Table 3.1.1 SUMMARY OF CLIMATIC CONDITIONS

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Mean Temperature (°C)													
San Miguel (1968 - 1979)	25.1	25.0	27.0	28.6	28.8	28.1	27.4	26.8	27.3	26.8	26.3	25.4	26.9
Baliwag (1970 - 1979)	24.1	25.1	26.2	27.4	27.4	27.7	27.2	26.9	27.0	26.7	26.4	25.5	26.5
Cabanatuan (1976 - 1979)*1	25.9	23.5	27.4	29.3	28.6	28.3	28.2	27.1	27.6	27.7	27.0	26.5	27.3
Mean Maximum Temperature (°C)													
San Miguel (1968 - 1979)	31.0	31.7	33.9	35.3	34.7	33.3	32.1	30.9	31.6	31.7	30.2	30.7	33.3
Baliwag (1970 - 1979)	29.6	29.5	31.9	33.0	32.6	32.1	31.1	29.4	31.2	30.7	30.7	29.7	31.0
Mean Minimum Temperature (°C)													
San Miguel (1968 - 1979)	18.8	19.0	20.3	21.9	23.1	23.2	22.8	23.2	22.6	22.3	21.6	20.2	21.6
Baliwag (1970 - 1979)	19.9	19.7	20.2	21.7	22.8	23.7	23.6	23.2	23.3	22.6	22.2	21.3	22.0
Mean Relative Humidity (%)													
San Miguel (1968 - 1979)*2	83.1	75.4	77.6	71.9	79.2	86.0	87.9	90.7	88.8	86.5	82.5	82.3	82.7
Cabanatuan (1976 - 1979)*1	73.1	67.8	66.1	63.1	76.8	80.4	83.8	88.0	85.6	81.9	77.9	75.6	76.7
Sunshine Hour (hr/day)													
San Miguel (1968 - 1979)	6.2	7.3	7.1	8.3	7.5	5.2	5.1	3.9	4.1	5.6	6.3	6.5	6.1
Mean Wind Speed (km/hr)													
San Miguel (1968 - 1979)	2.7	3.1	3.2	3.1	2.2	2.0	1.7	1.6	1.4	1.7	2.6	3.4	2.4
Cabanatuan (1976 - 1979)*1	4.2	4.8	3.6	3.6	3.9	2.5	2.9	3.3	4.6	3.2	4.6	4.9	3.8
Evaporation (mm/month)													
San Miguel (1968 - 1979)	145.8	152.3	194.1	204.2	170.2	138.2	127.5	112.5	126.9	130.5	131.4	134.5	1,768.1
Baliwag (1970 - 1979)	143.5	141.1	177.6	191.1	171.4	152.2	141.3	133.0	152.4	143.3	133.7	134.3	1,815.0

*1 Data since 1949 are collected, analysis has not been completed so far.

*2 Relative Humidity measured at 8:00 A.M.

Table 3.1.2 AREA AND ITS EXTENT BY SOIL MAPPING UNIT

Soil Mapping Symbol	Name of Soil Mapping Unit	Area (ha)	Extent (%)
Acs	Angeles Coarse Sand	8,600	8.3
Afs	Angeles Fine Sand	10,000	9.7
Asl	Angeles Sandy Loam	17,000	16.5
Lcl	La Paz Silt Clay Loam	5,600	5.4
Lsl	La Paz Sandy Loam	20,400	19.8
Mc	Masantol Clay	8,500	8.3
Pc	Prensa Clay	500	0.5
Ql	Quingua Silt Clay Loam	6,500	6.3
Sc	San Fernando Clay	10,400	10.1
Tc	Tagolod Clay	7,300	7.2
Zc	Zaragosa Clay	8,200	7.9
	Total	103,000	100.0

Table 3.1.3 SOIL PROFILE OF ANGELES SOIL SERIES

1. Angeles Fine Sand

No. of soil pit : 73
Location : Maliwan, Bacolor
Land use : Sugarcane

A	0 - 20 cm	Grayish yellow brown (10 YR 5/2) fine sand; structureless; non sticky; non plastic; clear smooth boundary
B	20 - 55 cm	Grayish yellow brown (10 YR 6/2) fine sand; structureless; non sticky; non plastic; clear smooth boundary
C	55 - 100 cm	Gray (5 Y 5/1) fine sand; structureless; non sticky; non plastic

2. Angeles Sandy Loam

No. of soil pit : 36
Location : Arenar
Land use : Paddy

A	0 - 25 cm	Brownish black (10 YR 3/1) sandy loam; few fine distinct brown mottles; structureless; non plastic, non sticky; clear smooth boundary
B	25 - 60 cm	Yellowish gray (2.5 Y 6/1) sand; structureless; non plastic; non sticky; gradual smooth boundary
C	60 - 100 cm	Light gray (2.5 Y 7/1) sand; structureless; non plastic; non sticky

Table 3.1.4 SOIL PROFILE OF LA PAZ SOIL SERIES

1. La Paz Silt Clay Loam

No. of soil pit : 32
Location : Garianin, Arayat
Land use : Paddy

A	0-16 cm	Grayish yellow brown (10 YR 4/2) silt clay loam; few fine faint brown mottles; weak fine granular structure; non plastic; non sticky; abrupt smooth boundary
B	16-32 cm	Gray (5 Y 5/1) loam; few fine distinct mottles; moderate subangular blocky structure; non plastic; non sticky; gradual smooth boundary
C1g	32-77 cm	Dark grayish brown (2.5 Y 5/2) silt clay loam; few fine faint brown mottles; weak subangular blocky structure; non plastic; non sticky; clear smooth boundary
C2g	77-100 cm	Yellowish gray (2.5 Y 5/1) sandy loam; structureless; non plastic; non sticky

Depth (cm.)	pH 1 = 1 Soil - Water Ratio	pH 1 = 2 Soil:1N KCl Ratio	Elec. Cond : EC x 10^3 mmho/cm/25°C 1=1 Soil - Water Ratio	Organic Carbon (%)
0-16	6.7	5.8	0.20	1.53
16-32	6.8	5.7	0.06	0.96
32-77	6.9	5.8	0.06	-
77-100	7.2	5.9	0.06	-

Depth (cm.)	Organic Matter (%)	Nitrogen (%)	Avail. Phosphorus (ppm)	Avail. Iron (ppm)
0-16	2.63	0.13	9.8	0.78
16-32	1.64	0.08	8.1	-
32-77	-	-	6.5	-
77-100	-	-	6.5	-

(to be continued)

Table 3.1.4 SOIL PROFILE OF LA PAZ SOIL SERIES (Continued)

2. La Paz Sandy Loam

No. of soil pit : 24
Location : Laput, Mexico
Land use : Paddy

A	0-15 cm	Brownish gray (10 YR 6/1) sandy loam, few fine faint brown mottles; structureless; non plastic; non sticky; clear smooth boundary
B	15-54 cm	Grayish yellow brown (10 YR 5/2) sandy loam; common medium distinct yellowish brown mottles; structureless; non plastic; non sticky; clear smooth boundary
C	54-76 cm	Dull yellow brown (10 YR 6/3) silt loam; weak subangular blocky structure; slightly sticky; non plastic; clear smooth boundary
IICg	76-100 cm	Brownish gray (10 YR 5/1) sand; few fine distinct mottles; structureless; non plastic; non sticky

Table 3.1.5 SOIL PROFILE OF MASANTOL SOIL SERIES

Masantol Clay

No. of soil pit : 86
Location : Bo. Dabuel, Macabebe
Land use : Paddy

A	0 - 30 cm	Brownish gray (10 YR 5/1) clay; common, medium distinct brown mottles; moderate medium blocky structure; plastic; sticky; clear smooth boundary
Cl_g	30 - 70 cm	Light bluish gray (5 BG 7/1) clay; moderate medium blocky structure; plastic; sticky; clear smooth boundary
$C2_g$	70 - 100 cm	Light olive gray (2.5 GY 7/1) clay; massive; plastic; sticky

Table 3.1.6 SOIL PROFILE OF PRENSA SOIL SERIES

Prensa Clay

No. of soil pit : 201
Location : San Nicors, Magalang
Land use : Paddy

A	0 - 20 cm	Grayish yellow brown (10 YR 4/2) clay; moderate subangular blocky structure; slightly plastic; slightly sticky; abrupt smooth boundary
A	20 - 100 cm	Brownish black (10 YR 3/1) clay; many fine Fe/Mn concretions and gravels; very plastic; very sticky

Table 3.1.7 SOIL PROFILE OF QUIGUA SOIL SERIES

Quigua Silt Clay Loam

No. of soil pit : 26
Location : Bo. San Miguel
Land use : Paddy

A	0-22 cm	Brownish gray (10 YR 4/1) clay loam, few fine faint yellowish brown mottles; strong blocky structures; sticky; plastic; gradual smooth boundary
B	22-36 cm	Brownish gray (10 YR 5/1) sandy loam; weak subangular blocky structure; non plastic; non sticky; gradual smooth boundary
B	36-59 cm	Grayish yellow brown (10 YR 5/2) sandy loam; common medium distinct mottles; weak granular structure; slightly plastic; slightly sticky; clear smooth boundary
C	59-80 cm	Brownish gray (10 YR 6/1) silt loam; common medium distinct mottles; weak granular structure; slightly plastic; slightly sticky

Depth (cm.)	pH 1 = 1 Soil - Water Ratio	pH 1 = 2 Soil: 1N KCl Ratio	Elec. Cond : EC x 10^3 mmho/cm/25°C 1=1 Soil - Water Ratio	Organic Carbon (%)
0-22	6.9	5.9	0.62	1.76
22-36	7.7	6.1	0.22	0.59
36-59	7.6	6.1	0.31	-
59-80	7.8	6.1	0.40	-

Depth (cm.)	Organic Matter (%)	Nitrogen (%)	Avail. Phosphorus (ppm)	Avail. Iron (ppm)
0-22	3.02	0.15	17.0	21.96
22-36	1.01	0.05	8.1	0.39
36-59	-	-	8.1	1.29
59-80	-	-	4.6	1.01

Table 3.1.8 SOIL PROFILE OF SAN FERNANDO SOIL SERIES

San Fernando Clay

No. of soil pit : 17
Location : Sto. Domingo, San Simon
Land use : Paddy

A	0-15 cm	Brownish black (10 YR 3/1) clay; few fine distinct brown mottles; strong blocky structure; sticky; plastic; clear smooth boundary
B	15-40 cm	Dark grayish yellow (2.5 Y 4/2) clay; few fine faint yellowish brown mottles; moderate subangular blocky structure; very plastic; very sticky; gradual smooth boundary
C1g	40-70 cm	Gray (7.5 Y 4/1) silty clay; common fine distinct brown mottles; moderate granular structure; plastic; sticky; gradual smooth boundary
C2g	70-100 cm	Gray (7.5 Y 4/1) silty clay; few fine soft manganese concretion; many fine prominent mottles; weak subangular blocky structure; slightly plastic; slightly sticky

Depth (cm.)	pH 1 = 1 Soil - Water Ratio	pH 1 = 2 Soil: 1N KCl Ratio	Elec. Cond : EC x 10^3 mmho/cm/25°C 1=1 Soil - Water Ratio	Organic Carbon (%)
0-15	6.4	5.3	0.74	2.28
15-70	8.0	6.4	0.21	0.68
70-100	7.9	6.6	0.20	-

Depth (cm.)	Organic Matter (%)	Nitrogen (%)	Avail. Phosphorus (ppm)	Avail. Iron (ppm)
0-15	3.29	0.16	5.5	23.52
15-70	1.18	0.06	5.5	0.78
70-100	-	-	4.0	0.78

Table 3.1.9 SOIL PROFILE OF TAGOLOD SOIL SERIES

Tagolod Clay

No. of soil pit : 8
Location : Bo. Sta. Lucia, Candaba
Land use : Paddy

A	0-20 cm	Yellowish gray (2.5 Y 5/1) clay; common fine distinct brown mottles; strong subangular blocky structure; plastic; sticky; gradual smooth boundary
B	20-35 cm	Gray (5 Y 5/1) clay; few fine faint brown mottles; strong subangular blocky structure; very plastic; very sticky; gradual smooth boundary
Clg	35-70 cm	Gray (5 Y 4/1) clay; common few distinct brown mottles; moderate subangular blocky structure; plastic; sticky; diffuse smooth boundary
IICg	70-100 cm	Gray (5 Y 4/1) loam; many fine prominent brown mottles; weak subangular blocky structure; slightly plastic; slightly sticky

Depth (cm.)	pH 1 = 1 Soil - Water Ratio	pH 1 = 2 Soil: 1N KCl Ratio	Elec. Cond : EC x 10^3 mmho/cm/25°C 1=1 Soil - Water Ratio	Organic Carbon (%)
0-22	6.9	5.5	0.17	1.52
20-35	7.2	5.7	0.12	1.52
35-70	7.1	5.7	0.10	-
70-100	7.2	5.7	0.09	-

Depth (cm.)	Organic Matter (%)	Nitrogen (%)	Avail. Phosphorus (ppm)	Avail. Iron (ppm)
0-20	2.61	0.13	37.5	-
20-35	2.61	0.13	14.0	-
35-70	-	-	6.5	-
70-100	-	-	5.5	-

Table 3.1.10 SOIL PROFILE OF ZARAGOSA SOIL SERIES

Zaragosa Clay

No. of soil pit : 57
Location : San Roque La Paz
Land use : Paddy/Grass

A	0-16 cm	Brownish black (10 YR 3/1) clay; few fine faint bright reddish brown mottles; strong blocky structure; very plastic; very sticky; clear smooth boundary
B	16-51 cm	Gray (5 Y 4/1) clay; strong blocky structure; very plastic; very sticky; clear smooth boundary
C	51-100 cm	Gray (7.5 Y 5/1) clay; few fine faint olive brown mottles; strong blocky structure; very plastic; very sticky

Depth (cm.)	pH		Elec. Cond : EC x 10^3 mmho/cm/25°C	Organic Carbon (%)
	1 = 1 Soil - Water Ratio	1 = 2 Soil: 1N KCl Ratio	1=1 Soil - Water Ratio	
0-16	6.5	5.1	0.18	2.05
16-51	6.6	6.2	0.50	2.00
51-100	7.4	6.5	0.85	-

Depth (cm.)	Organic Matter (%)	Nitrogen (%)	Avail. Phosphorus (ppm)	Avail. Iron (ppm)
0-16	3.53	0.18	8.1	0.78
16-51	3.44	0.17	5.5	1.79
51-100	-	-	5.5	-

Table 3.1.11 ASSESSMENT OF LAND CAPABILITY FOR MAPPING UNIT

Name of Mapping Unit / Symbol of Factor for Assessment of Land Capability	a		b		c		d		e		f		g		h		i		j		k		Synthetical Assessment	
	P/1	D/2	P	D	P	D	P	D	P	D	P	D	P	D	P	D	P	D	P	D	P	D	P	D
Angeles coarse sand	I	I	I	I	I	I	I	I	III	-	I	-	-	II	III	III	I	I	I	I	I	I	IIIeh	IIIh
Angeles fine sand	I	I	I	I	I	I	I	I	III	-	I	-	-	II	II	II	I	I	I	I	I	I	IIIe	IIgh
Angeles sandy loam	I	I	I	I	I	I	I	I	II	-	I	-	-	I	I	I	I	I	I	I	I	I	IIe	I
La Paz silt clay loam	I	I	I	I	I	I	I	I	I	-	I	-	-	I	I	I	I	I	II	II	I	I	IIj	IIj
La Paz sandy loam	I	I	I	I	I	I	I	I	II	-	I	-	-	I	I	I	I	I	II	II	I	I	IIej	IIj
Masantol clay	I	I	I	I	I	I	II	II	I	-	II	-	-	III	I	I	I	I	III	III	I	I	IIIj	IIIgj
Prensa clay	I	I	I	I	I	I	III	III	I	-	I	-	-	I	I	I	I	I	I	I	I	I	IIId	IIId
Quingua silt clay loam	I	I	I	I	I	I	I	I	I	-	I	-	-	I	I	I	I	I	I	I	I	I	I	I
San Fernand clay	I	I	I	I	I	I	III	III	I	-	II	-	-	III	I	I	I	I	III	III	I	I	IIIdj	IIIdgj
Tagolod clay	I	I	I	I	I	I	III	III	I	-	I	-	-	I	I	I	I	I	II	II	I	I	IIId	IIId
Zaragosa clay	I	I	I	I	I	I	-	III	I	-	I	-	-	I	I	I	I	I	II	II	I	I	IIj	IIId

/1: Paddy

/2: Diversified crops

Table 3.1.12 LAND CAPABILITY CLASS

			Area (ha)	Extent (%)
(1)	Paddy			
	Class I		6,500	6.3
		Quigua silt clay loam	6,500	6.3
	Class II		51,200	49.6
	IIe:	Angeles sandy loam and La Paz sandy clay loam	22,600	21.9
	IIj:	La Paz sandy loam and Zaragosa clay	28,600	27.7
	Class III		45,300	44.1
	IIIeh:	Angeles coarse sand	8,600	8.3
	IIIe :	Angeles fine sand	10,000	9.7
	IIId :	Masantol clay, Prensa clay and Tagolod clay	16,300	16.0
	IIIdj:	San Fernando clay	10,400	10.1
		Total	103,000	100.0
(2)	Diversified Crops			
	Class I		23,500	22.8
		Angeles sandy loam	17,000	16.5
		Quigua silt clay loam	6,500	6.3
	Class II		36,000	34.9
	IIgh:	Angeles fine sand	10,000	9.7
	IIj :	La Paz sandy clay loam and La Paz sandy loam	26,000	25.2
	Class III		43,500	42.3
	IIIh:	Angeles coarse sand	8,600	8.3
	IIIgj:	Masantol clay	8,500	8.3
	IIId :	Prensa clay/Tagolod clay and Zaragosa	16,000	15.6
	IIIdgj:	San Fernando clay	10,400	10.1
		Total	103,000	100.0

Table 3.3.1 LAND USE IN THE OBJECTIVE AREA

	Area (ha)	Proportional Percentage (%)	
1) Farm Land			
a. Paddy Field	101,500	31.7	(80.5)
- Rainfed Area	39,600	12.4	(31.5)
- Irrigated Area	61,900	19.3	(49.0)
b. Sugar Cane Field	21,000	6.6	(16.8)
c. Other Crop Area	3,500	1.1	(2.7)
Sub-total	126,000	39.4	(100.0)
2) Land such as Fishpond, Residential Area, Non-Arable Land, etc.	194,000	60.6	
Total	320,000	100.0	

Table 3.3.2 FARM INPUT PER HA AT PRESENT CONDITIONS IN PAMPANGA PROVINCE

	Irrigated Land		Rainfed Land	Sugarcane
	Wet Season Paddy	Dry Season Paddy	Wet Season Paddy	
1. Seed (kg or pcs)	95	99	95	34,000
2. Fertilizer (kg)				
N	46	48	46	120
P	7	12	5	0
K	2	4	2	0
3. Chemicals (ℓ)	1.1	1.4	0.8	0
4. Laborer (man·day)	86	93	81	120
5. Mechanical Power (days)	1.53	1.53	1.53	4.6
6. Animal Power (days)	9.1	9.1	9.1	6.65

Table 3.3.3 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF PADDY IN THE OBJECTIVE AREA

Objective area distributed to each province		Irrigated Land						Non irrigated			Total		
		Wet Season Paddy			Dry Season Paddy								
		HA (ha)	UY (t/ha)	TP (t)	HA (ha)	UY (t/ha)	TP (t)	HA (ha)	UY (t/ha)	TP (t)	HA (ha)	UY (t/ha)	TP (t)
Pampanga	1977	32,283	2.34	75,551	25,574	2.28	58,435	8,789	1.84	16,167	66,646	2.25	150,153
	1978	29,487	1.96	57,169	23,170	2.31	53,431	6,445	1.96	12,613	59,102	2.10	123,952
	1979	22,718	2.30	52,169	20,802	2.83	58,935	9,118	1.88	17,109	52,638	2.44	128,213
	Average	28,163	2.20	61,876	23,182	2.46	56,930	8,117	1.88	15,296	59,462	2.26	134,102
Tarlac	1977	4,773	2.49	11,906	2,055	2.70	5,557	6,105	1.93	11,788	12,933	2.26	29,251
	1978	4,083	2.72	11,106	2,267	2.68	6,071	5,814	2.19	12,747	12,164	2.46	29,924
	1979	3,771	2.68	10,104	2,177	2.42	5,276	6,316	2.26	14,253	12,264	2.42	29,633
	Average	4,209	2.77	11,639	2,166	2.60	5,635	6,078	1.58	9,596	12,454	2.38	29,603
N. Ecija	1977	9,546	2.32	22,183	8,740	2.97	25,988	4,920	1.46	7,197	23,206	2.38	55,368
	1978	8,012	4.02	32,222	11,870	3.14	37,232	6,418	1.79	11,496	26,300	3.08	80,950
	1979	9,935	3.21	31,884	11,202	4.70	52,609	5,114	1.82	9,284	26,251	3.57	93,777
	Average	9,164	3.14	28,763	10,604	3.64	38,609	5,484	1.70	9,326	25,252	3.04	76,698
Bulacan	1977	10,697	3.83	41,004	6,311	3.33	21,030	17,557	2.75	48,345	34,565	3.19	110,379
	1978	11,421	3.09	35,255	7,146	3.22	23,041	12,275	2.28	27,939	30,842	2.80	86,235
	1979	10,488	3.93	41,202	6,639	4.91	32,114	14,981	2.55	38,274	32,008	3.49	111,590
	Average	10,869	3.60	39,154	6,665	3.81	25,395	14,938	2.56	28,186	32,472	3.16	102,735
Bataan	1977	-	-	-	-	-	-	-	-	-	-	-	-
	1978	1,572	2.76	4,339	1,571	2.26	3,553	171	1.13	194	3,314	2.44	8,086
	1979	-	-	-	-	-	-	-	-	-	-	-	-
	Average	1,572	2.76	4,339	1,571	2.26	3,553	171	1.13	194	3,314	2.44	8,086
Total (Objective Area)		53,977	2.70	145,771	44,188	2.94	130,122	34,788	2.09	72,598	146,287	2.40	351,224

HA - Harvested Area

UY - Unit Yield

TP - Total Production

Table 3.3.4 PLANTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF SUGAR IN THE OBJECTIVE AREA (1978/79)

Objective Area Distributed to Each Province	Planted Area (ha)	Unit Yield (t/ha: sugar)	Total Production (t)
Pampanga	17,990	2.76	49,652
Tarlac	2,920	3.98	11,622
Nueva Ecija	-	-	-
Bulacan	-	-	-
Bataan	-	-	-
Total	20,910	2.93	61,274

Table 3.3.5 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF MAJOR UPLAND CROPS IN THE OBJECTIVE AREA

Kind of Crops	Wet Season			Dry Season			Total	
	HA/1 (t)	UY/2 (t/ha)	TP/3 (t)	HA (ha)	UY (t/ha)	TP (t)	HA (ha)	TP (t)
Corn	2,288	0.72	1,636	537	0.71	378	2,819	2,014
Mongo	23	0.50	12	552	0.67	372	575	384
Soybean	0	0	0	2	0.9	1.8	2	11.8
Sweet Potato	408	2.15	879	584	3.5	2,044	992	2,923
Cassava	66	1.42	94	74	2.28	169	140	263
Sorghum	171	1.53	262	92	1.12	103	263	365
Fruit Vegetable	384	6.58	2,526	1,290	8.14	10,504	1,674	13,030
Leafy Vegetable	136	2.12	288	484	4.73	2,287	620	2,575
Peanut	19	0.58	11	156	0.70	109	175	120

/1: HA: Harvested area

/2: UY: Unit yield

/3: TP: Total production

Source: Semi Annual Field Report, EAEcon

Table 3.3.6 PAST TREND OF HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION FOR PADDY IN THE FIVE PROVINCES FROM 1970 TO 1978

	A/1	B/1
Harvested Area (ha)		
Pampanga	977	183,122
Tarlac	-620	116,712
N. Ecija	-3,292	424,645
Bulacan	-174	99,372
Bataan	1,737	-105,897
Unit Yield (t/ha)		
Pampanga	0.044	-1.22
Tarlac	-0.031	4.31
N. Ecija	0.088	-4.35
Bulacan	0.144	-8.14
Bataan	-0.007	2.59
Total Production (t)		
Pampanga	5,440	254,764
Tarlac	-3,843	428,721
N. Ecija	6,622	104,093
Bulacan	11,656	643,577
Bataan	3,658	224,231

/1 : Y = AX + B
A ; Annual increasing ratio

Table 3.3.7 PAST TREND OF PLANTED AREA, UNIT YIELD AND PRODUCTION OF SUGAR IN THE OBJECTIVE AREA (FROM 1974/75 TO 1978/79)

	Tarlac	Nasudeco	Pasudeco
Planted Area			
A	-535	-951	-709
B	65,663	86,191	71,155
Production			
A	-2,014	-2,512	-3,462
B	261,584	219,084	328,158
Yield			
A	0.012	-0.039	-0.063
B	3.430	5.000	8.430

Y = AX + B

y = production

X = year (in case of 1974/75, X = 75)

A = annual increasing ratio

Table 3.3.8 NUMBER OF LIVESTOCK AND POULTRY IN THE OBJECTIVE AREA

(Unit: Heads)

Provinces	Carabao	Cow	Pig	Chicken	Duck
Pampanga	30,367	2,218	72,614	322,160	329,246
Tarlac	10,152	1,728	29,651	101,604	23,102
Nueva Ecija	8,696	634	31,512	293,088	79,699
Bulacan	7,050	3,970	158,707	414,418	252,962
Bataan	295	22	1,067	20,460	810
Total	56,560	8,572	293,551	1,151,730	685,819

Table 3.3.9 SUMMARY OF TENURIAL STATUS IN FIVE PROVINCES RELATED TO THE OBJECTIVE AREA (AGRARIAN LAND REFORM PROGRAM)

	Pampanga	Tarlac	N.Ecija	Bulacan	Bataan
1. Lessee					
Number (No)	12,397	16,544	17,390	18,240	4,122
Area (ha)	20,218	20,805	35,680	30,710	6,808
Farm size (ha)	1.63	1.26	2.05	1.68	1.65
2. Amortizing Owner					
Number (No)	15,743	15,927	52,376	10,427	2,228
Area (ha)	29,890	33,033	118,343	16,499	10,869
Farm size (ha)	1.90	2.07	2.26	1.58	4.88
3. Owner Operator					
Number (No)	1,323	8,220	6,490	6,745	1,024
Area (ha)	2,225	14,205	21,312	12,051	4,172
Farm size (ha)	1.68	1.73	3.28	1.79	4.07
4. Total (1+2+3)					
Number (No)	29,463	40,691	76,256	35,412	7,374
Area (ha)	52,333	68,043	175,335	59,260	21,849
Farm size (ha)	1.78	1.67	2.30	1.67	2.96
5. % of Owner Operator to Total Number	4.5	20.2	8.5	19.1	13.9
6. % of Lessee to Total Number	42.1	40.7	22.8	51.5	55.9
7. % of Amortizing Owner to Total Number	53.4	39.1	68.7	29.4	30.2
8. % of Lessee and Amortizing Owner to Total Number	95.5	79.8	91.5	80.9	86.1

Table 3.3.10(1) BALANCE OF SUPPLY AND DEMAND OF RICE IN THE FIVE PROVINCES RELATED TO THE OBJECTIVE AREA (DURING THE PERIOD OF 1970 to 1979)

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1. Production Palay (tons)										
1. Bataan	25,305	32,710	45,160	46,795	52,350	49,195	54,545	49,410	62,350	42,400
2. Bulacan	220,735	231,815	120,055	147,230	232,630	214,205	243,125	278,580	282,220	255,500
3. Nueva Ecija	418,565	425,365	286,710	306,510	421,540	378,285	368,505	358,335	509,320	578,000
4. Pampanga	127,395	127,290	110,090	137,150	180,975	173,090	162,300	168,915	142,680	146,400
5. Tarlac	195,155	178,730	83,650	124,155	166,545	145,070	128,240	134,335	143,285	140,300
Total	987,155	995,910	645,665	761,840	1,054,040	959,845	956,715	989,575	1,139,855	1,162,600
2. Waste & Seeds (tons)1/										
1. Bataan	2,530	3,271	4,516	4,679	5,235	4,919	5,454	4,941	6,235	4,240
2. Bulacan	22,073	23,181	12,005	14,723	23,263	21,420	24,312	27,858	28,222	25,550
3. Nueva Ecija	41,856	42,536	28,671	30,651	42,154	37,828	36,850	35,833	50,932	57,800
4. Pampanga	12,739	12,729	11,009	13,715	18,097	17,309	16,230	16,891	14,268	14,640
5. Tarlac	19,515	17,873	8,365	12,415	16,654	14,507	12,824	13,433	14,328	14,030
Total	98,715	99,591	64,566	76,184	105,404	95,984	95,671	98,957	113,985	116,260
3. Available Palay (tons)										
1. Battan	22,774	29,439	40,644	42,115	47,115	44,275	49,090	44,469	56,115	38,160
2. Bulacan	198,661	208,633	108,049	132,507	209,367	192,784	218,812	250,722	253,998	229,950
3. Nueva Ecija	376,708	382,828	258,039	275,859	379,386	340,456	331,654	322,501	458,388	520,200
4. Pampanga	114,655	114,561	99,081	123,435	162,877	155,781	146,070	152,023	128,412	131,760
5. Tarlac	175,639	160,857	75,285	111,739	149,890	130,563	115,416	120,901	128,956	126,270
Total	888,439	896,319	581,098	685,656	948,636	863,860	861,043	890,617	1,025,869	1,046,340
4. Available Rice (tons)2/										
1. Bataan	14,348	18,547	25,606	26,532	29,682	27,893	30,927	28,015	35,352	24,041
2. Bulacan	125,156	131,439	68,071	83,479	131,901	121,454	137,852	157,955	160,019	144,868
3. Nueva Ecija	237,326	241,182	162,565	173,791	239,013	214,487	208,942	203,176	288,784	327,726
4. Pampanga	72,233	72,173	62,421	77,764	102,613	98,142	92,024	95,174	80,900	83,009
5. Tarlac	110,652	101,340	47,430	70,396	94,431	82,255	72,712	76,168	81,242	79,550
Total	559,717	564,681	366,092	431,963	597,641	544,232	542,457	561,089	646,297	659,194

1/ : 10% of Production of Palay

2/ : 63% Milling Recovery Rate

(to be cont'd)

Table 3.3.10(2) BALANCE OF SUPPLY AND DEMAND OF RICE IN THE FIVE PROVINCES RELATED TO THE OBJECTIVE AREA (DURING THE PERIOD OF 1970 to 1979) (cont'd)

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
5. Population										
1. Bataan	216,210	224,895	233,929	243,326	253,100	263,269	274,081	285,337	297,056	309,256
2. Bulacan	836,431	848,685	861,118	873,733	886,533	1,050,134	1,091,488	1,134,471	1,179,146	1,225,581
3. N. Ecija	851,294	869,810	888,728	908,058	927,808	947,995	971,456	995,497	1,020,134	1,045,380
4. Pampanga	907,275	932,778	958,999	985,956	1,013,671	1,042,164	1,068,169	1,094,823	1,122,142	1,150,143
5. Tarlac	559,708	575,076	590,867	607,091	623,760	640,889	649,682	658,595	667,631	676,791
Total	3,370,918	3,451,550	3,534,111	3,618,647	3,705,205	3,793,846	3,899,808	4,008,729	4,120,693	4,235,784
6. Total Rice Consumption (tons)[3/]										
1. Bataan	25,945	26,987	28,071	29,199	30,372	31,592	32,890	34,240	35,647	37,111
2. Bulacan	100,371	101,842	103,334	104,848	106,384	126,016	130,979	136,137	141,498	147,069
3. N. Ecija	102,155	104,377	106,647	108,967	111,337	113,759	116,575	119,460	122,416	125,446
4. Pampanga	108,873	111,933	115,080	118,315	121,640	125,060	128,180	131,379	134,657	138,017
5. Tarlac	67,165	69,009	70,904	72,851	74,851	76,907	77,962	79,031	80,116	81,215
Total	404,509	414,148	424,036	434,180	444,584	473,334	486,586	500,247	514,334	528,858
7. Marketable Rice Surplus (Balance of supply and demand of rice) Surplus (Deficit)										
1. Bataan	(11,594)	(8,440)	(2,465)	(2,667)	(690)	(3,699)	(1,963)	(6,225)	(295)	(13,070)
2. Bulacan	24,785	29,597	(35,263)	(24,036)	25,517	(4,562)	6,873	21,818	18,521	(2,201)
3. N. Ecija	135,170	136,805	55,918	64,824	127,676	100,728	92,367	83,716	166,368	202,280
4. Pampanga	(36,640)	(39,760)	(52,659)	(40,551)	(18,527)	(26,918)	(36,156)	(36,205)	(53,757)	(55,008)
5. Tarlac	43,487	32,331	(23,474)	(2,455)	19,580	5,348	(5,250)	(2,863)	1,126	(1,665)
Total	155,208	150,533	(57,944)	(2,217)	153,057	70,898	55,871	60,842	131,963	130,336

3/ : Annual per Capita Consumption in 120 kilogram of Rice

Table 3.3.11 INFLOW OF RICE SUPPLY TO METRO MANILA THROUGH THE CHANNEL OF NFA METRO MANILA IN 1979

Source	Rice (Ton)	Percent (%)
Five Provinces		
Nueva Ecija	13,596	15.12
Pampanga	1,101	1.22
Tarlac	5,887	6.54
Sub-total	20,584	22.88
Other Source		
Ilocos Norte	887	0.98
Ilocos Sur	1,020	1.13
La Union	1,414	1.57
Pangasinan	5,417	6.02
Allacapan	425	0.47
Cagayan	11,971	13.31
Isabela	7,394	8.22
Kalinga-Apayao	1,799	2.00
Nueva Vizcaya	2,299	2.55
Quirino	1,546	1.72
Aurora (Sub-province)	579	0.64
Batangas	231	0.25
Laguna	800	0.89
Mindoro Occidental	10,701	12.00
Mindoro Oriental	2,412	2.68
Palawan	195	0.21
Albay	2,483	2.76
Camarines Norte	635	0.70
Camarines Sur	4,056	4.51
Catanduanes	67	0.07
Sorsogon	1,049	1.16
Iloilo	409	0.45
Southern Leyte	258	0.28
Zamboanga Norte	39	0.04
Misamis Occidental	378	0.42
Agusan Norte	1,250	1.39
Misamis Oriental	440	0.49
Davao Norte	205	0.23
Davao Sur	644	0.71
South Cotabato	1,094	1.21
Maguindanao	2,948	3.28
North Cotabato	1,956	2.17
Sultan Kudarat	2,345	2.61
Sub-total	69,346	77.12
Total	89,930	100.00

Table 3.3.12 CROP PRODUCTION INFRASTRUCTURE SUPPORT SERVICES OF THE OBJECTIVE AREA

Province	Fertilizer/ Pesticides Dealers			Rice Mills		Warehouses		Agricultural Machineries		
	No.	Volume Fert.	Stock Pest.	No.	Milling Capacity (Cav./day)	No.	Storage Capacity (Cav.)	Wheel Tractor (No.)	Hand Tractor (No.)	Power Sprayer (No.)
Pampanga	-	-	-	250	42,472	127	1,587,435	212	1,565	1,864
Tarlac	11	3,013.3	-	44	3,212.4	14	18,500	161	38	1,806
Nueva Ecija	31	8,400	-	79	53,941.5	84	34,232	218	1,485	7,946
Bulacan	53	3,617	342	201	29,322.04	241	1,581,988	65	1,221	-
Bataan	2	450	-	3	250	9	159,210	34	9	4
Total (Objective Area)	97	15,480.3	342	577	129,197.94 /1	475	3,381,365 /2	690	4,318	11,620

Source: BAEx

/1: Equivalent to 6,500 tons/day

/2: Equivalent to 169,000 tons

Table 3.3.13 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF RICE

(Unit: ₱/ton)

	1980		1985
	Financial	Economic	Economic
Export price F.O.B. Manila	2,620	2,620	2,970
Cost, loading port	60	50	50
Cost, terminal warehouse	55	45	45
Milling cost	190	155	155
By-product sale	(125)	(100)	(100)
Ex-mill value	2,440	2,470	2,820
Rice equivalent (63%)	1,540	1,560	1,780
Procurement costs	85	70	70
Farm-gate price	1,455	1,490	1,710

Table 3.3.14 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF SUGAR

(Unit: ₱/ton)

	1980		1985
	Financial	Economic	Economic
Export F.O.B. Manila	2,160	2,140	2,334
Cost, loading port	60	50	50
Cost, terminal warehouse	55	45	45
Land and transport ex-mill	75	60	60
Ex-mill value	1,950	1,985	2,175
Milling cost	680	555	555
By-products role	(500)	(410)	(410)
Taxes	40	-	-
Farmgate sugar price	1,730	1,840	2,030
Farmgate sugarcane price	170	180	200

Table 3.3.15 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF FERTILIZER

	Urea			Triple Superphosphate			Muriate of Potash		
	1980		1985	1980		1985	1980		1985
	Financial	Economic	Economic	Financial	Economic	Economic	Financial	Economic	Economic
Import price C&F Manila	1,730	1,730	2,190	2,000	2,000	2,800	1,120	1,120	1,280
Importer Expenses	250	205	205	250	205	205	250	205	205
Import gate cost	1,980	1,935	2,395	2,250	2,205	3,005	1,370	1,325	1,485
Transport to wholesale outlet	90	75	75	90	75	75	90	75	75
Expenses at wholesale outlet	190	155	155	190	155	155	190	155	155
Wholesale cost	2,260	2,165	2,625	2,530	2,435	3,235	1,650	1,555	1,715
Subsidy	470	-	-	590	-	-	30	-	-
Official wholesale price	1,970	2,165	2,626	1,940	2,435	3,235	1,620	1,555	1,715
Transport to retail outlet	70	55	55	70	55	55	70	55	55
Expenses at retail outlet	120	100	100	120	100	100	120	100	100
Sales price to farmer	1,980	2,322	2,780	2,130	2,590	3,390	1,430	1,710	1,870
Nutrient farm-gate price (₱/kg)	4.4	5.2	6.2	4.6	5.6	7.4	2.4	2.9	3.1

Table 3.3.16 M-99 PROGRAM IN THE OBJECTIVE AREA

Objective Area Distributed to Each Province	Phase XIII				
	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Repayment
1. Pampanga	1,445	2,525	3,109,137	2,050,704	66
2. Tarlac	119	1,329	1,403,158	796,825	57
3. N. Ecija	3,206	7,927	10,303,118	6,578,080	67
4. Bulacan	2,364	4,881	3,062,745	2,326,040	76
5. Bataan	6	15	15,868	5,677	36
Total	7,134	16,677	17,894,026	11,757,332	66

	Phase XIV				
	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Repayment
1. Pampanga	854	1,331	1,678,580	927,199	55
2. Tarlac	194	417	675,918	131,796	19
3. N. Ecija	1,652	3,826	4,830,269	2,242,041	46
4. Bulacan	1,754	1,560	4,549,303	1,881,451	41
5. Bataan	-	-	-	-	-
Total	4,754	7,134	11,734,070	5,182,493	44

Source: BAEx

Note: With credit only

Table 3.4.1 SERVICE AREA OF EACH IRRIGATION SYSTEM

(Unit: ha)

Province	National Irrigation System		CIS/1	PIS/2		Private System
	Wet	Dry		Surface	Groundwater	
Tarlac	23,800	4,300	19,985	2,053	3,678	/3
Nueva Ecija	103,900	98,900	25,345	410	3,572	/3
Pampanga	14,870	13,700	13,201	5,172	10,226	8,048
Bataan	950	320	5,401	396	786	/3
Bulacan	32,200	42,200	3,965	3,522	1,069	/3
Total	175,720	159,420	67,897	12,003	19,331	8,048

Source: NIA Central Office, Regional Office and Provincial Office

Remarks: /1 Communal Irrigation System
/2 Pump Irrigation System
/3 No data available

Table 3.4.2 EXISTING NATIONAL IRRIGATION SYSTEMS

System	Province	Water Source	Service Area (ha)	
			Dry Season	Wet Season
Caulaman	Bataan	Caulaman R.	320	950
Porac-Gumain	Pampanga	Porac & Gumain	4,200	5,370
San Miguel-O'Donnell	Tarlac	O'Donnell R.	2,300	9,800
Tarlac	Tarlac	Tarlac R.	2,000	14,000
UPRP/1	Nueva Ecija	Pantabangan Res.; Pampanga, Digmala Coronel & Talavera R.; Vaca and Murcon Cr.	88,900	93,900
Penaranda & Penaranda Ext.	Nueva Ecija Bulacan Pampanga	Pantabangan Res.; and Aurora Diversion; Penaranda, Maliba, San Miguel and Garlang River	29,500	29,500
Angat-Maasin	Bulacan	Angat Res.; Angat and Maasin R.	32,200	32,200
		Total	159,420	185,720

Source: NIA, Central Luzon Report

/1: Upper Pampanga River Project

Tble 3.4.3 LIST OF CIS IN THE OBJECTIVE AREA OF THE SAN ANTONIO RESERVOIR PROJECT

Province Municipality	Name of System	Irrigable Area (ha) Wet Season	Dry Season	Water Source
Pampanga				
1. Arayat	Bitas	265	20	Bitas Creek
2. "	Gatiawin	129	10	Buracan Creek
3. "	Lacmit	405	80	Lacmit Creek
4. "	La Paz Turo	70	70	Sapanga Matua Creek
5. "	Panlinlang	200	40	Bitukang Manok Creek
6. "	San Juan Bono	365	130	Bono Creek
7. "	San Roque Bitas	343	30	San Roque Creek
8. "	Mumang Baca	115	0	Mumang Baca Creek
9. Bacolor	Bacolor	550	250	Cugu Creek
10. "	Macabacle	86	0	Potrero Creek
11. "	Sta. Barbara	167	0	Potrero Creek
12. Candaba	Barangca	455	0	San Miguel R.
13. Guagua	San Juan Nepo	50	0	Betis Creek
14. Macabebe	Batasan	100	0	Pampanga River
15. "	Casturi	250	0	Saplad River
16. "	San Gabriel	194	0	Danga River
17. "	San Jose	250	0	Samankal Creek
18. "	San Juan	190	0	Danga River
19. "	San Rafael	200	0	Ara River
20. "	San Roque	134	0	Danga River
21. "	Sta. Maria	250	0	Samangkai Creek
22. "	Sapa Libutad	180	0	Sapa Libutad Creek
23. "	Saplad David	350	0	Saplad River
24. "	Tacasan	171	0	Tacasan Creek
25. "	Telacsan	180	0	Telacsan Creek
26. Magalang	La Paz	200	60	Quitanpil River
27. "	San Agustin	60	0	Salibasac Creek
28. "	Sta. Cruz	300	80	Malou Creek
29. "	San Pedro	80	0	Quitangil River
30. "	San Roque Balan	150	0	Malou Creek
31. "	San Vicente	275	0	Sn. Vicente Creek
32. Masantol	Malauli	200	0	Pampanga River
33. "	Nigui	200	0	Pampanga River
34. "	Sagrada	220	0	Pampanga River
35. Mexico	Abacan	90	40	Abacan River
36. "	Bungang Guinto	255	0	Betio River
37. "	Mexico	130	0	Sn. Patricio Creek
38. "	San Jose Malino	132	0	Abacan Creek
39. "	Anao	120	0	Anao Creek
40. Minalin	Dauwe	150	0	Dauwe River
41. "	Maningo	200	0	Maningo Creek
42. "	St. Domingo	120	0	Tizman Creek
43. "	San Isidro	140	0	Batasan Creek
44. Sta. Ana	San Isidro	60	0	Muman Baka Creek
45. "	San Pablo	200	0	Misanga River
46. "	San Roque	415	100	Darabulbul Creek
47. Sta. Rita	Dampol	96	0	Dampol Creek
48. "	Dila-Dila	38	15	Jogu Creek
49. "	Paligue Libutad	93	20	Sapa Libutad
50. "	Magsaysay	228	90	Sapang Matua Creek
	Sub-total	9,801	1,035 (10.6%)	
Tarlac				
1. Bamban	Bamban	700	700	Parua River
2. Conception	Lilibangan	162	140	Parua River
3. "	Magao	500	300	Balico Creek
4. "	San Bartolome	180	38	Sapang Balen Creek
5. "	San Isidro	91	40	Balandanum Creek
6. "	Sta. Rita	180	80	Cuartel Creek
7. "	Talimundoc, Panalicsican	No Data	0	Papaya Creek
8. "	San Martin	200	125	Parua River
9. "	Baluto	320	150	Parua River
	Sub-total	2,333	1,573 (67.4%)	
	Total	12,134	2,608 (21.5%)	

Source: NIA Regional Office

Table 3.4.4 PUMP IRRIGATION SYSTEM IN PAMPANGA PROVINCE SURFACE WATER PUMP

Municipality	No. of Pumps with Different Diameters (inches)											Area (ha)
	(4")	(5")	(6")	(8")	(10")	(12")	(16")	(20")	(36")	(42")	Total	
1. Apalit*	3	1	21	7	-	1	10	-	-	-	43	546.6
2. Arayat*	7	7	13	3	2	-	4	4	-	-	40	456.5
3. Bacolor*	-	-	11	-	1	-	-	-	-	-	12	105.0
4. Candaba*	4	10	14	5	1	-	2	-	-	1	37	575.0
5. Floridablanca	-	1	2	-	-	-	-	-	-	-	3	13.5
6. Guagua*	-	2	2	1	-	-	-	-	-	-	5	48.0
7. Lubao*	1	-	2	1	-	-	-	-	-	-	4	45.5
8. Mabalacat	1	2	-	-	-	-	-	-	-	-	3	16.5
9. Macabebe*	1	-	14	14	3	-	7	1	1	1	42	765.5
10. Magalang*	2	4	9	3	-	-	-	-	-	-	18	130.5
11. Masantol*	2	1	1	7	-	-	1	-	-	-	12	127.5
12. Mexico*	11	6	12	7	4	4	2	-	-	-	46	525.5
13. Minalin*	1	-	3	1	1	-	5	-	-	-	11	267.0
14. San Fernando*	-	-	3	3	-	-	1	-	-	-	7	94.0
15. Porac	1	1	-	-	-	-	-	-	-	-	2	8.0
16. San Simon*	9	-	-	-	3	-	2	-	-	-	14	246.0
17. Santa Ana*	5	5	1	3	-	-	-	-	-	-	14	88.0
18. Santa Rita*	5	1	1	-	-	-	-	-	-	-	7	41.5
19. Santo Tomas*	-	1	1	-	-	-	3	-	-	-	5	174.0
20. Sexmoan*	-	-	-	1	-	-	-	-	-	-	1	9.5
21. San Luis*	6	5	15	8	-	-	3	4	-	1	42	888.5
Total	59	47	125	64	15	5	40	9	1	3	368	5,172.1
Irrigable Area	58	45	123	64	15	5	40	9	1	3	363	5,150.6

Source: NIA Provincial Office

* Municipality included in the Irrigable Area of San Antonio Reservoir Project

Table 3.4.5 PUMP IRRIGATION SYSTEM IN PAMPANGA PROVINCE GROUNDWATER PUMP

Municipality	No. of Pumps with Different Diameters (inches)								Area (ha)
	(4")	(5")	(6")	(8")	(10")	(12")	(16")	Total	
1. Angeles City	4	-	-	-	-	-	-	4	17.8
2. Apalit*	17	4	2	-	-	-	-	23	108.4
3. Arayat*	49	46	1	-	-	-	-	96	513.3
4. Bacolor*	181	81	12	-	-	-	-	274	1,199.5
5. Candaba*	47	29	27	1	-	-	-	104	832.6
6. Floridablanca	166	17	4	-	-	-	-	189	774.0
7. Guagua*	231	21	7	-	-	-	-	259	923.5
8. Lubao*	43	10	5	-	-	-	-	58	227.1
9. Mabalacat	2	-	1	-	-	-	-	3	14.5
10. Macabebe*	11	7	8	-	-	-	-	26	142.0
11. Magalang*	22	5	10	-	-	-	-	37	497.4
12. Masantol*	2	1	-	-	-	-	-	3	20.8
13. Mexico*	171	55	36	-	-	-	-	262	1,167.9
14. Minalin*	15	4	1	-	-	-	-	20	135.5
15. Porac	146	17	7	-	-	-	-	170	616.7
16. San Fernando*	32	6	18	1	-	-	-	57	359.2
17. San Simon*	26	8	21	3	-	-	-	58	380.5
18. Sta. Ana*	41	17	15	-	-	-	1	74	394.0
19. Sexmoan*	3	-	-	-	-	-	-	3	9.5
20. San Luis*	25	11	5	-	-	-	-	41	222.3
21. Sto. Tomas*	12	8	3	-	-	-	-	23	144.0
22. Sta. Rita*	291	36	23	-	-	-	-	350	1,525.6
Total	1,537	383	206	5	-	-	1	2,132	10,226.1
Irrigable Area	1,219	349	194	5	-	-	1	1,768	8,803.1

Source: NIA Provincial Office

* Municipality comprising the Irrigable Area of San Antonio Reservoir Project

Table 3.4.6 PUMP IRRIGATION SYSTEM IN TARLAC PROVINCE OF SAN ANTONIO PROJECT

Municipality	No. of Pumps with Different Diameters (inches)								Area (ha)
	(4")	(5")	(6")	(8")	(10")	(12")	(16")	Total	
Surface Water Pump									
Concepcion	4	1	10	2	-	-	-	17	505.0
La Paz	-	1	2	-	-	-	-	3	20.5
Total	4	2	12	2	-	-	-	20	525.5
Groundwater Pump									
Concepcion	104	30	1	-	-	-	-	135	768.4
La Paz	135	7	-	-	-	-	-	142	600.5
Total	239	37	1	-	-	-	-	277	1,368.9

Source: NIA Central Office

Table 3.4.7 IRRIGATION FEE OF NATIONAL IRRIGATION SYSTEM

System	Gravity		Pump	
	Wet Season	Dry Season	Wet Season	Dry Season
1. Angat - Maasim RIS	2 cav/ha 130.00 ₱/ha	3 cav/ha 195.00 ₱/ha	3 cav/ha 195.00 ₱/ha	5 cav/ha 325.00 ₱/ha
2. Porac - Gumain RIS	- do -	- do -	- none -	
3. Caulaman RIS	- do -	- do -	- none -	
4. UPRIS - Districts I - IV/1	2.5 cav/ha 162.50 ₱/ha	3.5 cav/ha 227.50 ₱/ha	- none -	
5. Smoris/2	2 cav/ha 130.00 ₱/ha	3 cav/ha 195.00 ₱/ha	- none -	
6. Tarlac RIS	2 cav/ha 130.00 ₱/ha	3 cav/ha 195.00 ₱/ha	- none -	

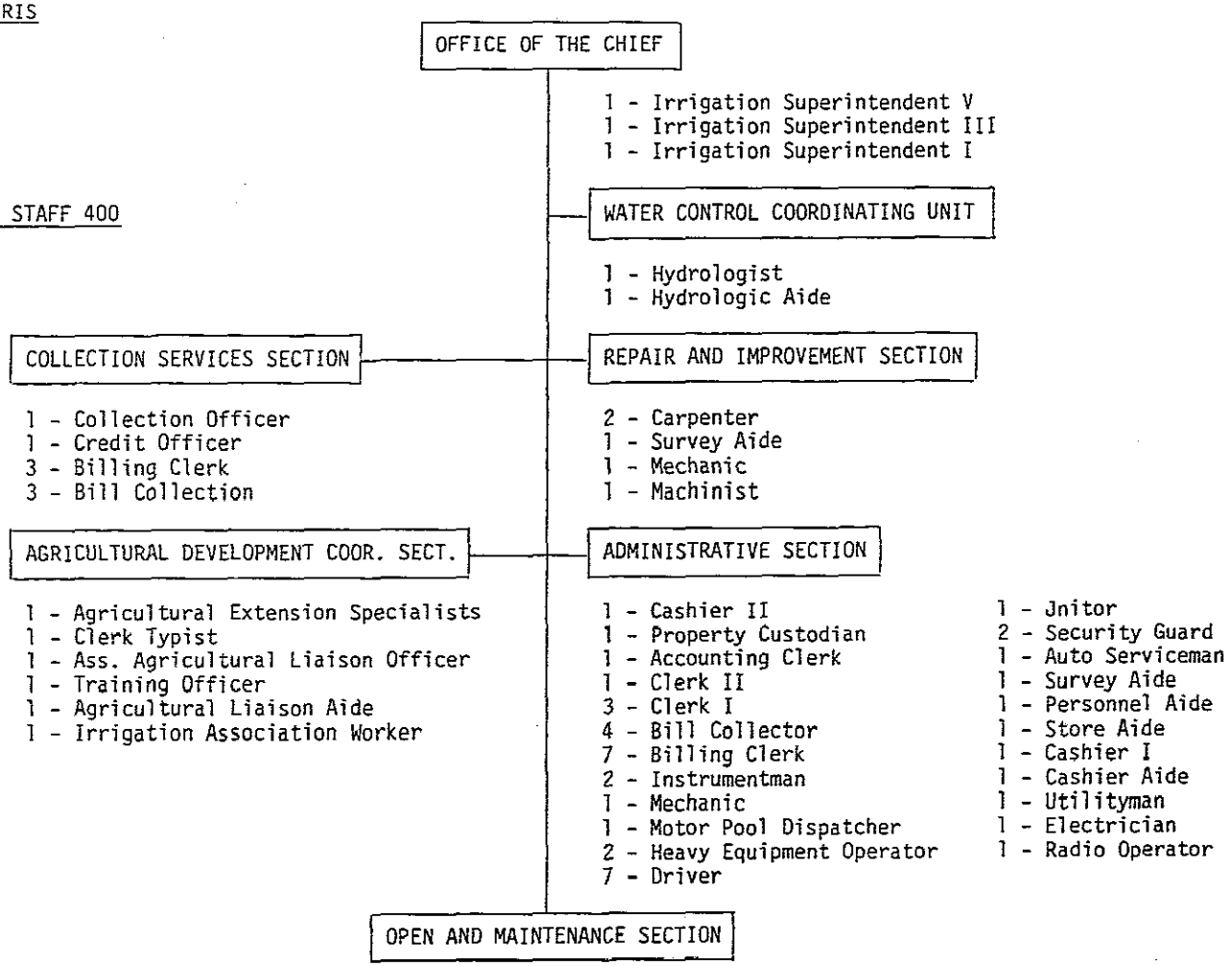
Remarks: /1 District IV is Penaranda RIS

/2 San Miguel O'Donnell River Irrigation System

Table 3.4.8 TYPICAL ORGANIZATION CHART OF NATIONAL IRRIGATION ADMINISTRATION

·ANGAT - MAASIN RIS

·NO OF PERMANENT STAFF 400



Source: NIA System Management Dept.

Table 3.4.9 PERMANENT STAFF ON NATIONAL IRRIGATION SYSTEM

Name of System	Max. Service Area (ha) (1)	No. of P.Staff Tech. Staff (2)	No. of P.Staff Total (3)	(1)/(2)	(1)/(3)
Caulaman	950	25	35	38	27
Porac - Gumain	5,370	47	58	114	93
TISIP (Tarlac RIS and San Miguel O'Donnell RIS)	23,800	140	161	170	148
UPRP	93,900	1,088	1,144	86	82
Penaranda & Penaranda Ext.	29,500	288	307	102	96
AMRIS	32,200	343	400	94	81

Source: NIA System Management Dept.

Table 3.4.10 PROPOSED NATIONAL IRRIGATION PROJECTS IN PAMPANGA RIVER BASIN

Project	Sources of Water Supply	Irrig. Service Area (ha)	Ave. Annual Irrig. Requirement (MCM)	
			Total	Demand on Reservoir
Project with Reservoir				
Gumain	Gumain Res., Gumain & Caulaman R.	16,200	271.3	239.2
Tibu	Tibu Res.	4,500	73.1	73.1
Marimla	Marimla Res.	11,600	183.7	176.1
Balog-Balog	Balog-Balog Res.	46,900	823.4	786.6
Maringalo	Maringalo Res., & Talavera R.	13,400	251.5	241.8
Pantabangan	Katgipsipan Res.	66,000	1,336.2	1,281.3
Kalaanan	Kalaanan Res., & Digmala R.	6,700	129.7	118.6
Lubingan	Coronel R.	10,000	94.0	228.5
Lower Cabu	Lower Cabu Res.	3,000	58.1	58.4
Papaya	Papaya Res., & Chico R.	9,800	189.8	185.7
Balintingon	Balintingon Res., & Sumacbao R.	35,620	617.0	504.9
Salapangan	Salapangan Res.	2,500	43.3	42.1
Maasin	Maasin Res.	2,100	36.4	36.0
Carlang	Carlang Res.	1,600	27.7	27.4
Bayabas	Bayabas Res.	3,900	67.9	67.2
	Sub-total	234,420	4,703.4	-
Project without Reservoir				
SW. Groundwater	96 Groundwater Well	3,800	60.2	-
Pampanga Pump	Pampanga R. & Irrigation Return Flow	9,700	137.1	-
W. Groundwater	160 Groundwater Well	9,700	137.1	-
	Sub-total	51,700	938.3	-
	Total	286,120	5,641.7	

Source: Irrigation Development Study for Central Luzon, NIA

Table 3.4.11 PROPOSED CIS PROJECTS IN THE SERVICE AREA OF THE SAN ANTONIO RESERVOIR PROJECT

Province & Municipality	Name of System	Irrigable Area	Water Source	Proposed Year
Nueva Ecija				
1. Aliaga	Pantoc	1,100	Himukay Creek	-
2. Zaragosa	Sta. Lucia	615	Himukay Creek	-
3. "	Gapumaca	1,000	Himukay Creek	-
4. "	Burnae	1,800	Cabaste/Magating	-
5. Licab	Caber	800	Himukay Creek	-
Sub-total		5,316		
Pampanga				
1. San Fernando	Cutcut	135	Syquaco Creek	1980
2. "	Telabastangan	141	Balimbing Creek	1980
3. Mexico	Betis	431	Betis River	1980
4. Divisoria	Mexico	204	Quinata Creek	1980
5. Arayat & Mexico	Pandacaqui	200	Pandacaqui	1981
6. Arayat	Buenavista	100	- No data -	1981
7. Bacolor	Concepcion	300	Gugu Creek	1982
8. Mexico	Laput-Concepcion	295	Laput Creek	1982
9. Bacolor	Pasig Potrero	200	Potrero River	1983
10. Mexico	San Miguel	200	Lagundi Creek	1983
11. Magalang	PAC Project	75	- No data -	1984
12. Mexico	Capaya	170	Laput Creek	1984
13. "	Saclaban	120	Abacan Creek	1984
14. "	Nueva Victoria	100	Nueva Victoria Creek	1985
15. "	Dalisdis	250	Abacan Creek	1985
16. Bacolor & Sta. Rita	Lazamana	120	Libutad Creek	1985
17. Apalit	Colgante	250	Telasiko	-
18. Arayat	Banga	115	Banga Creek	-
19. "	Dalayap	600	Spring	-
20. Lubao	Palitic	85	Palitic Creek	-
21. "	Saba	70	Prado Creek	-
22. Masantol	Bagang	100	Pampanga River	-
23. Minalin	San Isidro	90	San Isidro Creek	-
Sub-total		4,351		
Tarlac				
1. Concepcion	San Martin	200	Parua River	1980
2. "	Baluto	320	Parua River	1980
Sub-total		520		
Total		10,186		

Source: NIA Regional Office

Table 3.5.1 DISTANCE FROM THE RIVER MOUTH

Location	Distance (km)
River Moutn	0
Bifurcation of Bebe Sn. Esteban C.O.C.	18
Bifurcation of Hagonoy River	21
Sulipan Bridge	26
Apalit	27
North Manila Expressway Br.	30
San Simon	36
San Luis	42
Candaba	50
Arayat Bridge	61
Confluence of Pampanga and Rio Chico Rivers	66
Candabacabiao Floodway	71
San Isidro Bridge	86
Cabanatuan	140
Zaragoza (Rio Chico River)	101

Note: The distance is measured along the center line of low water channel, on the map of a scale of 1:50,000.

Table 3.5.2 ELEVATION-AREA, CAPACITY RELATIONS OF CANDABA SWAMP

EL. (m)	North Swamp A (km^2)	North Swamp V ($10^6 m^3$)	South Swamp A (km^2)	South Swamp V ($10^6 m^3$)	Ring Levee A (km^2)	Ring Levee V ($10^6 m^3$)	Total A (km^2)	Total V ($10^6 m^3$)
0			0	0			0	0
1			1.4	0.7			1.4	0.7
2	0	0	13.3	8.1			8.3	16.4
3	5.8	2.9	50.0	39.8			55.8	42.7
4	41.2	26.3	79.3	104.5	0	0	120.5	130.8
5	72.0	82.9	106.3	197.3	2.5	1.3	180.8	281.5
6	146.6	192.2	122.5	311.7	16.8	11.0	285.9	514.9
7	179.3	355.1	141.3	443.6	27.3	33.1	347.9	831.8
8	211.5	550.5	161.3	594.9	34.0	63.8	406.8	1,209.2
9	245.3	778.9	182.8	767.0	38.3	100.0	466.4	1,645.9
10	286.8	1,045.0	198.8	967.8	40.5	139.4	526.1	2,142.2

Remarks: Area and Capacity are obtained from the contour map which was made on the basis of S = 1/5,000 topographic maps and S = 1/25,000 contour map made by NIA and the check survey in the North Candaba Swamp by JICA.

Table 3.5.3 ELEVATION-AREA, CAPACITY RELATIONS OF SAN ANTONIO SWAMP

EL. (m)	A (km^2)	V ($10^6 m^3$)
7	0	0
8	17.20	8.60
9	40.93	37.67
10	85.71	100.99
11	130.90	209.30
12	178.46	363.98
13	223.89	560.16
14	265.24	799.73

Remarks: Area and Capacity are obtained from the contour map which was drawn based on S = 1/5,000 topographic maps surveyed by NIA and the results of the check survey by JICA.

Table 3.5.4 FLOOD CONTROL EFFECT BY SAN ANTONIO SWAMP UNDER EXISTING CONDITION

Flood	Max. Inflow			Max. Outflow			San Antonio S.		Reduction	
	I_{PM} (m^3/s)	I_{RC} (m^3/s)	I_{Total} (m^3/s)	Q_{AY} (m^3/s)	Q_{CC} (m^3/s)	Q_{Total} (m^3/s)	H_{max} (EL.m)	V_{max}/1 ($10^6 m^3$)	Peak (m^3/s)	Ratio/2 (%)
Past Floods										
Oct. 1973	3,206	1,973	5,179	2,420	1,312	3,732	11.18	287	1,447	28
Aug. 1974	3,177	2,261	5,438	2,500	1,365	3,865	11.35	316	1,573	29
May 1976	3,512	2,099	5,611	2,783	1,838	4,621	11.96	418	990	18
Probable Flood										
100-year Flood	4,895	4,368	9,263	3,734	4,159	7,893	13.75	824	1,370	15

Remarks: I_{PM} : Inflow to the San Antonio Swamp from the Pampanga River
I_{RC} : Inflow to the San Antonio Swamp from the Rio Chico River
Q_{AY} : Discharge flowing out through Arayat
Q_{CC} : Discharge flowing out through the Cabiao-Candaba Floodway
/1 : Volume controlled by the San Antonio Swamp
/2 : Reduction ratio of peak discharge;

$$\text{Ratio} = (I_{Total} - Q_{Total}/I_{Total}) \times 100$$

Table 3.5.5 CARRYING CAPACITY OF RIVER CHANNEL UNDER EXISTING CONDITION

(Unit: m^3/s)

	River	Stretch	Carrying Capacity (Bankful)
1.	Pampanga River	River mouth - Masantol	500
		Masantol - Sulipan	2,200
		Sulipan - Candaba	1,800
		Candaba - Arayat	2,500
		Arayat - Cabiao	2,000
		Cabiao - San Isidro	2,500
2.	Bebe San Esteban Channel	River mouth - Masantol	1,700
3.	Hagonoy River	Hagonoy - Diversion Point	70
4.	Labangan Floodway	River mouth - Calumpit	700
5.	Angat River	Calumpit - Expressway Br.	900
6.	Maasim River	Confluence to Pampanga R. - Bahay Pare	100
7.	Candabacabiao Floodway	Candaba Swamp - Diversion Point	4,000
8.	San Fernando River	Sexmoan - San Fernando	200
		San Fernando - Mexico	50

Table 3.5.6 100 YEAR FLOOD DISCHARGE OF PRINCIPAL RIVERS IN PAMPANGA DELTA AREA AS ESTIMATED BY MPW

Stream	Location	100 Year Design Flood Discharge (m^3/sec)
Upper Pampanga River /1	Arayat, Pampanga	9,100
Candaba Swamp Outlet	Calumpit, Bulacan	1,970
Angat River	Calumpit, Bulacan	1,090
Pampanga River	Calumpit, Bulacan	7,060
Labangan River	Calumpit, Bulacan	3,060
San Miguel Sulipan Floodway	Apalit, Pampanga	3,700
Bebe-San Esteban Floodway	Masantol, Pampanga	3,500

Source: Bureau of Public Works, Report on the Proposed Reclamation of the Candaba and San Antonio Swamp, Vol. II (Manila: Bureau of Public Works, 1962)

Remarks: /1: including Rio Chico River Watershed.

Table 3.5.7 STATUS OF IMPLEMENTATION OF MPW FLOOD CONTROL SCHEME BY THE END OF 1979 (APPROXIMATE ESTIMATE IN PERCENTAGE OF TOTAL AMOUNT OF WORK)

Name of Works	Completion Percentage (%)	Completion Year
Arayat-Apalit-Masantol Setback Levee	100	1975
Calumpit-Plaridel-Bustos Levee	100	1975
Bebe-San Esteban Channel, Dikes, Floodgates	100	1975
Arayat-Cabiao Ring Levee (including improvement)	80	-
Cabiao-Candaba North Dikes	100	1977
Cabiao-San Isidro Levee	100	1975
Luyos-Bagong Sikat Cutoff Channel	100	1975
San Antonio-Cabanatuan Levee	0	-
Rio Chico River Control System	20	-
Quitangil River Control	15	-
Parua Floodgate	100	1979
Pasig-Potrero River Control	75	-
Gumain-Porac Diversion Channel	86	-
Sapang Maragul Floodgate	100	1979
Labangan Floodway	50	-
Abacan River Control	20	-

Table 3.5.8 PROBABLE FLOOD DISCHARGE OF MAIN STATION IN PAMPANGA RIVER BASIN AS ESTIMATED BY TEAM

River	Station	Catchment Area (Km^2)	Discharge (m^3/s)					Remarks
			5-yr	10-yr	20-yr	50-yr	100-yr	
Pampanga Main Stream	Cabanatuan	2,482	1,977	2,365	2,725	3,205	3,572	
	San Isidro	3,472	2,408	3,051	3,641	4,315	4,857	
	Cabiao	3,512	2,424	3,071	3,668	4,349	4,895	
	Arayat	6,532	2,349	2,731	3,068	3,451	3,734	After control by Swamp
	Sulipan	8,907	2,654	3,517	4,779	6,111	7,039	- do -
Rio Chico	Zaragoza	1,675	1,061	1,497	1,883	2,422	2,840	
	Inflow to San Antonio Swamp	3,020	1,508	2,212	2,853	3,721	4,368	Before control by Swamp
Peñaranda	Confluence to Main Stream	601	529	732	864	1,046	1,192	
Angat	Longos	895	737	1,015	1,367	2,050	2,429	
Gua-Gua	San Fernando	445	272	353	423	566	682	
	Rivermouth	945	326	470	573	774	1,004	

Table 3.5.9 INUNDATED AREA FOR THE PAST MAJOR FLOODS

Flood	Flooded Area (Km^2)			
	San Antonio Swamp & Surrounding Area	Candaba Swamp & Surrounding Area	Delta Area	Total
Aug. 1960	392	368	600	1,360
May 1966	220	196	340	756
July/Aug. 1972	428	396	504	1,328
May 1976	496	488	464	1,448

Table 3.5.10(1) FLOOD DAMAGES OF AUGUST 1960

Item	Estimated Damage (₱10³) Pampanga River Proper	Rio Chico River Proper	Total	Percentage (%)
Direct Losses				
1. Commercial, Residential, Agricultural Buildings, Equipment, etc.	611	306	917	5
2. Non-seasonal Crops	697	167	864	5
3. Livestocks	600	208	808	4
4. Fishing Industry	1,619	-	1,619	9
5. Roads, Bridges, Culvert, etc.	982	218	1,200	7
6. Seasonal Crops				
Relay	7,063	4,440	11,503	
Sugarcane	146	13	159	
Sub-total	7,209	4,453	11,662	65
7. Total	11,718	5,352	17,070	
Indirect Losses	541	356	897	5
Grand Total	12,259	5,708	17,967	100

Data Source: Report on "The Pampanga River Flood of August 1960" by MPW

Table 3.5.10(2) FLOOD DAMAGES OF MAY 1976

For the three provinces that mainly comprise the basin alone damages amounting to more than sixty (60) million pesos were recorded. The total damages and casualties caused by the typhoon and floods to all affected provinces are listed below.

A. Damages

1.	Public Properties	₱443,197.000
2.	Private Properties including Agricultural crops	₱169,000.000
3.	Houses totally destroyed	3,792 units
4.	Houses partially destroyed	4,992 units
5.	Infrastructure Project	10 dikes, 20 bridges destroyed
6.	2 light planes missing and ships washed ashore off North Harbor and Roxas Boulevard.	
7.	5 ships aground off the east coast of Mindanao.	

B. Casualties

1. Death - 200 persons, 10 died by drowning and 4 died by electrocution in Metro Manila.
2. Missing - 147 persons.
3. Injured - 20 persons, thousands of commuter strended, several vehicles under water at Lagusnilad in Metro Manila. About 537,385 families comprising of an estimated 3,253,020 persons affected.

Data Source: "Hydrological Data Summary of the May 1976 Flood in the Pampanga River Basin" Sept. 1978 PAGASA.

Table 3.5.10(3) FLOOD DAMAGES IN 1978
(PAMPANGA PROVINCE)

(Unit: ₱10³)

Flood	Estimated Damage				
	Crops/ Livestocks	Private Properties	Public Works	Roads/ Bridges	Total
Apr. (Typhoon ATANG)	11,976	9,610	15,956	*/1	
Aug. (Typhoon HELING)	2,191	3,110	1,750	1,345	8,396
Oct. (Tropical Storm YANING & MIDING)	3,089	2,463	2,560	6,055	14,167
Nov. (Typhoon KADING)	869/2	7,561	12,043	20,209	
Average	5,752	5,686	8,077	9,203	28,718
Percentage (%)	20	20	28	32	100

Data Source: Office of Civil Defense, MND

/1 : Data not available

/2 : Excluding damages to crops

Table 3.6.1 RICE-FISH CULTURE - RICE AND FISH YIELDS IN TRIALS CONDUCTED (1978)

REGION/PROVINCE	SPECIES USED	YIELD OF FISH (Kgs.)	% RECO-VERY	CUL-TURE DAYS	YIELD OF RICE/HA (150 kgs. = 1 cav.) Rice With Fish	Rice w/o Fish
I. PANGASINAN	Tilapia nilotica	128	73	90	117	187
II. N. VIZCAYA	Tilapia nilotica	104	74	116	85	91
N. VIZCAYA	Tilapia nilotica	75	76	118	77	84
III. PAMPANGA	Tilapia nilotica	590	98	100	100	108
PAMPANGA	Tilapia nilotica	310	95	66	95	96
IV. BATANGAS	Tilapia nilotica	164	71	65	98	104
V. SORSOGON	Tilapia mossambica	188	85	115	88	31.2/*
CAMARINES SUR	Tilapia mossambica	238	95	98	115	114
VI. ILOILO	Tilapia mossambica	141	77	87	122	121
ILOILO	Tilapia mossambica	143	83	77	126	119
ILOILO	Tilapia mossambica	184	87	80	116	121
VII. NEGROS OCC.	Tilapia nilotica	113	51	72	141	145
NEGROS OCC.	Tilapia nilotica	183	73	71	115	124
VIII. LEYTE	Common carp	299	73	104	95	106
IX. ZAMBOANGA	Tilapia nilotica	295	76	75	112	107
X. BUKIDNON	Common carp	114	43	70	103	101
BUKIDNON	Tilapia mossambica	103	81	65	83	85
BUKIDNON	Tilapia nilotica	156	57	78	103	101
XI. DAVAO NORTE	Tilapia mossambica	138	91	90	100	106
DAVAO DEL SUR	Common carp	343	98	100	218	237
AVERAGE YIELD/ HA		201	78	87	113	119

Note: /* Result of this particular trial was not included in the computation

Table 3.6.2 FISH PRODUCTION RECORD- MARATAF PROJECT AREA
CY 1976-1977

LOCATION	GREEN REVOLUTION PROJECT (BACKYARD FISHPOND)						
	NUMBER OF COOPERATOR	AREA (m^3)	SPECIE STOCKED (Pcs.)	NUMBER OF STOCK (Kg.)	PRODUC-TION (Kg.)	PRODUC-TION (Kg/ha)	VALUE (₱)
A. MAGALANG							
I. SEEDED FISHPOND							
1. San Agustin	1	1,300	TILAPIA	1,500	135	1,040	405
2. Sto. Rosario	4	1,390	TILAPIA-CARP	2,000	180	1,290	543
3. Ayala	1	408	TILAPIA	500	45	1,130	135
4. San Jose	1	500	TILAPIA	500	45	900	133
5. San Antonio	11	500	TILAPIA	500	45	900	135
6. San Francisco	1	500	TILAPIA	500	45	900	135
7. Sta. Cruz	1	500	TILAPIA	300	27	540	0
8. San Vicente	1	300	CARP	500	45	1,500	135
B. ARAYAT							
1. Candating	1	350	CARP	300	27	770	21
2. Panlinlang	1	1,000	CARP	500	45	450	135
3. Lacmit	1	300	TILAPIA	500	45	1,500	135
4. Plazang Luma	1	5,000	TILAPIA	1,200	108	260	324
5. Cacutud	1	430	TILAPIA	500	45	1,050	135
6. San Mateo	1	29,000	TILAPIA	1,000	90	30	270
7. Bitas	1	500	TILAPIA	500	45	900	135
SUB-TOTAL	20	41,970		10,800	972	232	2,916

Table 3.6.3 ANNUAL BUDGET OF OPERATING ONE HECTARE OF FISHPOND/1

Item	Unit	Lower Delta			Upper Delta		
		Quantity	Price (₱)	Total (₱)	Quantity	Price (₱)	Total (₱)
Gross value of fish output	kg	1,050	4.9	5,145	750	4.9	3,675
Costs							
Fingerlings	1	3,500	0.25	875	2,500	0.25	650
Labor	man-day	25	12	300	22	10	220
Fertilizer (NPK)	kg	400	2	800	300	2	600
Manure	ton	2.5	300	750	2	300	600
Pesticides	kg	60	1.7	102	30	1.7	51
Rice bran	kg	600	0.8	480	300	0.8	240
Equipment		1	150	150	1	100	100
Lease		1	1,200	1,200	1	850	850
Total costs				4,657			3,311
Net Value				488			364

/1 1975 market prices as paid and received by the producer.on the basis ofthe Socio-Economic Profile of Bulacan Province in 1974.

Table 3.6.4 FISH PRODUCTION BY SECTOR 1978

(Unit: Metric tons, (%))

Area Sector	Commercial Fishing	Municipal Fishing	Fishpond	Total
Philippines	505.8 (36.1)	775.9 (55.4)	118.7 (8.5)	1,400.4 (100)
Objective Area	1.47 (4.6)	5.03 (15.7)	25.59 (79.7)	32.09 (100)
Bulacan & Pampanga	0.41 (1.6)	2.03 (7.9)	23.26 (90.5)	25.70 (100)
	1.06 (16.6)	3.00 (46.9)	2.33 (36.5)	6.39 (100)

Source: Fisheries Statistics of the Philippines, 1978

Table 3.6.5 FARM MANAGEMENT AND PRODUCTIVITY OF BRACKISH FISHPOND[/1]

Item	Pond Scale	0.5 ha		2 ha		5 ha		10.7 ha		20 ha		30 ha		40 ha	
		Unit	₱/Yr	Unit	₱/Yr	Unit	₱/Yr	Unit	₱/Yr	Unit	₱/Yr	Unit	₱/Yr	Unit	₱/Yr
1. Main Species		bangus	-	bangus	-	bangus	-	bangus	-	bangus	-	bangus	-	bangus	-
2. Harvest	(Times/Yr)	2.3	-	2.8	-	2.3	-	2.8	-	4.0	-	3.3	-	3.5	-
3. Operation Expense															
1) Labor: * Managerial	(Persons/Pond)	1	0	1	0	0.33	0	0.5	0	0.5	-	0	0	0	0
* Caretaker	(Persons/Pond)	0	0	1	1,342	1	3,805	2.7	5,782	2	3,910	2	19,264	3	43,108
* Pond Worker for															
- Maintenance	(Man-day/Yr)	96	507	231	2,207	189	1,365	233	2,326	340	2,720	450	5,400	457	3,459
- Harvest	(Man-day/Yr)	9	75	29	364	33	273	62	670	98	640	120	1,080	138	1,108
2) Preparation & Maintenance															
* Repair		-	150												
* Earthwork		-	150		556		1,333		1,035		3,500		1,500		1,958
3) Farm Input															
* Fry	(Pc/ha/harvest)	0	0	0	0	0	0	0	0	0	0	3,000	18,150	4,640	17,000
* Fingerling	(Pc/ha/harvest)	1,333	607	1,143	2,067	1,920	4,917	1,472	11,525	2,000	43,200	1,333	13,600	577	8,775
* Other Types	(Pc/ha/harvest)	0	0	1,000	113	200	17	0	0	0	0	0	0	125	125
* Fertilizer															
- Organic	(Sacks/ha/Yr)	0	0	30	77	0.33	533	-	2,833	-	600	-	12,000	-	3,668
- Inorganic	(Sacks/ha/Yr)	0	0	22	594	5.7	728	-	1,448	-	1,620	-	9,720	-	5,953
* Feed	(Cavans/ha/Yr)	0	0	5	410	-	1,000	-	201	0	0	0	0	-	2,217
* Pesticide	(Sacks/ha/Yr)	0	0	-	21	-	295	-	724	-	660	-	120	-	3,009
4) Other Expenses															
* Transportation	(₱/harvest)	15	35	44	124	65	152	207	552	360	1,441	150	600	191	621
* Lease	(₱/ha/Yr)	1,000	333	1,000	666	1,333	3,333	1,333	7,667	-	-	-	-	2,000	22,500
* Consignee	(%/gross sales)	-	-	3-4	247	4-5	922	4-5	594	-	-	4	4,800	4-5	28,923
5) Total of Op. Expenses	(₱/Yr)		- 1,857		- 8,788		- 18,673		- 35,257		- 58,291		- 80,234		- 142,424
6) Operation Income															
* Bangus	(Kg/ha/Yr)	1,578	-	1,813	-	1,202	-	1,323	-	1,800	-	1,333	-	1,981	-
	(₱/pcs)	1.1	2,527	1.2	10,567	1.1	19,580	1.0	37,667	1.0	144,000	1.0	120,000	1.0	218,250
* Other Fish		-	457	-	1,767	-	1,291	-	1,483	-	-	-	-	-	3,500
* Other Farm Incomes		-	167	-	0	-	167	-	-	-	-	-	-	-	-
7) Total of Op. Income			- 3,151		- 12,834		- 21,038		- 39,150		- 144,000		- 120,000		- 221,750
8) Net Income (7-5)	(₱/Yr)		- 1,294		- 4,046		- 2,365		- 3,793		- 85,709		- 39,744		- 79,326
	(₱/ha/Yr)		- 2,588		- 2,023		- 473		- 354		- 4,285		- 1,326		- 1,983

Remark /1: Based on the Farm Management interview survey in Bulacan fishpond area, done by BFAR, Pampanga in 1973.

Table 4.1.1 CHARACTERISTICS OF EXISTING AND PROJECTED RESERVOIRS IN THE PAMPANGA-PASAG BASIN

	Dam Site	Stream	Sub-basin	Main Basin	Drainage Area to Reservoir (Sq Km)	Ratio of Drainage Area to Area Sub-Basin	Irrigation Oriented		Irrigation & Flood Control Oriented	
							Spillway Crest Above Base Level (m)	Maximum Storage Capacity (MCM)	Spillway Crest Above Base Level (m)	Maximum Storage Capacity (MCM)
A.	Existing Reservoirs*									
	Pantabangan	Pampanga R.	A_1	Pampanga	890	1.0	86.5	2,301	86.5	2,301
	Angat	Angat R.	C_7	Pampanga	550	0.88	90.0	1,100	90.0	1,100
	Total							3,401		3,401
B.	Projected Reservoirs									
	Maringalo	Maringalo R.	B_1	Pampanga	55	0.14	282	76	291	125
	Coronel**	Coronel R.	A_2	Pampanga	84	0.12	232	112	249	212
	Antipas**	Antipas R.	A_2	Pampanga	47	0.07	190	70	195	85
	Lubingan**	Lubingan Cr.	A_2	Pampanga	135	0.19	360	257	378	342
	Bugnam	Bugnam Cr.	A_2	Pampanga	39	0.05	306	56	314	70
	Cabu	Cabu Creek	A_2	Pampanga	75	0.10		50		60
	Canaan	Banc. Creek	A_3	Pampanga	71	0.08	112	121	112	121
	Kalaanan	Digmala R.	A_3	Pampanga	90	0.10	301	159	301	159
	Papaya**	Peñaranda R.	A_4	Pampanga	125	0.82	181	237	190	316
	Balintingon**	Sumacbao	A_5	Pampanga	226	0.76	186	376	206	615
	Bulu**	Bulu R.	C_1	Pampanga	43	0.72	91	92	95	110
	Madbum**	Madburn R.	C_3	Pampanga	75	0.31	113	186	117	200
	Balacag	Balacag R.	C_3	Pampanga	39	0.16	163	98	167	120
	Gumain	Gumain R.	D_6	Pasag	114	0.93	139	85	139	85
	Total				1,218			1,975		2,620
	San Antonio	Rio Chico	$B_1+B_2+B_3$	Pampanga	3,000	1.00	16.0	1,100	18.0	1,560

* The existing reservoirs according to the presently accepted operation rules are included in all the simulations.

** These reservoirs are included both among the 15 and the 8 irrigation and flood control oriented reservoir operation simulations.

Table 4.1.2 REDUCTION OF PEAK DISCHARGES AT CABIAO, PAMPANGA RIVER BY MEANS OF FLOOD CONTROL BY UPSTREAM RESERVOIRS, AS ESTIMATED BY PD/CS TAHAL

Comparative Conditions	1/10			1/50			1/100		
	Q (m^3/s)	dQ (m^3/s)	r (%)	Q (m^3/s)	dQ (m^3/s)	r (%)	Q (m^3/s)	dQ (m^3/s)	r (%)
1. Existing conditions as related to natural condition/1	1,918	-	-	2,648	-	-	2,925	-	-
2. Full development of upstream reservoirs for irrigation as related to existing conditions/2	1,430	488	25.4	2,118	530	20.0	2,413	512	17.5
3. Full development of upstream reservoirs for irrigation and flood control as related to existing conditions/2	1,235	683	35.6	1,753	895	33.8	1,975	950	32.5
4. Partial development of upstream related to existing conditions/3	1,258	600	34.4	1,788	860	32.5	2,015	910	31.1

Remarks: /1 Existing conditions include the Pantabangan Dam.

/2 Includes the Pantabangan Dam and 9 additional dams upstream from Cabiao.

/3 Includes in addition to the Pantabangan Dam only 5 dams upstream from Cabiao.

Q: Peak discharge, dQ: Reduction of peak discharge, r: Reduction ratio (r = dQ/Q)

Table 4.1.3(1) PROBABLE NATURAL DAILY AVERAGE PEAK DISCHARGE AS ESTIMATED BY PD/CS TAHAL

(Unit: m^3/s)

Sub-basin	Station Name	Return Periods in Years 10	50	100
A1	Pampanga River, Pialuan, Pantabangan, Nueva Ecija	836	1,122	1,240
A2	Coronel River, Bangkerohan, Bongabon Nueva Ecija	961	1,344	1,504
A3	Pampanga River, Valdefuente, Cabanatuan City, Nueva Ecija	1,122	1,464	1,606
A4	Chico River, General Tinio, Nueva Ecija	267	377	422
A5	Sumacbao River, Pias, General Tinio, Nueva Ecija	537	756	847
A6	Peñaranda River, (RR Bridge), San Jose, Peñaranda, Nueva Ecija	882	1,243	1,393
A7	Peñaranda River, San Vicente, Gapan, Nueva Ecija	884	1,244	1,394
A8	Pampanga River, San Vicente, Cabiao, Nueva Ecija	1,959	2,673	2,970
B1	Talavera River, Kaboboloonan, Talavera, Nueva Ecija	354	492	546
B2	Rio Chico River, Sto. Rosario, Zaragoza, Nueva Ecija, Pampanga	938	1,227	1,343
B3	Rio Chico River, Banga Arayat, Pampanga	1,135	1,466	1,604
B4	Pampanga River, San Agustin, Arayat, Pampanga	2,200	2,850	3,150
C1	Bulu River, Malibay, San Miguel, Bulacan	93	132	149
C2	Candaba Swamp, Ducma, Candaba, Pampanga	964	1,347	1,506
C3	San Miguel, San Vicente, Gapan, Nueva Ecija	318	456	513

(to be cont'd)

Table 4.1.3(2) PROBABLE NATURAL DAILY AVERAGE PEAK DISCHARGE AS ESTIMATED BY PD/CS TAHAL

(Unit: m^3/s)

Sub-basin	Station Name	Return Periods in Years		
		10	50	100
C4	Garlang River, Garlang San Ildefonso, Bulacan	109	148	164
C5	Maasim River, Diliman, San Rafael, Bulacan	255	338	373
C6	Maasim River, Bahay Pare, Candaba, Pampanga	273	364	402
C7	Angat (below IPO Dam) Norzaragay, Bulacan	710	944	1,041
C8	Labangan River, Bagbag, Calumpit, Bulacan	850	1,127	1,242
D1	San Fernando River, Pampanga	306	448	508
D2	San Fernando River, Pampanga	678	992	1,123
D3	San Fernando River, Pampanga	960	1,403	1,391
D4	Pasig-Potrero River, Cabetican, Bacolor, Pampanga	212	300	349
D5	Porac River, Valdez, Floridablanca, Pampanga	339	491	555
D6	Gumain River, Pabanlag, Floridablanca, Pampanga	254	369	417
D7	Caulaman River, Pabanlag, Floridablanca, Pampanga	315	454	511
D8	Lower Gumain River	663	957	1,080

Table 4.1.4 COMPARISON OF PROBABLE PEAK DISCHARGE AS ESTIMATED FROM OBSERVED DISCHARGE DATA AND SYNTHETIC RAINFALL SERIES

(Unit: m^3/s)

Station	No.	Return Periods in Years					
		10		50		100	
		Real	Synt	Real	Synt	Real	Synt
Chico River	A4	456	267	669	377	759	422
Arayat	B4	2,698	2,200	3,328	2,850	3,595	3,150
Gumain River	D6	365	254	564	369	649	417
Coronel River	A2	806	961	1,159	1,344	1,308	1,504

Remarks: Real: Probable peak discharge calculated from observed discharge data.

Synt: Probable peak discharge calculated from synthetic rainfall series.

Table 4.1.5 COMPARISON OF FLOOD PEAK DISCHARGE AS ESTIMATED BY MPW, PD/CS TAHAL AND TEAM

(Unit: m^3/s)

Location	Discharge Estimated by MPW/1	Discharge Estimated by PD/CS-TAHAL/2			Discharge Estimated by the Team/3			
	100-yr	10-yr	50-yr	100-yr	10-yr	50-yr	100-yr	100-yr/4
- Pampanga R. at Cabanatuan	-	1,122	1,465	1,606	2,365	3,205	3,572	4,273
- Pampanga R. at Cabiao	9,100/5	1,959	2,673	2,970	3,071	4,349	4,895	5,581
- Rio Chico R. at Zaragoza	-	938	1,227	1,343	1,497	2,422	2,840	-
- Rio Chico R. before retarding by San Antonio Swamp	-	1,135	1,466	1,604	2,212	3,721	4,368	-
- Angat R. Longos	1,090/6	850	1,127	1,242	1,013	2,050	2,429	2,850
- San Fernando R. at San Fernando	-	306	448	508	242	462	583	-
- Guagua R. at Guagua	1,200	960	1,403	1,391	470	774	1,004	-

Remarks /1: Discharge estimated by MPW in 1958 with BPW Scheme III in full operation.

/2: Daily average peak discharge excluding Pantabangan and Angat Dams.

/3: Including Pantabangan and Angat Dams.

/4: Excluding Pantabangan and Angat Dams.

/5: Including Rio Chico River Watershed.

/6: Including Angat Dam.

Table 4.1.6 STORAGE CAPACITY OF EXISTING AND POTENTIAL RESERVOIR

(Unit: $10^6 m^3$)

Dam Site	Stream	Catch-ment Area (km^2)	Irrigation Single Purpose		Multipurpose for Irrigation and Flood Control during Flood Season			
			Dead	Max.	Dead	Irrigation	Flood Control	Max.
A. Existing Reservoirs								
1. Pantabangan	Pampanga R.	890	-	-	225	1,753	330	2,308
2. Angat	Angat R.	550		1,100	-	-	-	-
B. Potential Reservoirs								
1. Lubingan	Lubingan C.	135	10	219	10	219	102	331
2. Papaya	Peñaranda R.	125	9	229	9	229	92	330
3. Balintingan	Sumacbao R.	226	96	559	96	559	154	809

Table 4.2.1 H-V CURVE OF SAN ANTONIO SWAMP (PLAN-2)

ELEVATION-AREA-CAPACITY RELATIONS

EL (m)	Area (km^2)	Capacity ($10^6 m^3$)
7	0	0
8	23.3	11.7
9	78.6	62.7
10	134.0	169.0
11	158.3	315.1
12	176.3	482.3
13	185.8	663.3
14	210.0	861.2
15	234.8	1,083.6
16	252.3	1,327.1
17	271.8	1,589.1
18	299.3	1,874.6

Table 4.2.2 FLOOD CONTROL EFFECT BY SAN ANTONIO RESERVOIR (DESIGN FLOOD)

Item	Unit	Present Condition	Flood Control Capacity ($10^6 m^3$) 0	200	400	600	800	1000	1200	1400	1600
1. Reservoir Plan-1											
- North Candaba											
Max. Water Level	EL.m	9.39	9.75	9.54	9.34	9.12	8.91	8.75	8.60	8.46	8.36
- do -, Reduction	m	-	-	-	0.05	0.27	0.48	0.64	0.79	0.93	1.03
Max. Inundation Area	km^2	262.0	277.0	268.5	259.8	250.0	242.5	237.0	232.0	227.0	223.7
- do -, Reduction	km^2	-	-	-	2.2	12.0	19.5	25.0	30.0	35.0	38.3
- South Candaba											
Max. Water Level	EL.m	7.53	7.90	7.72	7.55	7.37	7.21	7.07	6.95	6.84	6.75
- do -, Reduction	m	-	-	-	-	0.16	0.32	0.46	0.58	0.69	0.78
Max. Inundation Area	km^2	152.0	159.2	155.5	152.5	149.0	145.5	142.7	140.0	138.5	136.5
- do -, Reduction	km^2	-	-	-	-	3.0	6.5	9.3	12.0	13.5	15.5
- At Sulipan Calumpit											
Max. Water Level	EL.m	7.20	7.54	7.38	7.20	7.06	6.92	6.78	6.66	6.56	6.47
- do -, Reduction	m	-	-	-	-	0.14	0.28	0.42	0.54	0.64	0.73
2. Reservoir Plan-2											
- North Candaba											
Max. Water Level	EL.m	9.39	9.47	9.28	9.08	8.90	8.75	8.61	8.50		
- do -, Reduction	m	-	-	0.11	0.31	0.49	0.64	0.78	0.89		
Max. Inundation Area	km^2	262.0	265.3	257.5	249.0	242.3	237.0	233.0	228.5		
- do -, Reduction	km^2	-	-	4.5	13.0	19.7	25.0	29.0	33.5		
- South Candaba											
Max. Water Level	EL.m	7.53	7.60	7.46	7.30	7.14	7.01	6.91	6.83		
- do -, Reduction	m	-	-	0.07	0.23	0.39	0.52	0.62	0.70		
Max. Inundation Area	km^2	152.0	153.0	150.0	147.5	144.5	141.5	139.5	138.0		
- do -, Reduction	km^2	-	-	2.0	4.5	7.5	10.5	12.5	14.0		
- At Sulipan Calumpit											
Max. Water Level	EL.m	7.20	7.27	7.12	6.97	6.82	6.72	6.62	6.52		
- do -, Reduction	m	-	-	0.08	0.23	0.38	0.48	0.58	0.68		

Table 4.2.3 FLOOD CONTROL EFFECT BY WEST DIVERSION CHANNEL (DESIGN FLOOD)

Item	Unit	Present Condition	West Diversion Channel Q = 1,500 m^3/s
1. West Diversion Channel (Plan-1)			
- North Candaba Swamp			
Max. Water Level	El.m	9.39	8.95
-do-, Reduction	m^2	-	0.44
Max. Inundation Area	km^2	262.0	244.0
-do-, Reduction	km^2	-	18.0
- South Candaba Swamp			
Max. Water Level	El.m	7.53	7.17
-do-, Reduction	m^2	-	0.36
Max. Inundation Area	km^2	152.0	144.5
-do-, Reduction	km^2	-	7.5
- At Sulipan Calumpit			
Max. Water Level	El.m	7.20	6.86
-do-, Reduction	m	-	0.34
2. West Diversion Channel (Plan-2)			
- North Candaba Swamp			
Max. Water Level	El.m	9.39	9.31
-do-, Reduction	m^2	-	0.08
Max. Inundation Area	km^2	262.0	258.5
-do-, Reduction	km^2	-	3.5
- South Candaba Swamp			
Max. Water Level	El.m	7.53	7.09
-do-, Reduction	m^2	-	0.44
Max. Inundation Area	km^2	152.0	143.0
-do-, Reduction	km^2	-	9.0
- At Sulipan Calumpit			
Max. Water Level	El.m	7.20	6.79
-do-, Reduction	m	-	0.41

Table 4.2.4 INUNDATION AREA DUE TO FLOODS WITHOUT FLOOD CONTROL MEASURES (PRESENT CONDITION)

Item	Unit	Return Period (year) 1.1	2	5	10	20	50	100
1. North Candaba Swamp								
Maximum Water Level	EL.m	5.0	6.2	7.29	7.85	8.34	8.95	9.39
Inundation Area (Uncultivated)	km^2	72.0	153.1	188.6	206.7	223.0	243.6	261.5
Ave. Annual Inundation Area	km^2							147.6
2. South Candaba Swamp								
Maximum Water Level	EL.m	2.7	3.7	5.06	5.91	6.54	7.13	7.53
Inundation Area	km^2	39.0	70.5	107.3	121.0	132.7	143.9	151.9
Paddy Area (irrigated)	km^2	-	-	18.1	31.8	43.5	54.7	62.7
Uncultivated Area	km^2	39.0	70.5	89.2	89.2	89.2	89.2	89.2
Average Annual Inundation Area	km^2							77.5
Paddy Area (irrigated)	km^2							9.2
Uncultivated Area	km^2							68.3
3. Lower Reaches of Sulipan								
Inundation Area	km^2	38.6	74.1	108.9	133.6	133.6	133.6	133.6
Cultivated Area (rainfed)	km^2	-	16.2	25.5	32.4	32.4	32.4	32.4
Potential Area (to be Paddy Field)	km^2	22.9	22.9	22.9	22.9	22.9	28.9	28.9
Fish Pond Area	km^2	15.7	35.0	60.5	78.3	28.3	78.3	78.3
Average Annual Inundation Area	km^2							79.9
Cultivated Area (rainfed)	km^2							16.1
Potential Area (to be Paddy Field)	km^2							22.9
Fish Pond Area	km^2							40.9

Table 4.2.5(1) DECREASE IN INUNDATION AREA OF CANDABA SWAMP WITH FLOOD CONTROL BY WEST DIVERSION CHANNEL (PLAN-1)

Item	Unit	Return Period (year) 1.1	2	5	10	20	50	100
1. North Candaba Swamp								
Maximum Water Level	EL.m	5.0	6.2	6.8	7.2	7.5	7.9	8.15
Inundation Area (uncultivated)	km^2	72.0	153.1	172.8	185.7	195.4	208.3	216.6
Decrease in Inundation Area	km^2	-	-	15.8	21.0	27.6	35.3	44.9
2. South Candaba Swamp								
Maximum Water Level	EL.m	2.7	3.7	4.9	5.7	6.3	6.8	7.17
Inundation Area								
Paddy Area (irrigated)	km^2	-	-	14.4	28.4	38.9	48.3	55.5
Uncultivated Area	km^2	39.0	70.5	89.2	89.2	89.2	89.2	89.2
Sub-total	km^2	39.0	70.5	103.6	117.6	128.1	137.5	144.7
3. Decrease in Inundation Area (total)								
Paddy Area (irrigated)	km^2	-	-	3.7	3.4	4.6	6.4	7.2
Uncultivated Area	km^2	-	-	15.8	21.0	27.6	35.3	44.9
Sub-total	km^2	-	-	19.5	24.4	32.2	41.7	52.1
4. Ave. Annual Decrease in Inund. Area								
Paddy Area (irrigated)	km^2							1.3
Uncultivated Area	km^2							6.8
Sub-total	km^2							8.1

Table 4.2.5(2) DECREASE IN INUNDATION AREA OF CANDABA SWAMP WITH FLOOD CONTROL BY WEST DIVERSION CHANNEL (PLAN-2)

Item	Unit	Return Period (year)						
		1.1	2	5	10	20	50	100
1. North Candaba Swamp								
Maximum Water Level	EL.m	5.0	6.2	7.2	7.8	8.3	8.9	9.31
Inundation Area (uncultivated)	km^2	72.0	153.1	187.6	205.2	221.4	241.9	258.2
Decrease in Inundation Area	km^2	-	-	1.0	1.5	1.6	1.7	3.3
2. South Candaba Swamp								
Maximum Water Level	EL.m	2.7	3.7	4.9	5.7	6.2	6.7	7.09
Inundation Area								
Paddy Area (irrigated)	km^2	-	-	14.4	28.4	37.1	46.5	53.9
Uncultivated Area	km^2	39.0	70.5	89.2	89.2	89.2	89.2	89.2
Sub-total	km^2	39.0	70.5	103.6	117.6	126.3	135.7	143.1
3. Decrease in Inundation Area (total)								
Paddy Area (irrigated)	km^2	-	-	3.7	3.4	6.4	8.2	8.8
Uncultivated Area	km^2	-	-	1.0	1.5	1.6	1.7	3.3
Sub-total	km^2	-	-	4.7	4.9	8.0	9.9	12.1
4. Ave. Annual Decrease in Inund. Area								
Paddy Area (irrigated)	km^2							1.7
Uncultivated Area	km^2							0.4
Sub-total	km^2							2.1

Table 4.2.6(1) DECREASE IN INUNDATION AREA WITH FLOOD CONTROL BY CHANNEL IMPROVEMENT OF PAMPANGA RIVER (PLAN-1)

Item	Unit	Return Period (year) 1.1	2	5	10	20	50	100
1. North Candaba Swamp								
Maximum Water Level	EL.m	3.5	5.2	6.6	7.39	7.99	8.8	9.39
Inundation Area (Uncultivated)	km^2	23.5	86.9	166.2	191.9	211.2	238.5	261.5
Decrease in Inundation Area	km^2	48.5	66.2	22.4	14.8	11.8	5.1	-
Ave. Annual Decrease in Inund. Area	km							44.8
2. South Candaba Swamp								
Maximum Water Level	EL.m	1.7	2.3	2.8	3.14	3.36	3.6	3.86
Inundation Area	km^2	9.7	24.3	42.7	54.1	60.5	67.6	75.2
Paddy Area (irrigated)	km^2	-	-	-	-	-	-	-
Uncultivated Area	km^2	9.7	24.3	42.7	54.1	60.5	67.6	75.2
Decrease in Inundation Area	km	29.3	46.2	64.6	66.9	72.2	76.3	76.7
Paddy Area (irrigated)	km^2	-	-	18.1	31.8	43.5	54.7	62.7
Uncultivated Area	km^2	29.3	46.2	46.5	35.1	28.7	21.6	14.0
Ave. Annual Decrease in Inund. Area	km^2							48.6
Paddy Area (irrigated)	km^2							9.2
Uncultivated Area	km							39.4
3. Lower Reaches of Sulipan								
Decrease in Inundation Area	km^2	40.1	106.9	123.2	125.7	128.3	130.9	133.6
Cultivated Area (rainfed)	km^2	-	28.0	43.8	45.8	47.9	49.9	52.1
Potential Area (to be Paddy Field)	km^2	28.1	28.1	28.1	28.1	28.1	28.1	28.1
Fish Pond Area	km^2	12.0	50.8	51.3	51.8	52.3	52.9	53.4
Ave. Annual Decrease in Inund. Area	km^2							95.3
Cultivated Area (rainfed)	km^2							26.6
Potential Area (to be Paddy Field)	km^2							27.8
Fish Pond Area	km							40.9

Table 4.2.6(2) DECREASE IN INUNDATION AREA WITH FLOOD CONTROL BY CHANNEL IMPROVEMENT OF PAMPANGA RIVER (PLAN-2)

Item	Unit	Return Period (year)						
		1.1	2	5	10	20	50	100
1. North Candaba Swamp								
Maximum Water Level	EL.m	5.0	6.2	7.29	7.85	8.34	8.95	9.39
Inundation Area (Uncultivated)	km^2	72.0	153.1	188.6	206.7	223.0	243.6	261.5
Decrease in Inundation Area	km^2	-	-	-	-	-	-	-
Ave. Annual Decrease in Inund. Area	km^2							-
2. South Candaba Swamp								
Maximum Water Level	EL.m	1.7	2.3	2.8	3.14	3.36	3.6	3.86
Inundation Area	km^2	9.7	24.3	42.7	54.1	60.5	67.6	75.2
Paddy Area (irrigated)	km^2	-	-	-	-	-	-	-
Uncultivated Area	km^2	9.7	24.3	42.7	54.1	60.5	67.6	75.2
Decrease in Inundation Area	km^2	29.3	46.2	64.6	66.9	72.2	76.3	76.7
Paddy Area (irrigated)	km^2	-	-	18.1	31.8	43.5	54.7	62.7
Uncultivated Area	km^2	29.3	46.2	46.5	35.1	28.7	21.6	14.0
Ave. Annual Decrease in Inund. Area	km^2							48.6
Paddy Area (irrigated)	km^2							9.2
Uncultivated Area	km^2							39.4

Table 4.2.7 DECREASE IN FLOOD DAMAGES WITH FLOOD CONTROL BY WEST DIVERSION CHANNEL

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
A. Plan-1				
- Decrease in Damage to Paddy				
Irrigated Area	ha	130	7,695 /1	1,000
Unirrigated Area	ha	680	3,557 /2	2,420
Sub-total				3,420
- Decrease in Other Damages /3				1,200
- Total				4,620
B. Plan-2				
- Decrease in Damage to Paddy				
Irrigated Area	ha	170	7,695	1,310
Unirrigated Area	ha	40	3,557	140
Sub-total				1,450
- Decrease in Other Damages				510
- Total				1,960

Remarks, /1 Unit price of gross income in irrigated area.
/2 Unit price of gross income in unirrigated area.
/3 35% of agricultural damages was assumed as other damages.

Table 4.2.8(1) DECREASE IN FLOOD DAMAGES WITH FLOOD CONTROL BY CHANNEL IMPROVEMENT (PLAN-1)

Improved Stretch: River Mouth - Confluence of Maasim R.

Design Flood : 100-year

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
A. River mouth - Sulipan				
- Decrease in Damage to Paddy and Fish				
Paddy Area (Rainfed)	ha	2,700	3,557	9,600
Potential Area to be Paddy Field	ha	2,800	1,492	4,180
Fish Pond Area	ha	4,100	3,464	14,200
Sub-total				27,980
- Decrease in Other Damages (35% of above)				9,790
- Total				37,770
B. South Candaba Swamp				
- Decrease in Damage to Paddy				
Irrigated Area	ha	900	7,695	6,930
Potential Area to be irrigated Paddy Field	ha	3,900	4,864	18,970
Sub-total				25,900
- Decrease in Other Damages (35% of above)				9,070
- Total				34,970
C. North Candaba Swamp				
- Decrease in Damage to Paddy				
Unirrigated Area	ha	4,500	3,557	16,010
- Decrease in Other Damages (35% of above)				5,600
- Total				21,610
D. Grand Total				94,350.

Table 4.2.8(2) DECREASE IN FLOOD DAMAGES WITH FLOOD CONTROL BY CHANNEL IMPROVEMENT (PLAN-2)

Improved Stretch: Candaba - Sulipan
Design Flood : 100-year

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
A. River mouth - Sulipan				
- Decrease in Damage to Paddy and Fish				
Paddy Area (Rainfed)	ha	-	3,557	-
Potential Area to be Paddy Field	ha	-	1,492	-
Fish Pond Area	ha	-	3,464	-
Sub-total				-
- Decrease in Other Damages (35% of above)				-
- Total				-
B. South Candaba Swamp				
- Decrease in Damage to Paddy				
Irrigated Area	ha	900	7,695	6,930
Potential Area to be irrigated Paddy Field	ha	3,900	4,864	18,970
Sub-total				25,900
- Decrease in Other Damages (35% of above)				9,070
- Total				34,970
C. North Candaba Swamp				
- Decrease in Damage to Paddy				
Unirrigated Area	ha	-	3,557	-
- Decrease in Other Damages (35% of above)				-
- Total				-
D. Grand Total				34,970

Table 4.2.9(1) CONSTRUCTION COST FOR WEST DIVERSION CHANNEL (PLAN-1)

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
Main Civil Works				
- Preparation	L.S.	-	-	30,463
- Embankment				
14K - 42K	10^3m^3	4,041	12,000	48,492
- Excavation				
0K - 14K	10^3m^3	13,668	8,000	109,344
0K - 14K	10^3m^3	3,910	12,000	46,920
14K - 28K	10^3m^3	7,959	8,000	63,672
23K - 42K	10^3m^3	5,645	12,000	67,740
Sub-total				287,676
- Revetment	m	3,000	900	2,700
- Diversion	m	160	15,000	2,400
- Bridge				
National Road	m	360	58,000	20,880
Expressway	m	360	116,000	41,760
Provincial Road	m	360	58,000	20,880
Railway	m	360	29,000	10,400
Sub-total				93,920
- Miscellaneous (15% of above)				69,849
- Total				535,500
Acquisition & Compensation				
Land Acquisition	ha	2,036	20,000	40,720
House Compensation	Nos.	950	5,000	4,750
Sub-total				45,470
Contingency (15% of above)				87,150
Eng. Service & Administration (8% of above)				53,450
Grand Total				721,570

Table 4.2.9(2) CONSTRUCTION COST FOR WEST DIVERSION CHANNEL (PLAN-2)

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
Main Civil Works				
- Preparation	L.S.	2,368	-	24,334
- Embankment (14K - 31K)	10^3m^3	2,368	12,000	28,416
- Excavation				
0K - 14K	10^3m^3	12,749	8,000	101,992
0K - 14K	10^3m^3	3,900	12,000	46,800
14K - 24K	10^3m^3	6,443	8,000	51,544
24K - 31K	10^3m^3	2,814	12,000	33,768
Sub-total				234,104
- Bank Protection	m	1,500	900	1,350
- Diversion Weir	m	190	15,000	2,850
- Bridge				
National Road (2 lanes)	m	300	58,000	17,400
Expressway (4 lanes)	m	300	116,000	34,800
Provincial Road (2 lanes)	m	300	58,000	17,400
Railway (1 lane)	m	390	29,000	11,310
Sub-total				80,910
- Miscellaneous (15% of above)				55,796
- Total				427,760
Acquisition & Compensation				
Land Acquisition	ha	1,585	20,000	31,700
House Compensation	Nos.	910	5,000	4,550
Sub-total				36,250
Contingency (15% of above)				69,600
Eng. Service & Administration (8% of above)				42,690
Grand Total				576,300

Table 4.2.10(1) CONSTRUCTION COST FOR CHANNEL IMPROVEMENT (PLAN - 1)

Probability: W = 1/100
Stretch : River mouth to Maasim R.

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
Main Civil Works				
- Preparation	L.S.			37,765
- Embankment				
Pampanga R. Right-Bank	10^3m^3	1,429	12,000	17,148
Pampanga R. Left-Bank	10^3m^3	4,499	12,000	53,988
Maasim R.	10^3m^3	761	12,000	9,132
Angat R.	10^3m^3	319	12,000	3,828
Labangan R.	10^3m^3	650	12,000	7,800
Sub-total				94,116
- Excavation				
Pampanga R.	10^3m^3	43,870	8,000	350,960
Labangan R.	10^3m^3	1,354	8,000	10,832
Sub-total				361,790
- Revetment	m	3,600	900	3,240
- Outlet Structures				
Sluce	L.S.			17,000
Culvert	L.S.			17,000
Sub-total				34,000
- Bridge				
Railway and Road	m	90	87,000	7,830
Expressway	m	90	116,000	10,440
Provincial Road	m	700	29,000	20,300
- Others	L.S.			10,000
- Miscellaneous (15% of above)	L.S.			86,587
- Total				663,850
Acquisition and Compensation				
- Land Acquisition	ha	1,790	20,000	35,800
- House Compensation	Nos.	6,100	5,000	30,500
- Total				66,300
Contingency				109,520
Eng. Service & Administration (8% of above)				67,170
Grand Total				906,840

Table 4.2.10(2) CONSTRUCTION COST FOR CHANNEL IMPROVEMENT (PLAN - 2)

Probability: W = 1/100
Stretch : Sulipan to Maasim R.

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱ x 10^3)
Main Civil Works				
- Preparation	L.S.			30,604
- Embankment				
Pampanga R. Right-Bank	10^3m^3	1,338	12,000	16,056
Pampange R. Left-Bank	10^3m^3	2,591	12,000	31,092
Maasim R.	10^3m^3	761	12,000	9,132
Angat R.	10^3m^3	605	12,000	7,260
Labangan R.	10^3m^3	-	12,000	-
Sub-total				63,540
- Excavation				
Pampanga R.	10^3m^3	33,390	8,000	267,120
Labangan R.	10^3m^3	-	8,000	-
Sub-total				267,120
- Revetment	m	2,000	900	1,800
- Outlet Structures				
Sluce	L.S.			17,000
Culvert	L.S.			7,500
Sub-total				24,500
- Bridge				
Railway and Road	m	400	87,000	34,800
Expressway	m	160	116,000	18,560
Provincial Road	m	720	29,000	20,880
- Others	L.S.	437,200		6,000
- Miscellaneous (15% of above)	L.S.			70,176
- Total				537,980
Acquisition and Compensation				
- Land Acquisition	ha	1,200	20,000	24,000
- House Compensation	Nos.	4,510	5,000	22,550
- Total				46,550
Contingency				87,680
Eng. Service & Administration (8% of above)				53,780
Grand Total				725,990

Table 4.2.11(1) MULTI-CROPPING INDEX

	With Project		Without Project	
	Area (ha)	Multi-Cropping Index	Area (ha)	Multi-Cropping Index
Alternative Plan 1,2,3 and 4				
Irrigated land				
Wet season paddy	30,000		18,000	
Dry season paddy	30,000		14,400	
Sugarcane	6,000		-	
Rainfed land				
Wet season paddy	-		12,000	
Mongo bean	-		1,565	
Sugarcane	-		6,000	
Total and Multi-Cropping Index	66,000	1.83	51,960	1.44
Alternative Plan 5,6,7 and 8				
Irrigated land				
Wet season paddy	24,500		14,700	
Dry season paddy	24,500		11,760	
Sugarcane	2,200		-	
Rainfed land				
Wet season paddy	-		9,800	
Mongo beans	-		1,290	
Sugarcane	-		2,200	
Total and Multi-Cropping Index	51,200	1.92	39,730	1.49
Alternative Plan 9				
Irrigated land				
Wet season paddy	24,500		14,700	
Dry season paddy	34,500		11,760	
Sugarcane	2,200		-	
Rainfed land				
Wet season paddy	-		9,800	
Mongo beans	-		1,270	
Sugarcane	-		2,200	
Total and Multi-Cropping Index	61,200	1.67	39,730	1.08

(to be continued)

Table 4.2.11(2) MULTI-CROPPING INDEX

	With Project		Without Project	
	Area (ha)	Multi-Cropping Index	Area (ha)	Multi-Cropping Index
Alternative Plan 10 and 11				
Irrigated land				
Wet season paddy	15,500		9,300	
Dry season paddy	25,500		7,440	
Sugarcane	2,200		-	
Rainfed land				
Wet season paddy	-		6,200	
Mongo beans	-		800	
Sugarcane	-		2,200	
Total and Multi-Cropping Index	43,200	1.59	25,940	0.95
Alternative Plan 12 and 13				
Irrigated land				
Wet season paddy	10,000		6,000	
Dry season paddy	20,000		4,800	
Rainfed land				
Wet season paddy	-		4,000	
Mongo beans	-		520	
Total and Multi-Cropping Index	30,000	1.5	15,320	0.77
Alternative Plan 14				
Irrigated land				
Wet season paddy	30,850		18,510	
Dry season paddy	30,850		14,800	
Sugarcane	7,350		-	
Rainfed land				
Wet season paddy	-		12,340	
Mongo beans	-		1,600	
Sugarcane	-		7,350	
Total and Multi-Cropping Index	69,050	1.81	54,600	1.43

(to be cont'd)

Table 4.2.11(3) MULTI-CROPPING INDEX

	With Project		Without Project	
	Area (ha)	Multi-Cropping-Index	Area (ha)	Multi-Cropping Index
Alternative Plan 15				
Irrigated land				
Wet season paddy	11,000		6,600	
Dry season paddy	8,000		5,280	
Rainfed land				
Wet season paddy	-		4,400	
Mongo bean	-		570	
Total and Multi-Cropping Index	19,000	1.73	16,850	1.53

Table 4.2.12 FARM INPUT PER HA FOR PADDY AND SUGARCANE CULTIVATION WITH PROJECT CONDITION

	Wet Season Paddy	Dry Season Paddy	Sugar-cane
Seed (kg or No.)	60	60	20,000
Fertilizer (kg)			
N	70	90	150
P	20	20	50
K	0	0	50
Chemicals (/)	2	2	2.14
Laborer (man-day)	125	125	160
Mechanical power (day)	3.38	3.38	5.67
Animal power (day)	9.1	9.1	3.8

Table 4.2.13 DESIGN CRITERIA OF PROPOSED FARMING FOR PADDY WITH PROJECT

1.	Varieties	IR series
2.	Growing period	130 days
3.	Amount of seed	60 kg
4.	Nursery period	15 - 20 days
5.	Area of nursery fed	1/20 - 1/25 of paddy field
6.	Land preparation	One time of ploughing, and 3 times of hallowing-leveling
7.	Planting method	Transplanting
8.	Planting density	30 cm x 15 cm, 3 seedlings per hill
9.	Planting depth	Within 3 cm from the surface
10.	Fertilization	
	Nursery bed	2 kg of N/ha
	Paddy field	- 68 kg of N/ha and 20 kg of P/ha for wet season paddy
		- 88 kg of N/ha and 20 kg of P/ha for dry season paddy
	Time in paddy field	
	All P	Basic dressing
	35% of N	Basic dressing at transplanting time
	25% of N	First top dressing at two weeks after transplanting time
	40% of N	2nd top dressing in the late period of a young panicle formation stage
11.	Application of chemicals	2ℓ/ha
12.	Weeding	Two time about 25th and 50th day after

Table 4.2.14 DESIGN CRITERIA OF PROPOSED FARMING FOR SUGARCANE WITH PROJECT

1.	Varieties	Phil series such as Phil 6T23
2.	Growing period	12 months
3.	Land preparation	One to two plowing, two harrowing at minimum depth of 20 cm
4.	Depth of planting	25 cm
5.	Rate of planting and ratooning	40,000 seed pieces/ha and one ratoon crop
6.	Fertilization	
	Volume	N: 150 kg/ha P: 50 kg/ha K: 50 kg/ha
	Time	
	All P, 50% of P and K	Basic dressing
	50% of N and K	At 5 months after planting
7.	Application of chemicals	2.14ℓ/ha
8.	Weeding	At the period after 1st and 2nd off-barring

Table 4.2.15 FARM INPUT PER HA FOR PADDY, SUGARCANE AND MONGO BEANS CULTIVATION WITHOUT PROJECT CONDITION

	Wet Season Paddy		Dry Season Paddy	Sugar-cane	Mongo Bean
	Irrigated land	Rainfed land	Irrigated land		
Seed (kg or No.)	95	95	99	34,000	20
Fertilizer (kg)					
N	51	51	53	120	0
P	9	7	14	0	0
K	3	3	5	0	0
Chemicals (ℓ)	1.2	0.9	1.5	0	1.7
Laborer (man-day)	97	89	101	120	50
Mechanical power (day)	2.37	2.37	2.37	4.6	0.46
Animal power (day)	9.5	9.5	9.5	6.65	1.52

Table 4.2.16 FUTURE UNIT YIELD OF CROPS

(Unit: ton/ha)

	Without Project	With Project
(1) Paddy		
Irrigated land		
Wet season paddy	2.40	4.5
Dry season paddy	2.66	5.0
Rainfed area		
Wet season paddy	2.08	-
Dry season paddy	-	-
(2) Sugarcane (Sugar)	3.38	6.35
(3) Mongo beans	0.4	-

Table 4.2.17(1) FUTURE CROP PRODUCTION AT FULL STAGE FOR THE ALTERNATIVE IRRIGATION PROJECTS

(Unit: tons)

	With Project (A)	Without Project (B)	Increment (A)-(B)
Alternative 1,2,3 and 4			
(1) Paddy	285,000	106,460	178,540
Irrigated land			
Wet season paddy	135,000	43,200	91,800
Dry season paddy	150,000	38,300	111,700
Rainfed land			
Wet season paddy	-	24,960	-24,960
(2) Sugarcane	38,100	20,280	17,820
(3) Mongo beans	-	620	- 620
Alternative 5,6,7 and 8			
(1) Paddy	232,750	86,940	145,810
Irrigated land			
Wet season paddy	110,250	35,280	74,970
Dry season paddy	122,500	31,280	91,220
Rainfed land			
Wet season paddy	-	20,380	-20,380
(2) Sugarcane	13,970	7,440	6,530
(3) Mongo beans	-	510	- 510
Alternative 9			
(1) Paddy	282,750	86,940	195,810
Irrigated land			
Wet season paddy	110,250	35,280	74,970
Dry season paddy	172,500	31,280	141,220
Rainfed land			
Wet season paddy	-	20,380	-20,380
(2) Sugarcane	13,970	7,440	6,530
(3) Mongo beans	-	510	-510

(to be cont'd)

Table 4.2.17(2) FUTURE CROP PRODUCTION AT FULL STAGE FOR THE ALTERNATIVE IRRIGATION PROJECTS

(Unit: tons)

	With Project (A)	Without Project (B)	Increment (A)-(B)
Alternative 10 and 11			
(1) Paddy	197,250	55,010	142,240
Irrigated land			
Wet season paddy	68,750	22,320	47,430
Dry season paddy	127,500	19,790	107,710
Rainfed land			
Wet season paddy	-	12,900	-12,900
(2) Sugarcane	13,970	7,440	6,530
(3) Mongo beans	-	320	-320
Alternative 12 and 13			
(1) Paddy	145,000	35,490	109,510
Irrigated land			
Wet season land	45,000	14,400	30,600
Dry season paddy	100,000	12,770	87,230
Rainfed land			
Wet season paddy	-	8,320	-8,320
(2) Mongo beans	-	210	-210
Alternative 14			
(1) Paddy	293,080	133,000	160,080
Irrigated land			
Wet season paddy	138,830	44,420	94,410
Dry season paddy	154,250	39,340	114,910
Rainfed land			
Wet season paddy	-	49,240	-49,240
(2) Sugarcane	46,670	24,840	21,830
(3) Mongo beans	-	-	-

(to be cont'd)

Table 4.2.17(3) FUTURE CROP PRODUCTION AT FULL STAGE FOR THE ALTERNATIVE IRRIGATION PROJECTS

(Unit: tons)

	With Project (A)	Without Project (B)	Increment (A)-(B)
Alternative 15			
(1) Paddy	89,500	39,035	50,465
Irrigated land			
Wet season paddy	49,500	15,840	33,660
Dry season paddy	40,000	14,045	25,955
Rainfed land			
Wet season paddy	-	9,150	-9,150
(2) Mongo beans	-	230	-230

Table 4.2.18 PROJECTED POPULATION OF THE FIVE PROVINCES RELATED TO THE OBJECTIVE AREA AND METRO MANILA

Province	1985	1990	1995	2000
Bataan	367,481	427,086	485,287	543,424
Bulacan	1,210,681	1,377,956	1,536,521	1,715,402
Nueva Ecija	1,191,209	1,338,263	1,496,772	1,652,919
Pampanga	1,355,567	1,540,795	1,735,874	1,929,728
Tarlac	831,442	943,566	1,060,248	1,176,035
Total	4,956,380	5,627,666	6,314,702	7,017,508
Metro Manila	7,417,441	8,652,994	9,772,162	10,856,317

Source: Philippine Year Book 1979
National Census and Statistic Office, Manila

Table 4.2.19(1) FORECAST OF SUPPLY AND DEMAND OF RICE IN THE FIVE PROVINCES

Item	1985	1990	1995	2000
1. Production Paddy (Ton)/1				
1. Bataan	86,657	104,944	123,232	141,519
2. Bulacan	347,169	405,448	463,727	522,006
3. Nueva Ecija	458,741	491,849	524,957	558,065
4. Pampanga	207,600	234,798	261,996	289,194
5. Tarlac	137,025	148,913	160,801	172,689
Total	1,237,192	1,385,952	1,534,713	1,683,473
2. Waste & Seeds (Ton)/2				
1. Bataan	8,666	10,494	12,323	14,152
2. Bulacan	34,717	40,545	46,373	52,200
3. Nueva Ecija	45,874	49,185	52,495	55,806
4. Pampanga	20,760	23,480	26,199	28,919
5. Tarlac	13,703	14,891	16,080	17,269
Total	123,720	138,595	153,470	168,346
3. Available Paddy (Ton)				
1. Bataan	77,991	94,450	110,909	127,367
2. Bulacan	312,452	364,903	417,354	469,806
3. Nueva Ecija	412,867	442,664	472,462	502,259
4. Pampanga	186,840	211,318	235,797	260,275
5. Tarlac	123,322	134,022	144,721	155,420
Total	1,113,472	1,247,357	1,381,243	1,515,127
4. Available Rice/3				
1. Bataan	49,134	59,503	69,873	80,241
2. Bulacan	196,845	229,889	262,933	295,978
3. Nueva Ecija	260,106	278,878	297,651	316,423
4. Pampanga	117,709	133,130	148,552	163,973
5. Tarlac	77,693	84,434	91,174	97,915
Total	701,487	785,834	870,183	954,530

(to be cont'd)

/1: Projected based on the past trend of paddy production from 1970 to 1978

/2: 10% of paddy production

/3: Milling recovery rate 63%

Table 4.2.19(2) FORECAST OF SUPPLY AND DEMAND OF RICE IN THE FIVE PROVINCES

Item	1985	1990	1995	2000
5. Total Population				
1. Bataan	367,481	427,086	485,287	543,424
2. Bulacan	1,210,681	1,377,956	1,536,521	1,715,402
3. Nueva Ecija	1,191,209	1,338,263	1,496,772	1,652,919
4. Pampanga	1,355,567	1,540,795	1,735,874	1,929,728
5. Tarlac	831,442	943,566	1,060,248	1,176,035
Total	4,956,380	5,627,666	6,314,702	7,017,508
6. Rice Consumption				
1. Bataan	44,098	51,250	58,234	65,211
2. Bulacan	145,282	165,355	184,382	205,848
3. Nueva Ecija	142,945	160,591	179,612	198,350
4. Pampanga	162,668	184,895	208,305	231,567
5. Tarlac	99,773	113,228	127,230	141,124
Total	594,766	675,319	757,763	842,100
7. Marketable Surplus of Rice	Surplus (deficit)			
1. Bataan	5,036	8,253	11,639	15,030
2. Bulacan	51,563	64,534	78,551	90,130
3. Nueva Ecija	117,161	118,287	118,039	118,073
4. Pampanga	(44,959)	(51,765)	(59,753)	(67,594)
5. Tarlac	(22,080)	(28,794)	(36,056)	(43,209)
Total	106,721	110,515	112,420	112,430

Table 4.2.20 DEMAND OF RICE IN METRO MANILA

		1985	1990	1995	2000
(1)	Projected Population	7,417,441	8,652,994	9,772,162	10,856,317
(2)	Demand of Rice in Metro Manila (ton)	778,831	908,564	1,026,077	1,139,913
(3)	Demand of Rice Shared to the Five Provinces related to the Objective Area (ton)				
	(2) x 25%	194,708	227,140	256,519	284,978
	(2) x 20%	155,766	181,713	205,215	227,983
	(2) x 15%	166,825	136,285	153,911	170,987

Table 4.2.21 ALTERNATIVE PLANS ON IRRIGATION DEVELOPMENT

Parameters		San Antonio Reservoir Plan						Pampanga Pump Plan	
		Dam Axis		Maintaining Nat'l Flood Retent'n Volume in Swamp		Dead Capacity Utilization			
Alternative Plans	Irrigation Service Area (ha)	Down-Stream	Up-Stream	Dam Capacity Increase	Downstream Improvement	No Use	Used by Pump	Return Flow	Present Flow
1	36,000	0	-	0	-	0	-	-	-
2	36,000	0	-	0	-	-	0	-	-
3	36,000	0	-	-	0	0	-	-	-
4	36,000	0	-	-	0	-	0	-	-
5	26,700	0	-	0	-	0	-	-	-
6	26,700	0	-	0	-	-	0	-	-
7	26,700	0	-	-	0	0	-	-	-
8	26,700	0	-	-	0	-	0	-	-
9	36,700	-	0	-	0	0	-	-	-
10	27,700	-	0	0	-	0	-	-	-
11	27,700	-	0	-	0	0	-	-	-
12	20,000	-	0	0	-	0	-	-	-
13	20,000	-	0	-	0	0	-	-	-
14	38,200	-	-	-	-	-	-	-	-
15	11,000	-	-	-	-	-	-	-	-

Table 4.2.22 PRINCIPLE FEATURE OF DAM FOR ALTERNATIVE PLAN 1 TO 8

Item	Unit	Alternative Plan 1	2	3	4	5	6	7	8
Net Irrigable Area	ha	36,000	36,000	36,000	36,000	26,700	26,700	26,700	26,700
Two Crop Paddy	ha	30,000	30,000	30,000	30,000	24,500	24,500	24,500	24,500
One Crop Paddy	ha	-	-	-	-	-	-	-	-
Sugarcane	ha	6,000	6,000	6,000	6,000	2,200	2,200	2,200	2,200
Average Annual Diversion Requirement	MCM	688	688	688	688	510	510	510	510
Reservoir Capacity									
Gross	MCM	1,330	1,090	910	670	1,150	910	730	490
Effective for Irrigation	MCM	570	570	570	570	390	390	390	390
Dead/1	MCM	340	340	340	340	340	340	340	340
Effective by Pump	MCM	-	240	-	240	-	240	-	240
Sedimentation	MCM	100	100	100	100	100	100	100	100
Flood Control	MCM	420	420	-	-	420	420	-	-
Reservoir Water Surface Elevation									
Maximum	m	16.8	15.8	15.0	13.9	16.1	15.1	14.2	12.9
Gravity Intake	m	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Effective by Pump	m	-	10.0	-	10.0	-	10.0	-	10.0
Dam Crest Elevation	m	20.8	19.8	19.0	17.9	20.1	19.1	18.2	16.9
Submerged by Reservoir									
Area	ha	27,000	24,000	20,800	19,000	25,600	21,000	19,400	17,400
Houses	Nos.	1,790	1,720	1,650	1,600	1,760	1,650	1,610	1,600
Annual Shortage									
Maximum	%	26.6	25.5	26.6	25.5	29.1	27.1	29.1	27.1
Average	%	4.9	4.3	4.9	4.3	5.3	4.4	5.3	4.4
Pumping Drainage Area	ha	7,200	6,000	5,000	3,500	6,200	5,100	3,900	2,000
Irrigation Pump Facility									
Actual Head	m_3	-	2.0	-	2.0	-	2.0	-	2.0
Required Capacity	m^3/sec	-	61	-	61	-	46	-	46
Average Dependant	%		19.5		19.5		28.2		28.2
Length of Dam Axis	km	81	81	74	72	81	74	72	67

/1 Dead means reservoir capacity below intake water surface elevation.

Table 4.2.23 PRINCIPLE FEATURE FOR ALTERNATIVE PLAN 9 to 15

Item \ Alternative Plan	Unit	9	10	11	12	13	14	15
Net Irrigable Area	ha	36,700	27,700	27,700	20,000	20,000	38,200	11,000
Two Crop Paddy	ha	24,500	15,000	15,000	10,000	10,000	30,850	8,000
One Crop Paddy	ha	10,000	10,000	10,000	10,000	10,000	0	3,000
Sugarcanr	ha	2,200	2,200	2,200	-	-	7,350	0
Average Annual Diversion Water Requirement	MCM	652	474	474	339	339	696	171
Reservoir Capacity								
Gross	MCM	595	530	430	415	315	-	-
Effective for irrigation	MCM	495	330	330	215	215	-	-
Dead /1	MCM	100	100	100	100	100	-	-
Effective by Pump	MCM	-	-	-	-	-	-	-
Sedimentation	MCM	100	100	100	100	100	-	-
Flood Control	MCM	-	100	-	100	-	-	-
Reservoir Water Surface Elevation								
Maximum	m	18.0	17.6	16.9	16.8	16.1	-	-
Gravity Intake	m	13.8	13.8	13.8	13.8	13.8	-	-
Dam Crest Elevation	m	22.0	21.6	20.9	20.8	20.1	-	-
Submerged by Reservoir								
Area	ha	16,500	16,200	15,200	15,000	13,000	-	-
Houses	Nos.	1,000	990	970	970	930	-	-
Annual Shortage								
Maximum	%	27.9	29.2	29.2	26.7	26.7	-	35.3
Average	%	5.6	6.4	6.4	6.3	6.3	-	6.6
Pumping Drainage Area	ha	-	-	-	-	-	-	-
Length of Dam Axis	km	72	72	72	72	72	-	-
Irrigation Pump Facility at Arayat								
Actual Head	m	-	-	-	-	-	10	10
Required Capacity	m^3/sec	-	-	-	-	-	63	15

/1 Dead means reservoir capacity below intake water surface elevation.

Table 4.2.24 PAN EVAPORATION

Average of Hacienda Luisita and Sabang Baliwag

(Unit: mm)

Year \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1968	154.3	164.9	225.9	226.1	162.1	143.1	130.8	109.6	120.3	161.5	154.4	148.4	1,901.4
1969	154.4	169.6	219.5	230.4	191.4	157.7	132.1	137.9	116.1	135.7	126.7	148.2	1,919.5
1970	164.3	161.5	193.4	185.9	179.1	127.2	134.5	110.3	123.2	108.4	111.3	118.4	1,718.0
1971	131.4	138.1	166.5	189.2	147.5	139.5	123.6	158.1	132.3	140.8	126.2	132.7	1,725.9
1972	130.5	156.2	198.1	313.8	185.0	162.3	86.9	101.1	153.8	147.1	134.5	134.6	1,802.9
1973	148.3	155.1	220.0	261.4	209.3	171.6	152.0	119.1	133.3	137.0	128.6	123.5	1,959.2
1974	149.3	155.8	195.8	217.2	163.4	143.4	162.0	90.6	138.6	108.3	127.9	114.9	1,767.2
1975	128.1	153.7	185.7	177.6	162.7	113.8	120.2	109.2	130.2	130.8	142.4	116.9	1,671.3
1976	145.0	152.0	216.1	216.3	160.7	140.8	135.1	112.6	104.5	137.4	147.3	132.4	1,800.2
1977	138.7	150.1	183.5	208.3	174.6	148.1	111.5	131.5	115.4	155.5	129.0	166.5	1,812.7
1978	161.1	149.0	198.0	197.0	183.7	119.9	140.4	74.1	105.9	98.4	120.2	151.7	1,699.4
1979	161.0	151.2	183.4	176.3	136.2	115.5	108.9	118.3	131.5	140.8	146.3	153.5	1,722.9
Total	1,766.9	1,857.2	2,385.9	2,498.5	2,055.7	1,682.7	1,538.0	1,372.4	1,505.1	1,601.7	1,594.8	1,641.7	19,708.6
Average	147.2	154.8	198.8	208.2	171.3	140.2	128.2	114.4	125.4	133.5	132.9	136.8	1,791.7

Table 4.2.25 MONTHLY AREA FACTOR AND CROP COEFFICIENT

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Area Factor (Af)												
Two Crops Paddy												
Land Preparation	-	-	-	-	0.278	0.622	1.000	-	-	0.100	0.622	0.278
Nursery	-	-	-	-	0.011	0.033	0.006	-	-	0.003	0.031	0.016
Field Crop	1.000	1.917	0.333	-	-	0.333	0.917	1.000	0.769	0.148	0.148	0.769
One Crop Paddy												
Land Preparation	-	-	-	-	-	-	-	-	-	0.278	0.622	0.100
Nursery	-	-	-	-	-	-	-	-	-	0.011	0.033	0.006
Field Crop	1.000	0.769	0.148	-	-	-	-	-	-	-	0.333	0.917
Sugarcane	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Crop Coefficient (kc)												
Two Crops Paddy												
Nursery	-	-	-	-	0.800	0.800	0.800	-	-	0.800	0.800	0.800
Field Crop	1.116	1.120	1.042	-	-	0.920	1.019	1.154	1.094	1.023	0.900	0.978
One Crop Paddy												
Nursery	-	-	-	-	-	-	-	-	-	0.800	0.800	0.800
Field Crop	1.142	1.083	1.023	-	-	-	-	-	-	-	0.920	1.020
Sugarcane	0.798	0.788	0.804	0.863	0.942	1.004	1.035	1.046	1.029	0.971	0.892	0.829

Table 4.2.26 MONTHLY PROJECT RAINFALL

Average of San Fernando and Arayat (Unit: mm)

Year \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1968	12.2	11.2	6.4	12.1	104.9	76.8	210.0	482.4	201.3	120.3	11.9	5.1	1,254.6
1969	6.4	5.1	7.8	20.3	88.4	122.5	428.0	283.9	233.8	46.2	55.8	19.7	1,317.9
1970	5.1	5.4	21.7	92.7	48.2	253.1	223.0	375.7	425.8	156.1	100.8	33.5	1,741.1
1971	11.8	1.0	17.6	18.6	208.3	300.5	407.0	51.6	166.2	331.8	124.0	148.8	1,787.2
1972	90.8	24.3	48.8	29.8	148.7	121.4	1,720.1	875.6	251.0	25.2	23.0	21.5	3,380.2
1973	1.3	0.3	1.0	11.0	55.1	127.9	264.6	266.0	163.1	400.3	127.9	12.9	1,431.4
1974	7.5	3.7	74.0	47.0	46.0	390.6	281.0	889.6	102.5	330.5	374.8	78.4	2,625.6
1975	8.3	3.1	4.1	25.9	130.8	153.4	162.6	321.5	174.5	299.9	57.4	163.5	1,505.0
1976	8.0	0.7	6.6	17.9	802.5	537.6	253.7	300.0	441.7	38.8	18.3	53.0	2,478.8
1977	46.4	0	1.3	10.1	64.3	118.7	259.4	335.1	343.6	0	217.5	0	1,396.4
1978	0	6.4	13.1	38.9	112.2	101.6	186.6	740.5	344.2	603.5	34.9	22.2	2,204.1
Total	197.8	61.2	202.4	324.3	1,809.4	2,304.1	4,396.0	4,921.9	2,847.7	2,352.6	1,146.3	558.6	21,122.3
Average	18.0	5.6	18.4	29.5	164.5	209.5	399.6	447.4	258.9	213.9	104.2	50.8	1,920.2

Table 4.2.27 MONTHLY AVAILABLE WATER AT ARAYAT

(Unit: MCM)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1968	86.5	52.1	47.7	28.0	34.6	43.0	348.2	1,588.8	2,453.1	1,014.0	101.6	196.6	5,994.2
1969	64.8	28.3	9.9	9.8	11.0	67.9	392.9	1,922.2	986.3	545.1	152.7	121.6	4,312.5
1970	46.1	17.2	5.9	2.2	4.6	198.8	288.5	811.6	2,397.6	1,720.1	930.8	391.8	6,815.2
1971	92.1	51.0	62.9	22.6	121.3	964.2	1,874.6	1,119.8	652.4	2,766.2	573.4	815.3	9,115.8
1972	775.9	126.5	52.0	45.6	76.6	166.7	4,292.9	4,092.6	1,515.0	226.9	252.5	142.8	11,766.0
1973	25.7	26.1	0	0	0	18.7	114.1	710.0	604.2	2,247.9	599.3	142.8	4,488.8
1974	30.8	3.1	12.3	1.1	5.4	532.1	744.3	2,206.7	575.2	1,868.7	2,322.6	841.3	9,143.6
1975	351.4	153.4	90.8	102.4	108.7	234.3	125.3	436.6	589.7	524.2	183.0	452.4	3,352.2
1976	395.3	75.4	31.3	16.8	1,646.9	645.4	1,268.0	1,359.0	1,332.0	1,126.8	760.2	206.5	8,863.6
1977	141.2	37.3	16.3	6.0	25.0	108.9	348.7	988.3	1,687.9	746.2	932.3	404.2	5,442.3
1978	209.7	154.1	74.7	108.1	103.7	394.2	856.0	1,850.0	2,616.9	2,387.5	2,228.9	959.1	11,942.9
Total	2,219.5	724.5	403.8	342.6	2,137.8	3,374.2	10,653.5	17,085.6	15,410.3	15,173.3	9,037.3	4,674.4	81,237.1
Average	201.8	65.9	36.7	31.1	194.3	306.7	968.5	1,553.2	1,400.9	1,379.4	821.6	424.9	7,385.2

Remarks: Monthly discharge minus discharge equivalent to 10 m^3/s

Table 4.2.28 SUMMARY OF IRRIGATION PUMPING SCHEMES ON SAN ANTONIO RESERVOIR

Alternative	Irrigable Area (ha)	Delivery WL. (m)	Reservoir Cap. Volume (MCM)	Reservoir Cap. WL. (m)	Dead Water Volume (MCM)	Dead Water WL. (m)	Sediment Volume (MCM)	Sediment WL. (m)	Pumping Eqpt. Head (m)	Pumping Eqpt. Cap. (m^3/sec)	Const. Cost (₱10^6) Pump House	Const. Cost (₱10^6) Pump
2 & 4	36,000	12.0	670	13.9	340	12.0	100	10.0	2.0	61	15	24
6 & 8	26,700	12.0	490	12.9	340	12.0	100	10.0	2.0	46	13	18

Note: Dependence on pumping equipment of each scheme is as follows.
(Average from 1968 through 1978 refer to Table 5.8 to Table 5.10

2 & 4	19.5%
6 & 8	28.2%

Table 4.2.29 QUANTITY OF DAM EARTHWORKS

Alternative Plan	Dam Embankment (MCM)	Drain Material (MCM)	Rip Rap (MSM)	Sod Facing (MSM)	Stripping (MCM)	Drainage Earthworks (MCM)
1.	16.0	2.8	1.6	1.7	2.1	8.5
2.	12.3	2.4	1.4	1.4	1.8	7.9
3.	9.9	2.1	1.2	1.2	1.6	7.9
4.	7.0	1.7	1.0	0.9	1.3	7.9
5.	13.3	2.5	1.5	1.5	1.9	8.0
6.	10.2	2.1	1.2	1.2	1.6	7.9
7.	7.7	1.8	1.1	1.0	1.4	7.9
8.	4.9	1.4	0.8	0.7	1.1	7.9
9.	14.8	2.7	1.6	1.6	2.0	7.3
10.	13.4	2.5	1.5	1.5	1.9	7.0
11.	11.0	2.2	1.3	1.3	1.7	6.6
12.	10.7	2.2	1.3	1.3	1.7	6.5
13	8.6	1.9	1.1	1.1	1.5	6.0

Table 4.2.30 UNIT PRICE APPLIED FOR COST ESTIMATE ON DAM EARTHWORKS

No.	Item	Unit	Description	Unit Price (₱)
Dam Earthworks				
1.	Clearing	m^3	Removing surface soil	8.00
2.	Filling	m^3	Borrowing, hauling distance 5 km in average and compacting	39.00
3.	Drain	m^3	Borrowing, hauling distance 10 km in average and compacting	48.50
4.	Riprap	m^2	Including foundation gravel	96.35
5.	Sod Facing	m^2		2.00
6.	Excavation	m^3	For side drain, 30% by manpower	8.20

Table 4.2.31 BREAKDOWN OF CONSTRUCTION COST OF BRIDGE

Based on Standard Section of IBRD Highway Project

Item	Unit	Q'ty	Unit Price (₱)	per 10 m Amount (₱)
Concrete	m^3	38.0	1,230.00	46,740.00
Concrete Pile	m	90.0	700.00	63,000.00
Re-Bar	kg	7,000.0	6.00	42,000.00
Hand Rail	m	20.0	300.00	6,000.00
Miscellaneous	about 25% of above sum			40,000.00
Total				200,000.00

Table 4.2.32 BREAKDOWN OF CONSTRUCTION COST OF BAMBAN DIVERSION WEIR

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱10^3)
Concrete (210 kg/cm^2)	m^3	1,100	1,350.00	1,485.00
Concrete (180 kg/cm^2)	m^3	4,200	1,230.00	5,166.00
Re-Bar	kg	57,000	6.00	342.00
Gate	ton	11	34,000.00	374.00
Excavation	m^3	19,000	8.00	152.00
Filling	m^3	13,000	12.00	156.00
Total				7,675.00
				(Say ₱7.7 x 10^6)

Table 4.2.33 COST ESTIMATE ON RIVER IMPROVEMENT FOR MAINTAINING NATURAL FLOOD DETENTION VOLUME IN SAN ANTONIO SWAMP

Case 1. Flood Control Capacity 420 x $10^6 m^3$

	Item	Unit	Q'ty (10^3)	Unit Price (₱10^6)	
1.	Excavation				
1.1	Bebe Sn. Esteban Channel	m^3	2760	8	22.1
1.2	Masantol - Sulipan	m^3	2994	8	24.0
1.3	Sulipan - San Luis	m^3	3962	8	31.7
1.4	San Luis - Candaba	m^3	7254	8	58.0
1.5	Candaba Arayat	m^3	2340	8	18.9
	Sub-total				154.7
2.	Embankment				
	Pampanga River	m^3	238	12	2.9
3.	Bridges				
3.1	Expressway	L.S.	-	-	25.6
3.2	San Simon Road	L.S.	-	-	5.6
3.3	San Luis Road	L.S.	-	-	5.6
3.4	Candaba Road	L.S.	-	-	3.5
3.5	Arayat Road	L.S.	-	-	7.0
	Sub-total				47.4
4.	Outlet Structures				5.0
5.	Land Acquisition	ha	260	20,000	5.2
6.	Others	about 10% of above sum			21.8
	Grand Total				237.0

Case 2. Flood Control Capacity 100 x $10^6 m^3$

$237 \times 10^6 \times 100/420 = ₱56 \times 10^6$

Table 4.2.34 BREAKDOWN OF CONSTRUCTION COST ON DAM ALTERNATIVE PLAN 1 to 13

Slope 1:2.5 Freeboard 4m

(Unit: P10^6)

Item / Alternative	1	2	3	4	5	6	7	8	9	10	11	12	13
Civil Works													
Earth Work	939	450	619	465	802	635	505	346	876	804	680	632	551
Dam Structure (10% of Above)	94	75	62	47	80	64	51	35	88	80	68	63	55
River Improvement	-	-	237	237	-	-	237	237	56	-	56	-	56
Drainage Earth Works	99	92	92	92	93	92	92	92	85	82	76	75	70
Drainage Pump Civil Works	46	32	23	12	36	24	15	5	-	-	-	-	-
Irrigation Pump Civil Works	-	15	-	15	-	13	-	-	-	-	-	-	-
Bridge	40	40	40	40	40	40	40	40	40	40	40	40	40
Bamban Diversion Weir	-	-	-	-	-	-	-	-	8	8	8	8	8
House Compensation	9	9	8	8	9	8	8	8	5	5	5	5	5
Miscellaneous (15% of Above Sum)	184	152	162	137	159	131	142	116	174	153	140	123	118
Contingency (15% of Above Sum)	211	175	186	158	183	151	164	134	200	176	161	142	136
Sub-total	1,622	1,340	1,429	1,211	1,402	1,158	1,254	1,026	1,533	1,348	1,235	1,088	1,039
Mechanical Works													
Gate and Others/1	4.7	3.8	3.1	2.4	4.0	3.2	2.6	1.8	4.4	4.0	3.4	3.2	2.8
Drainage Pump/2	46	32	23	12	36	24	15	5	0.9	0.8	0.7	0.6	0.6
Irrigation Pump/2	-	24	-	24	-	18	-	18	-	-	-	-	-
Micellaneous (20% of Above Sum)	10.3	12.2	5.2	7.7	8.0	9.3	3.5	5.0	-	-	-	-	-
Contingency (15% of Above Sum)	9.0	11.0	4.7	6.9	7.0	8.5	3.2	4.5	0.8	0.7	0.2	0.6	0.5
Sub-total	70	83	36	53	55	63	24	34	6	6	4	4	4
Total	1,692	1,423	1,465	1,264	1,457	1,221	1,278	1,060	1,539	1,354	1,239	1,092	1,043
Engineering Fee (8% of Total)	135	114	117	101	117	98	102	85	123	108	99	87	83
Grand Total	1,827	1,537	1,582	1,365	1,574	1,319	1,380	1,145	1,662	1,462	1,338	1,179	1,126

/1: 5% of structure cost

/2: To be replaced in 35 years later.

Table 4.2.35 BREAKDOWN OF CONSTRUCTION COST FOR IRRIGATION FACILITIES OF ALTERNATIVE 1 to 4

Item	Unit	Q'ty	Unit Price (₱)	Amount (₱10³)
1. Head Reach				
Excavation, Common	m^3	450,000	8	3,600
" , Rock	m^3	50,000	52	2,600
Embankment, Excavated M.	m^3	210,000	12	2,520
Concrete Lining	m^3	28,800	550	15,840
Related Structure	L.S.	-	-	4,570
Land Acquisition	ha	47	15,000	705
			Total	29,835 (829 ₱/ha)
2. Irrigation Canal				
Excavation, Common	m^3	2,290,000	8	18,320
" , Rock	m^3	15,000	52	780
Embankment, Excavated M.	m^3	1,570,000	12	18,840
" , Borrowed M.	m^3	1,460,000	30	43,800
Concrete Lining	m^3	9,200	550	5,060
Concrete Flume				
- Reinforce Concrete	m^3	2,600	1,350	3,510
- Foundation Concrete	m^3	300	660	198
- Reinforcement Bar	ton	260	6,000	1,560
Related Structures	L.S.	-	-	39,837
Land Acquisition	ha	803	20,000	16,060
			Total	147,965 (4,110 ₱/ha)
3. Booster Pump				
Pump House & Civil Works	L.S.	-	-	12,500
Mechanical & Electrical Facilities	L.S.	-	-	17,800
			Total	30,300 (841 ₱/ha)
4. Drainage Canal				
Excavation, Common	m^3	5,170,000	8	41,360
Embankment	m^3	2,890,000	12	34,680
Related Structures	L.S.	-	-	13,500
Land Acquisition	ha	760	20,000	15,200
			Total	112,800 (3,133 ₱/ha)
5. Farm Road				
Embankment, Excavated M.	m^3	710,000	12	8,520
" , Borrowed M.	m^3	1,350,000	30	40,500
Gravel Pavement	m^3	63,500	90	5,715
Land Acquisition	ha	563	20,000	11,260
			Total	65,795 (1,827 ₱/ha)
6. On Farm Development	ha	36,000	1,500	54,000 (1,500 ₱/Ha)
			Grand Total	440,695

For other alternative, unit construction cost per ha is applied except pumping facilities and Head Reach.

Table 4.2.36 SUMMARY OF WORK Q'TY AND COST OF PUMP HOUSE FOR ALTERNATIVE 14

	Q'ty	Unit Price (₱)	Const. Cost (₱ 10^3)
Inlet Channel & Transition			
Concrete	1,410 m^3	1,230/m^3	1,734
Reinforcing bar (70 kg/m^3 excluding floor concrete 850 m^3)	39.2 ton	6,000/ton	235
Excavation	28,000 m^3	11.50/m^3	322
Backfill	3,800 m^3	14.00/m^3	53
Outlet Cistern			
Concrete	590 m^3	1,230/m^3	726
Foundation concrete	160 m^3	660/m^3	106
Reinforcing bar (70 kg/m^3 excluding foundation concrete 160 m)	41.3 ton	6,000/ton	248
Excavation	4,200 m^3	11.50/m^3	48
Suction Pit			
Concrete	2,120 m^3	1,230/m^3	2,608
Reinforcing bar (70 kg/m^3)	148.4 ton	6,000/ton	890
Pump House			
Concrete	8,700 m^3	1,350/m^3	11,745
Reinforcing bar (80 kg/m^3)	696 ton	6,000/ton	4,176
Excavation (including Suction Pit)	29,200 m^3	11.50/m^3	336
Backfill (including Suction Pit)	6,800 m^3	14.00/m^3	95
		Total	23,322,000
		Say	₱23.3 x 10^6
Booster Pump			₱12.5 x 10^6
	Grand Total		₱35.8 x 10^6

Table 4.2.37 SUMMARY OF WORK Q'TY AND COST OF PUMP HOUSE FOR ALTERNATIVE 15

	Q'ty	Unit Price (₱)	Cost (₱ 10^3)
Inlet Channel & Transition			
Concrete	660 m^3	1,230/m^3	812
Reinforcing bar (70 kg/m^3 excluding floor concrete 100 m^3)	39.2 ton	6,000/ton	235
Excavation	8,200 m^3	11.50/m^3	94
Backfill	2,800 m^3	14.00/m^3	39
Outlet Cistern			
Concrete	150 m^3	1,230/m^3	185
Foundation concrete	30 m^3	660/m^3	20
Reinforcing bar (70 kg/m^3 excluding foundation conc. 30 m^3)	10.5 ton	6,000/ton	63
Excavation	800 m^3	11.50/m^3	9
Suction Pit			
Concrete	640 m^3	1,230/m^3	787
Reinforcing bar (70 kg/m^3)	46.9 ton	6,000/ton	281
Pump House			
Concrete	3,200 m^3	1,350/m^3	4,320
Reinforcing bar (80 kg/m^3)	256.0 ton	6,000/ton	1,536
Excavation (Including Suction Pit)	11,300 m^3	11.50/m^3	130
Backfill (Including Suction Pit)	3,900 m^3	14.00/m^3	55
	Total		8,566,000
			Say ₱8.6 x 10^6

Table 4.2.38 COST ESTIMATE FOR PUMPING EQUIPMENT AND RELATED METAL WORKS FOR ALTERNATIVE 14

(Unit: ¥10^3)

1.	Vertical Mixed-flow pump x 17 Nos. (4 Nos. x 63/14.8 = 17.0) Discharge 222 m^3/min Head 12 m Diameter 1,200 mm Motor 650 KW	35,000 x 17	=	595,000
2.	Butterfly valve x 17 Nos.	9,000 x 17	=	153,000
3.	Overhead crane 20 t x 1 Nos.			30,000
4.	Drainage pump x 17 Nos.	1,500 x 17	=	25,500
	Screen x 17 Nos.	1,000 x 17	=	17,000
5.	Delivery pipe 68 ton	700 x 68	=	47,600
6.	Erection & Others 25% of above sum			217,000
	Total			1,085,100

¥1,085,000,000/200 = US$5,425,500

US$5,425,500 x 7.50 = ₱40,691,000

30% electric facilities, transportation and etc. ₱12,207,000

Total ₱52,898,000

Say ₱52.9 x 10^6

Booster Pump ₱17.8 x 10^6

Grand Total ₱70.7 x 10^6

Table 4.2.39 COST ESTIMATE FOR PUMPING EQUIPMENT AND RELATED METAL WORKS FOR ALTERNATIVE 15

(Unit: ¥10^3)

1.	Vertical mixed-flow pump x 4 Nos. Discharge 222 m^3/m Head 12 m Diameter 1,200 mm Motor 650 KW	35,000 x 4 =	140,000
2.	Butterfly valve x 4 Nos.	9,000 x 4 =	36,000
3.	Overhead crane 20t x 1 No.	30,000 x 1 =	30,000
4.	Drainage pump x 4 Nos.	1,500 x 4 =	6,000
	Screen x 4 Nos.	1,000 x 4 =	4,000
5.	Delivery pipe 16 ton	700 x 16 =	11,200
6.	Election and others 25% of about sum		62,800
	Total		290,000

¥290,000 ÷ 200 = US$1,450,000

US$1,450,000 ÷ 7.50 = ₱10,875,000

30% for electric facilities transportation and etc. ₱3,262,500

Grand Total ₱14,137,500

Say ₱14.1 x 10^6

Table 4.2.40 BREAKDOWN OF CONSTRUCTION COST ON IRRIGATION FACILITIES

(Unit: ₱10^6)

Alternatives	1 - 4	5 - 8	9	10 & 11	12 & 13	14	15
Irrigable Area (ha)	36,000	26,700	36,700	27,700	20,000	38,200	11,000
Civil Works							
Head Reach	29.6	21.9	-	-	-	-	-
Irrigation Canal System	148.0	109.7	150.8	113.8	82.2	157.0	45.2
Drainage Canal System	112.8	83.7	115.0	86.8	62.7	119.7	34.5
Road System	65.8	48.8	67.1	50.6	36.5	69.8	20.1
On Farm Development	54.0	40.1	55.1	41.6	30.0	57.3	16.5
Pump House	12.5	-	-	-	-	35.8	8.6
Miscellaneous (15%)	63.4	45.6	58.2	43.9	31.7	65.9	18.7
Contingency (15%)	72.9	52.5	66.9	50.5	36.5	75.8	21.5
Sub-total	559.0	402.3	513.1	387.2	279.6	581.3	165.1
Mechanical Works							
Canal Facility	13.0	9.3	11.7	8.8	6.4	13.4	3.9
Pump	17.8	-	-	-	-	70.7	14.1
Miscellaneous (15%)	4.6	1.4	1.8	1.3	1.0	12.6	2.7
Contingency (15%)	5.3	1.6	2.0	1.5	1.1	14.5	3.1
Sub-total	40.7	12.3	15.5	11.6	8.5	111.2	23.8
Total	599.7	414.6	528.6	398.8	288.1	692.5	188.9
Engineering Fee (6.%)	36.0	24.9	31.7	23.9	17.3	41.6	11.3
Grand Total	635.7	439.5	560.3	422.7	305.4	734.1	200.2
Per ha (₱10^3)	17.6	16.5	15.3	15.3	15.3	19.2	18.2

Table 4.2.41 TOTAL CONSTRUCTION COST FOR EACH ALTERNATIVE PLAN

(Unit: ₱10^6)

Alternative Plan	Dam and Related Works	Compensation Cost of Reservoir Dam /1	Irrigation Facilities	Total
1	1,827	277.4	635.7	2,740.1
2	1,537	246.6	"	2,419.3
3	1,582	213.7	"	2,431.4
4	1,365	195.2	"	2,195.9
5	1,574	263.0	439.5	2,276.5
6	1,319	215.8	"	1,974.3
7	1,380	199.3	"	2,018.8
8	1,145	173.8	"	1,763.3
9	1,662	169.5	560.3	2,390.8
10	1,462	166.5	422.7	2,051.2
11	1,338	156.2	422.7	1,225.9
12	1,179	154.1	305.4	1,638.5
13	1,126	138.7	305.4	1,570.1
14	-	-	734.1	734.1
15	-	-	200.2	200.2

/1: ₱15,000/ha for paddy field and ₱1,500/ha for grass land and swamp are considered.

Table 4.2.42 LIST OF PUMPING PLANT

Alternative Plan	Actual Pump Head (m)	Maximum Discharge (m^3/s)	Power Requirement	
			Maximum (MW)	Annual Energy (GWH)
Irrigation Pump				
Reservoir Intake Pump				
2 & 4	2.0	61.0	3.0	1.8
6 & 8	2.0	46.0	2.3	2.0
Arayat Pump				
14	10.0	62.9	11.1	33.9
15	10.0	14.8	2.6	7.7
Irrigation Booster Pump				
1 to 4 & 14	20.0	14.4	5.0	13.8
Drainage Pump				
Reservoir Drainage Pump				
1	5.4	84.0	19.4	1.6
2	4.3	70.0	16.3	1.3
3	3.6	57.0	13.7	1.1
4	2.4	40.0	9.8	0.8
5	4.6	74.0	17.3	1.4
6	3.6	58.0	13.8	1.1
7	2.7	44.0	10.7	0.9
8	1.4	22.0	6.2	0.4

Table 4.2.43 ENERGY COST OF IRRIGATION BOOSTER PUMP FOR ALTERNATIVE 1 TO 4

Paddy 5,500 ha
Sugarcane 3,800 ha

---

1. Total water requirement

$$1{,}980 \text{ mm} \times 5{,}500 \times 10^4 \times 10^{-3} = 109 \times 10^6 \text{ m}^3$$

$$1{,}870 \times 3{,}800 \times 10^4 \times 10^{-3} = 71 \times 10^6 \text{ m}^3$$

$$\text{Total} \qquad 162 \times 10^6 \text{ m}^3$$

2. Pump operation hours

$$\frac{162 \times 10^6}{3.6 \times 3{,}600} = 12{,}500 \text{ hrs}$$

3. Energy consumption

$$1{,}100 \text{ KW} \times 12{,}500 \text{ hrs} = 13.8 \times 10^6 \text{ KWh}$$

Base	Motor	1,100 KW x 4 =	4,400
	Others		600
			5,000 KW

12 Month x 5,000 x 22 = ₱1,320 x 10^3

13.8 x 10^6 KWh x 0.332 x 1.1 = ₱5,040 x 10^3

Total ₱6,360 x 10^3

Say ₱6,500 x 10^3

Table 4.2.44 OPERATION COST FOR IRRIGATION PUMPING EQUIPMENT

No.	Item \ Alternative	2 & 4	6 & 8	14	15
1.	Pumping Requirement (MCM)	1,471.3	1,584.1	7,662.6	1,760.0
2.	Operation Months	29	35	103	83
3.	Mean Monthly Requirement (MCM)	50.7	45.3	74.4	21.2
4.	Pumping Capacity (m^3/sec)	61.0	46.0	63	15
5.	Mean Monthly Operation hour	231	274	328	393
6.	Motor Capacity (KW)	3,000	2,300	11,050	2,600
7.	Demand Charge (₱10^3)	46	35	175	40
8.	Monthly Power Consumption (10^3 KWH)	693	630	3,624	1,022
9.	Energy Charge (₱10^3)	203	186	1,079	306
10.	Monthly Power Charge (₱10^3)	249	221	1,254	346
11.	Annual Power Charge (₱10^3)	656	703	11,742	2,611

Note: item 2 is operation months for 11 years from 1968 through 1978.
: item 5 = item 3 / (item 4 x 3,600)
: item 7 = ₱12 x 500 + ₱16 x (item 6 - 500)
: item 8 = item 5 x item 6
: item 9 = item 8 x(₱0.29/h for first 200 hours)
(₱0.31/h for second 200 hours)

Table 4.2.45 BREAKDOWN OF OPERATION AND MAINTENANCE COST ON ALTERNATIVE PLAN 1 to 15

(Unit: ₱10^6)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dam O & M Cost															
Dam Facilities/1	8.1	6.7	7.1	6.1	7.0	5.8	6.3	5.1	7.7	6.7	6.2	5.4	5.2	-	-
Mechanical Facilities/2	1.4	1.7	0.7	1.1	1.1	1.3	0.5	0.7	0.1	0.1	0.1	0.1	0.1	-	-
Drainage Pump Energy	2.5	2.1	1.7	1.2	2.2	1.7	1.3	0.7	-	-	-	-	-	-	-
Irrigation Pump Energy	-	0.7	-	0.7	-	0.7	-	0.7	-	-	-	-	-	-	-
Sub-total	12.0	11.2	9.5	9.1	10.3	9.5	8.1	7.2	7.8	6.8	6.3	5.5	5.3	-	-
Irrigation System O & M Cost															
Irrigation and Drainage Facility/3	12.6	12.6	12.6	12.6	9.3	9.3	9.3	9.3	12.8	9.7	9.7	7.0	7.0	13.4	3.9
Mechanical Facility/2	0.8	0.8	0.8	0.8	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	1.2	0.5
Irrigation Pump Energy	6.5	6.5	6.5	6.5	-	-	-	-	-	-	-	-	-	18.2	2.6
Sub-total	19.9	19.9	19.9	19.9	9.5	9.5	9.5	9.5	13.1	9.9	9.9	7.2	7.2	33.8	7.0
Total	31.9	31.1	29.4	29.0	19.8	19.0	17.6	16.6	20.9	16.7	16.2	12.7	12.5	33.8	7.0

/1 : 0.5% of Financial Cost

/2 : 2.0% of Financial Cost

/3 : ₱350/ha

Table 4.2.46 ECONOMIC CONSTRUCTION COST FOR IRRIGATION FACILITIES

(Unit: ₱10^6)

	1 - 4	5 - 8	9	10 & 11	12 & 13	14	15
Civil Works	559.0	402.3	513.1	387.2	279.6	581.3	165.1
Local (55%)	307.5	221.3	282.2	213.0	153.8	319.7	90.8
Tax (3%)	9.2	6.6	8.5	6.4	4.6	9.6	2.7
Profit (15%)	46.1	33.2	42.3	31.9	23.1	48.0	13.6
Deducted Cost	503.7	362.5	462.3	348.9	251.9	523.7	148.8
Mechanical Works	40.7	12.3	15.5	11.6	8.5	111.2	23.8
Local (35%)	14.2	4.3	5.4	4.0	3.0	38.9	8.3
Tax (3%)	0.4	0.1	0.2	0.1	0.1	1.2	0.2
Profit (15%)	2.1	0.6	0.8	0.6	0.4	5.8	1.2
Deducted Cost	38.2	11.6	14.5	10.9	8.0	104.2	22.4
Total	541.9	374.1	476.8	359.8	259.9	627.9	171.2
Engineering Fee (6%)	36.0	24.9	31.7	23.9	17.3	41.6	11.3
Total	577.9	399.0	508.5	383.7	277.2	669.5	182.5
Per ha (₱10^3)	16.1	14.9	13.9	13.9	13.9	17.5	16.6

Table 4.2.47 ECONOMIC CONSTRUCTION COST FOR DAM FACILITIES FOR ALTERNATIVE PLANS 1 to 13

(Unit: ₱10^6)

Item / Alternative	1	2	3	4	5	6	7	8	9	10	11	12	13
Civil Works	1,622	1,340	1,429	1,211	1,402	1,158	1,254	1,026	1,533	1,348	1,235	1,088	1,039
Local (50%)	811	670	715	606	701	579	627	513	767	674	618	544	520
Tax (3%)	24	20	21	18	21	17	19	15	23	20	19	16	16
Profit (15%)	122	101	107	91	105	87	94	77	115	101	93	82	78
Deducted Cost	1,476	1,219	1,301	1,102	1,276	1,054	1,141	934	1,395	1,227	1,123	990	945
Mech. Works	70	83	36	53	55	63	24	34	6	6	4	4	4
Local (50%)	35	42	18	27	28	32	12	17	3	3	2	2	2
Tax (3%)	1.1	1.3	0.5	0.8	0.8	1.0	0.4	0.5	0.1	0.1	0.1	0.1	0.1
Profit (15%)	5.3	6.3	2.7	4.1	4.2	4.8	1.8	2.6	0.5	0.5	0.3	0.3	0.3
Deducted Cost	64	75	33	48	50	57	22	31	5	5	4	4	4
Sum	1,540	1,294	1,334	1,150	1,326	1,111	1,163	965	1,400	1,232	1,127	994	949
Engineering	135	114	117	101	117	98	102	85	123	108	99	87	83
Total	1,675	1,408	1,451	1,251	1,443	1,209	1,265	1,050	1,523	1,340	1,226	1,081	1,032
Per ha (₱10^3)	46.5	39.1	40.3	34.8	54.0	45.3	47.4	39.3	41.5	48.4	44.3	54.1	51.6

Table 4.2.48 TOTAL ECONOMIC CONSTRUCTION COST FOR EACH ALTERNATIVE PLAN

(Unit: ₱10^6)

Alternative Plan	Dam and Related Works	Irrigation Facilities	Total
1	1.675	577.9	2,252.9
2	1.408	577.9	1,985.9
3	1.451	577.9	2,028.9
4	1.251	577.9	1,828.9
5	1.443	399.0	1,842.0
6	1.209	399.0	1,608.0
7	1.265	399.0	1,664.0
8	1.050	399.0	1,449.0
9	1.523	508.5	2,031.5
10	1.340	383.7	1,723.7
11	1.226	383.7	1,609.7
12	1.081	277.2	1,358.2
13	1.032	277.2	1,309.2
14	*	669.5	669.5
15	*	182.5	182.5

Table 4.2.49 PRIMARY PROFIT PER HA FOR WET SEASON PADDY IN RAINFED LAND WITHOUT PROJECT

(Unit: ₱)

A)	Gross Income			
	2.08 tons x 1,710 ₱/ton			3,557
B)	Production Cost			2,065
	1) Farm Input			
	Seed		95 kg x 1.8 ₱/kg	171
	Fertilizer	N:	51 kg x 6.2 ₱/kg	316
		P:	7 kg x 7.4 ₱/kg	52
		K:	3 kg x 3.1 ₱/kg	9
	Chemicals		0.9 ℓ x 70 ₱/ℓ	63
	2) Laborer Cost		89 man·day x 10 ₱/man·day	890
	3) Mechanical Power		2.37 day x 190 ₱/day	450
	4) Animal Power		9.5 day x 12 ₱/day	114
C)	Primary Profit (A - B)			1,492

Table 4.2.50 PRIMARY PROFIT PER HA FOR WET SEASON PADDY IN IRRIGATED LAND WITHOUT PROJECT

(Unit: ₱)

A)	Gross Income			
	2.4 tons x 1,710 ₱/ton			4,104
B)	Production Cost			2,181
	1) Farm Input			
	Seed		95 kg x 1.8 ₱/kg	171
	Fertilizer	N:	51 kg x 6.2 ₱/kg	316
		P:	9 kg x 7.4 ₱/kg	67
		K:	3 kg x 3.1 ₱/kg	9
	Chemicals		1.2 ℓ x 70 ₱/ℓ	84
	2) Laborer Cost		97 man·day x 10 ₱/man·day	970
	3) Mechanical Power		2.37 day x 190 ₱/day	450
	4) Animal Power		9.5 day x 12 ₱/day	114
C)	Primary Profit (A - B)			1,923

Table 4.2.51 PRIMARY PROFIT PER HA FOR DRY SEASON PADDY IN IRRIGATED LAND WITHOUT PROJECT

(Unit: ₱)

A)	Gross Income			
	2.66 tons x 1,710 ₱/ton			4,549
B)	Production Cost			2,306
	1) Farm Input			
	Seed		99 kg x 1.8 ₱/kg	178
	Fertilizer	N:	53 kg x 6.2 ₱/kg	329
		P:	14 kg x 7.4 ₱/kg	104
		K:	5 kg x 3.1 ₱/kg	16
	Chemicals		1.5 ℓ x 70 ₱/ℓ	105
	2) Laborer Cost		101 man·day x 10 ₱/man·day	1,010
	3) Mechanical Power		2.37 day x 190 ₱/day	450
	4) Animal Power		9.5 day x 12 ₱/day	114
C)	Primary Profit (A - B)			2,243

Table 4.2.52 PRIMARY PROFIT PER HA FOR SUGARCANE WITHOUT PROJECT

(Unit: ₱)

A)	Gross Income		
	3.38 tons x 2,030 ₱/ton		6,861
B)	Production Cost		3,102
	1) Farm Input		
	Seed	34,000 pcs x 0.006 ₱/pcs	204
	Fertilizer	N: 120 kg x 6.2 ₱/kg	744
		P: 0	
		K: 0	
	Chemicals	0	
	2) Laborer Cost	120 man·day x 10 ₱/man·day	1,200
	3) Mechanical Power	4.6 days x 190 ₱/day	874
	4) Animal Power	6.65 days x 12 ₱/day	80
C)	Primary Profit (A - B)		3,759

Table 4.2.53 PRIMARY PROFIT PER HA FOR MONGO BEANS WITHOUT PROJECT

(Unit: ₱)

A)	Gross Income			
	0.4 ton x 4,600 ₱/ton			1,840
B)	Production Cost			832
	1) Farm Input			
	Seed		20 kg x 5.4 ₱/kg	108
	Fertilizer	N: 0		
		P: 0		
		K: 0		
	Chemicals		1.7 ℓ x 70 ₱/ℓ	119
	2) Laborer Cost		50 man·day x 10 ₱/man·day	500
	3) Mechanical Power		0.46 day x 190 ₱/day	87
	4) Animal Power		1.52 day x 12 ₱/day	18
C)	Primary Profit (A - B)			1,008

Table 4.2.54 PRIMARY PROFIT PER HA FOR WET SEASON PADDY WITH PROJECT

(Unit: ₱)

A)	Gross Income			
	4.5 tons x 1,710 ₱/ton			7,695
B)	Production Cost			2,831
	1) Farm Input			
	Seed		60 kg x 1.8 ₱/kg	108
	Fertilizer	N:	70 kg x 6.2 ₱/kg	434
		P:	20 kg x 7.4 ₱/kg	148
	Chemicals		2 ℓ x 70 ₱/ℓ	140
	2) Laborer Cost		125 man·day x 10 ₱/man·day	1,250
	3) Mechanical Power		3.38 days x 190 ₱/day	642
	4) Animal Power		9.1 days x 12 ₱/day	109
C)	Primary Profit (A - B)			4,864

Table 4.2.55 PRIMARY PROFIT PER HA FOR DRY SEASON PADDY WITH PROJECT

(Unit: ₱)

A)	Gross Income			
	5.0 tons x 1,710 ₱/ton			8,550
B)	Production Cost			2,955
	1) Farm Input			
	Seed		60 kg x 1.8 ₱/kg	108
	Fertilizer	N:	90 kg x 6.2 ₱/kg	558
		P:	20 kg x 7.4 ₱/kg	148
	Chemicals		2 ℓ x 70 ₱/ℓ	140
	2) Laborer Cost		125 man·day x 10 ₱/man·day	1,250
	3) Mechanical Power		3.38 days x 190 ₱/day	642
	4) Animal Power		9.1 days x 12 ₱/day	109
C)	Primary Profit (A - B)			5,595

Table 4.2.56 PRIMARY PROFIT PER HA FOR SUGARCANE WITH PROJECT

(Unit: ₱)

A)	Gross Income		
	6.35 tons x 2,030 ₱/ton		12,891
B)	Production Cost		4,448
	1) Farm Input		
	Seed	20,000 pcs x 0.006 ₱/pcs	120
	Fertilizer	N: 150 kg x 6.2 ₱/kg	930
		P: 50 kg x 7.4 ₱/kg	370
		K: 50 kg x 3.1 ₱/kg	155
	Chemicals		150
	2) Laborer Cost	160 man·day x 10 ₱/man·day	1,600
	3) Mechanical Power	5.67 days x 190 ₱/day	1,077
	4) Animal Power	3.8 days x 12 ₱/day	46
C)	Primary Profit (A - B)		8,443

Table 4.2.57(1) IRRIGATION BENEFIT AT FULL STAGE FOR EACH ALTERNATIVE OF THE IRRIGATION PROJECT

(Unit: ₱10³)

Number of Alternative	With Project			Without Project			Benefit (₱10³)
	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱10³)	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱10³)	
Alternative 1-4							
1) Paddy							
Irrigated (wet)	30,000	4,864	145,920	18,000	1,923	34,614	111,306
Irrigated (dry)	30,000	5,595	167,850	14,400	2,243	32,299	135,551
Rainfed (wet)	-	-	-	12,000	1,492	17,904	-17,904
2) Sugarcane	6,000	8,443	50,658	6,000	3,759	22,554	28,104
3) Mongo beans	-	-	-	1,560	1,008	1,572	-1,572
Total			364,428			108,943	255,485
Alternative 5-8							
1) Paddy							
Irrigated (wet)	24,500	4,864	119,168	14,700	1,923	28,268	90,900
Irrigated (dry)	24,500	5,595	137,078	11,760	2,243	26,378	110,700
Rainfed (wet)	-	-	-	9,800	1,492	14,622	-14,622
2) Sugarcane	2,200	8,443	18,575	2,200	3,759	8,270	10,305
3) Mongo beans	-	-	-	1,270	1,008	1,280	-1,280
Total			274,821			78,818	196,003
Alternative 9							
1) Paddy							
Irrigated (wet)	24,500	4,864	119,168	14,700	1,923	28,268	90,900
Irrigated (dry)	34,500	5,595	193,028	11,760	2,243	26,378	166,650
Rainfed (wet)	-	-	-	9,800	1,492	14,622	-14,622
2) Sugarcane	2,200	8,443	18,575	2,200	3,759	8,270	10,305
3) Mongo beans	-	-	-	1,270	1,008	1,280	-1,280
Total			330,771			78,818	251,953
Alternative 10 and 11							
1) Paddy							
Irrigated (wet)	15,500	4,864	75,392	9,300	1,923	17,884	57,508
Irrigated (dry)	25,500	5,595	142,673	7,440	2,243	16,688	125,985
Rainfed (wet)	-	-	-	6,200	1,492	9,250	-9,250
2) Sugarcane	2,200	8,443	18,575	2,200	3,759	8,270	10,305
3) Mongo beans	-	-	-	800	1,008	806	-806
Total			236,640			52,898	183,742

(to be cont'd)

Table 4.2.57(2) IRRIGATION BENEFIT AT FULL STAGE FOR EACH ALTERNATIVE OF THE IRRIGATION PROJECT

(Unit: ₱10^3)

Number of Alternative	With Project			Without Project			Benefit (₱10^3)
	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱10^3)	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱10^3)	
Alternative 12 and 13							
1) Paddy							
Irrigated (wet)	10,000	4,864	48,640	6,000	1,923	11,538	37,102
Irrigated (dry)	20,000	5,595	111,900	4,800	2,243	10,766	101,134
Rainfed (wet)	-	-	-	4,000	1,492	5,968	-5,968
2) Mongo beans	-	-	-	520	1,008	524	-524
Total			160,540			28,796	131,744
Alternative 14							
1) Paddy							
Irrigated (wet)	30,850	4,864	150,054	18,510	1,923	35,595	114,459
Irrigated (dry)	30,850	5,595	172,606	14,800	2,243	33,196	139,410
Rainfed (wet)	-	-	-	7,350	3,759	27,629	34,427
2) Sugarcane	7,350	8,443	62,056	12,340	1,492	18,411	-18,411
3) Mongo beans	-	-	-	1,600	1,008	1,613	-1,613
Total			384,716			116,444	268,272
Alternative 15							
1) Paddy							
Irrigated (wet)	11,000	4,864	53,504	6,600	1,923	12,692	40,812
Irrigated (dry)	8,000	5,595	44,760	5,280	2,243	11,843	32,917
Rainfed (wet)	-	-	-	4,400	1,492	6,565	-6,565
2) Mongo beans	-	-	-	570	1,008	575	-575
Total			98,264			31,675	66,589

Table 5.3.1 NEGATIVE BENEFIT ACCRUED FROM THE IMPLEMENTATION OF THE SAN ANTONIO RESERVOIR

No. of Alternative Plan	Submerged Area (ha)	Paddy Field /1 in the Submerged Area (ha)	Negative Benefit		Total Negative Benefit (₱10³)
			Paddy /2 (₱10³)	Mongo /3 (₱10³)	
1	27,000	17,550	26,185	1,769	27,954
2	24,000	15,600	23,275	1,572	24,847
3	20,800	13,520	20,172	1,363	21,535
4	19,000	12,350	18,426	1,245	19,671
5	25,600	16,640	24,827	1,672	26,504
6	21,000	13,650	20,366	1,376	21,742
7	19,400	12,610	18,814	1,271	20,085
8	17,400	11,310	16,875	1,140	18,015
9	16,500	11,550	17,232	1,164	18,396
10	16,200	11,340	16,919	1,143	18,062
11	15,200	10,640	15,875	1,073	16,948
12	15,000	10,500	15,666	1,058	16,724
13	13,500	9,450	14,099	953	15,052

/1: For alternative plans from No. 1 to No. 8; submerged area x 0.65
For alternative plans from No. 9 to No. 13; submerged area x 0.70

/2: Paddy field x primary profit per ha (₱1,492) for wet season paddy without project.

/3: Paddy field x 10% x primary profit per ha (₱1,008) for mongo beans without project.

Table 5.5.1 INTERNAL RATE OF RETURN AND SENSITIVITY ANALYSIS

	IRR (%)	Sensitivity Analysis		
		Cost +20%	0%	+20%
		Benefit .0%	-20%	-20%
Flood Control Project				
(1) West Diversion Channel Project				
Plan - 1	*	*	*	*
Plan - 2	*	*	*	*
(2) Channel Improvement Project of the Pampanga River				
Plan - 1	8.6	7.2	6.8	5.4
Plan - 2	3.5	*	*	*
Irrigation Project				
(1) San Antonio Reservoir Irrigation Project				
Alternative Plan No. 1	5.9	4.7	4.4	*
Alternative Plan No. 2	6.8	5.5	5.2	4.0
Alternative Plan No. 3	6.9	5.6	5.4	4.1
Alternative Plan No. 4	7.6	6.3	6.0	4.7
Alternative Plan No. 5	5.5	4.3	4.1	*
Alternative Plan No. 6	6.6	5.4	5.1	4.0
Alternative Plan No. 7	6.5	5.3	5.1	4.0
Alternative Plan No. 8	7.5	6.3	6.0	4.8
Alternative Plan No. 9	7.3	6.1	5.8	4.6
Alternative Plan No. 10	6.0	4.9	4.6	*
Alternative Plan No. 11	6.6	5.4	5.1	*
Alternative Plan No. 12	5.2	4.1	*	*
Alternative Plan No. 13	5.5	4.4	4.2	*
(2) Pumping Irrigation Project				
Alternative Plan No. 14	19.2	16.6	16.0	13.6
Alternative Plan No. 15	18.5	16.0	15.4	13.2

Remark: * Less than 4.0%

Table 5.6.1 NUMBER OF HOUSES AND POPULATION IN THE SAN ANTONIO RESERVOIR

Alternative Plan	Number of Houses	Number of Farmers
1	1,790	10,700
2	1,720	10,300
3	1,650	9,900
4	1,600	9,600
5	1,760	10,600
6	1,650	9,900
7	1,610	9,700
8	1,600	9,600
9	1,000	6,000
10	990	5,900
11	970	5,800
12	970	5,800
13	930	5,600

Table 5.7.1 SUMMARY OF EVALUATION AND EFFECTS ON THE FLOOD CONTROL PROJECT

Plan	IRR (%)	Benefit (₱10^6)	Construction Cost		Design Flood (yr.)	Stretch to be improved or constructed	Length (km)	Effect		
			Economic (₱10^6)	Financial (₱10^6)				Decrease in Inund. Area (10^3 ha)	Increase of Paddy Prod. (10^6 tons)	Decrease in Inund. Houses
West Diversion Channel										
Plan-1	*	4.62	673.6	721.2	100	Candaba - Manila Bay	42	0.81	0.59	100
Plan-2	*	1.96	538.1	576.3	100	San Simon - Manila Bay	31	0.21	0.77	700
River Improvement										
Plan-1	8.6	94.35	823.2	906.8	100	Candaba - Masantol	32	18.90	16.20	9,900
Plan-2	*	34.97	655.1	726.0	100	Candaba - Sulipan	19	4.80	4.10	4,600

Remark: * less than 4%

Table 5.7.2 SUMMARY OF EVALUATION AND EFFECTS ON THE IRRIGATION PROJECT

No. of Alternative Plan	IRR (%)	Irrigation Benefit (₱10⁶)	Cost		Irrigation Area		Project Effect				
			Economic (₱10⁶)	Finamcial (₱10⁶)	Wet (10^3 ha)	Dry (10^3 ha)	Production to be Increased		Resettlement Needed		
							Paddy (10^3 ton)	Sugar (10^3 ton)	Submerged Area (10^3 ha)	No. of Houses	No. of People
(1) San Antonio Reservoir Irrigation Project											
1	5.9	255	2,253	2,740	36.0	36.0	178.5	17.8	27.0	1,790	10,700
2	6.8	255	1,986	2,419	36.0	36.0	178.5	17.8	24.0	1,720	10,300
3	6.9	255	2,029	2,431	36.0	36.0	178.5	17.8	20.8	1,650	9,900
4	7.6	255	1,829	2,196	36.0	36.0	178.5	17.8	19.0	1,600	9,600
5	5.5	196	1,842	2,277	26.7	26.7	145.8	6.5	25.6	1,760	10,600
6	6.6	196	1,608	1,974	26.7	26.7	145.8	6.5	21.0	1,650	9,900
7	6.5	196	1,664	2,019	26.7	26.7	145.8	6.5	19.4	1,610	9,700
8	7.5	196	1,449	1,763	26.7	26.7	145.8	6.5	17.4	1,600	9,600
9	7.3	252	2,032	2,391	26.7	36.7	195.8	6.5	16.5	1,000	6,000
10	6.0	184	1,724	2,051	17.7	27.7	142.2	6.5	16.2	990	5,900
11	6.6	184	1,610	1,226	17.7	27.7	142.2	6.5	15.2	970	5,800
12	5.2	132	1,358	1,639	10.0	20.0	109.5	-	15.0	970	5,800
13	5.5	132	1,309	1,570	10.0	20.0	109.5	-	13.5	930	5,600
(2) Pumping Irrigation Project											
14	19.2	268	670	734	38.2	38.2	160.1	21.8	-	-	-
15	18.5	67	183	200	11.0	8.0	50.5	-	-	-	-