Table 2.6.2 PRIMARY PROFIT PER HA FOR SUGARCANE WITH PROJECT
(IN TAGAYTAY AND GUADALUPE SERIES)

Item		(Unit : Peso)
A) Gross Income 55 ton x 165₱/ton	9,075	
B) Production Cost (Average)	4,901	
Plant cane	6,042	Ratoon (2 times) 4,330
1) Seed		
40,000 pcs x 0.01 ₱/pcs	400	5,000 pcs x 0.01 ₱/pcs 50
2) Fertilizer		
N : 180 kg x 6.5 ₱/kg	1,170	N : 180 kg x 6.5 ₱/kg 1,170
P : 80 kg x 7.8 ₱/kg	624	P : 80 kg x 7.8 ₱/kg 624
3) Chemicals	230	
4) Labor (man-days)		
138 days x 15 ₱/day	2,070	128 days x 15 ₱/day 1,920
5) Mechanical power	900	
6) Animal power (man-animal-days)		
12 days x 30 ₱/day	360	12 days x 30 ₱/day 360
7) Miscellaneous	288	206
C) Primary profit (A-B)	4,174	

Table 2.6.3 PRIMARY PROFIT PER HA FOR SUGARCANE WITH PROJECT
(IN MAGALLANES SERIES)

Item		(Unit : Peso)		
A) Gross Income 50 ton x 165 ₱/ton	8,250			
B) Production Cost (Average)	4,528			
Plant cane	5,669		Ratoon (2 times)	3,957
1) Seed				
40,000 pcs x 0.01 ₱/pcs	400		5,000 pcs x 0.01 ₱/pcs	50
2) Fertilizer				
N : 160 kg x 6.5 ₱/kg	1,040		N : 160 kg x 6.5 ₱/kg	1,040
P : 80 kg x 7.8 ₱/kg	624		P : 80 kg x 7.8 ₱/kg	624
3) Chemicals	230			
4) Labor (man-days)				
123 days x 15 ₱/day	1,845		113 days x 15 ₱/day	1,695
5) Mechanical power	900			
6) Animal power (man-animal days)				
12 days x 30 ₱/day	360		12 days x 30 ₱/day	360
7) Miscellaneous	270			188
C) Primary profit (A-B)	3,722			

Table 2.6.4 PRIMARY PROFIT PER HA FOR UPLAND RICE WITH PROJECT (PADDY)

Item	(Unit : Peso)
A) Gross Income	
1.5 ton x 2,035 ₱/ton	3,053
B) Production Cost	2,029
1) Seed	
75 kg x 2 ₱/kg	150
2) Fertilizer	
N : 60 kg x 6.5 ₱/kg	390
P : 40 kg x 7.8 ₱/kg	312
3) Labor (man-days)	
48 days x 15 ₱/day	720
4) Animal power (man-animal-days)	
12 days x 30 ₱/day	360
5) Miscellaneous	97
C) Primary Profit	1,024

Table 2.6.5 PRIMARY PROFIT PER HA FOR SUGARCANE WITHOUT PROJECT

Item		(Unit : Peso)
A) Gross Income 37 ton x 165 ₱/ton	6,105	
B) Production Cost (Average)	2,620	
Plant cane	3,673	Ratoon cane (2 times) 2,093
1) Seed		
40,000 pcs x 0.01 ₱/pcs = 400		5,000 pcs x 0.01 ₱/pcs = 50
2) Fertilizer		
N : 45 kg x 6.5 ₱/kg = 293		N : 45 kg x 6.5 ₱/kg = 293
3) Labor cost (man-days)		
103 days x 15 ₱/day = 1,545		78 days x 15 ₱/day = 1,170
4) Animal power (man-animal days)		
12 days x 30 ₱/day = 360		16 days x 30 ₱/day = 480
5) Mechanical power		
= 900		= 0
6) Miscellaneous		
= 175		= 100
C) Primary profit (A - B)	3,485	

Table 2.6.6 PRIMARY PROFIT PER HA FOR UPLAND RICE WITHOUT PROJECT (PADDY)

Item	(Unit : Peso)
A) Gross Income	
0.6 ton x 2,035 ₱/ton	1,221
B) Production Cost	1,363
1) Seed	
75 kg x 2 ₱/kg	150
2) Fertilizer	
N : 22 kg x 6.5 ₱/kg	143
3) Labor (man-days)	
43 days x 15 ₱/day	645
4) Animal power (man-animal-days)	
12 days x 30 ₱/day	360
5) Miscellaneous	65
C) Primary Profit	- 142

Table 2.6.7 PRIMARY PROFIT PER HA
FOR CORN WITHOUT PROJECT

Item	(Unit : Peso)
A) Gross Income	
0.55 ton x 1,280 ₱/ton	704
B) Production Cost	975
1) Seed	
50 kg x 1.3 ₱/kg	65
2) Fertilizer	
N : 20 kg x 6.5 ₱/kg	130
3) Labor (man-days)	
25 days x 15 ₱/day	375
4) Animal power (man-animal-days)	
12 days x 30 ₱/day	360
5) Miscellaneous	45
C) Primary Profit (A - B)	- 271

Table 2.6.8 PRIMARY PROFIT PER HA FOR CASSAVA WITHOUT PROJECT

Item	(Unit : Peso)
A) Gross Income	
5.4 ton x 625 ₱/ton	3,375
B) Production Cost	2,027
1) Seed	
13,200 pcs x 0.036 ₱/pcs	475
2) Labor (man-days)	
45 days x 15 ₱day	675
3) Animal power (man-animal-days)	
26 days x 30 ₱/day	780
4) Miscellaneous	97
C) Primary Profit	1,348

Table 2.6.9 PRIMARY PROFIT PER HA FOR PEANUTS WITHOUT PROJECT

Item	(Unit: Peso)
A) Gross Income	
0.53 ton x 4,090 ₱/ton	2,168
B) Production Cost	1,982
1) Seed	
100 kg x 4 ₱/kg	400
2) Fertilizer	
P: 40 kg x 7.8 ₱/kg	312
K: 20 kg x 3.3 ₱/kg	66
3) Labor (man-days)	
50 days x 15 ₱/day	750
4) Animal power (man-animal-days)	
12 days x 30 ₱/day	360
5) Miscellaneous	94
C) Primary Profit	186

Table 2.6.10 BENEFIT AT FULL STAGE

Crop	With Project			Without Project			Benefit
	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱/10^3)	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱/10^3)	(₱10^3)
1) Sugarcane	1,980	3,801	7.526	550	3,485	1,917	5,609
2) Upland Rice	660	1,024	676	1,630	-142	-231	907
3) Corn	0	-	0	300	-271	-81	81
4) Cassava	0	-	0	110	1,348	148	-148
5) Peanuts	0	-	0	80	186	15	-15
Total			8,202			1,768	6,434

Note : Estate farm area (400 ha) is excluded.

Table 2.7.1 TYPICAL FARM BUDGET WITH PROJECT
(FARM SIZE 2.0 HA)

(1) Type I (TENANT)

Item	Area (ha)	Unit Yield (t/ha)	Pro-duction (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					18,675
1) Farm Income					12,107
- Sugarcane	1.2	50	60	160	9,600
- Upland rice	0.4	1.5	0.6	1,455	873
- Rainfed paddy	0.4	2.0	0.8	1,455	1,164
- Livestock					470
2) Off-farm Income					6,568
II) Gross Outgo					18,120
1) Production Cost					6,980
		Plant	Ratoon		
- Sugarcane		6,481	4,618		5,239
Seed		312	39		
Fertilizer		1,459	1,459		
Agro-chemicals		240	-		
Hired labor		1,470	1,200		
Mechanical power		1,080	-		
Land rent /1		1,920	1,920		
- Others					
Seed					81
Fertilizer					273
Hired labor		16 man-days x ₱15/day			240
Harvesting and threshing		1.4 t x 1/5 x ₱1,455/t			407
Land rent /2					408
Miscellaneous					332
2) Living Expenses /3					11,140
III) Capacity to pay (I - II)					555

/1: Land rent; ₱9,600 x 20% = ₱1,920
/2: Land rent; (₱873 + ₱1,164 + ₱407) x 25% = ₱408
/3: Living expenses at present (₱8,570) x Increasing rate (1.3)=11,140

Table 2.7.2 TYPICAL FARM BUDGET WITH PROJECT
(FARM SIZE 2.5 HA)

(2) Type II (TENANT)

Item	Area (ha)	Unit Yield (t/ha)	Pro-duction (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					22,798
1) Farm Income					16,340
- Sugarcane	1.65	50	82.5	160	13,200
- Upland rice	0.55	1.5	0.83	1,455	1,200
- Perenical crop	0.30	70,000 pcs	21,000	70/1,000 pcs	1,470
- Livestock					470
2) Off-farm Income					6,458
II) Gross Outgo					20,032
1) Production Cost					8,892
		Plant	Ratoon		
- Sugarcane		8,915	6,350		7,205
• Seed		429	54		
• Fertilizer		2,006	2,006		
• Agro-chemicals		330	-		
• Hired labor		2,025	1,650		
• Mechanical power		1,485	-		
• Land rent /1		2,640	2,640		
- Others					
• Seed					83
• Fertilizer					251
• Hired labor		30 man-days x ₱15/day			450
• Harvesting and thresing		0.83 t x 1/5 x ₱1,455/t			240
• Land rent /2					240
• Miscellaneous					423
2) Living Expenses /3					11,140
III) Capacity to pay (I - II)					2,766

/1: Land rent; ₱13,200 x 20% = ₱2,640
/2: Land rent; (₱1,200 - ₱240) x 25% = ₱240
/3: Living expenses at present (₱8,570) x Increase rate (1.3) = 11,140

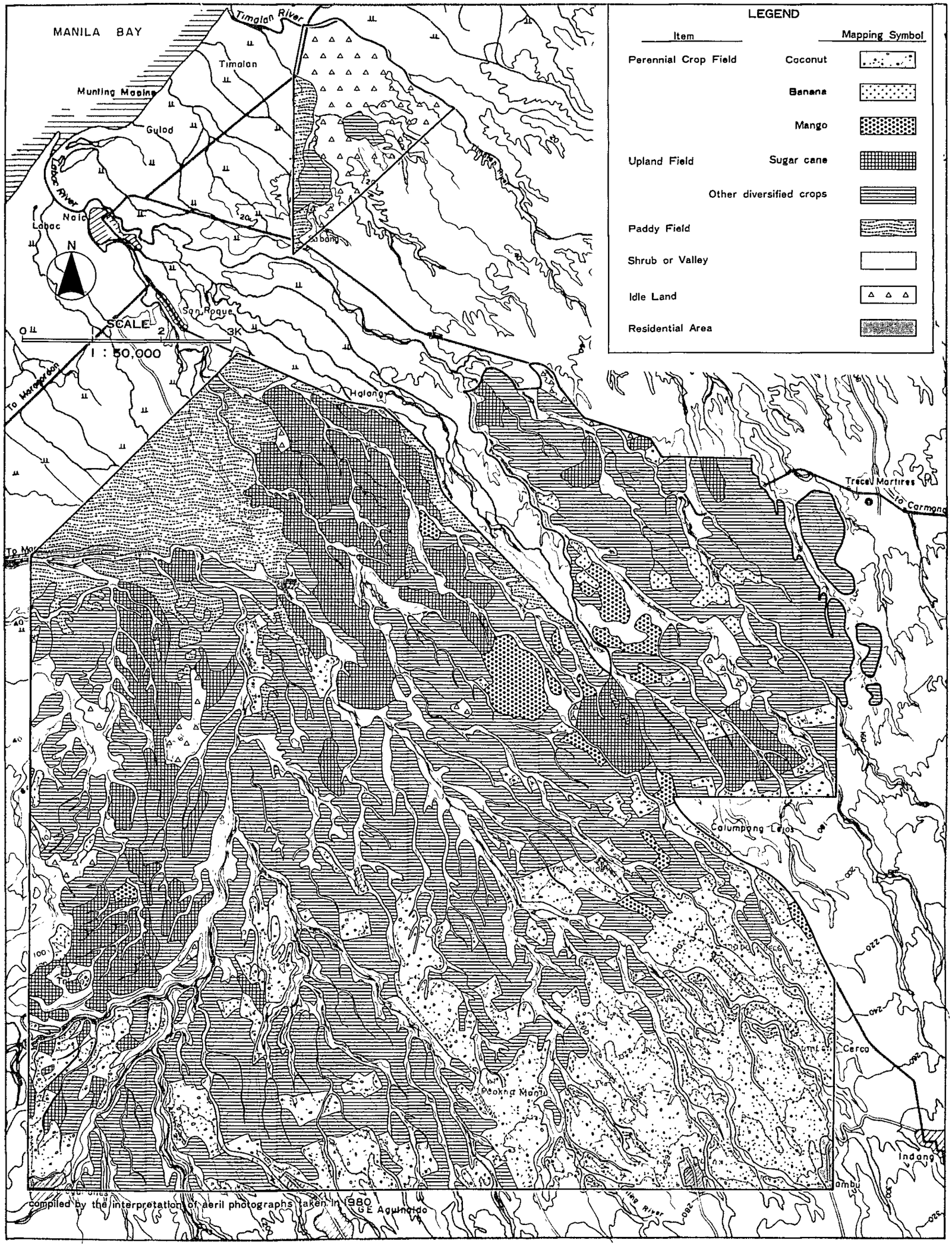
Table 2.7.3 TYPICAL FARM BUDGET WITH PROJECT
(FARM SIZE 2.7 HA)

(3) Type III (OWNER)

Item	Area (ha)	Unit Yield (t/ha)	Pro-duction (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					22,520
1) Farm Income					16,991
- Sugarcane	1.5	50	75	160	12,000
- Upland rice	0.5	1.5	0.75	1,455	1,091
- Perenial crop	0.7	70,000 pcs	49,000	70/1,000 pcs	3,430
- Livestock					470
2) Off-farm Income					5,529
II) Gross Outgo					16,914
1) Production Cost					5,774
		Plant	Ratoon		
- Sugarcane		5,709	3,373		4,152
• Seed		390	49		
• Fertilizer		1,824	1,824		
• Agro-chemicals		300	-		
• Hired labor		1,845	1,500		
• Mechanical power		1,350	-		
- Others					
• Seed					75
• Fertilizer					229
• Hired labor		55 man-days x ₱15/day			825
• Harvesting and threshing		0.75 t x 1/5 x ₱1,455/t			218
• Miscellaneous					275
2) Living Expenses /1					11,140
III) Capacity to pay (I - II)					5,606

/1: Living expenses at present (₱8,570) x Increasing rate (1.3)=11,140

Fig. I.2.1 LAND USE MAP



compiled by the interpretation of aeril photographs taken in 1980

GE Aguinaldo

Fig. 1.3.1 PRESENT CROPPING PATTERN

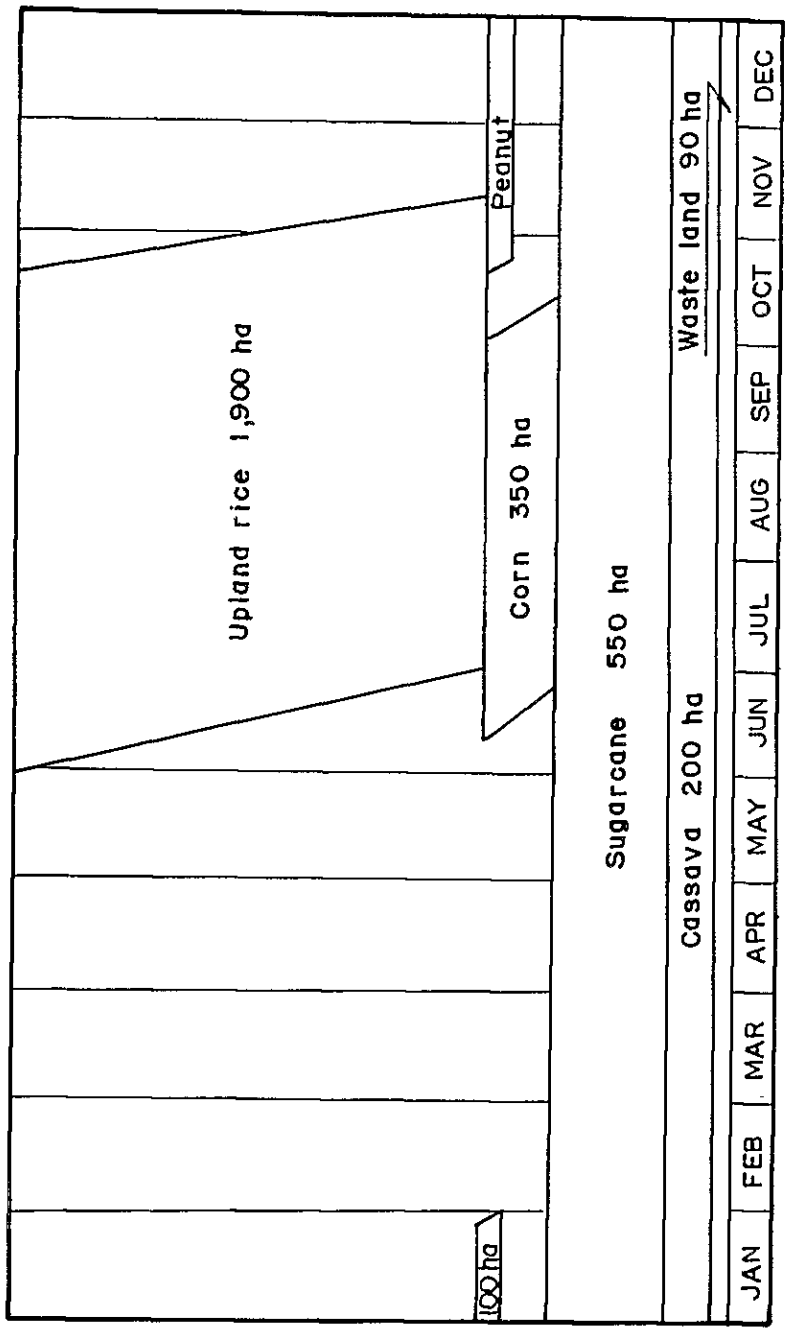
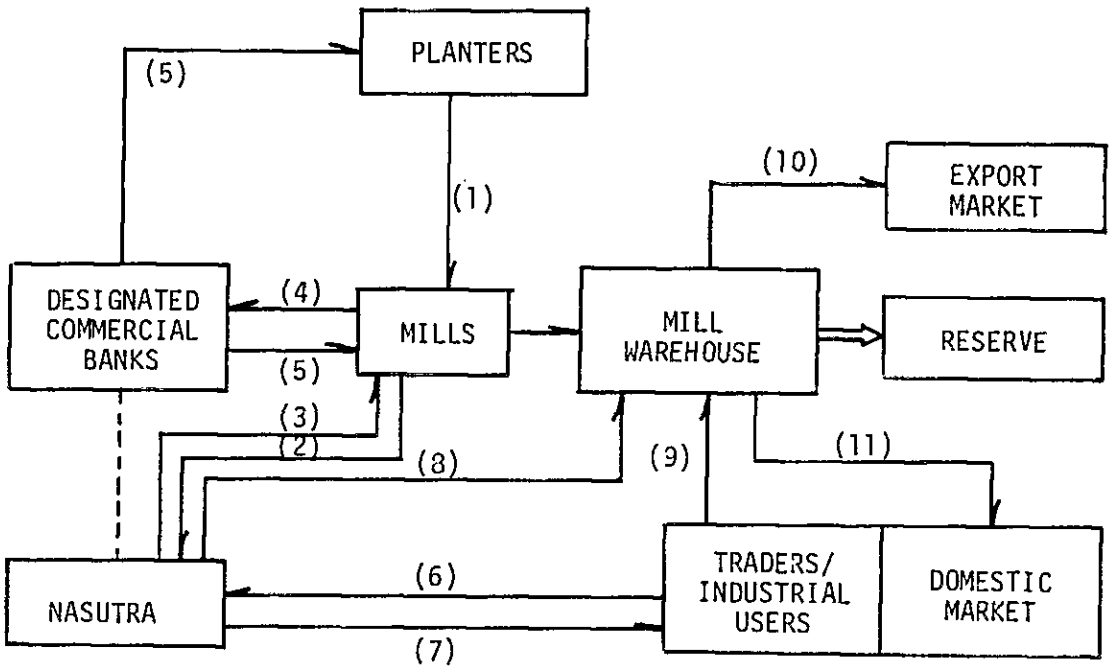


Fig. 1.6.1 SUGAR FLOW CHART



LEGEND

(1) Cane transport
(2) Submits warehouse receipts
(3) Issue Liquidation Payment Orders (LPO)
(4) Present LPO
(5) Pays proceeds of LPO
(6) Apply for allocation/ shows allocation
(7) Issues allocation/grants withdrawal permits
(8) Orders exportation/issues job orders
(9) Shows withdrawal permits
(10) Withdrawal by NASUTRA
(11) Withdrawal by Accredited Traders/Industrial Users

Source: PHILSUCOM

Fig. 2.1.1 PROJECT AREA

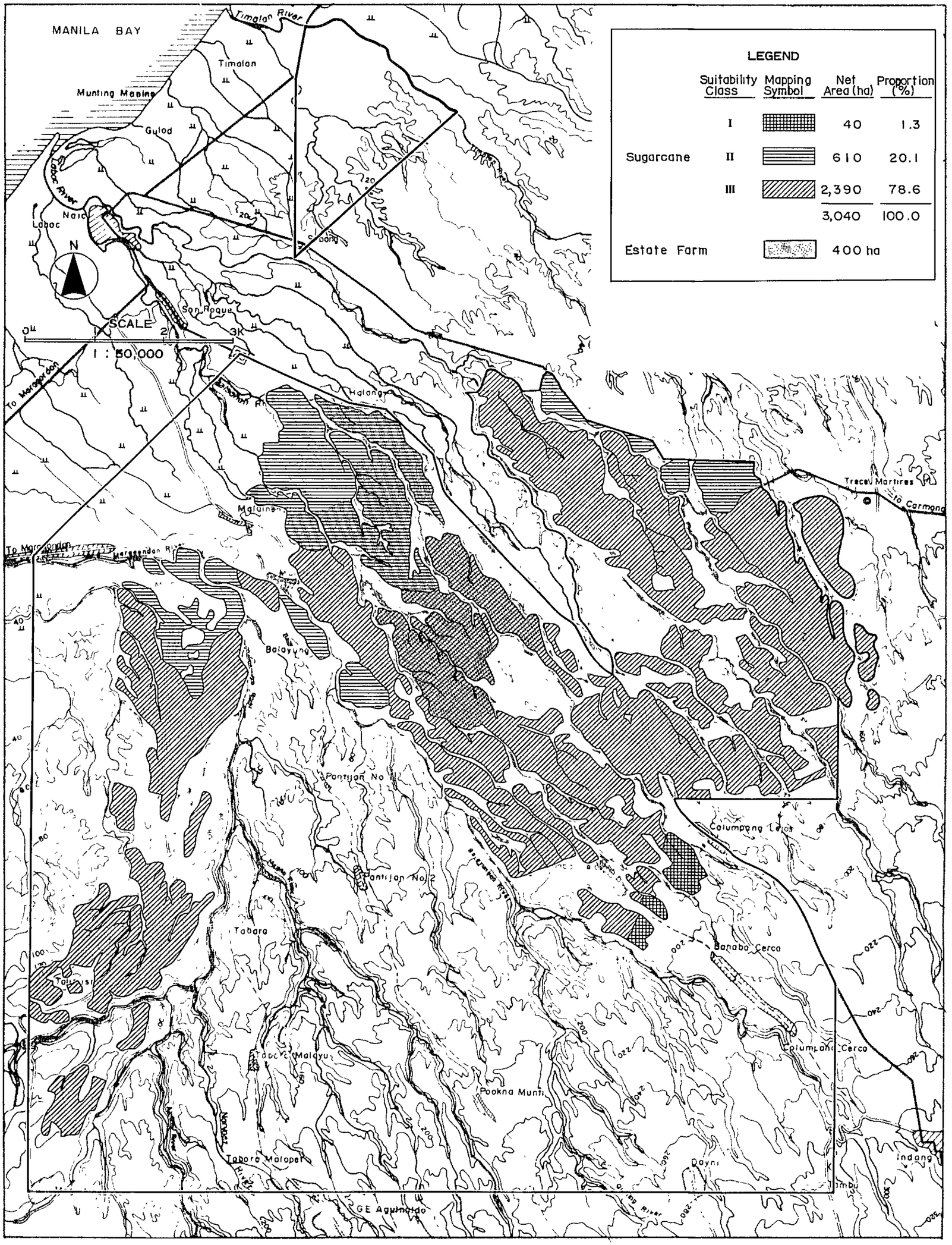
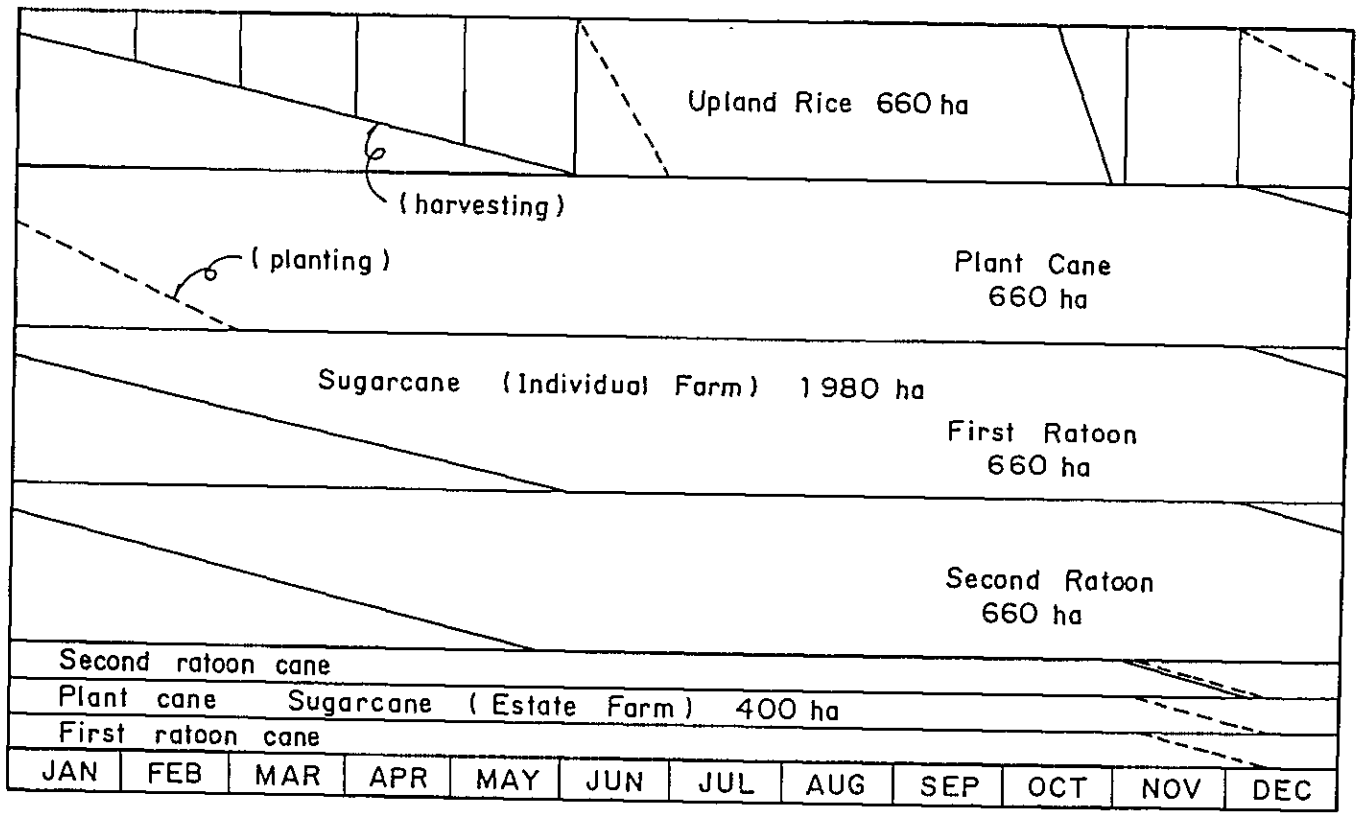


Fig. 2.3.1 PROPOSED CROPPING PATTERN



APPENDIX IV

INFRASTRUCTURE

APPENDIX IV INFRASTRUCTURE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX IV INFRASTRUCTURE

CHAPTER 1 ROAD NETWORK DEVELOPMENT PLAN

1.1 Present Conditions

In the objective area, there exist two national highways, i.e. Route 25 and Marcos Highway, which run from northeast to southwest mostly along the natural streams and rivers flowing in the area. These roads are of all-weather type paved with aspahlt and have an effective width of more than 6 m. Besides there are several provincial roads in the objective area, which are connected to the above highways forming a principal road network in this area. The provincial roads are generally of fair-weather type surfaced with gravelly materials.

Inside the objective area, there is no planned road, and communication and transportation are only through foot paths, small tracks and existing canal banks that are not passable even by heavy duty vehicles during the rainy season.

1.2 Road Improvement Plan by Provincial Government

The Provincial Government of Cavite has a plan to repair and upgrade the existing provincial roads in and around the objective area. Under this plan, the improvement of two provincial roads has already started and there are under preparation as detailed in the following table.

December, 1981

Route No.			Remarks
1.	Maragondon	- Magallanes	On-going
2.	Indang	- Route No.1	On-going
3.	Malainen Luma	- Malainen Bago	Proposed
4.	Malainen Luma	- Alfonso	Proposed
5.	Gen. Aguinaldo	- Route No.1	Proposed

After the completion of the improvement plan, all the above roads are expected to change into all-weather roads with asphalt or concrete pavement, having as effective width of 6 m.

1.3 Proposed Road Network

1.3.1 Basic Plan

The smooth and successful operation of the project is dependent on the establishment of an adequate road network, which can be used for the transportation of sugarcane products from farms to the distillery where the products are processed.

It is proposed that the distillery will be preferably located, facing a national or provincial road. Accordingly, the proposed road netwrok is so arranged as to incorporate the national and provincial roads into the network as trunk lines for the sugarcane transportation.

The proposed road network consists of (1) trunk roads, (2) main roads, (3) secondary roads and (4) farm roads, details of which are explained hereunder.

1.3.2 Trunk Road

The trunk roads are composed of the existing national or provincial roads including the roads which are under improvement or proposed to be improved by the Provincial Government. All these roads are of all-weather type paved with asphalt or concrete, have an affective width of 6 m or more and can be effectively utilized for the transportation of sugarcane products without and further upgrading works.

The national or provincial roads to be used as the trunk roads for the project are as detailed below:

Trunk Roads	Length
Natinoal highway: Route 25	16.1 km
: Marcos Highway	13.2
Provincial roads: five routes	46.5

1.3.3 Main Road

The main roads are to connect the trunk roads with the secondary roads, and will be provided almost perpendicularly to the trunk roads, traversing the project area from east to west. Two main roads are planned to be constructed, i.e. Main Road-A and Main Road-B.

For the Main Road-A, two alternative routes, i.e. (1) Malainen Luma-Palangi route and (2) Malainen Luma-MYC Farm-Halang route were considered, and a comparative study on these routes was made as follows:

	Malainen Luma - Palangui	Malainen Luma - Halang
Length	2,628 m	3,923 m
Direct Construction Cost	₱2,346,000	₱3,334,000
Cost per Meter	₱892/m	₱850/m

As seen above, the Malainen Luma-Palangi route is more economical and convenient for the transportation of sugarcane products, and is adopted as the route of Main Road-A.

Main Road-B will be provided between the east side of the Kay Alemang River and the Marcos Highway, utilizing an existing road for which earthworks for road embankment were already completed by the Provincial Government.

Both main roads are designed to have an effective width of 6 m with asphalt pavement so that trucks proposed to carry sugarcane products from farms will pass each other at an ordinary speed.

Principal features of the proposed main roads are as summarized below:

Items	Description
Length	Main Road-A : 2,630 m
	Main Road-B : 1,320 m
Width	Total width : 7.0 m
	Effective width : 6.0 m
Pavement	Asphalt surface course, t = 5 cm
	Gravel sub-base course, t = 15 cm

The routes of the proposed main roads and the typical road cross section are shown in Figs. 1.3.1 and 1.3.2, respectively.

1.3.4 Secondary Road

The secondary roads will be aligned to cover the whole project area and extended up to or near individual farms so that any farms are located within an average radius of 200-300 m (max. 500 m) from one of the roads. These secondary roads will be connected to the main roads or directly to the trunk roads.

All the secondary roads are designed to have an effective width of 3 m and gravel pavement in due consideration of the expected traffic volume of the roads. In total, 104 secondary roads are proposed to be provided with a combined length of 118.2 km of which the 24.7 km long portion will be construction by repairing and upgrading the existing roads. Out of the 93.5 km long roads to be newly constructed, 25.2 km long will be provided in the proposed estate farm.

Principal features of the proposed secondary roads are as summarized below:

Items	Descriptions
Length	118.2 km (104 nos.) Improved : 24.7 km Newly constructed: 93.5 km
Width	Total width : 4.0 m Effective width: 3.0 m
Pavement	Gravel pavement, t = 15 cm

Tipical cross section of the proposed secondary roads is illustrated in Fig. 1.3.2.

1.3.5 Farm Raads

The farm roads are to connect sugarcane fields with the secondary roads to secure efficient and speady transportion of sugarcane products from fields. The roads will be dirt roads formed on the natural ground surface, having a total width of 3 m. The proposed typical alignment of the roads is such that the roads run parallel to each other at a distance of 200 m. It is expected that the farm roads will also function as buffer lines in firing sugarcane plants for harvesting.

Under the project, the farm roads will be provided in the proposed estate farm only. For other farms, the roads are recommended to be constructed by concerned farmers themselves during the farming practices.

Principal featuees of the farm roads are as summarized below:

Items	Descriptions
Length	9.1 km (44 nos.)
Width	3.0

Typical alignment and cross section of the proposed farm roads are shown in Fig. 1.3.3 and 1.3.2.

1.3.6 Related Structures

In conjunction with the road network, the following structures will be constructed.

(1) Bridge

Bridges will be provided where roads cross relatively large streams or rivers. Under the project, two bridges are proposed to be constructed; a 12.6 m long bridges on Main Road-A and 21.6 m long one on Main Road-B. Both bridges will have a 6 m wide carriage way. All these bridges will be of reinforced concrete construction with pressed concrete girders, and are designed for a design truck load of 14 tons. The general features of these two bridges are shown in Figs. 1.3.4 and 1.3.5.

(2) Box Culvert

Eight box culverts, six for Main Road-A and two for Main Road-B, will be provided where those roads cross streams. All the proposed box culverts are of reinforced concrete construction and of single-barrel type with a dimension of 2.0 m (width) x 1.5 m (height). (See Fig. 1.3.6)

(3) Pipe Culvert

Pipe Culverts will be provided on the secondary roads where they cross small streams or drainage courses. In total, 15 pipe culverts will bo of tripple-barrel type consisting of 42"-diameter concrete pipes. (See Fig. 1.3.6)

1.4 Implementation Plan

1.4.1 General

The implementation schedule for the road network development plan is prepared based on the following presumptions.

(1) The project mobilization which includes financing, legalization, establishment of the project organization will be completed by the end of 1982.

(2) Annual workable days for construction equipment are estimated to be 210 days based on the rainfall records around the project area.

(3) Considering the scale of works and past experiences in the Philippines, all the construction works will be conducted on contract basis.

The proposed implementation schedule is illustrated in Fig. 1.4.1.

1.4.2 Preparatory Works

The preparatory works comprises; surveys, tests, detail design, tendering, land acquisition,and so on.

The preparatory works will be initiated with the detailed surveys and tests which may include the following items.

(1) Geological Survey

- on foundation of bridge site

(2) Soil Mechanical Test

- on material for earthfilling
- on material for gravel pavement and concrete aggregate

(3) Survey

- longitudinal and cross sectional survey for all roads
- plane table survey at bridge sites

The completion of the above surveys and tests will be immediately followed by the detailed designs and preparation of tender documents, and, then, the tendering and contract award will follow them. All these works from surveys to contract award are scheduled to be completed by the end of the rainy season of 1983 so that the main construction works can be smoothly commenced from the beginning of the dry season.

1.4.3 Main Construction Works

The main construction works will be started from the beginning of the dry season of 1983 and executed for the consecutive three and a half years. The works are schduled to proceed in the order of 1) Main Road-A, secondary roads and farm roads serving for the proposed estate farm, 2) Main Road-B and its related secondary roads and 3) all the remaining secondary roads.

Since efficient construction operations are hardly expected during the rainy seasons, all the works will be concentrically carried out during the dry seasons, except some structural works which can proceed even in the rainy seasons.

All the main construction works are expected to be finished by May 1986.

1.5 Cost Estimate

1.5.1 General

The project cost mainly comprises construction cost and maintenance cost and is estimated based on the following assumptions:

(1) The conversion rate between Peso and U.S. dollar is assumed at US$1.00 = ₱8.00.

(2) All the construction works will be executed on contract basis. The machinery and equipment required for the construction works will be provided by contractors themselves. Therefore, only depreciation costs of the machinery and equipment are taken into account in the cost estimate.

(3) The unit prices are divided into the foreign and local currency components. The ratio of the foreign and local currency components of each unit price is estimated on the basis of the following assumption referring to NIA criteria.

Unit: %

	Foreign Currency	Local Currency
Cement	75	25
Steel Bars and Hardware	80	20
Fuel and Oil	50	50
Equipment Rental	75	25
Sheet Pile and Steel Pile	100	0
Labour	0	100

All the costs are estimated based on the current prices in November 1981.

(4) The associated costs to be born by the Government, such as the costs for strengthening the extension services, improvement of the social infrastructure and so on are not included in the estimate.

1.5.2 Construction Cost

The construction cost comprises direct construction cost, engineering and administration cost, and compensation cost for land acquisition. These costs are estimated based on 1981 price level, and then price contingency is forecasted in accordance with the annual disbursement schedule.

The bacic rates of materials and labour wages and the unit prices for major work items used in the cost estimate are as shown in Tables 1.5.1 and 1.5.2.

(1) Direct constructon cost is estimated on the basis of quantity of the project works and the respective unit prices as follows:

Unit: ₱10^3

Item	Foreign Currency	Local Currency	Total
Infrastructure for	6,570	6,915	13,485
Infrastructure for Estate Farm	1,354	1,427	2,781
Total	7,924	8,342	16,266

The breakdowns of the construction cost are shown in Table 1.5.3.

(2) Compensation Cost for Land Acquisition

Private lands acquired for the project are to be compensated. The total costs of such compensation are estimated based on the unit rate of 24,000 pesos per ha.

(3) Engineering and Administration Cost

The engineering and administration costs are to cover all the costs and expenses required for the engineering and administrative works for the project execution, including preparation of detailed designs, tendering, construction supervision, etc.

(4) Physical Contingency

The physical contingency for the cost estimate is assumed to be 15% of the direct construction cost, taking into account the accuracy of the project planning in this stage.

(5) Price Contingency

The price contingency is estimated assuming an annual price escalation rate of 6.5% for the foreign currency component and 10% for the local currency component.

(6) Total Construction Cost

The total construction cost of the project consisting of the aforementioned various costs, is calculated as shown in Tables 1.5.4 and 1.5.5, and summarized as follows:

Unit: ₱10^3

Item	Foreign Currency	Local Currency	Total
I. Individual Farm			
1. Direct Construction Cost	6,573	6,912	13,485
2. Compensation for Lands	-	1,102	1,102
3. Engineering & Administration	750	754	1,504
4. Physical Contingency	1,007	1,202	2,209
Sub-Total	8,330	9,970	18,300
5. Price Contingency	2,130	3,970	6,100
Total	10,460	13,940	24,400
II. Estate Farm			
1. Direct Construction Cost	1,355	1,427	2,782
2. Compensation for Lands	-	-	-
3. Engineering & Administration	130	94	224
4. Physical Contingency	185	209	394
Sub-Total	1,670	1,730	3,400
5. Price Contingency	300	500	800
Total	1,970	2,230	4,200
Grand-Total	12,430	16,170	28,600

1.5.3 Maintenance Cost

Annual maintenance cost is estimated at the rate of 5% of the sum of direct construction cost and physical contingency.

CHAPTER 2 POSSIBILITY OF IRRIGATION DEVELOPMENT

2.1 Introduction

In the Interim Report (Phase I), the possibility of irrigation development was examined and tentative irrigation plans were formulated based on preliminary surveys and studies. Subsequently, detailed investigations and studies were carried out in Phase II to review the irrigation plans proposed in the Interim Report. The results indicate that the plans would be hardly feasible in the economical aspect as explained hereunder.

2.2 Potential Area for Irrigation Development

The Interim Report proposed the irrigation development of three areas, i.e. Sabang, Halang and Mabacab area in the project area. These areas were selected in view of the facts that each of the areas has an appropriate size for irrigation development, relatively flat topography and better soils. The detailed investigations in Phase II, however, revealed that whole the Sabang area is prospected for industrial use, therefore, has to be excluded from the project area. Accordingly, detailed studies on irrigation development were worked out for the remaining two areas:

Halang area: This is located at the south of Halang barangay, being bound by National Rout-25 on the north and by the Clong Clong River on the south. It has an area of about 350 ha with an elevation ranging from 25.0 m to 45.0 m. The soils in the area are generally of fine texture with relatively low intake rates. Most of the area is classified as Class II in the land classification. The sugar cane estate farm to be established under the project is planned to be located in this area.

Mabacab area: This area develops along the left bank of the Maragondon River and occupies about 250 ha of hilly lands with an elevation ranging 30.0 m to 50.0 m. The soils are of fine to medium texture in the surface layer, which is generally underlined by hard clay-pan with extremely low permeability. There exist much paddy fields which are mostly scattered in the southern part of the area.

2.3 Water Sources

2.3.1 River Water

The Balsahan and Maragondon rivers are considered as the possible water sources for the irrigation of the Halang and Mabacab areas, respectively. This is mainly because of the size of the rivers and their proximity to the respective areas. The Clong Clong and the Balayungan rivers flowing near the areas cannot be the irrigation water sources for the project since almost entire discharges of the rivers are already allotted to the existing irrigation schemes.

The mean monthly discharges of the Balsahan and Maragondon rivers are shown in Tables 5.1.2 and 5.1.3 of APPENDIX II. Along the rivers, there exist several irrigation schemes, for which the river waters are diverted with the registered water right of 0.998 m^3/s in the Balsahan river and 4.377 m^3/s in the Maragondon river. Since the measurements of the river discharges shown in Tables 5.1.2 and 5.1.3 are made after the water diversion to the said existing schemes, all those discharges are considered available for the project.

Based on the above mean monthly discharge records, 1/5 - probable minimum mean discharges of the rivers at both the gaging stations and the proposed intake sites are estimated for the month of peak irrigation requirements (March) as follows:

	1/5 - Probable Min. Discharge in March	
	At Gaging Station	At Proposed Intake Site
Balsahan Riv.	0.05 m^3/sec	0.05 m^3/sec
Maragondon Riv.	1.33 m^3/sec	1.16 m^3/sec

2.3.2 Groundwater

Investigations and studies on groundwater potential in Cavite Province were carried out by NIA through the Laguna de Bay Development Project. Based on the NIA's studies, the possible yield of one deep well in the proposed irrigation areas is assessed as shown in Table 2.3.1 and as summarized below:

Possible yield of one tubewell	Radius of drawdown effect
1.142 m^3/day or 13ℓ/sec	492 m

Assuming the peak irrigation requirements of sugar cane of fields to be 0.8 ℓ/s/ha, the area that can be irrigated by one tubewell is estimated at about 16 ha. On the other hand, tubewells have to be located about 1 km apart from each other to minimize the interference among the tubewells. This means that only 20% of lands can be brought under irrigation even though the groundwater is fully developed in the project area.

Due to the extermely limited availability of groundwater as mentioned above, the use of groundwater for irrigation is considered insignificant and impractical in the project area, except in case that 1) it is used for the irrigation of nursery farms with limited areas to obtain healthy sugar cane setts and 2) it is used as a supplementary water source for irrigation to balance out the seasonal fluctuation of river discharges.

2.4 Proposed Irrigation Development

2.4.1 General

The irrigation plans for the Halang and Mabacab areas are worked out on the basis of the estimated available discharges of the Balsahan and Maragondon rivers, the soil conditions as well as the topographic conditions of the areas. The use of groundwater is disregarded for the aforementioned reasons.

2.4.2 Irrigation Method

Two irrigation methods, i.e. furrow and sprinkling methods, are considered adaptable to the project. The furrow method is one of the surface irrigation methods generally characterized by easy operation and low irrigation costs, but has such disadvantages and relatively low irrigation efficiencies, necessity of land grading for fields, and high labour requirements. Whilst, the sprinkling method has, though its initial and operating costs are relatively high, various advantages such as high irrigation efficiencies, low labour requirements, etc. In addition, no land grading of fields is required under the sprinkling method.

As mentioned before, the proposed irrigation areas are mostly located in the hilly areas with a land slope ranging 1% to 10%, and the soils are generally shallow and of fine texture. Further, the available discharges of rivers are quite limited. Taking collectively into consideration these factors and the characteristics of the respective irrigation methods, it is proposed to adopt the sprinkling method to the project.

2.4.3 Irrigation Water Requirements

In the proposed cropping pattern (see Table 2.4.1), sugar cane is scheduled to be planted at the end of the rainly season and to be harvested 12 months after the planting. Generally, the application of irrigation water is needed throughout the growing period of sugar cane except for the last two months. The irrigation requrements are assessed based on this cropping pattern as follows:

(1) Consumptive use of water

The consumptive use of water for sugar cane is estimated based on the data presented in "Handbook on Surgarcane Growing, Philippine Sugar Institute". Table 2.4.1 shows the monthly values of the estimated consumptive use.

(2) Net Irrigation Requirements

The net irrigation requirements are determined by subtracting effective rainfall from the consumptive use of water. The effective rainfall in the project area is estimated as presented in Table 2.4.2 on the basis of the "Rainfall - Potential Effective Rainfall Curve" (Fig.2.4.1) and the monthly rainfall recorded at Naic (Table 2.4.3). The net irrigation requirements thus estimated are shown in Table 2.4.4.

As seen in Table 2.4.4, the seasonal net irrigation requirements are 646 mm on the average, the daily mean value being 2.1 mm.

(3) Irrigation Water Requirements

Ther irrigation water requirements are the sum of the net irrigation requirements and water losses due to application and conveyance. Since the sprinkling method is adopted and the water is proposed to be conveyed through pressure pipelines, the application and conveyance efficiencies are reasonably assumed to be 70% and 95%, respectively.

The peak irrigation water requirements, which are the basis for the design of irrigation facilities, are estimated based on the maximum consumptive use of water in March as summarized below:

Max. comsumptive use	149 mm/month
Effective rainfall	0
Net irrigation requirements	149
Application and conveyance losses	75
Irrigation water requirements	224
	(= 0.84 ℓ/sec/ha)

2.4.4 Preliminary Design of Irrigation System

Topographically, no gravity irrigation is possible in the Halang and Mabacab areas. The irrigation system proposed for both areas will consist of a set of diversion weir and pumping station for water intake, pressure pipelines for water conveyance, and portable sprinkler sets for water application.

For the Halang area the diversion weir and pumping station will be provided on the Balsahan river, about 1 km down stream of Palangui. The water lifted up will be regulated by pressure tanks and then conveyed through pressure pipelines with a diamiter ranging 300 mm to 200 mm. The on-farm facilities will consist of a number of portable sprinkler sets of rotating type, which can be connected to and detached from the pressure pipelines according to the necessity. Due to the small quantity of available river waters, the net irrigation area will be limited to about 56 ha.

The divesion weir and pumping station for the Mabcab area will be located on the Maragondon river, about 4 km upstream of the Maragondon town. The water pumped up at the site will be once stored in a regulating tank to be located at a high elevation and flow down by gravity through pressure pipelines of 200 to 300 mm - diameter. The on-farm facilities are the same as those proposed for the Halang area. For the topographic reasons, the net irrigation area is estimated to be 144 ha.

The principal features of the proposed irrigation systems are presented in Table 2.4.5.

2.5 Preliminary Cost Estimate and Economic Evaluation

2.5.1 Cost Estimate

The construction costs of the irrigation facilities for both the Halang and Mabacab areas are roughly estimated based on the price and wage levels of 1981 in the Philippines, and are summarized bellow.

. Unit: ₱10^3

	Item	Cost	
		Halang (56 ha)	Mabacab (144 ha)
1.	Diversion weir	635	635
2.	Pump, pump station and supply pipeline	1,080	3,120
3.	Supply tank	108	36
4.	Main pipeline	476	1,906
5.	Lateral line	390	1,350
6.	Sprinkler set	369	948
	Sub-total	3,058	7,995
7.	Engineering & Administration Cost	302	805
	Total	3,360	8,800

The annual O&M costs consist of various costs and expenses including those of personnel, supplies, repairing, fuel charges for pumping etc., and are estimated at ₱168 x 10^3 (₱3,000/ha) for the Halang area and ₱406 x 10^3(₱2,820/ha) for the Mabacab area.

2.5.2 Economic Evaluation

The economic benefit from tne proposed irrigation development will be the increase in sugarcane production due to irrigation. The unit yield of sugarcane under the project (without irrigation) is estimated at 51 tons/ha, and this yield is expected to increase to 76 tons/ha under the irrigation condition. Then, the annual benefits for the srspective areas are calculated as follows:

	Unit yield of Sugar cane	Gross Benefit (₱ 10^3)	
		Halang area (56 ha)	Mabacab area (144 ha)
	(ton/ha)		
With irrigation	76	681	1,751
Without irrigation	51	457	1,175
Annual Banefit		224	576

* Unit price of sugar cane is assumed at ₱160/ton.

The annual costs are the sum of the annual equivalent of the construction costs and the annual O&M costs. For the purpose of the economic evaluation, the annual costs are estimated for an assumed useful life of irrigation facilities of 40 years and an interest rate of 5% per annum. Based on the annual costs and the annual banefits mentioned above, the annual benefit-cost ratios for the Halang and Mabacab areas are computed as follows:

	Halang area	Mabacab area
Annual benefit	224 x 10^3 ₱	576 x 10^3 ₱
Annual cost	364	919
Benefit-cost ratio	0.62	0.63

2.6 Conclusions

The economic evaluation indicates that the proposed irrigation development in both the Halang and Mabacab areas would not be beneficial, the benefit-cost ratios being less than 1.0. This is mainly due to the facts that sugar cane can be well grown under the rainfed condition owing to much rainfall averaging about 2,000 mm/year and relatively short dry period in a year.

Accordingly, the provision of irrigation facilities for sugar cane fields under the project is not recommended. It is conceivable however, that irrigation may be beneficial to nursery farms with a view to obtaining healthy sugar cane setts that are essential for the successful operatiion of the project.

Table 1.5.1 - (1) BASIC RATE FOR COST ESTIMATE

A. Materials	Unit	Unit Cost (₱)
1. Gravel	cu.m.	140.0
2. Sand	cu.m.	90.0
3. Boulder	cu.m.	140.0
4. Lumber	bd.ft.	4.15
5. Hardware	kg.	9.16
6. Steel Bars	kg.	35.54
7. Cemet	bag	35.54
8. Asphalt (cold mixed)	metric ton	700.00
9. Diesel	liter	3.15
10. Gasoline	liter	5.10

Note: Unit Cost stated includes hauling cost up to proposed project site.

B. Labor Rate (Prevailing PNOC Rates)	Rate per Day (₱)
1. Laborer	32.00
2. Driver	36.50
3. Mason	36.00
4. Carpenter	36.00
5. Labor Foreman	36.00
6. Plumber	39.00
7. Welders	39.00
8. Mechanic	39.00
9. Electrician	36.00
10. Heavy Equipment Operator	42.50
11. Asst. Heavy Equipment Operator	36.50
12. Construction Foreman	45.25

C. Equipment Rental Rates

Types and Class of Equipment	Rate per Hour
1. Lifting and Excavating Equipment	
21 - 25 tons	155.60
15 - 20 tons	124.00
2. Crane, Truck Mounted	
30 - 35 tons	242.00
21 - 25 tons	193.55
16 - 20 tons	154.85
10 - 15 tons	137.10

(to be continued)

Table 1.5.1 - (2) BASIC RATE FOR COST ESTIMATE

Types and Class of Equipment	Rate per Hour
Attachments	
0.4 m^3 clamshell or dragline	12.45
0.58 m^3 clamshell or dragline	13.20
0.77 m^3 clamshell or dragline	13.90
0.96 m^3 clamshell or dragline	15.60
Drop hammer one ton	6.10
Drop hammer two tons	8.75
3. Diesel Pipe Hammer	
D-22 class	255.20
D-12 class	221.10
4. Backhoe, Hydraulic, Crawler	
0.3 - 0.45 cu.m.	212.90
0.7 - 1.00 cu.m.	231.10
5. Bulldozers	
185 - 200 HP	212.00
160 - 180 HP	185.10
145 - 155 HP	168.25
120 - 140 HP	134.60
95 - 115 HP	117.80
6. Front End Loader (Wheel Type)	
1.15 - 1.3 cu.m. cap	135.60
2.5 - 3.0 cu.m. cap	223.30
7. Motorized Grader	
115 - 125 HP	139.20
135 - 160	191.35
8. Compaction Equipment	
a) Roller, Static 2 - 3 drum	
5 - 8 tons	83.40
9 - 11 tons	115.80
b) Rollers vibratory, Steel Drum	
2 - 3 tons/10 m wide	59.20
5 - 7 tons	134.20
8 - 15 tons	158.40
9. Hauling Equipment	
a) Truck Tractor W/25 Tons Trailer	135.00
b) Dump Truck	
i) 6 tons (3.5 = 4.0 m^3cap.)	74.80
ii) 8 tons (4.5 - 6.0 m^3 cap.	99.00
iii) 12 tons (8 - 10.0 m^3 cap.)	128.70
c) Cargo Truck	
i) 5 tons, 6x6 ged.	59.20
ii) 4 - 6 tons,4x2	75.00
iii) 6 tons w/3 ton crane	90.80

(to be continued)

Table 1.5.1 - (3) BASIC RATE FOR COST ESTIMATE

Types and Class of Equipment	Rate per Hour
10. Concreting Machines	
a) 0.16 cu.m. (1 bagger)	13.20
b) 0.3 cu.m. (2 bagger)	17.10
c) Vibrator, Concrete Ged.	6.00
d) Concrete Batching Plant	111.10
11. Pump Equipment	
Centrifugal Pump	
a) 250 mm ø (10" ø)	20.25
b) 200 mm ø (8" ø)	17.10
c) 150 mm ø (6" ø)	14.20
d) 100 mm ø (4" ø)	9.40

Table 1.5.2 - (1) LIST OF UNIT PRICE FOR MAJOR WORK ITEMS

Unit:Peso

	Work Items	Unit	Foreign Currency	Local Currency	Total
I.	Earth works				
1.	Clearing and grubbing	m^2	0.77	0.83	1.60
2.	Common excavation				
	a) By crane w/.75 bucket	m^3	5.85	5.15	11.00
	b) By bulldozer	"	2.75	2.70	5.45
	c) By backhoe	"	6.35	5.40	11.75
	d) Manual	"	0.00	16.00	16.00
3.	Canal excavation	"	3.90	7.00	10.90
4.	Structure excavation	"	5.50	9.35	14.85
5.	Rock excavation	"	29.50	36.00	65.50
6.	Backfill structure				
	a) Manual	"	0.00	10.50	10.50
	b) Equipment	"	3.40	3.10	6.50
7.	Compaction of fill	"	3.60	5.90	9.50
8.	Compaction of fill with overhauling				
	a) Source distance of 1.0 km	"	10.10	11.65	21.75
	b) Source distance of 2.5 km	"	17.00	20.80	37.80
	c) Source distance of 5.0 km	"	21.10	24.80	45.90
	d) Source distance of 7.5 km	"	25.75	29.00	54.75
	e) Source distance of 10.0 km	"	26.90	40.30	67.20
II.	Concrete Works				
1.	Concrete - Type A	"	333.00	332.00	665.00
2.	- Type B	"	319.00	306.00	625.00
3.	- Type C	"	220.00	230.00	450.00
4.	Reinforcement bar	kg	4.20	3.75	7.95
5.	Concrete formworks	m^2	3.65	69.35	73.00
6.	Stone masonry				
	a) Dry	m^3	110.00	140.00	250.00

(to be continued)

Table 1.5.2 - (2) LIST OF UNIT PRICE FOR MAJOR WORK ITEMS

Unit : Peso

	Work Items	Unit	Foreign Currency	Local Currency	Total
	b) Wet	m^3	186.00	219.00	405.00
	7. Reinforce concrete pipes (Furnish & install)				
	a) 18' Ø R.C.P.	m	112.00	158.00	270.00
	b) 24"	"	173.00	212.00	385.00
	c) 30" Ø R.C.P.	"	230.00	280.00	510.00
	d) 36"	"	290.00	355.00	645.00
	e) 42"	"	351.00	429.00	780.00
	f) 48"	"	419.00	511.00	930.00
	8. Mass concrete	m^3	311.00	554.00	865.00
III.	Pavement Works				
	1. Gravel pavement	"	93.00	92.00	185.00
	2. Asphalt pavement	"	420.00	420.00	840.00
	3. Concrete pavement	"	332.50	332.50	665.00
IV.	Other Works				
	1 Sheet pile	m	313.00	192.00	505.00
	2. Pipe railing	m	127.00	203.00	330.00
	3. 3,000 psi concrete for canal structure	m^3	635.00	990.00	1,625.00
	4. Sod facing	m^2	0.00	2.20	2.20
	5. Mortar	m^3	784.00	816.00	1,600.00
	6. Reinforce concrete piles				
	a) 12" Ø R.C. pile	m	115.00	130.00	245.00
	b) 18"	"	225.00	255.00	480.00
	7. Concrete lining	m^3	440.00	560.00	1,000.00
	8. Land aquisition	ha			20,000-50,000
V.	Buidings				
	Field office	sq.m			1,000.00
	Living quarter	"			850.00
	Warehouse	"			750.00
	Workshop	"			750.00
	Equipment shed	"			600.00

Table 1.5.3 - (1) BREAKDOWN OF DIRECT CONSTRUCTION COST OF INFRASTRUCTURES

Unit : Peso

Work Item	Unit	Q'ty	Foreign Currency	Local Currency	Total
A. MAIN ROAD (A) L = 2,628 m					2,345,500
1. Earth Works					
a) Excavation by backhoe	m^3	18,000	114,100	97,000	211,100
b) Compaction of fill with overhauling (500 m distance)	m^3	15,900	110,600	128,100	238,700
			224,700	225,100	449,800
2. Pavement Works					
a) Gravel	m^3	2,340	217,500	215,200	432,700
b) Asphalt	m^3	780	327,200	327,200	654,400
			544,700	542,400	1,087,100
3. Bridge (A) 12.6 m					
a) Rock excavation	m^3	205	6,000	7,400	13,400
b) Excavation by backhoe	m^3	450	2,800	2,400	5,200
c) Backfill structure (equipment)	m^3	520	1,800	1,600	3,400
d) Concrete - Type A	m^3	190	63,300	63,100	126,400
e) Concrete - Type C	m^3	17	3,700	3,900	7,600
f) Concrete formworks	m^2	410	1,500	28,400	29,900
g) Reinforcement bar	kg	13,785	57,900	51,700	109,600
h) Superstructure work	m^2	75.6	103,600	125,500	229,100
			240,600	284,000	524,600
4. Box Culvert 6 Nos.					
a) Rock excavation	m^3	139	4,100	5,000	9,100
b) Backfill structure (equiqment)	m^3	89	300	300	600
c) Concrete - Type A	m^3	155	51,700	51,500	103,200
d) Concrete - Type C	m^3	15	3,300	3,500	6,800
e) Concrete formworks	m^2	844	3,100	58,600	61,700
f) Reinforcement	kg	12,905	54,200	48,400	102,600
			116,700	167,300	284,000

(to be continued)

Table 1.5.3 - (2) BREAKDOWN OF DIRECT CONSTRUCTION COST OF INFRASTRUCTURES

Unit : Peso

Work Item	Unit	Q'ty	Foreign Currency	Local Currency	Total
B. MAIN ROAD (B) L = 1,320 m					1,586,800
1. Earth Works					
a) Excavation by bachhoe	m^3	18,200	115,400	98,200	213,600
b) Compaction of fill	m^3	640	2,300	3,800	6,100
c) Clearing & grubbing	m^3	9,172	7,100	7,600	14,700
			124,800	109,600	234,400
2. Pavement Works					
a) Gravel	m^3	1,163	108,200	107,000	215,200
b) Asphalt	m^3	387	162,500	162,500	325,000
			270,700	269,500	540,200
3. Bridge (B) 21.6 m					
a) Rock excavation	m^3	162	4,800	5,900	10,700
b) Excavation by backhoe	m^3	882	5,600	4,800	10,400
c) Backfill structure (equipment)	m^3	913	3,100	2,800	5,900
d) Concrete - Type A	m^3	174	57,900	57,800	115,700
e) Concrete - Type B	m^3	16	3,500	3,700	7,200
f) Concrete formworks	m^2	368	1,300	25,500	26,800
g) Reinforcement bar	kg	12,109	50,900	45,400	96,300
h) Superstructure work	m^2	129.6	201,900	242,600	444,500
			329,000	388,500	717,500
4. Box Culvert 2 Nos.					
a) Rock excavation	m^3	46	1,400	1,700	3,100
b) Backfill structure (equipment)	m^3	29	100	100	200
c) Concrete - Type A	m^3	51	17,200	17,200	34,400
d) Concrete - Type C	m^3	5	1,100	1,200	2,300
e) Concrete formworks	m^2	281	1,000	19,500	20,500
f) Reinforcement bar	kg	4,301	18,100	16,100	34,200
			38,900	55,800	94,700

(to be continued)

Table 1.5.3-(3) BREAKDOWN OF DIRECT CONSTRUCTION COST OF INFRASTRUCTURES

Unit : Peso

Work Item	Unit	Q'ty	Foreign Currency	Local Currency	Total
C. SECONDARY ROAD (to be constructed) L = 93,440 m					
1. Earth Works					
a) Clearing & grubbing	m^2	547,400	421,500	454,300	875,800
b) Canal excavation	m^3	32,300	126,000	226,100	352,100
c) Compaction of fill	m^3	15,600	56,200	92,100	148,300
			603,700	772,500	1,376,200
2. Pavement Works Gravel	m^3	40,380	3,755,300	3,715,000	7,470,300
3. Pipe Culvert 15 Nos.					
a) Rock excavation	m^3	374	11,000	13,400	24,400
b) Backfill structure (manual)	m^3	104	0	1,100	1,100
c) Compaction of fill with overhauling (200 m distance)	m^2	1,200	6,300	7,300	13,600
d) Excavation by backhoe	m^3	34,600	219,900	187,000	406,900
e) Concrete - Type B	m^3	406	129,700	124,400	254,100
f) Concrete - Type C	m^3	221	48,700	50,900	99,600
g) Concrete formworks	m^2	1,570	5,700	108,900	114,600
h) 42" ø R.C.P.	m	369	129,500	158,300	287,800
			550,800	651,300	1,202,100

(to be continued)

Table 1.5.3-(4) BREAKDOWN OF DIRECT CONSTRUCTION COST OF INFRASTRUCTURES

Unit : Peso

Work Item	Unit	Q'ty	Foreign Currency	Local Currency	Total
D. SECONDARY ROAD (to be improved) L = 24,680 m					
1. Earth Works					
a) Canal excavation	m^3	8,890	34,700	62,200	96,900
b) Compaction of fill	m^3	4,300	15,500	25,400	40,900
			50,200	87,600	137,800
2. Pavement Works Gravel	m^3	11,106	1,032,900	1,021,700	2,054,600
			1,083,100	1,109,300	2,192,400
E. FARM ROAD L = 9,090 m					
1. Earth Works					
a) Clearing & grubbing	m^3	1,450	5,700	10,200	15,900
b) Compaction of fill	m^3	1,410	5,100	8,300	13,400
c) Clearing & grubbing	m^3	40,000	30,800	33,200	64,000
			41,600	51,700	93,300

Table 1.5.4 DISBURSEMENT SCHEDULE OF CONSTRUCTION COST FOR INDIVIDUAL FARM

Unit: P10^3

Item	Total			1983			1984			1985			1986		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. Direct Construction Cost															
1) Main Road A	1,126	1,220	2,346	220	219	439	906	1,101	1,907	-	-	-	-	-	-
2) Main Road B	764	823	1,587	-	-	-	113	108	221	651	715	1,366	-	-	-
3) Secondary Roads	4,683	4,869	9,552	309	317	626	1,374	1,429	2,803	1,762	1,823	3,585	1,238	1,300	2,538
2. Compensation Cost for Land Acquisition	-	1,102	1,102	-	1,102	1,102	-	-	-	-	-	-	-	-	-
3. Engineering & Administration Cost	750	754	1,504	590	170	760	40	152	192	60	216	276	60	216	276
4. Physical Contingency (15%)	1,007	1,202	2,209	81	242	323	367	380	747	367	386	753	192	194	386
Sub-Total	8,330	9,970	18,300	1,200	2,050	3,250	2,800	3,070	5,870	2,840	3,140	5,980	1,490	1,710	3,200
5. Price Contingency	2,130	3,970	6,100	170	440	610	590	1,020	1,610	820	1,460	2,280	550	1,050	1,600
Total	10,460	13,940	24,400	1,370	2,490	3,860	3,390	4,090	7,480	3,660	4,600	8,260	2,040	2,760	4,800

Note: F.C. Foreign Currency
L.C. Local Currency

Table 1.5.5 DISBURSEMENT SCHEDULE OF CONSTRUCTION COST FOR ESTATE FARM

Item	Total			1983			1984			1985			1986		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. Direct Construction Cost															
1) Main Road A	1,126	1,220	2,346	220	219	439	906	1,101	1,907	-	-	-	-	-	-
2) Main Road B	764	823	1,587	-	-	-	113	108	221	651	715	1,366	-	-	-
3) Secondary Roads	4,683	4,869	9,552	309	317	626	1,374	1,429	2,803	1,762	1,823	3,585	1,238	1,300	2,538
2. Compensation Cost for Land Acquisition	-	1,102	1,102	-	1,102	1,102	-	-	-	-	-	-	-	-	-
3. Engineering & Administration Cost	750	754	1,504	590	170	760	40	152	192	60	216	276	60	216	276
4. Physical Contingency (15%)	1,007	1,202	2,209	81	242	323	367	380	747	367	386	753	192	194	386
Sub-Total	8,330	9,970	18,300	1,200	2,050	3,250	2,800	3,070	5,870	2,840	3,140	5,980	1,490	1,710	3,200
5. Price Contingency	2,130	3,970	6,100	170	440	610	590	1,020	1,610	820	1,460	2,280	550	1,050	1,600
Total	10,460	13,940	24,400	1,370	2,490	3,860	3,390	4,090	7,480	3,660	4,600	8,260	2,040	2,760	4,800

Note: F.C. Foreign Currency
L.C. Local Currency

Table 2.3.1 POSSIBLE YIELD

Depth of Well	:	200 m
Diameter of Casing	:	10 in
Transmissibility/1	:	100 m^2/day
Hydraluic Gradient/1	:	1/90
Design Drawdown	:	15 m
Static Water Depth to Well Bottom	:	190 m
Possible Yield/2	:	1,142 m^3/day = 0.013 m^3/sec
Radius of Drawdown Effect/2	:	492 m

Note

/1 : Source ; Laguna de Bay Development Project, NIA

/2 : Formula used for the calculation is ;

Theime's formula

$$Q = \frac{2\pi \times T \times So}{2.3 \times \log_{10}(R/r)}$$

in which T : Transmissibility

So : Design drawdown

r : Radius of well casing

R : Radius of drawdown effect

The value of R is obtained by the follwong formula through trial and error calculation;

$$R = \frac{1.36 \times (H^2 - h^2)}{2 \times I \times H \times \log_{10}(R/r)}$$

in which H : Static water depth to well bottom

h : Drawdown water depth to well bottom (= H - So)

I : Hydraulic gradient

Table 2.4.1 CONSUMPTIVE USE OF WATER (SUGARCANE)

Unit : mm/day / mm/month

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
											Planting ●	
											Harvesting ●	
												Irrigation
Consumptive Use of Water	3.8 / 118	4.6 / 129	4.8 / 149	4.1 / 123	4.3 / 133	4.6 / 138	4.6 / 143	3.3 / 102			3.0 / 90	3.0 / 93

Source : Handbook on Sugarcane Growing 1975 Edition, Philippine Sugar Institute

Table 2.4.2 EFFECTIVE RAINFALL

Unit : mm/month

Year \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1974	0	6	11	5	52	194	159	228	78	170	175	115	1,193
1975	15	0	0	28	26	158	43	196	180	162	91	207	1,106
1976	0	0	9	0	148	122	139	201	204	4	9	106	942
1977	85	7	0	0	80	75	179	199	214	136	100	4	1,079
1978	0	0	0	24	87	67	153	240	196	191	65	4	1,032
Total	100	13	20	57	393	616	815	1,262	1,044	833	440	502	5,352
Average	20	3	4	11	79	123	136	210	174	139	88	84	1,070

Note : Effective rainfall was estimated based on the RAINFALL-POTENTIAL EFFECTIVE RAINFALL CURVE shown in Fig. 2.4.1

Table 2.4.3 MONTHLY RAINFALL AT NIA, NAIC (R-1)

Unit : mm/month

Year \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1974	0	5.9	11.4	5.5	53.0	359.9	221.5	803.0	87.0	251.0	267.5	137.5	2,204.2
1975	15.6	0	0	28.4	26.9	221.3	44.5	364.6	283.0	230.0	102.5	533.4	1,850.2
1976	0	0	9.0	0	190.6	147.0	174.0	429.0	487.5	4.0	9.0	122.0	1,572.1
1977	94.3	7.5	0	0	86.8	80.5	279.9	417.5	614.4	169.0	112.1/1	4.3	1,866.3
1978	0	0	0	24.5	94.5	73.6	204.8	1,157.6	387.4	334.1	69.5	9.0	2,355.0
Total	109.9	14.4	20.4	58.4	451.8	882.3	924.7	3,171.7	1,859.3	988.1	560.6	806.2	9.847.8
Average	22.0	2.9	4.1	11.7	90.4	176.5	184.9	634.3	371.9	197.7	112.1	161.2	1,969.6

Note : /1 Data is not available. The figure is an average of four other years'.

Table 2.4.4 IRRIGATION REQUIREMENT

Unit : mm/month

Year \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1974	118	123	138	118	81	0	0	0			0	0	578
1975	103	129	149	95	107	0	100	0			0	0	683
1976	118	129	140	123	0	16	4	0			81	0	611
1977	33	122	149	123	53	63	0	0			0	89	632
1978	118	129	149	99	46	71	0	0			25	89	726
Total	490	632	725	558	287	150	104	0			106	178	3,230
Average	98	126	145	112	57	30	21	0			21	36	646

Table 2.4.5 PRINCIPAL FEATURES OF IRRIGATION SYSTEM

Item	Description	
	Halang	Mabacab
Diversion weir	- Concrete weir - Weir hight : 1.5 m - Width : 30 m	- Concrete weir - Weir hight : 1.5 m - Width : 30 m
Pump facility	- Electric engine pump - TDH : 47 m - Discharge rate : 2,940 ℓ/min	- Electric engine pump - TDH : 57 m - Discharge rate : 8,820 ℓ/min.
Supply pipe line	- Ductile cast iron pipe - Diameter : ø300 - Length : 150 m	- Ductile cast iron pipe - Diameter : ø300 - Length : 700 m
Supply tank	- Pressure tank	- Concrete tank - Size : 5m x 5m x 3m
Main pipe line	- Asbestos concrete pipe - Length ø300 : 600 m ø200 : 1,000 m	- Asbestos concrete pipe - Length ø300 : 2,500 m ø200 : 3,800 m
Lateral pipe	- ø4" aluminum pipe - Length : 2,600 m	- ø4" aluminum pipe - Length : 9,000 m
Sprinkler set	- 13/64" sprinkler: 168 nos. - Spacing : 18m x 18m - ø3" aluminum pipe : 2,800 m	- 13/64" sprinkler: 432 nos. - Spacing : 18m x 18m - ø3" aluminum pipe : 7.200 m

Fig. 1.3.1 ROAD NETWORK

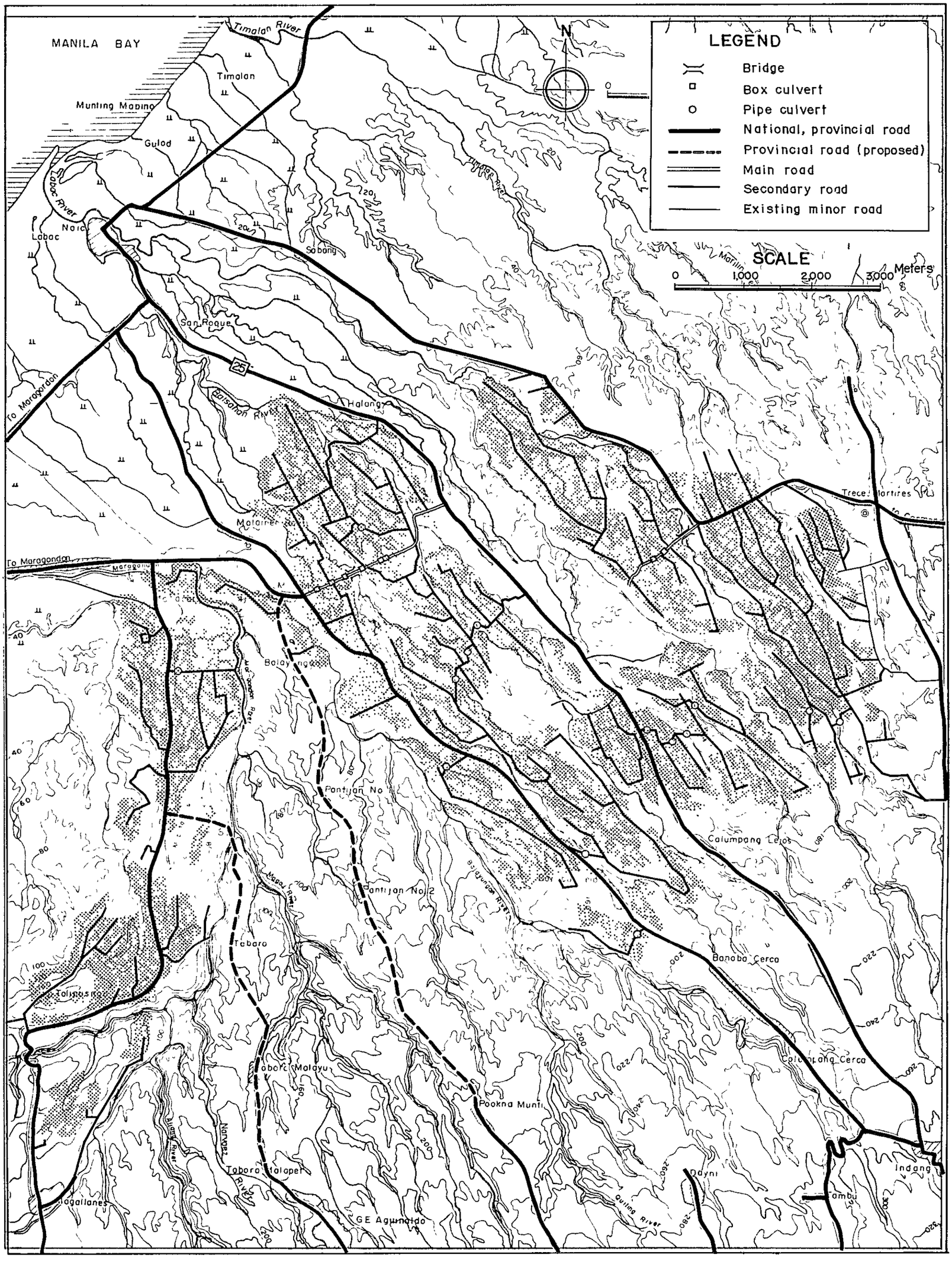
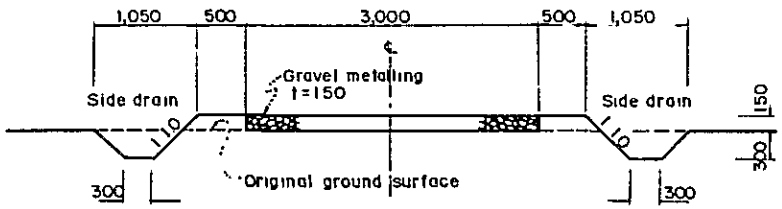
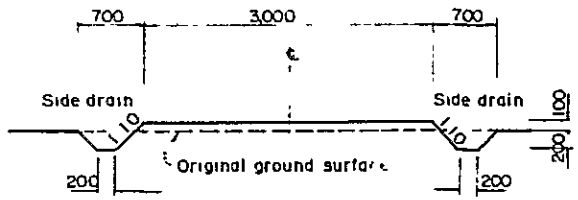


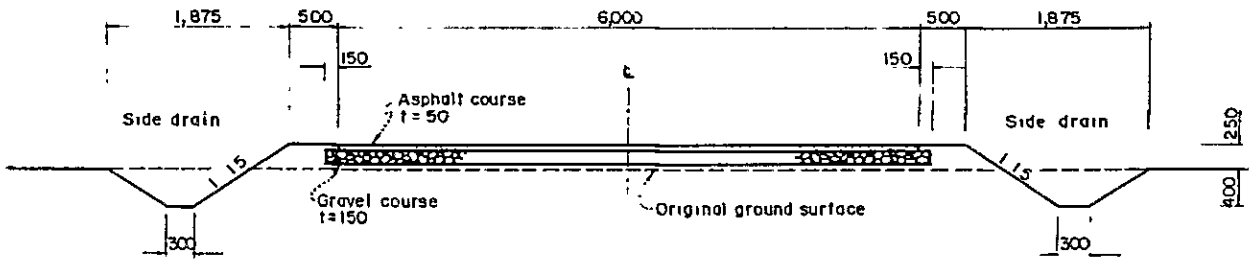
Fig. 1.3.2 TYPICAL CROSS SECTION OF TRANSPORTATION ROAD



SECONDARY ROAD



FARM ROAD



MAIN ROAD

SCALE

0 2 (m)

Fig. 1.3.3 TYPICAL LAYOUT OF SUGARCANE FARM

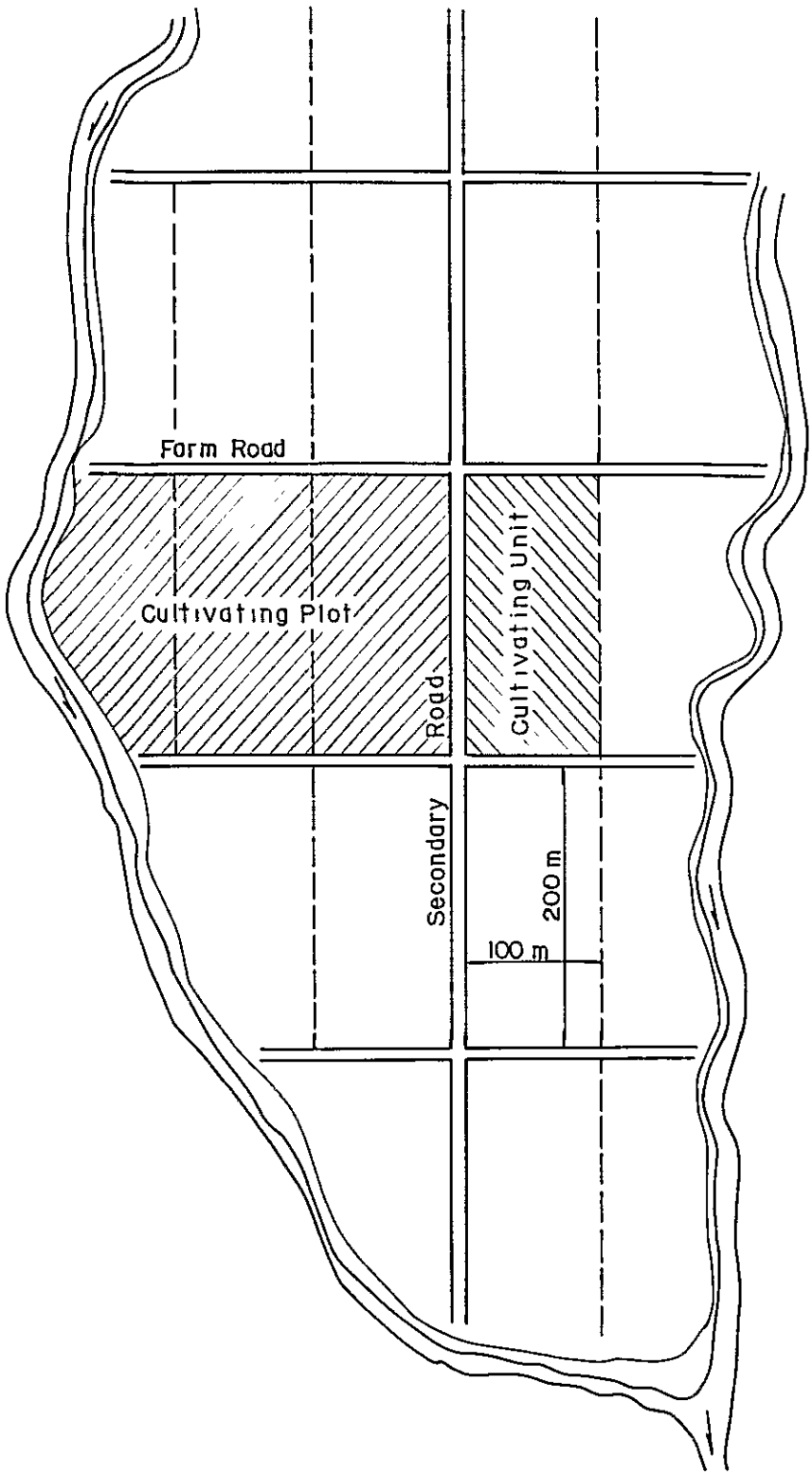
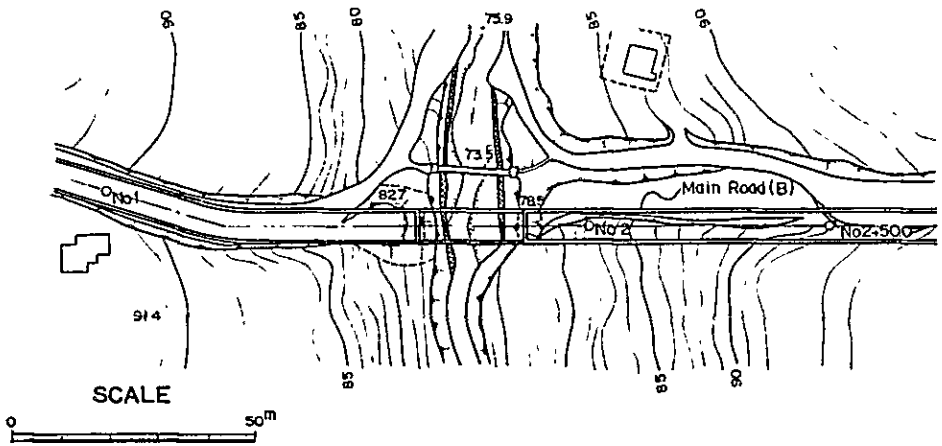
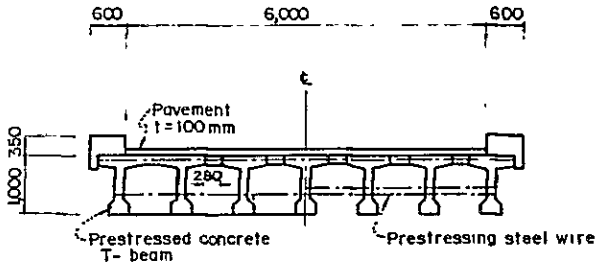


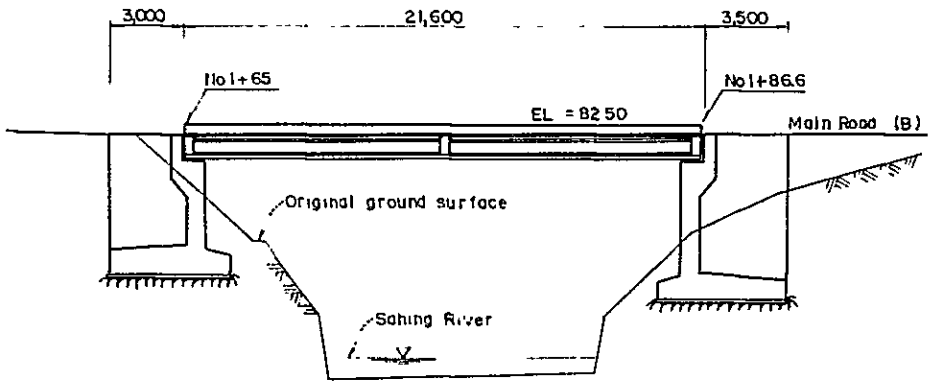
Fig. 1.3.4 SAHING BRIDGE



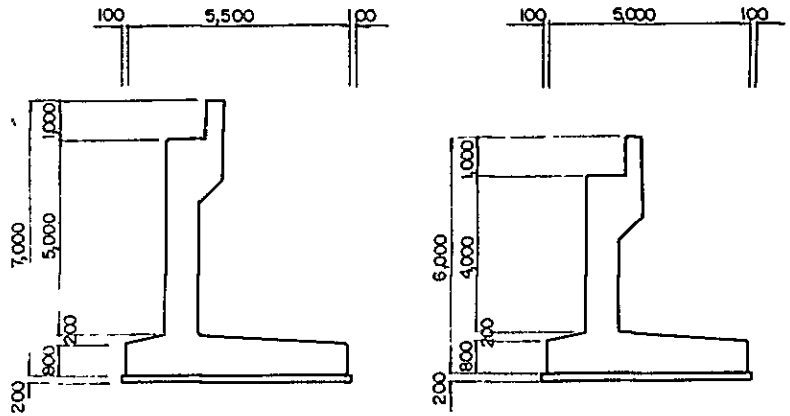
LOCATION MAP



CROSS SECTION OF SUPER STRUCTURE

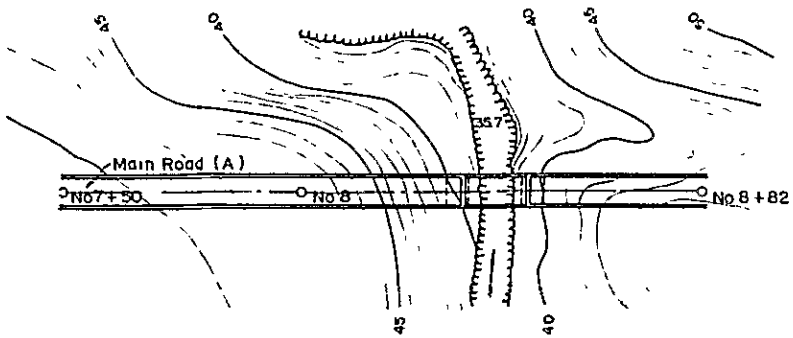


PROFILE



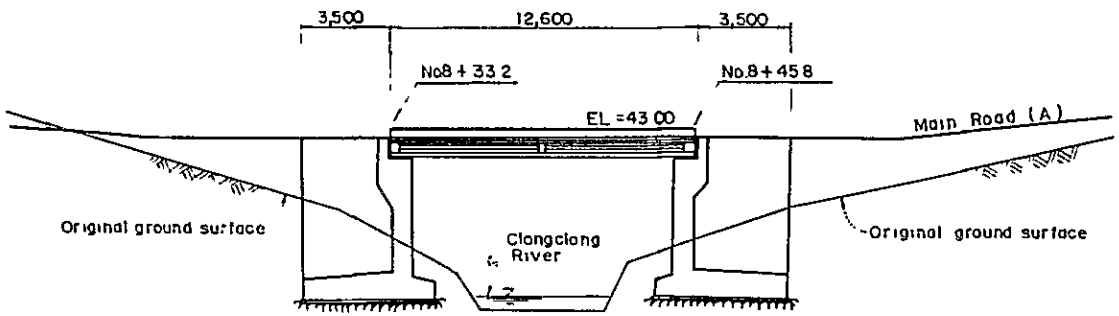
REINFORCED CONCRETE ABUTMENT

Fig.1.3.5 CLONGCLONG BRIDGE

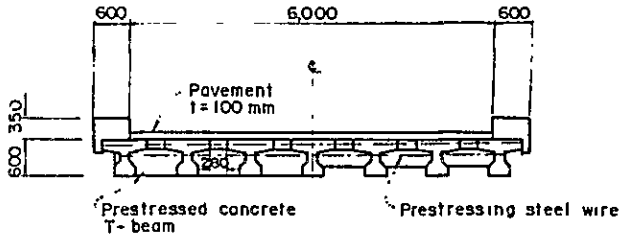


SCALE
0 50m

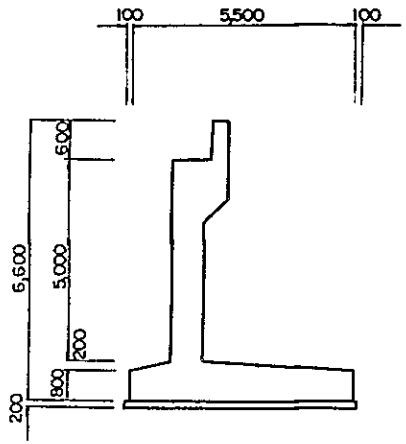
LOCATION MAP



PROFILE



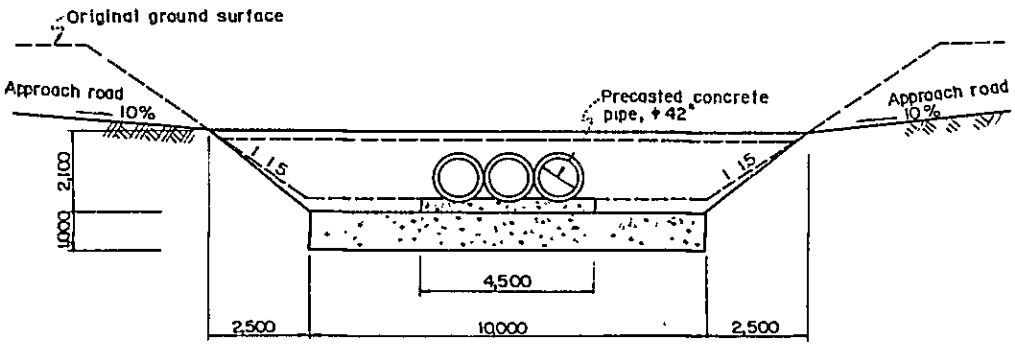
CROSS SECTION OF SUPER STRUCTURE



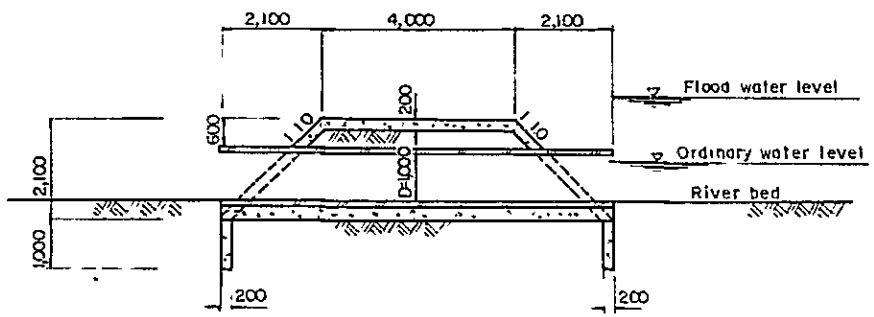
REINFORCED CONCRETE ABUTMENT

Fig. 1.3.6 BOX CULVERT AND PIPE CULVERT

TYPICAL FEATURES OF PIPE CULVERT

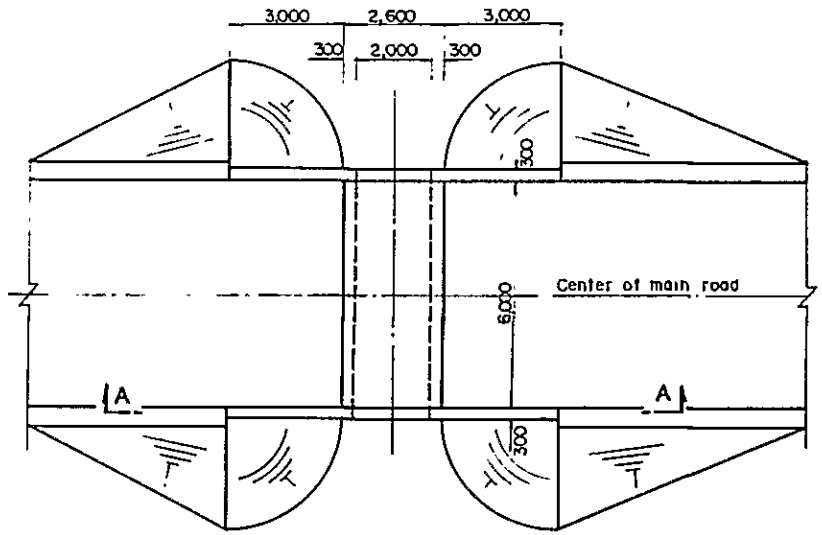


FRONT VIEW

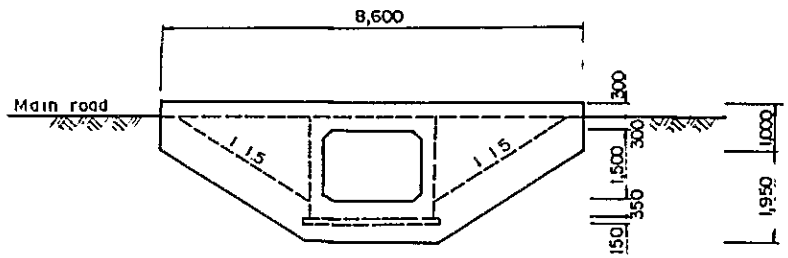


CROSS SECTION

TYPICAL FEATURES OF BOX CULVERT



PLAN



SECTION A-A

Fig. 1.4.1 IMPLEMENTATION TIME SCHEDULE

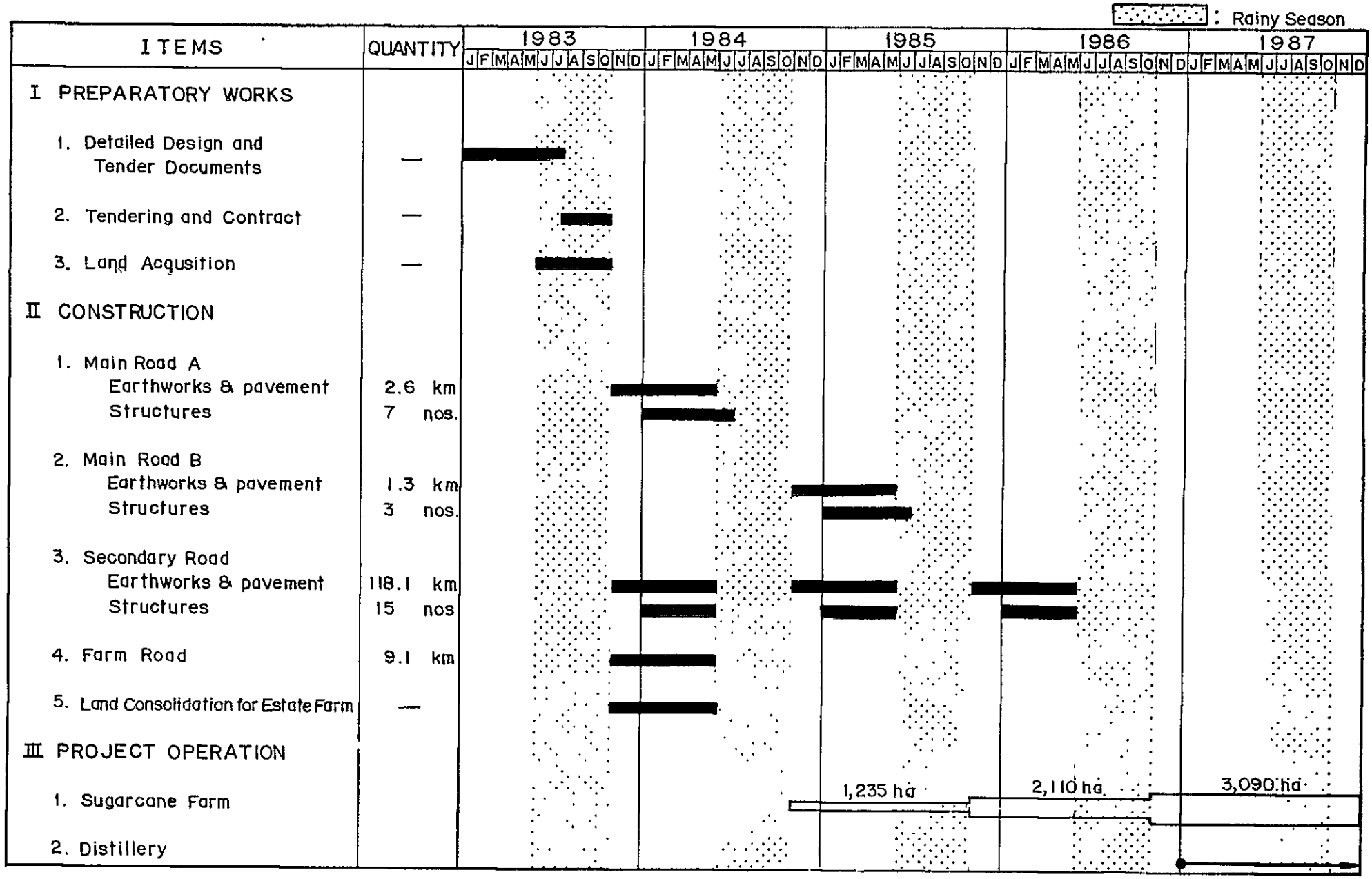
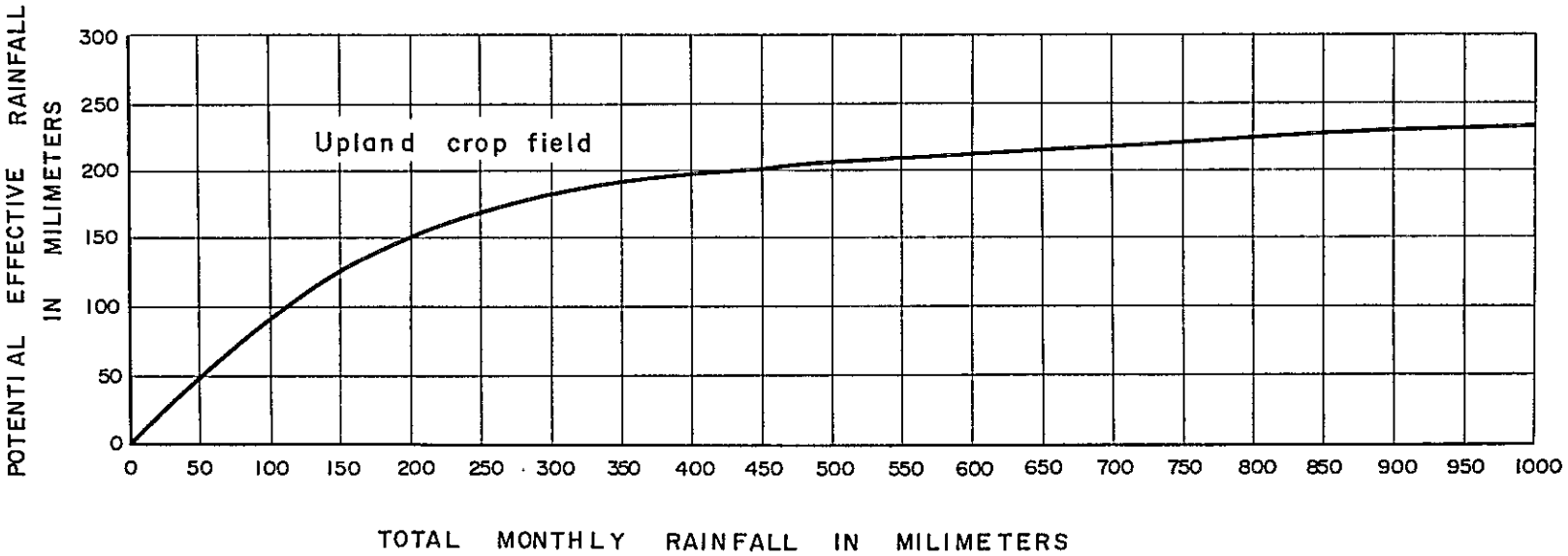


Fig. 2.4.1 RAINFALL-POTENTIAL EFFECTIVE RAINFALL CURVE



Scurce : NIA CENTRAL LUZON STUDY

APPENDIX V

ESTATE FARM

APPENDIX V ESTATE FARM

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX V ESTATE FARM

CHAPTER 1 GENERAL

1.1 Role of Estate Farm

Generally the important role of an estate farm to produce raw materials for an agro-industrial plant is not only for stabilized supply of raw materials to the factory, but also for increase of crop yield and decrease of production cost by applying pertinent farming practices.

The role of the estate farm which is planned in this project is as below.

(1) The raw materials produced in the estate farm will be supplied to the distillery from begining of November ot middle of December when transportation of products from the individual farm area is very hard due to bad road conditions.

(2) Increase of cane yield by mechanized farming and careful management will be expected.

(3) When the tractors have rooms in farming works of the estate farm, they will serve the land preparation works for individual farmers.

(4) The estate farm provides trucks to collect raw materials including the products of the individual farms to the distillery to be corresponding to the operation program of the factory.

CHAPTER 2 ESTABLISHMENT PLAN

2.1 Location and Land

The estate farm having a land of 410 ha (gross) will be established in the Halang area being adjacent to MYC farm and located between the Route 25 of national road and the provincial road from Malainen Luma to Indang as shown in Fig. 2.1.1 in Appendix III.

The land is relatively flat, and the soils in the site consist of 190 ha of the Guadalupe soil series and 220 ha of the Magallanes soil series.

2.2 Present Land Use

The present land use of the site is estimated upland rice of 270 ha, corn of 50 ha (with 20 ha of other crops after corn), and cassava of 90 ha. There is no sugarcane field.

2.3 Infrastructure and Facilities

In order to carry out the appropriate farming practice and to enhance the productivity the following construction plans of infrastructure and facilities will be established.

2.3.1 Road Network

The secondary roads with 3 m wide and 15 cm thick gravel pavement are planned. The total length of the roads is 25,160 m.

2.3.2 Land Consolidation

Land consolidation will be performed in conjunction with the farm road construction (Appendix IV, 1.4.4). No major earth works are expected, but the estate farm will be arranged its shape in making its farm roads. The typical layout of the estate farm is shown in Fig. 1.3.3 in Appendix IV.

2.3.3 Irrigation

Irrigation plan in the estate farm was studied, but the plan was concluded not for practical use. The results of study are expressed in Appendix IV.

2.3.4 Waste Water Treatment

The waste water of the distillery will be diluted with water and will be spread over the sugarcane fields of the estate farm. The distillery would produce the waste water of 32 m^3/hr all day long during the operating period, November to May. The 32 m^3/hr waste water will be diluted with water of 58 m^3/hr, totaling to 90 m^3/hr which is equivalent to 2,160 m^3/day. Sprinkler sets will be used in order to ensure light even application of the waste water over 40 ha of the sugarcane fields. A typical layout of sprinkler set is illustrated in Fig. 2.3.1 and the operation is as follows.

Time per set	:	23 hrs
Setting per day	:	one
Days of operation per interval	:	7 days
Application rate of waste water	:	1.6 mm/hr/1

A total precipitation rate of the waste water and rainfall is calculated using a rainfall record around the project area. The results are shown in Table 2.3.1, and it is proved that the total precipitation rate is always less than the basic intake rate of soil in the estate farm.

Quality of the waste water will be as follows:

BOD	3,500 ppm
Temp.	45°C
SS	700 ppm
PH	4.9
Oil & Grease	180 ppm

The above values are considered to be within the tolerable limit of sugarcane.

/1 : $\frac{2{,}160\ m^3/day \times 7\ day}{40\ ha \times 23\ hr}$

2.3.5 Farm Machinery and Equipment and Farming Facilities

The following farm machinery and equipment and farming facilities will be provided for managing the estate farm.

(1) Farm Machinery and equipment

Item	Nos.
- Wheel tractor (50 H.P.)	5
- Disc plow (26" x 3)	4
- Disc harrow (8" x 24)	4
- Furrower (3)	4
- Truck (6 tons)	40
- Sprinkler set	15
- Jeep	1
- Motorcycle	5
- Spare parts	L.S.

(2) Farming Facilities

Item	Design
- Field Office	150 m^2
- Work shop	150
- Warehouse	430
- Garage	50
- Living quarter	420

2.4 Sugarcane Production

Based on the soil condition and farming practices under with-project the sugarcane yield at the full development stage is projected at 22,900 tons.

Increase of yield from the initial year to the target year and annual production are projected as follows:

Year		Y.1	Y.2	Y.3
Guadalupe Soil Series (185 ha)	Yield (t/ha)	54	57	60
	Production (t)	9,990	10,545	11,100
Magallanes Soil Series (215 ha)	Yield (t/ha)	43	49	55
	Production (t)	9,223	10,524	11,825
Total (t)		19,210	21,070	22,930

2.5 Organization and Staffing

An agriculture department will be organized in the overall organization of the distillery. The Estate Farm Department will be composed of three sections: (1) Estate farm section, (2) Individual farm section, (3) Mechanization section. Number of total staff in the department will be 61 persons including 4 permanent laborers.

The estate farm section will have a responsibility for controlling works such as sugarcane growing, operation and maintenance of farm road in the estate farm.

The individual farm section will be organized to carry out smooth and efficient cane-collection to the distillery. This section will be closely interlinked with the Farmer's Association. The technicians in this section will guide and arrange the farming works of the individual farm such as planting, harvesting, and cane-transportation obtaining a help of SDT/1 of PHILSUCOM.

Composition of staff assigned of the department are as follows:

1 - Department chief
3 - Section chief
6 - Technician
2 - Mechanic
2 - Assistant Mechanic

/1 : Sugarcane Development Technologist.

5 - Tractor operator
38 - Driver
4 - Parmanent laborer

2.6 Cost Estimate for Estate Farm

2.6.1 General

Construction cost for the estate farm consists of : (1) compensation cost for land acquisition, (2) construction cost of the secondary roads and farm roads, (3) procurement cost of farm machinery and equipment, and (4) construction cost of farming facilities.

Regarding all these items, the cost estimate is made respectively for the foreign currency and the local currency portions for convenience of the project evaluation and the expected financial arrangement. The conversion rates of these currencies are fixed at : US$1.0 = ₱8.0 = ¥230, for the sake of this cost estimate and the succeeding project evaluation.

In the estimate, all the unit price used are based on the current prices in November 1981.

Physical contingency of the cost estimate is 15% of the construction cost.

Price contingency applied in the estimate is : 6.5% per annum for the foreign currency portion and 10% per annum for the local currency portion until commencement of the distillery's operation.

2.6.2 Construction Cost without Price Contingency

The total construction cost without price contingency for the estate farm is summarized as shown in Table 2.6.1

(1) Compensation Cost for Land Acquisition

The compensation cost for land acquisition comprises direct compensation cost and engineering and administration costs. The direct compensation cost is estimated at ₱24,000 per hectare on the basis of the information obtained from the asessor's office in Trece Martires City. For the gross area of estate farm (410 ha), direct compensation cost for land acquisistion is calculated at about ₱9.8 million.

The engineering and administration cost for land acquisition is estimated at the rate of 3% of the direct compensation cost for land acquisition.

(2) Construction Cost of the Roads

The construction cost of the secondary roads and the farm roads comprises direct construction cost and engineering and administration costs. The direct construction cost is estimated based on the detail unit price analysis and quantity calculation of the road works. The total construction cost of the road works is estimated to be ₱3.4 million consisting about ₱1.7 million equivalent to foreign currency and about ₱1.7 million of local currency.

(3) Procurement Cost of Farm Machinery and Equipment and Construction Cost of Farming Facilities

The farm machinery and equipment to be procured are those for the farming practices and for the cane-transport.
Farming facilities mainly consist of such buildings as garage for tractors, workshop for farming machinery and equipment, warehouse, etc.
The cost required for these machinery and equipment and farming facilities is estimated at about ₱9.8 million as shown in Table 2.6.2

2.6.3 Construction Cost for Estate Farm

The annual disbursement schedule is worked out based on the construction time schedule, and the total construction cost including price contingency for the estate farm is estimated as follows:

(Unit : P10^3)

Foreign Currency	Local Currency	Total
13,721	16,092	29,813

The summary of financial construction cost and annual disbursement schedule for the estate farm is shown in Table 2.6.3

2.6.4 Operation and Miantenance Cost

The annual operation and maintenance costs include all the farming expenses required for the estate farm. It mainly consists of : (1) operating cost of farm machinery and equipment, (2) personnel cost, (3) procurement cost of farm inputs such as fertilizers and agrochemicals, (4) maintenance cost of farming facilities, and (5) maintenance cost of the roads.

The annual operation and maintenance costs at the full development stage of the estate farm is estimated at about ₱3,449 thousand/1 as shown in Table 2.6.4.

While, it is expected that the income from tractor service to the individual farmer during the period of no land preparation work in the estate farm. That income is estimated at ₱164 thousand per annum.

The annual operation and maintenance costs during the build-up period of the estate farm is shown in Table 2.6.5.

2.6.5 Replacement Cost

Some of the facilities in the estate farm are required replacement at a certain time within the project useful life. The useful lives of the farm machinery and equipment are assumed to be seven years.

/1 : Includes service costs to the individual farms such as transportation of sugarcane cost and guidance cost for farm management.

Table 2.3.1 TOTAL PRECIPITATION RATE OF WASTE WATER & RAINFALL

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Wast Water $\frac{(m^3/day)}{(mm/hr)}$ /1	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$	$\frac{2,160}{1.6}$
Rainfall $\frac{(mm/month)}{(mm/hr)}$ /2 /3	$\frac{267.5}{3.2}$	$\frac{137.5}{2.6}$	$\frac{-}{-}$	$\frac{6.9}{0.6}$	$\frac{11.4}{1.0}$	$\frac{5.5}{1.0}$	$\frac{53.5}{1.2}$
Rainy day (day) /4	14	9	-	2	2	1	7
Total Precipitation Rate mm/hr	4.8	4.2	1.6	2.2	2.6	2.6	2.8

Note : /1 Twenty-three hrs operation per day

/2 Maximum-year-rainfall of recent five years

/3 Assuming 6 hrs of precipitation time every rainfall

/4 Number of rainy days in month (Annual Climatological Review, 1974, PAGASA)

Basic intake rate = 8 mm/hr for clay loam

Table 2.6.1 TOTAL CONSTRUCTION COST FOR ESTATE FARM

Item	Amount (₱10³)		
	F.C.	L.C.	Total
1. Farm Land Acquisition Cost	-	10,135	10,135
- Compensation cost for land acquisition	-	9,840	9,840
- Engineering and administration	-	295	295
2. Cane Farm Construction Cost	1,670	1,730	3,400
- Secondary roads	1,314	1,375	2,689
- Farm roads	41	52	93
- Engineering and administration cost	130	94	224
- Physical contingency	185	209	394
3. Procurement Cost of Farm Machinery and Equipment	8,572	-	8,572
- Procurement cost	7,454	-	7,454
- Physical contingency	1,118	-	1,118
4. Constructio Cost for Farm Buildings	-	1,186	1,186
- Construction cost	-	973	973
- Engineering and administration cost	-	58	58
- Physical contingency	-	155	155
Total	10,242	13,051	23,293

Table 2.6.2 COST FOR FARM MACHINERY AND EQUIPMENT AND FARMING FACILITIES

Item	Nos.	Unit Price (₱)	Amount (₱10³) F.C.	Amount (₱10³) L.C.
I) Farm Machinery and Equipment				
- Wheel tractor (50 H.P.)	5	200,000	1,000	-
- Disc plow (26" x 3)	4	13,500	54	-
- Disc harrow (8" x 24)	4	20,000	80	-
- Furrower (3)	4	10,000	40	-
- Truck (6 tons)	40	100,000	4,000	-
- Splinker set	15	29,020	435	-
- Jeep	1	100,000	100	-
- Motorcycle	5	5,000	25	-
- Spare parts (30% of above)			1,720	-
Sub Total			7,454	-
- Physical contingency			1,118	-
Total			8,572	-
II) Forming Facilities				
- Field office	150 m^2	1,000	-	150
- Workshop	150	750	-	113
- Warehouse	430	750	-	323
- Garage	50	600	-	30
- Living quarter	420	850	-	357
Sub Total			-	973
- Engineering & administration cost			-	58
- Physical contingency			-	155
Total			-	1,186
Grand Total			8,572	1,186
			9,758	

Table 2.6.3 DISBURSEMENT SCHEDULE OF CONSTRUCTION COST FOR ESTATE FARM

	Total			1983			1984			1985			1986			1987			1988		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. Compensation Cost for land Acquisition	-	10,135	10,135	-	10,135	10,135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Compensation cost	-	9,840	9,840	-	9,840	9,840	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Engineering & administration cost	-	295	295	-	295	295	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Cane Farm Construction Cost	1,670	1,730	3,400	500	440	940	1,170	1,290	2,460	-	-	-	-	-	-	-	-	-	-	-	-
- Secondary roads	1,314	1,375	2,689	333	343	676	981	1,032	2,013	-	-	-	-	-	-	-	-	-	-	-	-
- Farm roads	41	52	93	11	15	26	30	37	67	-	-	-	-	-	-	-	-	-	-	-	-
- Engineering & administration cost	130	94	224	110	30	140	20	64	84	-	-	-	-	-	-	-	-	-	-	-	-
- Physical contingency	185	209	394	46	52	98	139	157	296	-	-	-	-	-	-	-	-	-	-	-	-
3. Procurement Cost for Farm Machinery & Equipment	8,572	-	8,572	-	-	-	1,579	-	1,579	961	-	961	2,294	-	2,294	1,495	-	1,495	2,243	-	2,243
- Procurement cost	7,454	-	7,454	-	-	-	1,373	-	1,373	836	-	836	1,995	-	1,995	1,300	-	1,300	1,950	-	1,950
- Physical contingency	1,118	-	1,118	-	-	-	206	-	206	125	-	125	299	-	299	195	-	195	293	-	293
4. Construction Cost for Farm Buildings	-	1,186	1,186	-	-	-	-	1,186	1,186	-	-	-	-	-	-	-	-	-	-	-	-
- Construction cost	-	973	973	-	-	-	-	973	973	-	-	-	-	-	-	-	-	-	-	-	-
- Engineering & administration cost	-	58	58	-	-	-	-	58	58	-	-	-	-	-	-	-	-	-	-	-	-
- Physical contingency	-	155	155	-	-	-	-	155	155	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	10,242	13,051	23,293	500	10,575	11,075	2,749	2,476	5,225	961	-	961	2,994	-	2,294	1,495	-	1,495	2,243	-	2,243
5. Price Contingency	3,479	3,041	6,520	67	2,221	2,288	572	820	1,392	275	-	275	849	-	849	686	-	686	1,030	-	1,030
Total	13,721	16,092	29,813	567	12,796	13,363	3,321	3,296	6,617	1,236	-	1,236	3,143	-	3,143	2,181	-	2,181	3,273	-	3,273

Note: F.C. Foreign Currency
L.C. Local Currency

Table 2.6.4 OPERATION AND MAINTENANCE COSTS AT FULL DEVELOPMENT STAGE OF ESTATE FARM

Unit : ₱10^3

I)	Machinery Operation Cost	1,083
	1) Repair and Maintenance/1	767
	2) Fuel and Oil	316
II)	Personal Cost	1,413
	- Department chief (1 M x ₱17,600)	18
	- Section chief (3 M x ₱16,000)	48
	- Technician (6 M x ₱14,500)	87
	- Mechanic (2 M x ₱14,500)	29
	- Mechanic (Junior) (2 M x ₱13,100)	26
	- Tractor operator (5 M x ₱10,700)	54
	- Driver (38 M x ₱10,700)	407
	- Parmanent Labor (4 M x ₱ 7,000)	28
	- Hired labor (47,280 M x ₱15/day)	709
	- Hired carabao (450 x ₱15/day)	7
III)	Cost of Fertilizer and Chemicals	553
IV)	Maintenance Cost of Farming Facilities	
	- ₱973 x 3%	29
V)	O & M Cost of Farm Road	159
VI)	Miscellaneous	212
	Total	3,449

/1 : (Procurement cost - 10% of salvage value) ÷ 7 years x 80%

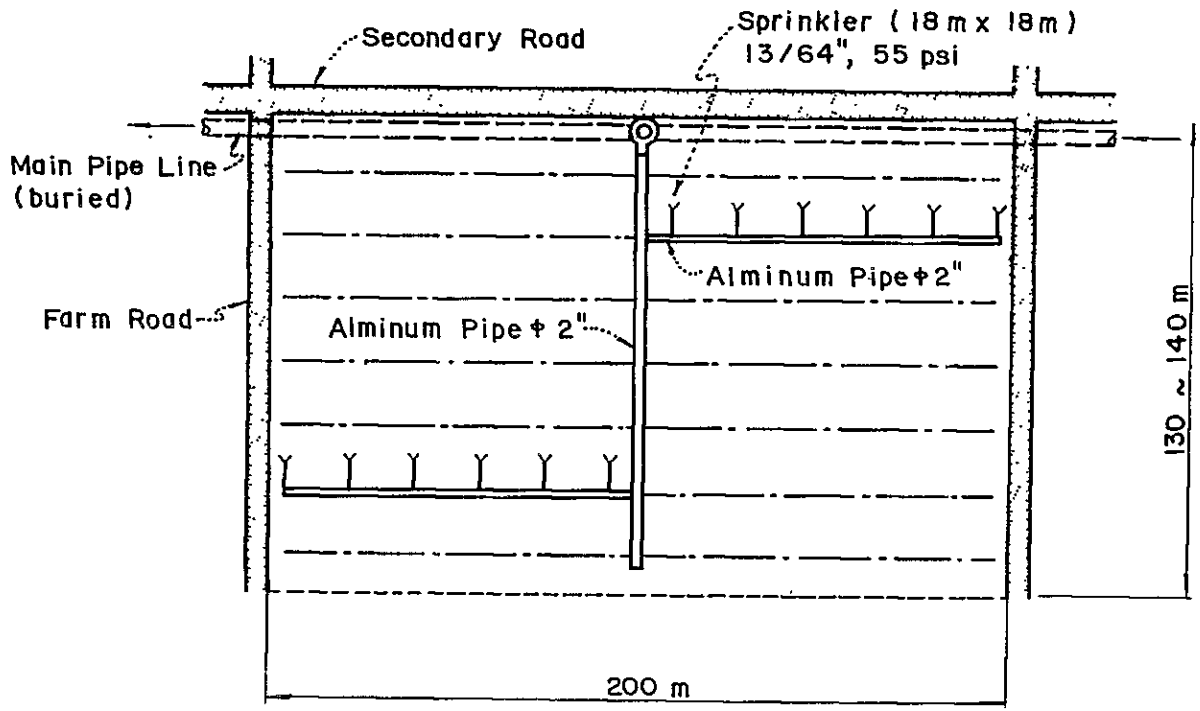
= (₱7,454 - ₱745) ÷ 7 x 80% = 767

Table 2.6.5 ANNUAL OPERATION AND MAINTENANCE COST OF ESTATE FARM

Unit : ₱10^3

		1984	1985	1986	1987	1988	1989	1990
I)	Machinery Operation Cost	166	355	605	786	1,038	1,083	1,083
	- Repair and maintenance	141	200	405	539	740	767	767
	- Fuel and oil	25	155	200	247	298	316	316
II)	Personal Cost	283	442	1,039	1,197	1,370	1,391	1,413
	- Staff	208	208	208	208	208	208	208
	- Operator	32	54	54	54	54	54	54
	- Driver	11	43	161	246	364	385	407
	- Permanent labor	14	14	14	28	28	28	28
	- Hired labor	18	123	595	654	709	709	709
	- Hired animal	-	-	7	7	7	7	7
III)	Cost of Speed Cane	20	-	-	-	-	-	-
IV)	Cost of Fertilizer and Chemicals	81	184	367	553	553	553	553
V)	Maintenance Cost of Farming Facilities	29	29	29	29	29	29	29
VI)	O & M Cost of Farm Road	40	159	159	159	159	159	159
VII)	Miscellaneous	40	74	138	173	206	211	212
	Total	659	1,243	2,337	2,897	3,355	3,426	3,449

Fig. 2.3.1 TYPICAL LAYOUT OF SPRINKLER SET



APPENDIX VI

EVALUATION

APPENDIX VI EVALUATION

TABLE OF CONTENTS

LIST OF TABLES

APPENDIX VI EVALUATIONS

CHAPTER 1 GENERAL

The evaluations for the agricultural development are made in order to ascertain the feasibility of the project in view of financial, economic and socio-economic aspects.

Firstly, the feasibility for the alcogas project is evaluated by calculating the capacity to pay in the farm budget to confirm the soundness of the project from the farmer's viewpoint.

Secondly, the economic feasibility only for the individual farm development is tentatively evaluated in terms of the internal rate of return on the assumption that the individual farm development is planned as an agricultural development project. The costs related to the distillery and the estate farm construction are excluded from the calculation of the internal rate of return. The calculation of the internal rate of return including all components of the project will be done by the Industrial Sector Team.

Finally, intangible socio-economic impacts of the agricultural development are also briefly studied in due consideration of the effect of the development.

CHAPTER 2 FINANCIAL EVALUATION

2.1 General

Financial evaluation of the project is made by the analysis of the typical farm budgets and the assessment for repayment of the construction cost of the individual farm development.

Farm budget analysis is conducted to assess whether the alcogas project will have sufficient incentive to the farmers in the project area and will bring enough income increase in the farmer's economy. Assessment of the charge on operation and maintenance cost of the road to be constructed in the project area is also made briefly.

2.2 Farm Budget Analysis

In order to assess the project from farmers' economy viewpoint, analysis of farm budget for typical farmers are examined under both the future without project and the future with project conditions as mentioned in APPENDIX III.

The typical farm budgets in both future without and with project conditions are outlined below.

(1) Without Project Condition

(Unit : Peso)

Item	Type I	Type II	Type III
I) Gross Income	10,757	10,673	11,090
(1) Farm income	4,189	4,215	5,561
(2) Off-farm income	6,568	6,458	5,529
II) Gross Outgo	10,757	10,763	10,870
(3) Production cost	2,187	2,103	2,300
(4) Living expenses	8,570	8,570	8,570
III) Net Reserve (Capacity (to Pay)	0	0	220
IV) Net Farm Income (I.1-II.3)	2,002	2,112	3,261

(2) With Project Condition

(Unit : Peso)

Item	Type I	Type II	Type III
I) Gross Income	18,675	22,798	22,520
(1) Farm income	12,107	16,340	16,991
(2) Off-farm income	6,568	6,458	5,529
II) Gross Outgo	18,120	20,032	16,914
(3) Production cost	6,980	8,892	5,774
(4) Living expenses	11,140	11,140	11,140
III) Net Reserve (Capacity to Pay)	555	2,766	5,606
IV) Net Farm Income (I.1-II.3)	5,127	7,448	11,217

Net farm incomes with project on the farm of Type I will be expected about 2.5 times of that of without project, about 3.5 times on Type II, and about 3.4 times on Type III, respectively.

In the future with project conditions, annual net reserve or capacity to pay will be ₱555 on the farm of Type I, ₱2,766 on Type II, and ₱5,606 on Type III, respectively.

While, on the land rent with project the farm of Type I will be increased to be about three times of that of without project and about four times on Type II, respectively as shown in the following table.:

(Unit : Peso)

Type/1	Land Rent		Amount Increased
	w/o Project	w/Project	
Type I	744	2,328	1,584
Type II	749	2,880	2,131

The above table also shows that the land owners of the typical farmers of Type I and Type II will earn ₱2,328 and ₱2,880, respectively as the land rent paid by the tenants in the future with project conditions.

/1 : Type III is owner-operated farm.

2.3 Charge on O & M Cost for Road

The annual operation and maintenance costs for the roads constructed in the individual farm is estimated at ₱785 thousand, equivalent to ₱297 per hectare.

This amount of charge for operation and maintenance costs will be divided into halves between tenants and owners because owners also will get profit from the project. These are summarized as shown in the following table:

(Unit : Peso)

Type	Sugarcane Area (ha)	Capacity to Pay or Land Rent	Charge on O&M Cost	Balance
Type I	1.6	555	238/2	317
Owner of Type I		2,328	238	2,090
Type II	2.2	2,766	327/3	2,439
Owner of Type II		2,880	327	2,553
Type III/1	2.0	5,606	594/4	5,012

/1 : Type III is owner-operated farm.

/2 : Annual O&M cost/ha x Sugarcane area ÷ 2
= ₱297 x 1.6 ha ÷ 2 = ₱238

/3 : ₱297 x 2.2 ha ÷ 2 = ₱327

/4 : ₱297 x 2.0 ha = ₱594

The charge for operation and maintenance cost to be collected from the farmer and/or land owner would be within a reasonable range.

2.4 Repayment of the Capital Cost

Fund requirement for the individual farm development is estimated on the basis of the disbursement schedule of the construction cost and expected cost escalation. The rates of cost escalation are estimated at 6.5% per annum for foreign currency portion and 10% per annum for local currency portion during the construction period. Estimated fund requirements are ₱24,400 thousand for the individual farm development as shown in Table 2.4.1.

The annual repayment of the capital cost for the individual farm development is estimated at around ₱3.9 million/1, which is equivalent to ₱1,480 per hectare/2. It is very hard to cover this amount with the net reserve or capacity to pay of the typical farms and the land rent paid by the tenant for owners as shown in the following table:

(Unit : Peso)

Type	Sugarcane Area (ha)	Capacity to Pay or Land Rent	Repayment of Capital Cost	Balance
Type I	1.6	555	1,184/2	-629
Owner of Type I		2,328	1,184	1,144
Type II	2.2	2,766	1,628 /3	1,138
Owner of Type II		2,880	1,628	1,252
Type III/1	2.0	5,606	2,960/4	2,646

/1 : Type III is owner-operated farm.

/2 : Annual repayment of the capital cost/ha x Sugarcane area ÷ 2
= ₱1,480 x 1.6 ha ÷ = ₱1,184

/3 : = ₱1,480 x 2.2 ha ÷ 2 = ₱1,628

/4 : ₱1,480 x 2.0 ha = ₱2.960

According to the information from the Industrial Sector Team, the repayment of the capital cost for the individual farm development also shows very hard in their financial evaluation. As a result, regarding the rapayment of the capital cost, the Government subsidy would be needed.

While, the annual operation and maintenance cost of the roads constructed in the individual farm will be covered with the net reserve of the typical farms and the owners' income as the land rent paid by tenants.

/1 : Capital cost x $\frac{0.08}{1 - (1 + 0.08)^{-9}}$

$= ₱24,400 \times 10^3 \times \frac{0.08}{1 - (1 + 0.08)^{-9}} = ₱3,906 \times 10^3$

/2 $₱3,906 \times 10^3 \div 2,640$ ha = ₱1,480/ha

CHAPTER 3 ECONOMIC EVALUATION

3.1 Basic Assumptions

For the economic evaluation of the individual farm development the following basic assumptions are established.

1) The project implementation period is 4 years from 1983 to 1986.

2) Only direct benefit is counted in the evaluation, and any indirect or intangible benefit are not taken into account.

3) The economic prices are estimated based on the projected international market price forecasted by IBRD for the period of 1985 to 1990 based on 1981 constant U.S. Dollars.

4) The economic useful life of the project is taken as 50 years from 1983 to 2032.

3.2 Benefit and Economic Cost

The individual farm development benefit is expected to be the increment of farm income of crops between future with and without project conditions. The benefit to be expected from the individual farm development is estimated at about ₱6.4 million.

Economic construction cost for the individual farm development is estimated taking into consideration tax and contractor's profit for the construction cost. The economic construction cost for the project is estimated at about ₱15.2 million. The annual operation and maintenance cost are also estimated at ₱684 thousand.

The benefit accrued from the individual farm development during the porject life is shown in Table 3.2.1 and the disbursement schedule of economic costs for the development is shown in Table 3.2.2

3.3 Internal Rate of Return

Using the benefit and cost mentioned above, IRR is calculated. The calculated IRR is around 25.3%, it indicates the economic soundness of the project.

3.4 Sensitivity Analysis

In order to evaluate further the soundness of the individual farm development to the possible change of economic conditions in future, the sensitivity analysis is made for the following critical conditions in terms of internal rate of return.

1) Cost increase due to unforeseen geological and topographical conditions and increase of material costs,

2) Decrease of forecasted price of sugarcane, and

3) Lower production than the expected.

For the above possible change of economic conditions, the following eight cases are examined.

	I	II	III	IV	V	VI	VII	VIII
Cost	0	0	+10%	+10%	+10%	+20%	+20%	+20%
Benefit	-10%	-20%	0	-10%	-20%	0	-10%	-20%

The calculated result of IRR for each case is shown in Table 3.4.1. As a result, it can be said that the individual farm development would be still sound even in the worst case, i.e. 20% increase of cost and 20% decrease of benefit.

CHAPTER 4 SOCIO-ECONOMIC IMPACT

4.1 General

In addition to the direct benefits stipulated in the economic evaluation, favourable but intangible socio-economic impacts are expected from the implementation of the agricultural development.

4.2 Increase of Employment Opportunity

The individual farm development will create a demand for farm labour requirement accrued from increased farm activities due to intensive use of the land and high productivity. The incremental farm labour requirement is estimated at 145 thousand man-days per annum as shown in Table 4.1.1.

4.3 Improvement of Local Transportation

The road constructed in the project area will be used not only for cane-transportation but also for another local economic activities. This means the road will contribute to rural people's life in and around the project area.

Table 2.4.1 DISBURSEMENT SCHEDULE OF CONSTRUCTION COST FOR INDIVIDUAL FARM

Unit: $P10^3$

	Total			Total			Total			Total			Total		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. Direct Construction Cost															
1) Main Road A	1,126	1,220	2,346	220	219	439	906	1,101	1,907	-	-	-	-	-	-
2) Main Road B	764	823	1,587	-	-	-	113	108	221	651	715	1,366	-	-	-
3) Secondary Roads	4,683	4,869	9,552	309	317	626	1,374	1,429	2,803	1,762	1,823	3,585	1,238	1,300	2,538
2. Compensation Cost for Land Acquisition	-	1,102	1,102	-	1,102	1,102	-	-	-	-	-	-	-	-	-
3. Engineering & Administration Cost	750	754	1,504	590	170	760	40	152	192	60	216	276	60	216	276
4. Physical Contingency (15%)	1,007	1,202	2,209	81	242	323	367	380	747	367	386	753	192	194	386
Sub-Total	8,330	9,970	18,300	1,200	2,050	3,250	2,800	3,070	5,870	2,840	3,140	5,980	1,490	1,710	3,200
5. Price Contingency	2,130	3,970	6,100	170	440	610	590	1,020	1,610	820	1,460	2,280	550	1,050	1,600
Total	10,460	13,940	24,400	1,370	2,490	3,860	3,390	4,090	7,480	3,660	4,600	8,260	2,040	2,760	4,800

Table 3.2.1 ECONOMIC COST AND BENEFIT FLOW FOR INDIVIDUAL FARM DEVELOPMENT

Unit : ₱10^3

Year	Year in Order	Economic Cost			Economic Benefit
		Const-ruction Cost	O & M Cost	Total	
1983	1	1,841	-	1,841	-
1984	2	5,196	54	5,251	-
1985	3	5,302	304	5,606	244
1986	4	2,852	556	3,408	1,937
1987	5	-	684	684	3,899
1988	6	-	684	684	5,733
1989	7	-	684	684	6,087
1990	8	-	684	684	6,337
1991	9	-	684	684	6,434
.	.	-	.	.	.
.	.	-	.	.	.
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.	.	-	.	.	.
.	.	-	.	.	.
.	.	-	.	.	.
.	.	-	.	.	.
.	.	-	.	.	.
2032	50	-	684	684	6,434

Table 3.2.2 DISBURSEMENT SCHEDULE OF ECONOMIC COST FOR INDIVIDUAL FARM DEVELOPMENT

Unit : ₱10^3

	Total	1983	1984	1985	1986
1. Main Road A	2,070	387	1,683	-	-
2. Main Road B	1,401	-	195	1,206	-
3. Secondary Road	8,431	553	2,474	3,164	2,240
4. Engineering and Administration Cost	1,504	760	192	276	276
Sub-total	13,406	1,700	4,544	4,646	2,516
5. Physical Contingency	1,786	141	653	656	336
Total	15,192	1,841	5,197	5,302	2,852

Table 3.4.1 SENSITIVITY ANALYSIS

	Internal Rate of Return (%)		
	Benefit Decreased		
Cost Increased	0%	-10%	-20%
0%	25.3	23.0	20.7
+10%	23.2	21.1	18.9
+20%	21.5	19.5	17.4

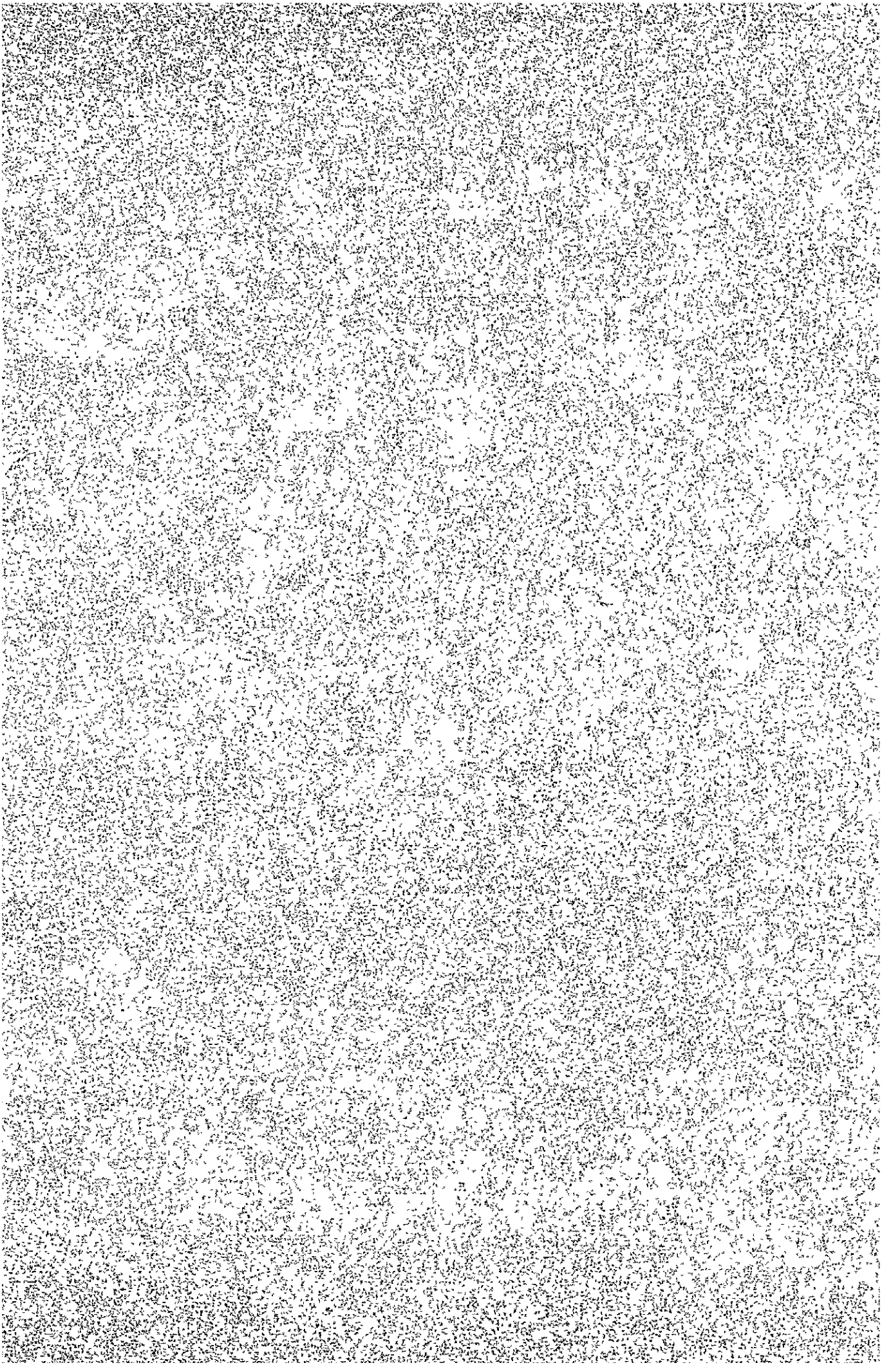
Table 4.1.1 SEASONAL LABOUR REQUIREMENT

Unit : 1,000 man-days

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A) Present Condition	7.9	14.4	5.9	5.2	9.5	31.4	26.5	27.5	12.7	20.3	8.8	7.2	177.3
1) Upland rice : 1,900 ha	-	-	-	-	5.7	20.9	22.8	24.7	11.4	19.0	-	-	104.5
2) Sugarcane : 550 ha	7.2	6.1	5.9	5.2	3.8	1.0	0.9	-	-	-	6.4	6.4	42.9
3) Corn : 250 ha	-	-	-	-	-	3.5	2.0	2.0	0.5	1.3	-	-	9.3
4) Cassava : 200 ha	-	6.0	-	-	-	6.0	0.8	0.8	0.8	-	-	-	14.4
5) Peanuts : 100 ha	0.7	2.3	-	-	-	-	-	-	-	-	2.4	0.8	6.2
B) With Project	31.1	31.1	29.1	29.1	30.6	37.0	36.1	26.9	10.9	20.1	33.6	33.5	322.4
I) Individual Farm	31.1	31.1	29.1	29.1	30.1	21.0	24.9	20.3	8.9	13.5	6.9	25.3	275.1
1) Sugarcane : 1,980 ha	31.1	31.1	29.1	29.1	28.1	13.7	13.7	6.9	6.9	6.9	6.9	25.3	235.5
2) Upland rice : 660 ha	-	-	-	-	2.0	11.3	11.2	6.6	2.0	6.6	-	-	39.6
II) Estate Farm (Sugarcane : 400 ha)	-	-	-	-	0.5	12.0	-	-	-	-	26.7	8.2	47.3
C) Increment (B - A)	23.2	16.7	23.2	23.9	21.1	5.6	9.6	-0.6	-1.8	-0.2	24.8	26.3	145.1

APPENDIX VII

PILOT FARM



APPENDIX VII PILOT FARM

TABLE OF CONTENTS

APPENDIX VII PILOT FARM

1. Necessity of Pilot Farm

The source of products in the sugar industry is sucrose. Several researches on sugarcane how the highest yield of sugar per hectare can be produced are being carried out by the sugarcane research stations of PHILSUCOM and the university of the Philippines College of Agriculture, and many effective results have been applied to increase sugar production.

While, the source of products in the alcohol industry processing sugarcane is the total fermentable sugar composed of sucrose and reducing sugar, i.e. glucose and fructose. The sufficient researches on the raw materials for sugar production are being carried out, on the contrary no research on those for alcohol production is done in the Philippines. The research on sugarcane cultivation adjusted the focus on alcohol production is very important and urgent matter.

For realization of the above purpose establishment of a pilot farm is recommended.

2. Role of Pilot Farm

The role of the pilot farm is as follows:

(1) Field Trials

Field trials will be carried out to lay emphasis on total fermentable sugar yield of sugarcane as raw materials for alcohol production.

The trials are as follows:

1) Varietal trials
2) Fertilizer trials
3) Trials on the most suitable planting and harvesting time in the Maragondon area
4) Trials on the most suitable number of cane-setts
5) Protection measurements from pests and diseases

6) Trials on harbicides

7) Trials on determination of sugar contents in sugarcane to lapse of time from harvest

8) Irrigation trials

(2) Propagation of sugarcane varieties for renovation and rapid propagation for new varieties.

(3) Establishment of demonstration fields

3. Facilities

In order to perform the role of the pilot farm, 50 ha of field with irrigation and buildings such as office, laboratory, warehouse, residences of staff and equipment for farming, experiments and office management will be provided. Location of the pilot farm will be selected depending upon a suitable land available in the estate farm or around the project area.