0.1 | 5.3 | 0.0 | 2.1 |
| 23 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 12.8 | 0.1 | 4.6 | 0.0 | 1.7 |
| 24 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 11.6 | 0.1 | 4.0 | 0.0 | 1.4 |
| 25 | 1.01 | 2.21 | 3.22 | 114.67 | 111.45 | 0.3 | 10.6 | 0.1 | 3.5 | 0.0 | 1.2 |
| 26 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 9.6 | 0.1 | 3.0 | 0.0 | 1.0 |
| 27 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 8.7 | 0.1 | 2.6 | 0.0 | 0.8 |
| 28 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 8.0 | 0.0 | 2.3 | 0.0 | 0.7 |
| 29 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 7.2 | 0.0 | 2.0 | 0.0 | 0.6 |
| 30 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 6.6 | 0.0 | 1.7 | 0.0 | 0.5 |
| 31 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 6.0 | 0.0 | 1.5 | 0.0 | 0.4 |
| 32 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 5.4 | 0.0 | 1.3 | 0.0 | 0.3 |
| 33 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.9 | 0.0 | 1.1 | 0.0 | 0.3 |
| 34 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.5 | 0.0 | 1.0 | 0.0 | 0.2 |
| 35 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.1 | 0.0 | 0.9 | 0.0 | 0.2 |
| 36 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.7 | 0.0 | 0.7 | 0.0 | 0.2 |
| 37 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.4 | 0.0 | 0.7 | 0.0 | 0.1 |
| 38 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.1 | 0.0 | 0.6 | 0.0 | 0.1 |
| 39 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 2.8 | 0.0 | 0.5 | 0.0 | 0.1 |
| 40 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.5 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.3 | 0.0 | 0.4 | 0.0 | 0.1 |
| 42 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.1 | 0.0 | 0.3 | 0.0 | 0.1 |
| 43 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.9 | 0.0 | 0.3 | 0.0 | 0.0 |
| 44 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.6 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 48 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1850.1 | | | | | 668.9 | 859.5 | 513.9 | 532.3 | 439.2 | 375.0 |
| | | | | | | | | FIRR = | | 15.9 % | |

## Table L.23 FIRR on Sensitivity Analysis

### - Case of 20% Increase of Project Cost -Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 498.40 | 2.57 | 500.97 | 39.01 | -461.96 | 455.4 | 35.5 | 435.6 | 33.9 | 417.5 | 32.5 |
| 2 | 0.00 | 2.73 | 2.73 | 62.68 | 59.95 | 2.3 | 51.8 | 2.1 | 47.4 | 1.9 | 43.5 |
| 3 | 0.00 | 7.50 | 7.5 | 66.97 | 59.47 | 5.6 | 50.3 | 4.9 | 44.0 | 4.3 | 38.8 |
| 4 | 0.00 | 2.21 | 2.21 | 75.73 | 73.52 | 1.5 | 51.7 | 1.3 | 43.3 | 1.1 | 36.5 |
| 5 | 0.00 | 2.21 | 2.21 | 80.47 | 78.26 | 1.4 | 50.0 | 1.1 | 40.0 | 0.9 | 32.3 |
| 6 | 0.00 | 2.21 | 2.21 | 81.66 | 79.45 | 1.2 | 46.1 | 1.0 | 35.3 | 0.7 | 27.3 |
| 7 | 0.00 | 2.21 | 2.21 | 84.89 | 82.68 | 1.1 | 43.6 | 0.8 | 31.9 | 0.6 | 23.7 |
| 8 | 0.00 | 2.21 | 2.21 | 88.09 | 85.88 | 1.0 | 41.1 | 0.7 | 28.8 | 0.5 | 20.5 |
| 9 | 0.00 | 2.21 | 2.21 | 90.28 | 88.07 | 0.9 | 38.3 | 0.6 | 25.7 | 0.4 | 17.5 |
| 10 | 0.00 | 2.21 | 2.21 | 100.20 | 97.99 | 0.9 | 38.6 | 0.5 | 24.8 | 0.4 | 16.2 |
| 11 | 0.00 | 2.21 | 2.21 | 100.38 | 98.17 | 0.8 | 35.2 | 0.5 | 21.6 | 0.3 | 13.5 |
| 12 | 0.00 | 2.21 | 2.21 | 101.83 | 99.62 | 0.7 | 32.4 | 0.4 | 19.0 | 0.2 | 11.4 |
| 13 | 0.00 | 2.21 | 2.21 | 103.76 | 101.55 | 0.6 | 30.1 | 0.4 | 16.9 | 0.2 | 9.7 |
| 14 | 0.00 | 2.21 | 2.21 | 105.17 | 102.96 | 0.6 | 27.7 | 0.3 | 14.9 | 0.2 | 8.2 |
| 15 | 0.00 | 2.21 | 2.21 | 106.53 | 104.32 | 0.5 | 25.5 | 0.3 | 13.1 | 0.1 | 6.9 |
| 16 | 0.00 | 2.21 | 2.21 | 108.44 | 106.23 | 0.5 | 23.6 | 0.2 | 11.6 | 0.1 | 5.9 |
| 17 | 151.87 | 2.21 | 154.08 | 110.29 | -43.79 | 30.5 | 21.8 | 14.3 | 10.2 | 6.9 | 5.0 |
| 18 | 303.74 | 2.21 | 305.95 | 111.61 | -194.34 | 55.0 | 20.1 | 24.7 | 9.0 | 11.5 | 4.2 |
| 19 | 455.65 | 2.21 | 457.86 | 112.87 | -344.99 | 74.9 | 18.5 | 32.2 | 7.9 | 14.3 | 3.5 |
| 20 | 455.65 | 2.21 | 457.86 | 114.67 | -343.19 | 68.1 | 17.0 | 28.0 | 7.0 | 11.9 | 3.0 |
| 21 | 151.90 | 2.21 | 154.11 | 114.67 | -39.44 | 20.8 | 15.5 | 8.2 | 6.1 | 3.3 | 2.5 |
| 22 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.3 | 14.1 | 0.1 | 5.3 | 0.0 | 2.1 |
| 23 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 12.8 | 0.1 | 4.6 | 0.0 | 1.7 |
| 24 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 11.6 | 0.1 | 4.0 | 0.0 | 1.4 |
| 25 | 1.01 | 2.21 | 3.22 | 114.67 | 111.45 | 0.3 | 10.6 | 0.1 | 3.5 | 0.0 | 1.2 |
| 26 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 9.6 | 0.1 | 3.0 | 0.0 | 1.0 |
| 27 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 8.7 | 0.1 | 2.6 | 0.0 | 0.8 |
| 28 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.2 | 8.0 | 0.0 | 2.3 | 0.0 | 0.7 |
| 29 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 7.2 | 0.0 | 2.0 | 0.0 | 0.6 |
| 30 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 6.6 | 0.0 | 1.7 | 0.0 | 0.5 |
| 31 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 6.0 | 0.0 | 1.5 | 0.0 | 0.4 |
| 32 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 5.4 | 0.0 | 1.3 | 0.0 | 0.3 |
| 33 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.9 | 0.0 | 1.1 | 0.0 | 0.3 |
| 34 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.5 | 0.0 | 1.0 | 0.0 | 0.2 |
| 35 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 4.1 | 0.0 | 0.9 | 0.0 | 0.2 |
| 36 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.7 | 0.0 | 0.7 | 0.0 | 0.2 |
| 37 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.4 | 0.0 | 0.7 | 0.0 | 0.1 |
| 38 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 3.1 | 0.0 | 0.6 | 0.0 | 0.1 |
| 39 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.1 | 2.8 | 0.0 | 0.5 | 0.0 | 0.1 |
| 40 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.5 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.3 | 0.0 | 0.4 | 0.0 | 0.1 |
| 42 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 2.1 | 0.0 | 0.3 | 0.0 | 0.1 |
| 43 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.9 | 0.0 | 0.3 | 0.0 | 0.0 |
| 44 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.6 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 48 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0.00 | 2.21 | 2.21 | 114.67 | 112.46 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 2018.2 | | | | | 727.3 | 859.5 | 558.9 | 532.3 | 477.8 | 375.0 |
| | | | | | | | | FIRR = | | 13.8 % | |

## Table L.24 FIRR on Sensitivity Analysis

- Case of 10% Decrease of Benefit -Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 415.33 | 2.57 | 417.9 | 35.11 | -382.79 | 379.9 | 31.9 | 363.4 | 30.5 | 348.3 | 29.3 |
| 2 | 0.00 | 2.73 | 2.73 | 56.41 | 53.68 | 2.3 | 46.6 | 2.1 | 42.7 | 1.9 | 39.2 |
| 3 | 0.00 | 7.50 | 7.5 | 60.27 | 52.77 | 5.6 | 45.3 | 4.9 | 39.6 | 4.3 | 34.9 |
| 4 | 0.00 | 2.21 | 2.21 | 68.16 | 65.95 | 1.5 | 46.6 | 1.3 | 39.0 | 1.1 | 32.9 |
| 5 | 0.00 | 2.21 | 2.21 | 72.42 | 70.21 | 1.4 | 45.0 | 1.1 | 36.0 | 0.9 | 29.1 |
| 6 | 0.00 | 2.21 | 2.21 | 73.49 | 71.28 | 1.2 | 41.5 | 1.0 | 31.8 | 0.7 | 24.6 |
| 7 | 0.00 | 2.21 | 2.21 | 76.40 | 74.19 | 1.1 | 39.2 | 0.8 | 28.7 | 0.6 | 21.3 |
| 8 | 0.00 | 2.21 | 2.21 | 79.28 | 77.07 | 1.0 | 37.0 | 0.7 | 25.9 | 0.5 | 18.4 |
| 9 | 0.00 | 2.21 | 2.21 | 81.25 | 79.04 | 0.9 | 34.5 | 0.6 | 23.1 | 0.4 | 15.7 |
| 10 | 0.00 | 2.21 | 2.21 | 90.18 | 87.97 | 0.9 | 34.8 | 0.5 | 22.3 | 0.4 | 14.6 |
| 11 | 0.00 | 2.21 | 2.21 | 90.34 | 88.13 | 0.8 | 31.7 | 0.5 | 19.4 | 0.3 | 12.2 |
| 12 | 0.00 | 2.21 | 2.21 | 91.65 | 89.44 | 0.7 | 29.2 | 0.4 | 17.1 | 0.2 | 10.3 |
| 13 | 0.00 | 2.21 | 2.21 | 93.38 | 91.17 | 0.6 | 27.0 | 0.4 | 15.2 | 0.2 | 8.7 |
| 14 | 0.00 | 2.21 | 2.21 | 94.65 | 92.44 | 0.6 | 24.9 | 0.3 | 13.4 | 0.2 | 7.4 |
| 15 | 0.00 | 2.21 | 2.21 | 95.88 | 93.67 | 0.5 | 23.0 | 0.3 | 11.8 | 0.1 | 6.2 |
| 16 | 0.00 | 2.21 | 2.21 | 97.60 | 95.39 | 0.5 | 21.2 | 0.2 | 10.4 | 0.1 | 5.3 |
| 17 | 126.56 | 2.21 | 128.77 | 99.26 | -29.51 | 25.5 | 19.6 | 12.0 | 9.2 | 5.8 | 4.5 |
| 18 | 253.12 | 2.21 | 255.33 | 100.45 | -154.88 | 45.9 | 18.1 | 20.6 | 8.1 | 9.6 | 3.8 |
| 19 | 379.71 | 2.21 | 381.92 | 101.58 | -280.34 | 62.4 | 16.6 | 26.8 | 7.1 | 12.0 | 3.2 |
| 20 | 379.71 | 2.21 | 381.92 | 103.20 | -278.72 | 56.8 | 15.3 | 23.3 | 6.3 | 10.0 | 2.7 |
| 21 | 126.58 | 2.21 | 128.79 | 103.20 | -25.59 | 17.4 | 13.9 | 6.8 | 5.5 | 2.8 | 2.2 |
| 22 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.3 | 12.7 | 0.1 | 4.8 | 0.0 | 1.9 |
| 23 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 11.5 | 0.1 | 4.1 | 0.0 | 1.6 |
| 24 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 10.5 | 0.1 | 3.6 | 0.0 | 1.3 |
| 25 | 1.01 | 2.21 | 3.22 | 103.20 | 99.98 | 0.3 | 9.5 | 0.1 | 3.1 | 0.0 | 1.1 |
| 26 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 8.7 | 0.1 | 2.7 | 0.0 | 0.9 |
| 27 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 7.9 | 0.1 | 2.4 | 0.0 | 0.8 |
| 28 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 7.2 | 0.0 | 2.1 | 0.0 | 0.6 |
| 29 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 6.5 | 0.0 | 1.8 | 0.0 | 0.5 |
| 30 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 5.9 | 0.0 | 1.6 | 0.0 | 0.4 |
| 31 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 5.4 | 0.0 | 1.4 | 0.0 | 0.4 |
| 32 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.9 | 0.0 | 1.2 | 0.0 | 0.3 |
| 33 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.4 | 0.0 | 1.0 | 0.0 | 0.3 |
| 34 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.0 | 0.0 | 0.9 | 0.0 | 0.2 |
| 35 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.7 | 0.0 | 0.8 | 0.0 | 0.2 |
| 36 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.3 | 0.0 | 0.7 | 0.0 | 0.1 |
| 37 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.0 | 0.0 | 0.6 | 0.0 | 0.1 |
| 38 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 2.8 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 2.5 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 2.3 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 2.1 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.9 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.7 | 0.0 | 0.3 | 0.0 | 0.0 |
| 44 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.6 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1682.0 | | | | | 610.5 | 773.5 | 468.9 | 479.1 | 400.6 | 337.5 |
| | | | | | | | | FIRR = | | 15.5 % | |

## Table L.25 FIRR on Sensitivity Analysis

**- Case of 20% Decrease of Benefit -** Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 415.33 | 2.57 | 417.9 | 31.21 | -386.69 | 379.9 | 28.4 | 363.4 | 27.1 | 348.3 | 26.0 |
| 2 | 0.00 | 2.73 | 2.73 | 50.14 | 47.41 | 2.3 | 41.4 | 2.1 | 37.9 | 1.9 | 34.8 |
| 3 | 0.00 | 7.50 | 7.5 | 53.58 | 46.08 | 5.6 | 40.3 | 4.9 | 35.2 | 4.3 | 31.0 |
| 4 | 0.00 | 2.21 | 2.21 | 60.58 | 58.37 | 1.5 | 41.4 | 1.3 | 34.6 | 1.1 | 29.2 |
| 5 | 0.00 | 2.21 | 2.21 | 64.38 | 62.17 | 1.4 | 40.0 | 1.1 | 32.0 | 0.9 | 25.9 |
| 6 | 0.00 | 2.21 | 2.21 | 65.33 | 63.12 | 1.2 | 36.9 | 1.0 | 28.2 | 0.7 | 21.9 |
| 7 | 0.00 | 2.21 | 2.21 | 67.91 | 65.7 | 1.1 | 34.8 | 0.8 | 25.5 | 0.6 | 19.0 |
| 8 | 0.00 | 2.21 | 2.21 | 70.47 | 68.26 | 1.0 | 32.9 | 0.7 | 23.0 | 0.5 | 16.4 |
| 9 | 0.00 | 2.21 | 2.21 | 72.22 | 70.01 | 0.9 | 30.6 | 0.6 | 20.5 | 0.4 | 14.0 |
| 10 | 0.00 | 2.21 | 2.21 | 80.16 | 77.95 | 0.9 | 30.9 | 0.5 | 19.8 | 0.4 | 12.9 |
| 11 | 0.00 | 2.21 | 2.21 | 80.30 | 78.09 | 0.8 | 28.1 | 0.5 | 17.3 | 0.3 | 10.8 |
| 12 | 0.00 | 2.21 | 2.21 | 81.46 | 79.25 | 0.7 | 26.0 | 0.4 | 15.2 | 0.2 | 9.1 |
| 13 | 0.00 | 2.21 | 2.21 | 83.01 | 80.8 | 0.6 | 24.0 | 0.4 | 13.5 | 0.2 | 7.8 |
| 14 | 0.00 | 2.21 | 2.21 | 84.14 | 81.93 | 0.6 | 22.2 | 0.3 | 11.9 | 0.2 | 6.6 |
| 15 | 0.00 | 2.21 | 2.21 | 85.22 | 83.01 | 0.5 | 20.4 | 0.3 | 10.5 | 0.1 | 5.5 |
| 16 | 0.00 | 2.21 | 2.21 | 86.75 | 84.54 | 0.5 | 18.9 | 0.2 | 9.3 | 0.1 | 4.7 |
| 17 | 126.56 | 2.21 | 128.77 | 88.23 | -40.54 | 25.5 | 17.5 | 12.0 | 8.2 | 5.8 | 4.0 |
| 18 | 253.12 | 2.21 | 255.33 | 89.29 | -166.04 | 45.9 | 16.1 | 20.6 | 7.2 | 9.6 | 3.4 |
| 19 | 379.71 | 2.21 | 381.92 | 90.30 | -291.62 | 62.4 | 14.8 | 26.8 | 6.3 | 12.0 | 2.8 |
| 20 | 379.71 | 2.21 | 381.92 | 91.74 | -290.18 | 56.8 | 13.6 | 23.3 | 5.6 | 10.0 | 2.4 |
| 21 | 126.58 | 2.21 | 128.79 | 91.74 | -37.05 | 17.4 | 12.4 | 6.8 | 4.9 | 2.8 | 2.0 |
| 22 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 11.3 | 0.1 | 4.2 | 0.0 | 1.7 |
| 23 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 10.2 | 0.1 | 3.7 | 0.0 | 1.4 |
| 24 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 9.3 | 0.1 | 3.2 | 0.0 | 1.2 |
| 25 | 1.01 | 2.21 | 3.22 | 91.74 | 88.52 | 0.3 | 8.5 | 0.1 | 2.8 | 0.0 | 1.0 |
| 26 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 7.7 | 0.1 | 2.4 | 0.0 | 0.8 |
| 27 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 7.0 | 0.1 | 2.1 | 0.0 | 0.7 |
| 28 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 6.4 | 0.0 | 1.8 | 0.0 | 0.6 |
| 29 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 5.8 | 0.0 | 1.6 | 0.0 | 0.5 |
| 30 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 5.3 | 0.0 | 1.4 | 0.0 | 0.4 |
| 31 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 4.8 | 0.0 | 1.2 | 0.0 | 0.3 |
| 32 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 4.3 | 0.0 | 1.0 | 0.0 | 0.3 |
| 33 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 4.0 | 0.0 | 0.9 | 0.0 | 0.2 |
| 34 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 3.6 | 0.0 | 0.8 | 0.0 | 0.2 |
| 35 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 3.3 | 0.0 | 0.7 | 0.0 | 0.2 |
| 36 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 3.0 | 0.0 | 0.6 | 0.0 | 0.1 |
| 37 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 2.7 | 0.0 | 0.5 | 0.0 | 0.1 |
| 38 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 2.5 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.1 | 2.2 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 2.0 | 0.0 | 0.3 | 0.0 | 0.1 |
| 41 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.8 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.7 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.5 | 0.0 | 0.2 | 0.0 | 0.0 |
| 44 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 47 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.0 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1682.0 | | | | | 610.5 | 687.6 | 468.9 | 425.9 | 400.6 | 300.0 |
| | | | | | | | | FIRR = | | 12.7 % | |

## Table L.26 FIRR on Sensitivity Analysis

- Case of 10% Decrease of Benefit and

10 % Increase of Project Cost - Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.1 | | Int.= 0.15 | | Int.= 0.20 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 456.86 | 2.57 | 459.43 | 35.11 | -424.32 | 417.7 | 31.9 | 399.5 | 30.5 | 382.9 | 29.3 |
| 2 | 0.00 | 2.73 | 2.73 | 56.41 | 53.68 | 2.3 | 46.6 | 2.1 | 42.7 | 1.9 | 39.2 |
| 3 | 0.00 | 7.50 | 7.5 | 60.27 | 52.77 | 5.6 | 45.3 | 4.9 | 39.6 | 4.3 | 34.9 |
| 4 | 0.00 | 2.21 | 2.21 | 68.16 | 65.95 | 1.5 | 46.6 | 1.3 | 39.0 | 1.1 | 32.9 |
| 5 | 0.00 | 2.21 | 2.21 | 72.42 | 70.21 | 1.4 | 45.0 | 1.1 | 36.0 | 0.9 | 29.1 |
| 6 | 0.00 | 2.21 | 2.21 | 73.49 | 71.28 | 1.2 | 41.5 | 1.0 | 31.8 | 0.7 | 24.6 |
| 7 | 0.00 | 2.21 | 2.21 | 76.40 | 74.19 | 1.1 | 39.2 | 0.8 | 28.7 | 0.6 | 21.3 |
| 8 | 0.00 | 2.21 | 2.21 | 79.28 | 77.07 | 1.0 | 37.0 | 0.7 | 25.9 | 0.5 | 18.4 |
| 9 | 0.00 | 2.21 | 2.21 | 81.25 | 79.04 | 0.9 | 34.5 | 0.6 | 23.1 | 0.4 | 15.7 |
| 10 | 0.00 | 2.21 | 2.21 | 90.18 | 87.97 | 0.9 | 34.8 | 0.5 | 22.3 | 0.4 | 14.6 |
| 11 | 0.00 | 2.21 | 2.21 | 90.34 | 88.13 | 0.8 | 31.7 | 0.5 | 19.4 | 0.3 | 12.2 |
| 12 | 0.00 | 2.21 | 2.21 | 91.65 | 89.44 | 0.7 | 29.2 | 0.4 | 17.1 | 0.2 | 10.3 |
| 13 | 0.00 | 2.21 | 2.21 | 93.38 | 91.17 | 0.6 | 27.0 | 0.4 | 15.2 | 0.2 | 8.7 |
| 14 | 0.00 | 2.21 | 2.21 | 94.65 | 92.44 | 0.6 | 24.9 | 0.3 | 13.4 | 0.2 | 7.4 |
| 15 | 0.00 | 2.21 | 2.21 | 95.88 | 93.67 | 0.5 | 23.0 | 0.3 | 11.8 | 0.1 | 6.2 |
| 16 | 0.00 | 2.21 | 2.21 | 97.60 | 95.39 | 0.5 | 21.2 | 0.2 | 10.4 | 0.1 | 5.3 |
| 17 | 139.22 | 2.21 | 141.43 | 99.26 | -42.17 | 28.0 | 19.6 | 13.1 | 9.2 | 6.4 | 4.5 |
| 18 | 278.43 | 2.21 | 280.64 | 100.45 | -180.19 | 50.5 | 18.1 | 22.7 | 8.1 | 10.5 | 3.8 |
| 19 | 417.68 | 2.21 | 419.89 | 101.58 | -318.31 | 68.7 | 16.6 | 29.5 | 7.1 | 13.1 | 3.2 |
| 20 | 417.68 | 2.21 | 419.89 | 103.20 | -316.69 | 62.4 | 15.3 | 25.7 | 6.3 | 11.0 | 2.7 |
| 21 | 139.24 | 2.21 | 141.45 | 103.20 | -38.25 | 19.1 | 13.9 | 7.5 | 5.5 | 3.1 | 2.2 |
| 22 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.3 | 12.7 | 0.1 | 4.8 | 0.0 | 1.9 |
| 23 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 11.5 | 0.1 | 4.1 | 0.0 | 1.6 |
| 24 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 10.5 | 0.1 | 3.6 | 0.0 | 1.3 |
| 25 | 1.01 | 2.21 | 3.22 | 103.20 | 99.98 | 0.3 | 9.5 | 0.1 | 3.1 | 0.0 | 1.1 |
| 26 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 8.7 | 0.1 | 2.7 | 0.0 | 0.9 |
| 27 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 7.9 | 0.1 | 2.4 | 0.0 | 0.8 |
| 28 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.2 | 7.2 | 0.0 | 2.1 | 0.0 | 0.6 |
| 29 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 6.5 | 0.0 | 1.8 | 0.0 | 0.5 |
| 30 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 5.9 | 0.0 | 1.6 | 0.0 | 0.4 |
| 31 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 5.4 | 0.0 | 1.4 | 0.0 | 0.4 |
| 32 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.9 | 0.0 | 1.2 | 0.0 | 0.3 |
| 33 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.4 | 0.0 | 1.0 | 0.0 | 0.3 |
| 34 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 4.0 | 0.0 | 0.9 | 0.0 | 0.2 |
| 35 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.7 | 0.0 | 0.8 | 0.0 | 0.2 |
| 36 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.3 | 0.0 | 0.7 | 0.0 | 0.1 |
| 37 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 3.0 | 0.0 | 0.6 | 0.0 | 0.1 |
| 38 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 2.8 | 0.0 | 0.5 | 0.0 | 0.1 |
| 39 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.1 | 2.5 | 0.0 | 0.4 | 0.0 | 0.1 |
| 40 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 2.3 | 0.0 | 0.4 | 0.0 | 0.1 |
| 41 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 2.1 | 0.0 | 0.3 | 0.0 | 0.1 |
| 42 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.9 | 0.0 | 0.3 | 0.0 | 0.0 |
| 43 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.7 | 0.0 | 0.3 | 0.0 | 0.0 |
| 44 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.6 | 0.0 | 0.2 | 0.0 | 0.0 |
| 45 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.4 | 0.0 | 0.2 | 0.0 | 0.0 |
| 46 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.3 | 0.0 | 0.2 | 0.0 | 0.0 |
| 47 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 |
| 48 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| 49 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 50 | 0.00 | 2.21 | 2.21 | 103.20 | 100.99 | 0.0 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 |
| Total | 1850.1 | | | | | 668.9 | 773.5 | 513.9 | 479.1 | 439.2 | 337.5 |
| | | | | | | | | FIRR = | | 13.3 % | |

## Table L.27 FIRR on Sensitivity Analysis

### - Case of 20% Decrease of Benefit and 20 % Increase of Project Cost -

Cropping Intensity 200%

| Year | Capital Cost | O & M Cost | Total | Benefit | Return | Present Worth by Discount rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Int.= 0.05 | | Int.= 0.10 | | Int.= 0.15 | |
| | | | | | | Cost | Benefit | Cost | Benefit | Cost | Benefit |
| 1 | 498.40 | 2.57 | 500.97 | 31.21 | -469.76 | 477.1 | 29.7 | 455.4 | 28.4 | 435.6 | 27.1 |
| 2 | 0.00 | 2.73 | 2.73 | 50.14 | 47.41 | 2.5 | 45.5 | 2.3 | 41.4 | 2.1 | 37.9 |
| 3 | 0.00 | 7.50 | 7.5 | 53.58 | 46.08 | 6.5 | 46.3 | 5.6 | 40.3 | 4.9 | 35.2 |
| 4 | 0.00 | 2.21 | 2.21 | 60.58 | 58.37 | 1.8 | 49.8 | 1.5 | 41.4 | 1.3 | 34.6 |
| 5 | 0.00 | 2.21 | 2.21 | 64.38 | 62.17 | 1.7 | 50.4 | 1.4 | 40.0 | 1.1 | 32.0 |
| 6 | 0.00 | 2.21 | 2.21 | 65.33 | 63.12 | 1.6 | 48.8 | 1.2 | 36.9 | 1.0 | 28.2 |
| 7 | 0.00 | 2.21 | 2.21 | 67.91 | 65.7 | 1.6 | 48.3 | 1.1 | 34.8 | 0.8 | 25.5 |
| 8 | 0.00 | 2.21 | 2.21 | 70.47 | 68.26 | 1.5 | 47.7 | 1.0 | 32.9 | 0.7 | 23.0 |
| 9 | 0.00 | 2.21 | 2.21 | 72.22 | 70.01 | 1.4 | 46.6 | 0.9 | 30.6 | 0.6 | 20.5 |
| 10 | 0.00 | 2.21 | 2.21 | 80.16 | 77.95 | 1.4 | 49.2 | 0.9 | 30.9 | 0.5 | 19.8 |
| 11 | 0.00 | 2.21 | 2.21 | 80.30 | 78.09 | 1.3 | 46.9 | 0.8 | 28.1 | 0.5 | 17.3 |
| 12 | 0.00 | 2.21 | 2.21 | 81.46 | 79.25 | 1.2 | 45.4 | 0.7 | 26.0 | 0.4 | 15.2 |
| 13 | 0.00 | 2.21 | 2.21 | 83.01 | 80.8 | 1.2 | 44.0 | 0.6 | 24.0 | 0.4 | 13.5 |
| 14 | 0.00 | 2.21 | 2.21 | 84.14 | 81.93 | 1.1 | 42.5 | 0.6 | 22.2 | 0.3 | 11.9 |
| 15 | 0.00 | 2.21 | 2.21 | 85.22 | 83.01 | 1.1 | 41.0 | 0.5 | 20.4 | 0.3 | 10.5 |
| 16 | 0.00 | 2.21 | 2.21 | 86.75 | 84.54 | 1.0 | 39.7 | 0.5 | 18.9 | 0.2 | 9.3 |
| 17 | 151.87 | 2.21 | 154.08 | 88.23 | -65.85 | 67.2 | 38.5 | 30.5 | 17.5 | 14.3 | 8.2 |
| 18 | 303.74 | 2.21 | 305.95 | 89.29 | -216.66 | 127.1 | 37.1 | 55.0 | 16.1 | 24.7 | 7.2 |
| 19 | 455.65 | 2.21 | 457.86 | 90.30 | -367.56 | 181.2 | 35.7 | 74.9 | 14.8 | 32.2 | 6.3 |
| 20 | 455.65 | 2.21 | 457.86 | 91.74 | -366.12 | 172.6 | 34.6 | 68.1 | 13.6 | 28.0 | 5.6 |
| 21 | 151.90 | 2.21 | 154.11 | 91.74 | -62.37 | 55.3 | 32.9 | 20.8 | 12.4 | 8.2 | 4.9 |
| 22 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.8 | 31.4 | 0.3 | 11.3 | 0.1 | 4.2 |
| 23 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.7 | 29.9 | 0.2 | 10.2 | 0.1 | 3.7 |
| 24 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.7 | 28.4 | 0.2 | 9.3 | 0.1 | 3.2 |
| 25 | 1.01 | 2.21 | 3.22 | 91.74 | 88.52 | 1.0 | 27.1 | 0.3 | 8.5 | 0.1 | 2.8 |
| 26 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.6 | 25.8 | 0.2 | 7.7 | 0.1 | 2.4 |
| 27 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.6 | 24.6 | 0.2 | 7.0 | 0.1 | 2.1 |
| 28 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.6 | 23.4 | 0.2 | 6.4 | 0.0 | 1.8 |
| 29 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.5 | 22.3 | 0.1 | 5.8 | 0.0 | 1.6 |
| 30 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.5 | 21.2 | 0.1 | 5.3 | 0.0 | 1.4 |
| 31 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.5 | 20.2 | 0.1 | 4.8 | 0.0 | 1.2 |
| 32 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.5 | 19.3 | 0.1 | 4.3 | 0.0 | 1.0 |
| 33 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.4 | 18.3 | 0.1 | 4.0 | 0.0 | 0.9 |
| 34 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.4 | 17.5 | 0.1 | 3.6 | 0.0 | 0.8 |
| 35 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.4 | 16.6 | 0.1 | 3.3 | 0.0 | 0.7 |
| 36 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.4 | 15.8 | 0.1 | 3.0 | 0.0 | 0.6 |
| 37 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.4 | 15.1 | 0.1 | 2.7 | 0.0 | 0.5 |
| 38 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 14.4 | 0.1 | 2.5 | 0.0 | 0.5 |
| 39 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 13.7 | 0.1 | 2.2 | 0.0 | 0.4 |
| 40 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 13.0 | 0.0 | 2.0 | 0.0 | 0.3 |
| 41 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 12.4 | 0.0 | 1.8 | 0.0 | 0.3 |
| 42 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 11.8 | 0.0 | 1.7 | 0.0 | 0.3 |
| 43 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 11.3 | 0.0 | 1.5 | 0.0 | 0.2 |
| 44 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.3 | 10.7 | 0.0 | 1.4 | 0.0 | 0.2 |
| 45 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 10.2 | 0.0 | 1.3 | 0.0 | 0.2 |
| 46 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 9.7 | 0.0 | 1.1 | 0.0 | 0.1 |
| 47 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 9.3 | 0.0 | 1.0 | 0.0 | 0.1 |
| 48 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 8.8 | 0.0 | 0.9 | 0.0 | 0.1 |
| 49 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 8.4 | 0.0 | 0.9 | 0.0 | 0.1 |
| 50 | 0.00 | 2.21 | 2.21 | 91.74 | 89.53 | 0.2 | 8.0 | 0.0 | 0.8 | 0.0 | 0.1 |
| Total | 2018.2 | | | | | 1119.7 | 1399.2 | 727.3 | 687.6 | 558.9 | 425.9 |
| | | | | | | | | FIRR = | | 8.8 % | |

# APPENDIX M. ENVIRONMENTAL CONDITIONS/PLAN

## M. 1 BACKGROUND

### M. 1. 1 Activities of the government of Philippines on Environmental Conservation

Palawan Island is located at about 550 km southwest of Manila, which is a long and slender island with the length of 450 km and the width of 40 km approximately. The Palawan province, is an area of 14,896 sq.km and the population in 1990 is about 528,000 increasing at an annual rate of 3.6%, higher than the Philippine rate of 2.4%. This high growth rate is attributed to the number of immigrants from other province, amounting to 3,000 to 4,000 people annually.

The central area of island is covered with tropical forest, and the coral reef is growing along a coastal line. On the other hand, the government of Philippines is afraid of destruction of beautiful and graceful the natural resources in Palawan Island, thus, the government has been gazetted the presidential degree and the act for the environmental conservation, which is summarized as follows:

a) Presidential Degree No. 219 on July 2, 1967

Entire province of Palawan with total area 1,475 sq.km was proclaimed as a game refuge and bird sanctuary.

b) Making a guide line of environmental conservation for Palawan 1983.

The Government of Philippines proposed to make Palawan Integrated Area Development Project (PIADP), which included the Environmental Assessment for the project. The study team carried out the investigation for environmental conservation. At the same time, the guide-line is provided taking into the consideration of future development in Palawan.

c) Act No. 7611 issued by the government in July, 1991

The government has been gazetted the strategy for environmental conservation in Palawan. Particularly, lumbering of forest area is prohibited without the permission of DENR. At the same time, the government informed that a lumbering of Mangrove-forest is prohibited completely in any cases.

### M. 1. 2 Development Strategy

According to the Medium Term Development Plan for Palawan (1994~2000), development strategy showing for agriculture, tourism, environment, social infrastructure, etc. till year 2000. In the MTPDP, CARP is considered as one of the important policy in parallel with the poverty alleviation and stated as promoting speedily and effectively. Palawan province shows first rank in the accomplishment of CARP as of January 1994. As of 1993, 26,923 ha of the 46,908 ha for CARP were distributed to 8,725 beneficiaries and about 20,000 ha remains for further distribution.

Study area was transferred from the Department of Justice to DAR depend on the Executive Order 407 in 1990, and it covers about 2,000 ha of Tagumpay Settlement area. On the other hand, from farm economic survey in Study Area, present annual house hold income estimated at 14,900 pesos on an average, while, this income level is only 37 % compared to 40,284 pesos of Puerto Princesa city, thus, the following development will be required.

- Provision of the irrigation facilities in the area.
- Installation of infrastructures such as electricity, potable water, farm road and clinics etc.
- Progress of the land reclamation for arable land in the area.
- Guidance and training of farmers as regards farm management in the area.
- Conducting for the establishment of farmers organization.

## M. 2 INVESTIGATION AND THE STUDY

For the study area and its surroundings, field investigation have been carried out during one month in dry season and monsoon season respectively, and the home office works also have been done based on data collected.

### M .2.1 Preceding Project

Basic data and information refer to environmental assessment have been collected and evaluated. As mentioned in M.1.1, the government is making an effort for the environmental conservation on whole Palawan Province. Fortunately, there are being Palawan Integrated Area Development Project (PIADP) under the cooperation of EEC. An implementation of the project carried out with Phase I (1983-1990), and Phase II stage (1988-1995) is undertaking by the cooperation with ADB. The project plans goal will be achieved through the following objectives.

- To establish a sound socioeconomic balance between resources exploitation and environmental protection;
- To define short and medium -term measures for environmental protection and rehabilitation, especially in environmentally critical parts of the island;
- To provide guidelines for effective long term regulatory environmental control;
- To integrate the implementation of short, medium and long-term planing thought the coordinated participation of all relevant agencies.

The component of said project make brief as follows;

- Agricultural Development

  - Crop intensification and diversification.
  - Livestock development.
  - Fishery support services.

- Irrigation Development

  - Rehabilitation and improvement of communal irrigation systems

- Infrastructure Development

  - Road construction and rehabilitation for Barangay.
  - Port construction on breakwater and ancillary facilities
  - Integrated health program
  - Rural water supply
  - Women in development
  - Survey and land titling.

a) Animals

In accordance with the recommendation of the Technical Group of ADB which evaluated the PIADP feasibility study, PIADP and Forest Research Institute (FORI) formalized a cooperative linkage in order to generate information on the fauna and floral resources and outdoor recreation potentials in Palawan.

1) Avian

Part of the activity was an inventory survey at Inagawan river basin, where 30 avian species have been confirmed at survey point. (refer to Table M.2.1)

2) Wild Beast

According to the interview with local people in the study area, and direct survey at CFI, the wild beast in the study area is summarized as follows.

- Wild monkey
- Wild bear
- Monitor lizard
- Bear cat.

Bear cats are confirmed directly in the Crocodile Farming Institute, however, it is not sure whether some are living in the project area.

3) Fish

The Inagawan river is the most important as a water resources for the project area. According to the Fishery Regulatory Services Office (FRSO) in Puerto Princesa, the Inagawan river is divided into two parts based on the water Characteristics. One part is the estuary where the effect of tidal current is visible. The other part is the upper and middle stream where only fresh water is flowing. The family of fish at the Inagawan River are classified as follows:

| | | |
|---|---|---|
| Fresh Water; | Mud fish, | Ophicephalus stratus |
| | Cat fish, | Clarias sp. |
| | Eel, | Clarias sp. |
| | Carp fish, | Cyprinus carpio |
| Sea (Brackish) Water; | Mullet, | Mugil sp. |
| | Apahap | |
| | Snapper | |
| | Groupr | |

According to officials concerned, tilapia (tilapia mos-sambica) is recommended for the fish-culture in fresh water lakes and reservoirs, which is beneficial to food and mosquito control.

b) Plants

Although part of the project area would be reclaimed from wild area to farm land, a wider area still remains as grassland and second forest area. PIADP carried out the investigation of floral resources in Palawan. Fortunately, the Inagawan river basin has been selected as a survey point in their investigation program. As a result of the survey, it is confirmed that 82 families of trees are living in the basin. (refer to Table M.2.2)

At present, the area is protected under P.D No.705 (Forestry Reform Code) issued for the protection, rehabilitation, and development of forest land.

### M. 2. 2 Sea Shores Environment Conditions

The project area is not inclusive of the mangrove area, however, a wide mangrove area lies along the sea shores very near the project area. Recently, a reduction of mangrove area has occurred and the major causes are the felling of trees for charcoal making as fuel and the conversion to fishpond or shrimp culture.

In this connection, the government now prohibits people to cut down mangrove. This action is considered the most suitable countermeasure for the protection of mangrove forest. Furthermore, it should consider not only the prohibition of cutting but also initiating programs for reforesting, and rehabilitation of the mangrove.

As for implementation of agricultural development project with irrigation and drainage system, the quantity and quality of pesticide would have to be regulated in reference to the environmental assessment.

The measurement of water quality on the electric conductivity (EC) was carried out in the mangrove area and in the sea shore. Results of the measurement shows that both have almost the same conductivity ranging from 27,000 to 28,000 ppm.

The mangrove area is under the control of PENRO and CENRO at present. These offices are executing a reforestation project in a portion of the mangrove area under the cooperation of ADB. According to CENRO, the reforestation project has been proposed to develop at 76 ha, and it has completed so far at about 70 ha.

As refer to the sea shores environment condition there are existing seven (7) drainage channels in the project area and they are cross with the national road and connected to the mangrove area finally.

### M. 2. 3 Existing Irrigation Project

There are tow communal irrigation systems at surroundings of the project area. Inagawan CIS is located at southern east of the project area, and its beneficial area is at 270 ha, and double cropping has been carried out

because of stable water resources depend on the Inagawan river. (Water Right 330 l/s) Another CIS is located at the most southern part at out side of the project area, however, its double cropping is limited due to water resources in Isaub river.

### M. 2. 4 Condition of Malaria Pollution

According to the information of MCSO in Puerto Princesa city, the polluted area of malaria is limited to mountain area, while the plain area is non-polluted. The umber of patients with malaria in two Barangays in 1991 and 1992 are shown as below.

| Barangay | 1991 | 1992 |
|---|---|---|
| Kamuning | 0 | 0 |
| Inagawan | 2 | 6 |

MCSO officials concerned recommended to the study team that though there are very rare outbreaks of malaria in the plain area, if construction of canal net-work is necessary in the project area. Following countermeasures are recommendable.

- To expose the surface water of canals under the sunshine
- To prevent the growing of water weeds in the canals and other facilities
- To propagate fish in the ponds and reservoir, etc., which feeds on the larvae of mosquito
- To design a faster velocity of water in the canals
- To encourage people to use mosquito-net when sleeping
- To keep their carabaos within ten (10) meters from the house to serve as a buffer between mankind and mosquitoes

## Table M.2.1 Avian Species in Inagawan River Basin

| | Species | | Species |
|---|---|---|---|
| 1. | Gray Drongo<br>Dicrurus leucophaeus leucophaeus<br>Vieillot, 1817 | 15. | Pink-Necked Green Pigeon<br>Treron vernans vernans<br>(Linne, 1771) |
| 2. | Olive-Brown Bulbul<br>Pycnonotus plumosus cinereifrons<br>(Tweeddate, 1878) | 16. | Crimson Backed Woodpecker<br>Chrysocolaptes lucidus erythrocephalus<br>Sharpe, 1877 |
| 3. | Black-Headed Bulbul<br>Pycnonotus atriceps atriceps<br>(Temminck, 1882) | 17. | Van Hasselt's Sunbird<br>Nectarinia sperata sperata<br>(Linnaeus, 1766) |
| 4. | Little Crow<br>Corvus enca pusillus<br>Tweeddate, 1878 | 18. | White-Breasted Swamphen<br>Amaurornis phoenicurus javanicus<br>Horsfield, 1821 |
| 5. | Palawan Shama<br>Copsychus niger<br>(Sharpe, 1877) | 19. | White-Collared Kingfisher<br>Halcyon chloris collaris<br>(Scopoli, 1786) |
| 6. | Rufous-Crowned Tailor Bird<br>Orthotomus sericeus nuntius<br>Bangs, 1992 | 20. | Gray Wagtail<br>Motacilla cinerea robusta<br>(Brehm, 1857) |
| 7. | Chestnut Mannikin<br>Lonchura malacca jagori<br>(Martens, 1866) | 21. | Lesser Egret<br>Egretta intermedia intermedia<br>(Wagler, 1829) |
| 8. | Black-Naped Oriole<br>Oriolus chinensis chiensis<br>Linnaeus, 1966 | 22. | Common Sandpiper<br>Tringa hypoleucos<br>(Linne, 1758) |
| 9. | Phillippine Turtle Dove<br>Streptopelia bitorquata dusumiere<br>(Temminck, 1823) | 23. | Macklot's Sunbird<br>Nectarinia calcostetha<br>Jardine, 1843 |
| 10. | Spangled Drongo<br>Dicrurus hottentottus palawanensis<br>Tweeddate, 1878 | 24. | Phgmy Flowerpecker<br>Dicaeum pygmaeum palawanorum<br>Hachsuka, 1926 |
| 11. | Common Coucal<br>Centropus sinensis bubutus<br>Horsfield, 1821 | 25. | Mongolian Plover<br>Charadrius mongolus mongolus<br>Pallas, 1776 |
| 12. | Philippine Glossy Starling<br>Aplonis panayensis panayensis<br>Scopoli, 1783 | 26. | Philippine Cockatoo<br>Kakatoe haematuropygia<br>(P.L.S. Muller, 1776) |
| 13. | White-Breasted Mannkin<br>Lonchura leucogastra palawana<br>Riply and Rabor, 1962 | 27. | Malaysian Kingfisher<br>Alcedo mininting amadoni<br>du Pont, 1971 |
| 14. | Schach Shrike<br>Lanius schach nasutus<br>Scopoli, 1786 | 28. | River Kingfisher<br>Alcedo atthis bengalensis<br>Gmeline, 1788 |
| | | 29. | Stork-Billed Kingfisher<br>Pelangopsis capensis gouldi<br>Sharpe, 1870 |



## Table M.2.2 Importance of Tree Family in Secondary Forest at Inagawan River Basin

| Common Name/ Scientific Name | FAMILY | Common Name/ Scientific Name | FAMILY |
|---|---|---|---|
| SL Malugai<br>Pometea pinnata | SAPINDACEAC | LL malugai<br>Pometea pinnata | SAPINDACEAC |
| bokbok<br>Xanthophyllum excelsum | POLYGALACEAE | Dulit<br>Canarium hersutumforma multipinnatum | BURSEARACEAE |
| Uas<br>Harpullia arborea | SAPINDACEAE | Taluto<br>Pterocymbium tinctorium | STECULIACEAE |
| Bugawak<br>Evodia confusa | RUTACEAE | Pagsahingin<br>Canarium asperum | BURSEARACEAE |
| Kupang<br>Parkia roxburghii | MIMOSACEAE | Pinka-Pinkahan<br>Oroxylon indicum | BIGNONIACEAE |
| Duguan<br>Myristicia philippinensis | MYRISTICACEAE | Balubar<br>Aglaia rimosa | MELIACEAE |
| Salakin<br>Aphanamixix cumingiana | MELIACEAE | Katong Matsing<br>Chisocheton pentandrus | MELIACEAE |
| Bayok-bayokan<br>Pterospermum niveum | STECULIACEAE | Kalios<br>Streblus asper | MORACEAE |
| Malapapaya<br>Polyscias nodosa | ARALIACEAE | Pahutan<br>Mangifera altissima | ANACARDIACEAE |
| Bahgkal<br>Nauclea orientalis | RUBIACEAE | Balite<br>Ficus balete | MORACEAE |
| Bayok<br>Pterospermum Diversifolium | STERCULIACEAE | Makaasino<br>Syzygium nitidum | MYRTACEAE |
| Ipil<br>Instia bijuga | CAESALPINIACEAE | Balakat<br>Ziziphus talanai | RHAMNACEAE |
| Kalmol<br>Drypetes megacarpa | EUPHORBIACEAE | Tinaan pantai<br>Drypetes macqulingensi | EUPHORBIACEAE |
| Gatasan<br>Garcinia venulosa | GUTTIFERAE | Balinghasai<br>Buchanania arboreseens | ANACARDIACEAE |
| Kapulasan<br>Nephelium mutabile | SAPINDACEAE | Lipa<br>Laportea luzonensis | URTICACEAE |

Note ; ?, No mentioned in the original paper.

(Cont'd)

## Table M.2.2 Cont'd

| Common Name/ Scientific Name | FAMILY | Common Name/ Scientific Name | FAMILY |
|---|---|---|---|
| Blalakat gubat<br>Sapium luzonicum | EUPHORBIACEAE | Batikuling<br>Litsea lentensis | LAURACEAE |
| Batino<br>Alstonia macrophylla | APOCYNACEAE | Tuai<br>Bischofea javanica | BISCHOFFIACEAE |
| Banato<br>Mallotus philippinensis | EUPHORBIACEAE | Balitantan<br>Bucchania netida | ANACARDIACEAE |
| Amugis<br>Kpprdersiodendron pinnatum | ? | Kamagong<br>Diosphyros philippinensis | EBENACEAE |
| Malasaging<br>Aglaia diffusa | MELIACEAE | Tan-ag<br>Kleinhovia hospita | STERCULIACEAE |
| Taguang Uak<br>? | ? | Dita<br>Alstonia scholaris | APOCYNACEAE |
| Binggas<br>Terminalia citrina | COMBRETACEAE | Alupag<br>Euphoria didyma | SAPINDACEAE |
| Galawan<br>Paretta membranacea | RUBIACEAE | White Nato<br>? | ? |
| Kamamao<br>Dysoxylum octandrum | MELIACEAE | Pospos<br>Lepisonthes schizolepes | ? |
| Kanglead<br>? | ? | Dukhitan<br>Pouteria duclitan | SAPOTACEAE |
| Arahan<br>Litsea albayana | LAURACEAE | Gubas<br>Endospermum peltatum | EUPHORBIACEAE |
| Duklap<br>Ziziphus trinervia | RHAMNACEAE | Talang gubat<br>Diosphyros copelandii | EBENACEAE |
| Anolang<br>Papualthia lanceolata | ANNONACEAE | Guijo<br>Shorea guiso | DIPTEROCARPACEAE |
| Kalimatas<br>Phaeanthus ebracteolatus | ANNONACEAE | Bolongeta<br>Diosphros pilosanthera | EBENACEAE |
| Red Plumbago<br>? | ? | Pagsahingin kulog<br>Canarium calophyllum | BURSERACEAE |
| Basikong<br>Ficus botryocarpa | MORACEAE | Kalimutain<br>Dysoxylum arborescens | MEHACEAE |
| Tiruhan<br>Belischmiedia glomerata | LAURACEAE | Ludik<br>Neonauclea bernardoi | RUBIACEAE |

Note ; ?, No mentioned in the original paper.

**(Cont'd)**



## Table M.2.2 Cont'd

| Common Name/ Scientific Name | FAMILY | Common Name/ Scientific Name | FAMILY |
|---|---|---|---|
| Ubole<br>? | ? | Malabagang<br>Glochidion album | EUPHORBIACEAE |
| Alim<br>? | EUPHORBIACEAE | Bato-bato<br>Drypetes littorales | EUPHORBIACEAE |
| Taklang anak<br>Garcinia dulce | GUTTIFERAE | Supa<br>Sendora supa | CAESALPINACEAE |
| Santol<br>Sandoricum koetjape | MELIACEAE | Alagasi<br>Leucosyke capitellata | URTICACEAE |
| Tamayauan<br>Stromboisia philippinensis | OLACACEAE | Hog plum<br>Spondias momben | ANACARDIACEAE |
| Kalubkub<br>Syzygium calubcob | MYRTACEAE | Syzygum sp<br>? | MYRTACEAE |
| Anilao<br>Colona serratifolea | TILIACEAE | Maladilap<br>Ziziphus otanesii | RHAMNACEAE |
| Binunga<br>Macaranga tanarius | EUPHORCIACEAE | Malasapsap<br>Ailanthus integrifolia | SIMAROUBACEAE |
| Uabunot<br>Stemunorus luzoniensis | ICACENACEAE | Banasalagin<br>Mimusops parviflora | SAPOTACEAE |
| Kahoi dalaga<br>Mussaenda philippica | RUBIACEAE | Buduan<br>Polyosma rericillata | SAXIFRAGACEAE |
| Iloilo<br>Aglaia iloilo | MELIACEAE | Luisin<br>Parinari corymbosa | AMYGDALACEAE |
| Alahan<br>Guioa Koelreuteria | SAPINOACEAE | Malapili<br>? | ? |
| Maniknik<br>Palaquium tenuipetiolatum | SAPOTACEAE | Mali-mali<br>Leea negrosensis | VITACEAE |

Note ; ?, No mentioned in the original paper.

## M. 3 STUDY AREA

### M. 3. 1 Present Land Situation

a) Land-Category

Based on the new topo-map with a scale of 1 : 4,000 prepared by the JICA Study Team, the present land-use condition is summarized as follows:

| Land Category | Acreage (ha) |
|---|---|
| Forest area | 1,288 |
| Broad Leaf | (628) |
| Bush/shrub | (660) |
| Grass-land | 267 |
| Farm-land | 463 |
| Others | 48 |
| Total | 2,066 |

b) Forest Area

The forest areas are scattered at the northeast and southwest side of the Study Area, and the largest portion found to be at higher elevation of 40 m. The forest area is divided into the broad-leaf tree forests and the shrubs respectively as mentioned above. The broad-leaf trees are mostly found at higher elevations and the shrubs lies at lower elevation.

c) Grassland

The grassland is located at lower elevations of 40 m, and it estimated at about 267 ha. However, grassland are not utilized effectively. Accordingly, the grassland will be able to expanded as a farmlands in the future.

d) Farmland

The topo map confirmed the area of farmland at 463 ha. The existing number of farmers in the project area has been registered at around 100 families. From this, average cultivated area for one family is estimated at about 4.6 ha. Details of land use of farmland is shown as follows:

| Item | Acreage (ha) |
|---|---|
| Paddy F. | 48 |
| Upland P.F. | 75 |
| Upland | 296 |
| Coconut | 14 |
| Caskewnut | 30 |
| Total | 463 |

During monsoon season, upland rice, mungo bean, cassave and ginger etc. are cultivated as upland crops. As for upland rice, a king of rice blast on their leaves was observed in a part of the area. Cashow is planted as a representative of cash crop near houses and in fruit gardens.

## M. 3. 2 Drainage Condition

Drainage area (Catchment area) and Canal's length for the project area are summarized as follows:

| Name of River | Watershed (ha) | Length (km) |
|---|---|---|
| Inagawan | 710 | 15.0 *1 |
| Isog | 530 | 11.5 |
| Saub | 660 *2 | 12.6 |
| Others | 200 | 6.8 |
| Total | 2,100 | 45.9 |

Note: *1 The length of Inagawan river does not include the length of the main river route.
*2 Total watershed of Saub river is estimated at about 3,300 ha.

All of the small rivers and channels except the tributary of the Inagawan river flows down to the Sulu sea after passing the national road. These estuaries are connected to the mangrove forest. Excess water from the farmland and domestic waste water in the study area should be also same flow system in future.

The topographical condition of the area is complicated sectionally, and there are small depressed grounds in a spots, and these depressed ground are change to small ponds by surface run-off in monsoon season.

Overflowing of excess water from said depressed ground is a cause of disruption to transportation.

There are overflowing at a pint of contact with national road and drainage canals in heavy rain because of lacking to canal capacity. However,the damages of crops are not so severe because of short inundation.

### M. 3. 3 Irrigation Condition

There are no systematic irrigation systems in the project area from lack of stable water resources. A part of the paddy field is irrigated by existing springs in monsoon season. As mentioned in present land-use, the paddy field is cultivated only at 48 ha, which is 10 % only for existing farmland in the project area, and the yield (1.7 ton/ha) is also very low as compared with nearby the developed area.

### M. 3. 4 Soil Erosion

There is no evidence of big scale land sliding and surface soil erosion (Gully Erosion) in the Area. However, if the grass land and waste land lay aside without any change for a long time, it is believed that soil fertility will lower gradually. Thus, its land reclamation plan should be put forward as soon as possible in consideration of surface soil erosion to recover its soil fertility.

### M. 3. 5 Socioeconomic Environment

a) Road

Function of the road in the area is minimal because of small stream flooding in the monsoon season. The surface of roads is muddy and submerged in spots, so that, even four wheeled vehicle can hardly enter in the area during rainy season. Instead of four wheeled vehicle, the carabao cart is most suitable. The countermeasure for said situation is considered as follows:

- to keep the road surface more higher than ground surface (at a minimum of 30 cm),
- to provide side ditch at both or one side depending on topographical condition, and
- to compact road surface and subbase course with sand and gravel.

b) Potable Water

The inhabitants of the Study Area are presently utilizing shallow wells and springs for their potable water. However, the capability of said water sources are not stable. Some of these wells becomes dry during the dry season and the water quality test of shallow wells shows the presence of colitis germs in some sample materials tested. As a countermeasure of said constraints, deep tubewells have been proposed as a new water resources for the village water supply.

The detailed investigation through two (2) testing wells have been carried out in the Area. When the said trial is successful, women and children would be released from the daily heavy task in getting water.

c) Energy Supply

An electric trunk transmission line with 13.2 kilovolts has been installed at the southeast part of the project boundary. However, distribution lines connecting the individual houses has not yet been provided, thus, the most of household are used kerosene for lighting, and used wood and /or charcoal for cooking.

d) Health and Sanitation

The management of sanitation is controlled by the Puerto Princesa city health office. There are two (2) types of service systems for public sanitation, namely, the Traveling Health Counsel and Traveling Clinic. The medical health workers of the city conduct inspections on the health and sanitation condition of the barangays in the city. However, due to lack of medical workers, materials and budget, not all the areas/barangays are

inspected. The mountainous district of Palawan is the breeding place of mosquitoes, the carriers malaria. Fortunately, the Study Area is located outside the malaria prone area. However, it seems incredible that no cases of malaria were reported in the Study Area.

e) Education

An elementary school has been provided at the Tagumpay Settlement area in 1993. At present, there are about 50 pupils enrolled in the said school. There are no secondary school in the study area.

## M. 4 INITIAL ENVIRONMENTAL EXAMINATION (IEE)

### M. 4. 1 Objectives

In the development of projects whether investigation, study or implementation stage, all possible impacts which could affect project implementation should be evaluated and assessed prior to implementation. At the initial stage of the process, an environmental impact assessment (EIA) is required to provide necessary items of investigation for environmental conservation. This should be included in the determination of countermeasure in the development of the project.

### M. 4. 2 Application Method

As a requirement of the government of Philippines, it is required that environmental impact assessment is undertaken for all development projects prior to implementation. It is important that the undertaking is conducted in accordance with the guidelines provided by the concerned government. In this connection, the government of Philippines has provided the guidelines in accordance with Presidential Decree No. 1151 (1977). The Decree pointed out the necessity to submit Environmental Impact Statement (EIS) for the government agencies concerned and the private corporation. Generally, the IEE is prepared to justify the necessity of preparing an EIS or (EIA) on the proposed project.

### M. 4. 3 Contents of IEE

a) Preparation of Checklist

In accordance with the guidelines of environmental impact assessment, checklist is compiled. The checklist consist of four main items as follows: (refer to Table M.4.1)

- Actions affecting environmental resources value
- Damage to environment
- Recommended feasible protection measurement

- Significant impact

b) Consideration of Impacts for Environment

1) Effect due to Project Location

- Effect to the forest area

The Study Area is partly a forest area as mentioned in present land use. Particularly, it is necessary to undertaken a very careful land use plan for the forest located in lower than elevation of 100 m. The remarkable points for the land use plan are indicated as follows:

- Soil conservation
- Agro-forest
- Reforestation
- Pasture

- Adjustment of water-right

There is no creative water resources for the irrigation except the Inagawan river, therefore, it is important to adjust water-right between existing and proposed water-right.

2) Remarkable points in planning and design

- Soil conservation

In case of land reclamation of grassland, forest land and wilderness, it is necessary to be taken into consideration topography, soil and vegetation of the proposed area. Particularly, soil conservation is very important because of the following reasons:

- to keep fertility of the soil
- to protect sedimentation

- Conservation of water quality

  Regarding the water quality, sampling test for the water qualities have been carried out by simple tools and the chemical reactions on existing shallow-well (8 wells), springs (3 springs), and the Inagawan River respectively. As a result of the testing, there are no conflict for the development except the water qualities for potable water with shallow well and springs, thus, the water resources of potables water is proposed to change into deep tubes wells. The water quality control shall be necessary because of agricultural chemicals and the domestic gray water etc in the study area. As mentioned previously, mangrove forest area is located at south to southeast of the study area, and the said excess waters should be flow down to the mangrove area. Monitoring system therefore shall be required at the end points of each channels in future.

- Improvement of drainage system

  Inadequate drainage system shall be made several conflict in the study area, particularly, the reduction of farm production and difficulties on farm management. Particularly, road networks will be damaged by spot depression.

3) Incidental problems with reference to O/M

- Poor water distribution

  If there are no proper water distribution in the project area, it may cause reduction of farm production, and unbalance of farm-income among farmers. Furthermore, said problems may cause social conflict.

- Water oriented disease hazards

  With proper water distribution and interception, water borne diseases will not prosper in the area.

- Reduction of use of pesticides on crop disease

  Following exact requirement of water would minimize crop disease and therefore would reduce the use of pesticides.

- Losses of fertilizer

  Several kinds of fertilizer shall be supplied to support the highest crops production through growing stage, and the more correct water management should be carried out to support said practices.

- Effect to aquaculture

  In case of including aquacultural industry in the project area, water management is required to be carried out more exactly. Especially, water quality control is the most important task.

# Table M.4.1 Checklist of Environmental Parameters

| (A) Actions Affecting Environmental Resources Value | (B) Damages to Environment | (C) Recommended Feasible Protection Measurement. | (D) IEE. | | | |
|---|---|---|---|---|---|---|
| | | | No. significant Effect $D_1$ | Significant Impact | | |
| | | | | Small $D_2$ | Moderate $D_3$ | Major $D_4$ |
| 1. Environmental effects due to project location. | | | | | | |
| a. Encroachment into forest, swampland. | a. Loss of precious natural resources. | a. Careful planning/design plus offsetting. | ○ | | | |
| b. Impediments to movement of wildlife cattle and people. | b. Impairment of wildlife and disruption of local socio-economics. | b. Careful planning/design. | ○ | | | |
| c. Impediment of historical cultural monument, buildings and value. | c. Loss of precious values. | c. Careful planning/design. | ○ | | | |
| d. Conflict in water supply right and fishing right | d. Socioeconomic inequities. | d. Careful planning/design. | ○ | | | |
| e. Disruption of region and municipality. | e. Conflict of administrative power. | e. Careful planning/design. | ○ | | | |
| f. influence for fauna, flora and an aquatic living things. | f. Destruction of Ecosystem. | f. Careful investigation and planning. | ○ | | | |
| g. Regional flooding drainage hazards. | g. Appearance of natural disaster. | g. Careful investigation and planning. | ○ | | | |
| 2. Problems from oversight in planning and Design. | | | | | | |
| a. Watershed erosion and modification. | a. Project benefit impaired. | a. Appropriate attention in Project formulation. | ○ | | | |
| b. Downstream water quality and quantity problems. | b. Impairment of downstream beneficial uses. | b. Careful planning design/operation. | ○ | | | |
| c. Suitability of water supply quality and quantities for irrigation. | c. Project benefit impaired. | c. Careful planning design/operation. | ○ | | | |
| d. Overpumping of graundwater. | d. Water right conflict salinization, ground subsidence. | d. Careful planning design/operation. | ○ | | | |
| e. Adequacy of drainage planning. | e. Project benefits impaired. | e. Careful planning design/operation. | ○ | | | |
| f. Land tenure problems. | f. Project benefits impaired. | f. Careful planning design/operation. | ○ | | | |
| g. Farmer credit limitations. | g. Project benefits impaired. | g. Careful planning design/operation. | ○ | | | |
| h. Feasibility of cooperatives | h. Project benefits impaired. | h. Careful planning design/operation. | ○ | | | |
| i. Feasibility of water users association | i. Project benefits impaired. | i. Careful planning design/operation. | ○ | | | |
| j. Disruption of existing farmer cooperative system. | j. Project benefits impaired. | j. Careful planning design/operation. | | | | |
| k. Use of agricultural chemicals. | k. Project benefits impaired plus damage to downstream. | k. Careful planning design/operation. | | ○ | | |
| l. Selection of pesticides. | l. Project benefit impaired plus environmental water quality contamination. | l. Careful planning design/operation. | | ○ | | |
| m. Land use conflicts | m. Social conflicts, project benefit impaired. | m. Careful planning design/operation. | | ○ | | |
| n. Inequities in water distribution. | n. Social conflicts, project benefit impaired. | n. Careful planning design/operation. | ○ | | | |
| o. Canal maintenance. | o. Project benefits impaired. | o. Careful planning design/operation. | ○ | | | |
| p. Passage way. | p. Loss of wildlife plus disruption of economics/ socioeconomic. | p. Careful planning design/operation. | | | | |
| q. Scouring hazards of the soil. | q. Project benefits impaired | q. Careful planning design/operation. | | ○ | | |

(Cont'd)

Table M.4.1 Cont'd

| (A) Actions Affecting Environmental Resources Value | (B) Damages to Environment | (C) Recommended Feasible Protection Measurement. | (D) IEE. | | | |
|---|---|---|---|---|---|---|
| | | | No. significant Effect D1 | Significant Impact | | |
| | | | | Small $D_2$ | Moderate $D_3$ | Major $D_4$ |
| 3. Problems during construction stage. | | | | | | |
| a. Erosion control. | a. Loss of soil plus damage to downstream water quality | a. Careful construction stage planning plus monitoring. | | ○ | | |
| b. Other construction stage hazards. | b. Adverse environmental effects. | b. Careful construction stage planning plus monitoring. | ○ | | | |
| c. Monitoring during construction. | c. Without this, serious adverse effects likely to occur. | c. Careful construction stage planning plus monitoring. | ○ | | | |
| 4. Problems stemming from deficiencies in operation | | | | | | |
| a. Inadequate O & M. | a. Loss in project efficiency | a. Careful operation plus monitoring. | ○ | | | |
| b. Adverse soil modification. | b. Loss in project efficiency | b. Careful operation plus monitoring. | ○ | | | |
| c. Changes in groundwater hydrology. | c. Adverse effects on other water and land use. | c. Careful operation plus monitoring. | ○ | | | |
| d. Water-oriented disease hazards. | d. Increase in communicable diseases in service area. | d. Careful operation plus monitoring. | ○ | | | |
| e. Toxic chemical hazard. | e. Adverse effects on aquaculture and on downstream water quality. | e. Careful use of agricultural chemicals including training. | ○ | | | |
| f. Fertilizer runoff hazard. | f. Adverse effect on Project and on down stream water quality. | f. Careful use of agricultural chemicals including training. | ○ | | | |
| g. Spread of local disease. | g. Adverse effect on Project area and Region | g. Careful operation plus monitoring | ○ | | | |
| h. Operations monitoring. | h. If not provided, operations inefficiency is likely | h. provision of monitoring | | | | |
| i. Aquaculture water supply | i. Serious aquacultures losses | i. Careful operation to ensure continuing of supply | ○ | | | |
| 5. Realization of enhancement potentials. | | | | | | |
| a. Community water supply in service area. | a. Non-realization of very valuable socioeconomic gains. | a. Project component for this. | ○ | | | |
| b. Aquaculture in services area. | b. Non-realization of very valuable socioeconomic gains. | b. Careful planning. | ○ | | | |
| 6. Overall environmental review criteria | | | | | | |
| a. Unwarranted losses in precious resources. | a. Long-Term national environmental and economic losses | a. Careful planning | ○ | | | |
| b. Unwarranted accelerated use of resources for short-term gains. | b. Long-Term national environmental and economic losses | b. Careful planning | ○ | | | |
| c. Adverse effects on national energy exchange situation. | c. Adverse effect on national economics. | c. Careful planning | ○ | | | |
| d. Unwarranted hazards to endangered species. | d. Long-Term environmental losses. | d. Careful planning | ○ | | | |
| e. Undesirable population migration to urban sector | e. Intensification of urban socioeconomic problems | e. Careful planning | ○ | | | |
| f. Increase in affluent/poor income gap. | f. Intensification of national socioeconomic imbalances. | f. Careful planning | ○ | | | |

## M. 5 SOIL CONSERVATION IN FARM LAND

In the Irrigation and Drainage Development Plan which include Land Reclamation works, soil conservation is the most important matter from standpoint of environmental conservation. Generally speaking, soil erosion make progress rapidly in case of land gradient with more than 14 % (8 degrees).

Accordingly, the proposed land reclamation plan in the Study Area should be established depend on said recommendation. Fortunately, the concerned government agencies in the Philippines is also applied same criteria on the land reclamation project (less than 15 %).

a) Soil Conservation in Paddy Field

As compared with upland field, the paddy field does not pose any serious problems on soil conservation, because, its farm lot is flat and surrounded with small levee, and the soil is generally clay loam type, and furthermore, if the water management is carried out appropriately. However, it is required to improve soil structure of paddy field in case of high rate of percolation, thus, big holes shall be develop sometimes due to strong and quick seepage in the bed of farm lot.

As a countermeasure for said phenomena, the Crushing and Compaction Method is recommendable for the elimination of such holes. Crushing and Compaction Method (CACM) is summarized as follows.

At first, the surface soil of paddy field should be removed to near stock yard, which is reused after the improvement of subsoil. After that, the subsoil will be plowed and/or beaked with 40~50cm depth, and pebble and/or gravel should be taken out from the subsoil. After said arrangement, the subsoil shall be compacted with tamper, and covered with surface soil again.

b) Soil Conservation for Upland Field

As mentioned in the previous section, the upper limit of land gradient for land reclamation is fixed at 15 % based on the criteria in the Philippine, which is reasonable in comparison with other country's standard.

However, an upland field is more conducive to soil loss as compared to paddy field, since the surface of soil in sloping area is affected directly with rainfall, wind and sunshine etc.

In case of land reclamation of upland field, careful implementations are required with the following consideration;

- The long side of the farm lot should be set in parallel with contour line and the length of short side shall be fixed depending on the land gradient. The length of long side and short side are at about 50 and 20 m, respectively. The land gradient should be adjusted to become less than five (5) degrees as much as possible.
- The height of flight between upper and lower farm lot should be kept within 1.0 m height as far as possible.
- Making of the ridge for crops should be in parallel with contour line.
- Strict water management shall be required to avoid provision of excessive water on upland irrigation.
- Application of Mulching is recommendable to protect erosion from raindrop and reduce the evaporation from surface of soil.

c) Orchard Reclamation of Sloping Field

In sloping field, the ridge of orchard should be in parallel with contour line and a farm road is provided in parallel with the ridge of orchard, and a ridge is connected with a farm road. In this case, the farm roads has two objective namely, one is to carry the input and output materials and the other is protection of land erosion. Furthermore, surroundings area of fruit tree is better to cover by the pasture and other grass.

d) Growth of Sand-Catch Forest

In order to protect the inflow of materials eroded by heavy rain, the Sand-Catch Forest is recommendable. The Sand-Catch Forest are provided at surroundings of farmland, household and reservoir etc. In case of land reclamation project, it should be consider to conserve more effectively on existing forest area in the study area.

## M. 6 ENVIRONMENTAL CONSERVATION PLAN

### M. 6. 1 Soil Conservation During Construction Stage

During the construction stage, many excavation and embankment works will be carried out in the Study Area. Through these works, much amount of earth materials should be moved from construction site to stock yard or from stock yard to construction site etc. Thus, careful treatments are required to protect the flowing over of these materials from the sites to surrounding area. The definitive countermeasures are summarized as follows.

a) To keep surplus spaces for the stock yard.

It is recommendable to keep surplus spaces in the stock yard for the protection to flow over the stocks by the rain.

b) To cover with the sheets on the surface of stock yard

It is necessary to cover the surface of embankment materials to avoid surface erosion by heavy rain.

c) To avoid the over loading of carrier (Dump Truck etc.)

In case of carrying on the excavation and embankment materials, the over load is a cause of spreading embankment or excavation materials over the road, and surroundings of the site.

d) To compact the embankment materials at construction site

Regarding the earth work of embankment, the compaction is conducted with the specification, however, that is keep out frequently at the site. After the completion of construction, the sliding and erosion are in fearful of occurrence at the site.

### M. 6. 2 Maintenance of Drainage Canals

Generally, drainage canals are constructed with earth lining. After the passage of several years, sliding and/or erosion should be occurrence in the canals. As a its result, big amount of sedimentary materials should cover the canal bed year by year. It is therefore recommendable to have a treatment of the sedimentation and protection of the sliding.

### M. 6. 3 Conservation of Water Quality

Farm land of 404 ha is existing the study area, which is managing with population of 500. As such, the water pollution seems to be very minimal. However, it is considered that farm land will be expanded to about 1,540 ha including the home lot area, and the population will be also expected to increase to 2,000. As a result of consideration on said situation, it is considered that water pollution will increase, and may spread to a more wider area in the future. The following phenomena are anticipate under above mentioned condition.

- eutrophication in the sea by nutrient rich salts may appear.
- agricultural chemicals may accumulate and diffused to a wider area.

a) Countermeasure for the Water Pollution

The following approach is the most rudimentary method for the protection of water pollution in the study area, and the treatment standard shall be grade up gradually depend on the environmental condition in future. The most elementary method is summarized as follows.

1) First Step of Treatment in Home Lot

A raw materials such as scums of vegetable, fish, meats and other foods which is produced every day in each family shall be collected and utilized to make the compost as a organic fertilizer. These organic fertilizer will be consumed individually in their farmland.

2) Treatment by the Pond

According to the field investigation, individual family gray water is flowing out directly to near existing small drainage channel, and it flowing into the sea finally. Said gray water in the Home Lots should be collected with concrete ditch net work and led to the treatment pond. For the treatment in the pond, it is recommendable to breed the Water Hyacinth, because, W.H is recognized generally to eliminate the Nitrogen and the Phosphorus through their growing activities. At the same time, installation of aeration facilities is also recommendable at the pond.

3) Installation of Screen with Charcoal

The charcoal has a characteristic to help the activities of bacteria for resolution of sludge in the waste water. It is therefore recommendable to install the charcoal screen at junction between the pond and concrete ditch net works.

b) Treatment of the Night-Soil

No there are waste water treatment Plant in Puerto Princesa City Area. Supposedly, it is required to provide the waste water treatment systems for environmental conservation in the city area in future. Fortunately, the study area is included administratively to Puerto Princesa City area, and the treatment system plan should be considered and established depend on the consideration of whole city area including the study area.

c) Monitoring System

No there are field investigation data except JICA study team's observations on the water qualities in the study area. As mentioned previously, the investigation could not cover full items required on the water qualities of drainage system in the study area. Particularly, basic element of effluent standards has been not examined yet in existing drainage channels (Such as, EC, PH, BOD, DO, SS, COP). It is therefore required to established the Monitoring System at outlet of each drainage channels in the study area as soon as possible.

## M. 7 SAFETY MEASURES RELATED TO THE BOMBING RANGE

### M. 7. 1 The Bombing Range

There exist a bombing range of the Philippine Air Force in the northeastern side of the project area. It is about 2,700 meters long and about 500 meters wide with a total area of 137 ha. It is used for bombing exercises each lasting for about a week in the dry season.

### M. 7. 2 Existing Safety Measures

Several weeks before the scheduled exercise, the Philippine Air Force Unit based in Puerto Princesa would inform concerned officials particularly the Philippine National Police and the Superintendent of Iwahig Penal Colony, where the bombing range is located, about the dates of the exercise. The Superintendent in turn informs the barangay chairman and the barangay chairman finally informs his constituents about the schedule of the exercise. The information is relayed to the people both orally and by written notice posted in public places like barangay hall and local stores.

Three days before the exercise all the roads leading to the bombing range are already guarded by military and local police to inform and/or prevent people from entering the danger area. During the actual day, no civilian is absolutely allowed to enter the bombing range.

### M. 7. 3 Safety Measures During Project Implementation and Operation

Although the bombing range is outside of the project are, about 500 meters of irrigation canal runs along the northwestern part of the bombing range. The canal intrude into the range only about 150 meters on the maximum inside the perimeter. With the irrigation canal as the boundary, about four (4) hectares of the project area is technically within the bombing range.

Construction of that canal portion would only take about one month and therefore, there is enough time to schedule its construction outside of the schedule of the bombing exercise.

During maintenance of the canal which take only once a year, no problem is foreseen because the maintenance should be scheduled no to coincide with the schedule of the bombing exercise.

It is therefore recommended that the area of about four (4) ha, which the main irrigation canal is running, should be excluded from the bombing range for more safety measures.

### M. 7. 4 Possible Impact

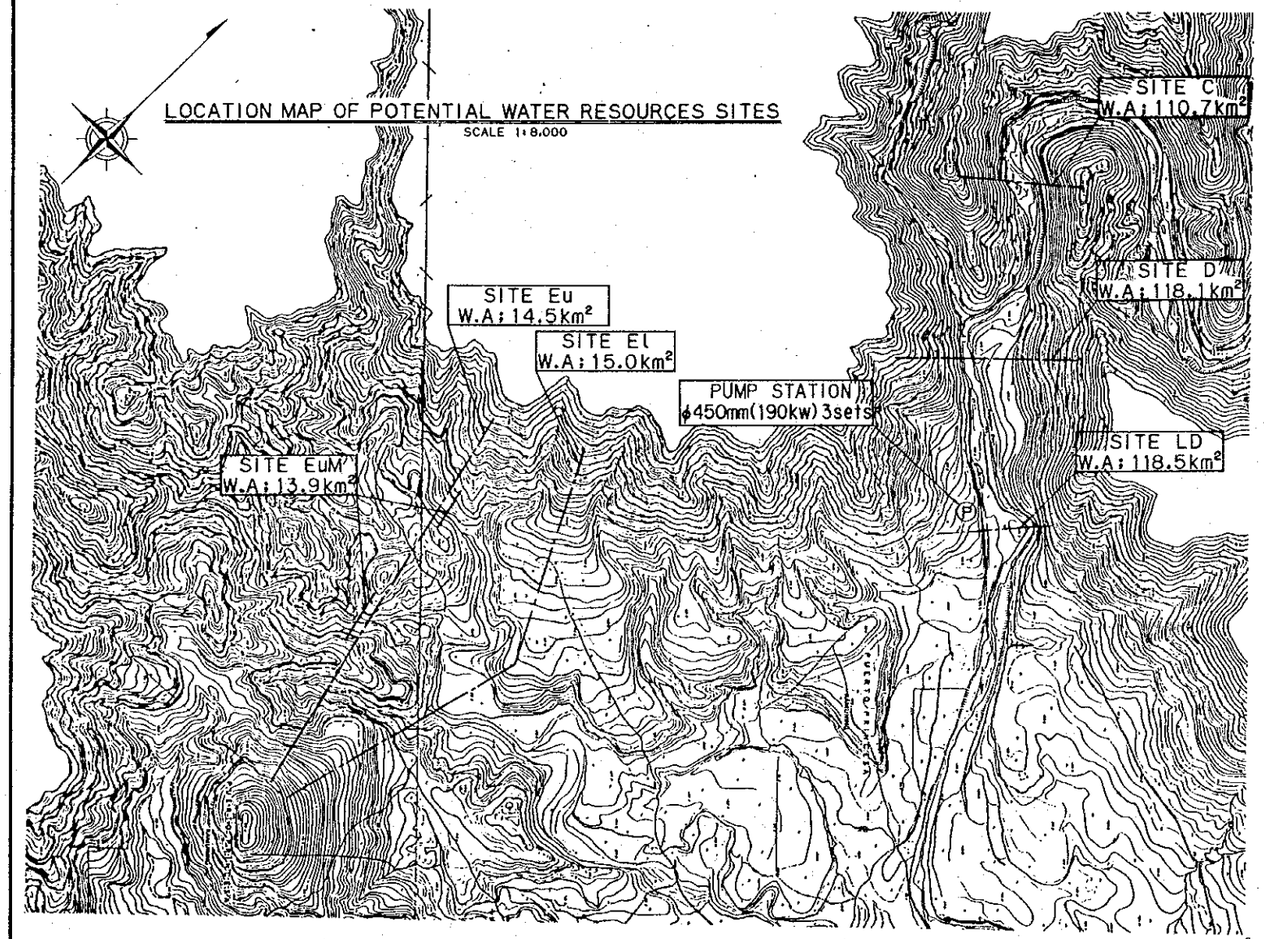
The presence of a bombing range adjacent to the project area would hardly generate any adverse impact on the project. The movement of the people however should be restricted during the actual bombing exercise but since this will occur only about twice a year, its impact on the movement of the people can hardly be measured.

The impact of the project on the bombing range is likewise minimal since construction of the canal within the bombing range should be scheduled only when there is no bombing exercise. The project therefore dose not interfere with the bombing exercise.

The Philippines Air Force Unit should notice the exercise schedule to the villagers at least three (3) days in advance prior to bombing exercise, through the necessary channels. During the day the villagers should keep people and animals away from the bombing range.

# APPENDIX N. DRAWINGS

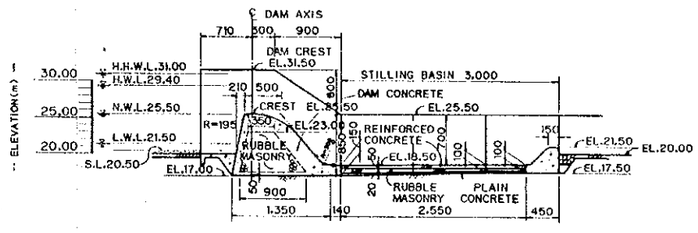
## LIST OF DRAWINGS



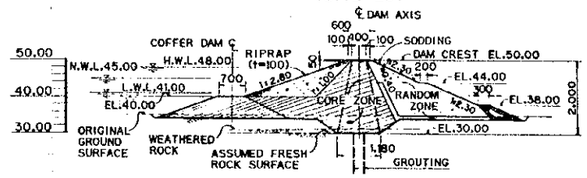

## ALTERNATIVE PLAN OF WATER RESOURCES DEVELOPMENT

| SITE | | SITE Eu | SITE El | SITE D | SITE C | SITE EuM | SITE LD |
|---|---|---|---|---|---|---|---|
| (1) INTAKE TYPE | | GRAVITY W/RESERVOIR | | | | | PUMP W/WEIR |
| (2) WATER SOURCE | | | | | | | |
| a) RIVER NAME | | PINAGSALURAN | PINAGSALURAN | INAGAWAN | INAGAWAN | PINAGSALURAN | INAGAWAN |
| b) WATERSHED AREA | (km²) | 14.5 | 15.0 | 118.1 | 110.7 | 13.9 | 118.5 |
| c) RIVERBED ELEVATION | (m) | 34.5 | 29.0 | 21.2 | 23.5 | 34.5 | 19.5 |
| (3) RESERVOIR | | | | | | | |
| a) REQUIRED E.STORAGE | (MCM) | 1.55 | 1.61 | 0.20 | 0.21 | 0.20 | 0.20 |
| b) SEDIMENT VOLUME | (MCM) | 0.44 | 0.45 | 2.36 | 2.21 | 0.11 | — |
| c) DEAD WATER VOLUME | (MCM) | 0.44 | 0.45 | 2.36 | 2.21 | 0.11 | 0.06 |
| d) N.W.L (MSL) | (m) | 54.00 | 46.50 | 40.00 | 42.50 | 45.00 | 25.50 |
| e) L.W.L (MSL) | (m) | 45.60 | 37.80 | 39.00 | 42.00 | 41.00 | 21.50 |
| f) W.SURFACE AT N.W.L | (ha) | 29 | 28 | 33 | 31 | 8 | 9 |
| (4) MAJOR FEATURE OF DAM/WEIR | | | | | | | |
| a) DAM TYPE | | FILLTYPE DAM | FILLTYPE DAM | CONCRETE DAM | CONCRETE DAM | FILLTYPE DAM | CONCRETE WEIR |
| b) DAM CREST ELEVATION (MSL) | (m) | 58.00 | 50.50 | 44.00 | 47.00 | 50.00 | 31.50 |
| c) DAM HEIGHT | (m) | 28.0 | 25.5 | 45.0 | 30.0 | 20.0 | 14.5 |
| d) DAM CREST LENGTH | (m) | 575 | 868 | 355 | 155 | 239 | 221 |
| e) DESIGN FLOOD DISCHARGE | (c.m.s) | 430 | 440 | 1,600 | 1,550 | 420 | 930 |
| f) INTAKE FOR PROJECT | (c.m.s) | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | — |
| INTAKE FOR E.PROJECT & R. | (c.m.s) | — | — | 0.45 | 0.45 | — | 0.45 |
| (5) MAJOR FEATURE OF PUMP | | | | | | | |
| a) TYPE OF PUMP | | — | — | — | — | — | VERTICAL PUMP |
| b) DIAMETER | (m/m) | — | — | — | — | — | φ 450×3units |
| c) DESIGN DISCHARGE | (c.m.s) | — | — | — | — | — | 0.84 |
| d) OUTPUT OF PUMP | (KW) | — | — | — | — | — | 190×3 |

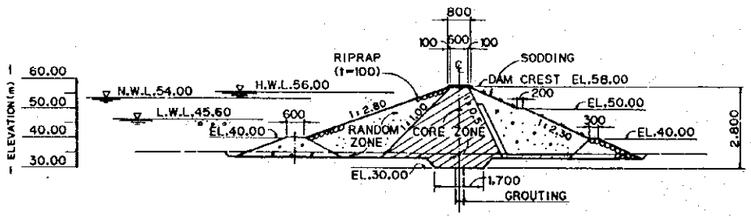
(NOTE) E.STORAGE : EFFECTIVE STORAGE
E.PROJECT & R. : EXISTING PROJECT AND RIVER MAINTENANCE



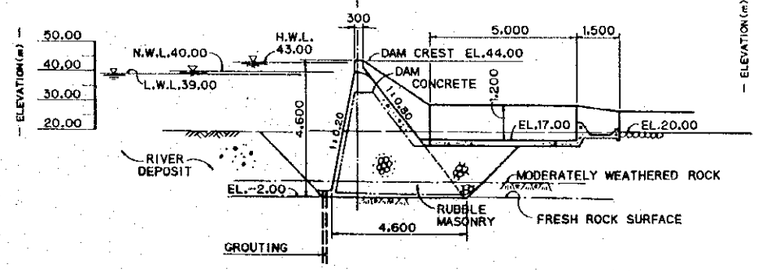

TYPICAL CROSS SECTION OF DAM
(SITE LD) SCALE 1:400



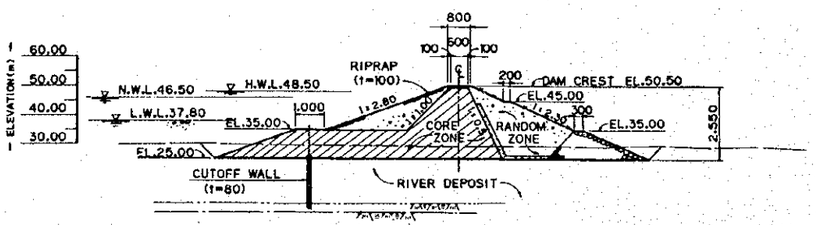

TYPICAL CROSS SECTION OF DAM
(SITE EuM) SCALE 1:800



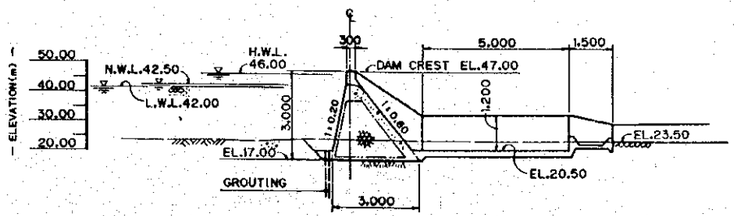

TYPICAL CROSS SECTION OF DAM
(SITE Eu) SCALE 1:1,000




TYPICAL CROSS SECTION OF DAM
(SITE D) SCALE 1:1,000




TYPICAL CROSS SECTION OF DAM
(SITE El) SCALE 1:1,000




TYPICAL CROSS SECTION OF DAM
(SITE C) SCALE 1:1,000

SCALE 1:800
0 20 40m
SCALE 1:400
0 10 20m
SCALE 1:8,000
0 200 400m
SCALE 1:1,000
0 10 20 30 40 50m

NOTE:

1. ALL DIMENSIONS ARE SHOWN IN CENTIMETER UNLESS OTHERWISE SPECIFIED.
2. ELEVATIONS ARE SHOWN IN METER (M.S.L.).
3. SITE D IS UNSUITABLE FOR DAM DUE TO DEEP RIVER DEPOSIT.
4. THE STUDY FOR SITE D.LD AND E IS MADE BASED ON TOPO-MAP SCALED 1:1,000. BUT SITE C. BASED ON TOPO-MAP SCALED 1:4,000.

THE FEASIBILITY STUDY ON THE DEVELOPMENT OF VIABLE AGRARIAN REFORM COMMUNITIES IN SOUTHERN PALAWAN

WATER RESOURCES DEVELOPMENT
ALTERNATIVE WATER RESOURCES

DAR

JICA
JAPAN INTERNATIONAL COOPERATION AGENCY

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