3.6 Irrigation Benefit

Irrigation benefit to be expected is defined as the difference of primary profit from crops between future with project and without project conditions. On the basis of the estimated production cost and gross income, primary profit for crop per ha is calculated both on future with and without project conditions as follows, and details are as shown in Table 3.5 to 3.10.

(Unit: Peso)

	With Project			Without Project		
	Gross Income	Production Cost	Primary Profit	Gross Income	Production Cost	Primary Profit
1) Paddy						
Irrigated (wet)	8,415	3,206	5,209	4,413	2,422	1,991
Irrigated (dry)	9,350	3,334	6,016	4,899	2,534	2,365
Rainfed (wet)	-	-	-	3,871	2,273	1,598
2) Mongo beans	1,840	1,097	743	1,840	1,097	743

Applying the primary profit per crop estimated above to crop area, total primary profits accrued from agricultural production for the irrigation project are estimated both on without and with project conditions. Based on this result, irrigation benefit is calculated. The benefit will be expected to increase linearly year by year and reach the full benefit in and after five years after the completion of the project. The irrigation benefit at the full stage is estimated at about 98 million pesos for the diversion dam scheme and about 76 million pesos for the pump scheme, respectively, as shown in Table 3.11.

3.7 Farm Economy

In order to assess the irrigation project from farmers' economy view point, analyses of farm budget for typical farmer are examined under both the future without project and the future with project conditions.

After the implementation of the irrigation project, year round irrigation will permit double cropping of paddy per annum for the most of the project area and increasing unit yield of paddy to 5 tons per ha for dry season paddy and 4.5 tons per ha for wet season paddy, respectively. As a result, drastic increase on farm income in the future with project condition can be expected in the typical farmer. On the other hand, substantial increase on farm income will be expected in the future without project condition. The typical farm budgets in both future without and with conditions are prepared as shown in Tables 3.12 and 3.13 and outlined below.

a) Without Project Condition

(Unit: ₱1,000)

Item	Single Corp of Paddy (Rainfed)	Single Crop of Paddy (Irrigated)	Double Crop of Paddy (Irrigated)
I) Gross Income	14.3	14.8	19.4
(1) Farm income	5.3	5.9	11.3
(2) Off-farm income	9.0	8.9	8.1
II) Gross Outgo	14.0	14.6	18.9
(3) Production cost	3.6	4.1	8.5
(4) Living expenses	10.4	10.4	10.4
III) Net Reserve (Capacity to pay)	0.3	0.2	0.5
IV) Net Farm Income (1-3)	1.7	1.7	2.8

b) With Project Condition

(Unit: ₱1,000)

Item	Diversion Dam Scheme	Pump Scheme
I) Gross Income	29.9	26.5
(1) Farm income	21.2	17.8
(2) Off-farm income	8.7	8.7
II) Gross Outgo	26.5	24.3
(3) Production cost	13.0	10.8
(4) Living expenses	13.5	13.5
III) Net Reserve (Capacity to pay)	3.4	2.2
IV) Net Farm Income (1-3)	8.2	7.0

Farm incomes with project on the typical farm under single cropping of paddy will be expected to become about 3 and 4 times of that of without project condition for the Pump and the Diversion Dam Schemes, respectively and about 2 times on the typical farm under double cropping of paddy.

Net farm incomes with project on the typical farm on single cropping of paddy will be expected to increase 4 to 5 times and about 3 times on the typical farm under double cropping of paddy.

Annual net reserve or capacity to pay will be about ₱250 on single cropping farm and ₱500 on double cropping of paddy farm in without project condition and become ₱3,400 in the Diversion Dam Scheme and ₱2,200 in the Pump Scheme.

The increased net reserve will offer incentives to the farmers and substantial capacity to pay will enable them to pay irrigation fee.

From the productivities of land and labor, it is expected that the both Diversion Dam and Pump Schemes will highly improve such productivities as follows:

	Productivity of Labor (₱/man-day)	Productivity of Land (₱/ha)
With Project		
- Diversion Dam Scheme/1	42	5,142
- Pump Scheme/2	41	4,329
Without Project/3	18	1,044

/1: Productivity of labor: ₱7,713/185 man-days = ₱42/man-day
Productivity of land : ₱7,713/1.5 ha = ₱5,142/ha

/2: Productivity of labor: ₱6,494/157 man-days = ₱41/man-day
Productivity of land : ₱6,494/1.5 ha = ₱4,329/ha

/3: Productivity of labor: ₱1,566/89 man-days = ₱18/man-day
Productivity of land : ₱1,566/1.5 ha = ₱1,044/ha

Table 1.1 LIST OF MUNICIPALITIES AND BARANGAYS IN THE IRRIGATION DEVELOPMENT AREA

Name of Municipality	Name of Barangay
1. Apalit	1. San Juan
	2. San Vicente
	3. Sucad
	4. Sulipan
	5. Tabuyoc
2. Arayat	1. Batasan
	2. Gatiawin
	3. Guenasan
	4. Manga Cacutud
	5. Paralaya
	6. Plazang Luma
	7. San Agustin Sur
	8. San Juan Bano
	9. San Nicolas
	10. Santa Lucia Matame
3. Candaba	1. Lanang
	2. Mandasig
	3. San Agustin
	4. Santo Rosario
4. Mexico	1. Lang Dolores
	2. Masangsang
	3. San Antonio
	4. San Carlos
	5. Santo Domingo
	6. San Jose Matulid
	7. San Lorenzo
	8. San Nicolas
	9. San Roque
5. Minalin	1. Lourdes
	2. San Isidro
	3. Santa Maria
	4. Santo Domingo
6. Santa Ana	1. San Agustin
	2. San Isidro
	3. San Ioaquin
	4. San Jose
	5. San Juan
	6. San Nicolas
	7. San Pedro
	8. Santa Lucia
	9. Santa Maria
	10. Santiago
	11. Santo Rosario
7. San Fernando	1. Del Pilar
	2. San Felipe
	3. San Nicolas
8. San Luis	1. San Carlos
	2. San Isidro
	3. San Sebastian
	4. Santa Catalina
	5. Santa Cruz Pambilong
	6. Santa Rita
	7. Santo Rosario
	8. Santo Tomas
9. San Simon	1. De la Paz
	2. Santa Monica
	3. San Isidro
	4. San Jose
	5. San Juan
	6. San Pablo Libutad
	7. San Pablo Proper
	8. San Pedro
	9. San Nino
10. San Tomas	1. San Matias
	2. Santo Rosario

Table 2.1 BASIC SOCIO DATA IN THE IRRIGATION DEVELOPMENT AREA

Municipality	Population 1975	Population 1980	Population Growth Rate 1975/80 (%)	Area (ha)	Population Density (person/km^2)	Total Household	Family Size	No. of Farm	Percentage of Farm Household
A) Municipalities Related to the Irrigation Development									
Apalit	41,283	48,264	3.17	6,147	785	7,682	6.3	2,139	22.7
Arayat	52,739	56,770	1.48	13,475	421	8,726	6.5	2,049	30.9
Candaba	48,458	52,643	1.67	20,870	252	8,086	6.5	1,857	52.4
Mexico	48,805	53,488	1.85	11,741	456	8,051	6.6	3,602	31.2
Minalin	25,428	27,326	1.45	2,908	940	4,000	6.8	1,198	25.0
San Fernando	98,382	110,423	2.34	8,119	1,360	17,358	6.4	352	7.3
San Luis	23,866	25,698	1.49	5,683	452	3,929	6.5	1,664	50.9
San Simon	21,553	23,537	1.78	5,736	410	3,682	6.4	1,838	34.5
Sta. Ana	22,595	25,342	2.32	4,596	551	4,392	5.8	984	23.9
Sto. Tomas	21,320	24,945	3.19	2,129	1,172	4,169	6.0	358	9.4
Total	404,429	448,436	2.09	81,404	551	70,075	6.4	16,041	22.9
B) Irrigation Development Area									
	94,400	104,700	2.09	14,000	750	16,390	6.4	4,600	28.1

Source: National Census and Statistic Office Region III

Table 2.2 RESULTS OF SURVEY ON THE NUMBER OF FARM HOUSEHOLDS AND LANDLESS LABORER HOUSEHOLDS (1981)

Barangay	Total Households	Number of Farm Households		Number of Landless Laborer Households		Others	
	No.	No.	(%)*	No.	(%)*	No.	(%)*
Paralaya	195	20	10.3	30	15.4	145	74.3
Guemasan	303	60	19.8	50	16.5	193	63.7
Sn. Isidro	528	217	41.1	200	37.9	111	21.0
Santiago	386	97	25.1	60	15.5	229	59.4
Sn. Nicolas	346	78	22.5	200	57.8	68	19.7
Sn. Juan	207	57	27.5	15	7.2	135	65.3
Sn. Pedro	118	70	59.3	12	10.2	36	30.5
Sto. Domingo	182	18	9.9	30	16.5	134	73.6
Sn. Roque	66	30	45.5	10	15.2	26	39.3
Total	2,331	647	27.8	607	26.0	1,077	46.2

*: Percentage of total households

Table 2.3 MONTHLY LABOR FORCE IN THE IRRIGATION DEVELOPMENT AREA

(Unit: 1,000 man-days)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A) Labor Force Available/1	336	336	336	336	336	336	336	336	336	336	336	336	4,030
B) Labor Requirement for Farming at Present Condition	73	72	50	35	26	102	154	140	97	161	195	145	1,250
1) Paddy/Diversified Crop (Rainfed) - 2,300 ha	1	3	1	-	-	22	38	42	17	21	27	24	196
2) Paddy/Diversified Crop (Irrigated) - 4,000 ha	2	6	3	-	-	39	67	76	33	44	56	50	376
3) Paddy Only (Irrigated) - 2,900 ha	31	44	21	-	-	-	-	-	34	60	50	24	264
4) Paddy/Paddy (Irrigated) - 2,300 ha	39	19	25	35	26	41	49	22	13	36	62	47	414
C) Balance (A-B)	263	264	286	301	310	234	182	196	239	175	141	191	2,782

/1: (Labor force from farmers + Labor force from landless workers) x Yearly workable days
= (5,900 + 7,900) x (365 days x 80%) = 4,030,000 man-days/year

Labor force from landless workers in the irrigation development area is estimated as follows:

Lf = Th x Lw x Fs x Ra x Ar = 16,390 x 0.26 x 6.4 x 0.58 x 0.5 = 7,900 persons

Where, Lf: Labor force from landless workers
Th: Total households (16,390)
Lw: Percentage of landless workers household to total household (26%)
Fs: Family size (6.4 person/household)
Ra: Ratio of age distribution between 15 and 59 (58%)
Ar: Ratio of available labor force (50%)

Table 2.4 HECTARAGE SUMMARY OF VARIOUS SOIL SERIES IN THE IRRIGATION DEVELOPMENT AREA

Soil Series	Soil Mapping Unit	Area (ha)	Proportional Extent (%)
San Fernando clay	SFe	7,400	52.9
Tagulod clay	Te	5,500	39.3
Quingua clay loam	Qcl	400	2.9
La Paz clay loam	Lcl	500	3.5
Masantol clay	Mc	200	1.4
Total		14,000	100.0

Table 2.5 HECTARAGE SUMMARY OF THE SOILS IN THE IRRIGATION DEVELOPMENT AREA ACCORDING TO LAND CAPABILITY CLASS

Grade in Class		Area (ha)	Proportional Extent (%)
CLASS I	I: Quingua clay loam	400	2.9
CLASS II	IIj: La Paz clay loam	500	3.5
CLASS III			
	IIIdgj: San Fernando clay	7,400	52.9
	IIId: Tagulod clay	5,500	39.3
	IIIgj: Masantol clay	200	1.4
Total		14,000	100.0

Table 2.6 SUMMARY OF CLIMATIC CONDITIONS

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	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 collected, analysis has not been completed so far.

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

Table 2.7 RAINFALL AT CABANATUAN CITY
(1951 - 1979)

(Unit: mm)

Month	Monthly Rainfall		
	Average	Maximum	Minimum
January	7.4	67.3	0
February	5.3	49.5	0
March	10.9	69.8	0
April	31.2	261.4	0
May	172.3	931.1	7.7
June	262.8	590.8	64.2
July	302.2	1,064.7	141.9
August	406.6	622.7	213.0
September	309.7	628.7	144.6
October	173.4	514.1	12.2
November	125.7	344.4	14.0
December	52.0	197.0	0
Annual	1,868.6	2,369.5	1,338.9
Wet Season			
(May - Oct.)	1,627.0	-	-
Percent (%)	87.1	-	-

Source: PAGASA

Table 2.8 PRESENT LAND USE IN THE IRRIGATION DEVELOPMENT AREA

	Area (ha)	Proportional Extent (%)
(1) Paddy field /1	11,500	82.2
Rainfed area	2,300	16.5
Irrigated area	9,200	65.7
- double cropping of paddy	(2,300)	
- single cropping of paddy	(6,900)	
(2) Grass land	100	0.7
(3) Swampy area	900	6.4
(4) Village/Road/Rivers/Others /2	1,500	10.7
Total	14,000	100.0

/1 : Net area

/2 : Containing the land of about 300 ha where existing canal facilities, feeder roads and farm levee are installed in the paddy field

Table 2.9 LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENTS (PRESENT CONDITION)

Requirements	Rainfed Paddy			Irrigated Paddy						Diversified Crops		
				Wet Season			Dry Season					
	F.L./1	H.L./1	Total	F.L.	H.L.	Total	F.L.	H.L.	Total	F.L.	H.L.	Total
1) Labor Force (man-day/ha)	34.2	46.8	81.0	39.8	49.2	89.0	41.4	49.6	91.0	23.0	37.0	60.0
- Nursery Preparation	4.0	1.0	5.0	4.0	1.0	5.0	4.0	1.0	5.0	-	-	-
- Land Preparation	10.0	4.0	14.0	10.0	4.0	14.0	10.0	4.0	14.0	4.0	2.0	6.0
- Transplanting	2.0	18,0	20.0	2.0	18.0	20.0	2.0	18.0	20.0	1.0	9.0	10.0/2
- Fertilizing	2.4	0.6	3.0	3.2	0.8	4.0	4.0	1.0	5.0	-	-	-
- Spraying	1.6	0.4	2.0	2.4	0.6	3.0	3.2	0.8	4.0	4.0	1.0	5.0
- Weeding	8.0	2.0	10.0	8.0	2.0	10.0	8.0	2.0	10.0	10.0	2.0	12.0
- Irrigating	1.0	-	1.0	4.0	-	4.0	4.0	-	4.0	-	-	-
- Harvesting and Threshing	2.0	20.0	22.0	3.0	22.0	25.0	3.0	22.0	25.0	2.0	23.0	25.0
- Hauling and Others	3.2	0.8	4.0	3.2	0.8	4.0	3.2	0.8	4.0	2.0	-	2.0
2) Animal Power (day/ha)	5.4	1.0	6.4	5.4	1.0	6.4	5.4	1.0	6.4	1.3	0.2	1.5
3) Mechanical Power (day/ha)	0.5	1.9	2.4	0.5	1.9	2.4	0.5	1.9	2.4	0.1	0.4	0.5

/1: F.L.: Family labor, H.L.: Hired labor
/2: Seeding

Source: Results of farm economic survey.
Hayami, Y. M. Kikuchi, P. F. Moya, L. M. Bambo and E. B. Marciano, 1978.
Anatomy of a peasant economy, IRRI, Los Baños, Philippines.

Table 2.10 RESULTS OF PADDY YIELD SURVEY - WET SEASON

Sample No.	Sampling Place		Number of Variety	Number of Hill per Ha.	Number of Grains per Hill	Number of Panicles per Hill	Number of Panicles per m^2	Number of Grains per Panicle	Weight of Ripened Grains per Hill (g)	Weight of 1,000 Grains (g)	Number of Ripened Grains per Hill	Percentage of Ripened Grains (%)	Unit Yield of Paddy (t/ha)
	Municipality	Barangay											
1	Sta. Ana	San Roque	IR-36	340,278	379	7	238	54	5.1	24.9	205	54	1.74
2	Sta. Ana	San Roque	IR-36	265,833	1,219	11	292	111	22.4	23.4	956	78	5.95
3	Apalit	Swlipan	247	166,111	455	9	149	51	6.7	23.8	282	62	1.11
4	Apalit	Swlipan	IR-20	116,111	1,191	23	267	52	19.7	23.7	831	70	2.29
5	Apalit	Sampaloc	BE_3	133,333	2,282	18	240	127	26.9	19.6	1,374	60	3.59
6	Apalit	Sampaloc	IR-36	266,667	1,056	10	267	106	13.3	23.8	559	53	3.55
7	Apalit	Sampaloc	IR-36	233,333	641	8	187	80	9.8	26.2	274	58	2.29
8	Apalit	San Juan	IR-36	193,333	1,085	12	232	90	21.1	23.3	904	83	4.08
9	Apalit	San Juan	IR-36	320,000	341	7	224	49	6.6	24.1	274	80	2.11
10	Apalit	San Juan	IR-53	257,778	779	13	335	60	12.7	23.3	544	70	3.27
11	Apalit	Sucad	IR-36	186,667	748	15	280	50	11.2	23.0	488	65	2.09
12	Apalit	Sucad	IR-36	225,000	863	12	270	72	12.1	23.7	510	59	2.72
13	Minalin	Sto. Domingo	IR-54	258,333	1,519	15	387	101	19.7	24.4	809	53	5.09
14	Minalin	Sto. Domingo	IR-44	311,667	264	5	156	53	3.9	23.1	169	64	1.22
15	San Simon	San Jose	IR-36	140,556	1,293	16	225	81	19.5	22.2	879	68	2.74
16	San Simon	San Jose	IR-50	187,778	1,639	20	376	82	22.8	19.3	1,184	72	4.28
17	Sta. Ana	San Juan	IR-36	340,000	446	7	238	64	8.9	23.4	381	85	3.03
	Average			231,928	953	12	257	75	14.3	23.2	631	67	3.01

Note: Survey period: 14th - 21th Sept., 1981

Table 2.11 RESULTS OF PADDY YIELD SURVEY - DRY SEASON

Sample No.	Sampling Place		Number of Variety	Number of Hill per Ha.	Number of Grains per Hill	Number of Panicles per Hill	Number of Panicles per m^2	Number of Grains per Panicle	Weight of Ripened Grains per Hill (g)	Weight of 1,000 Grains (g)	Number of Ripened Grains per Hill	Percentage of Ripened Grains (%)	Unit Yield of Paddy (t/ha)
	Municipality	Barangay											
1	Sto. Tomas	San Malias	Benzer	178,062	804	11	196	73	9.8	21.7	452	56	1.75
2	Mexico	San Juan	IR-38	233,644	881	17	397	52	11.4	23.9	476	54	2.66
3	Mexico	San Carlos	Poland	186,915	1,937	8	150	242	29.0	19.1	1,516	78	5.42
4	Mexico	San Juan	IR-21-03	292,397	1,296	17	497	76	12.1	23.7	511	39	3.54
5	Mexico	San Juan	IR-48	208,333	725	14	292	52	6.5	22.7	286	39	1.35
6	Arayat	Gat-tiawen	Marcos	233,644	540	13	304	42	5.6	26.2	214	40	1.31
7	Arayat	Gat-tiawen	Marcos	239,601	992	9	216	110	15.3	23.1	661	67	3.67
8	Sta. Ana	San Pedro	IR-36	237,857	846	16	381	53	4.1	18.2	225	27	0.98
9	Apalit	Sampaloc	IR-36	257,731	629	8	206	79	8.5	19.9	427	68	2.19
10	Apalit	Sampaloc	IR-42	215,526	2,553	26	560	98	36.2	23.4	1,544	60	7.80
11	Apalit	Sampaloc	IR-47	172,586	2,629	24	414	110	50.9	24.8	2,056	78	8.78
12	Mexico	San Roque	IR-42	228,937	1,139	17	389	67	15.9	20.9	759	67	3.64
13	Mexico	Canyo	IR-42	292,260	1,259	15	438	84	9.5	18.2	523	42	2.78
14	San Simon	San Isidro	IR-36	225,225	1,317	11	248	120	15.6	22.5	694	53	3.51
15	San Simon	St. Monica	IR-42	218,359	2,073	20	437	104	28.9	19.7	1,466	71	6.31
	Average			228,072	1,308	15	342	91	17.3	21.9	787	56	3.71

Note: Survey period: 19th - 25th Jan., 1981

Table 2.12 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF PADDY IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (1977)

Municipality	Irrigated Land						Non-irrigated Land			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)
Apalit	2,680	2.38	6,378	2,122	2.31	4,907	73	2.34	171	4,875	2.35	11,456
Arayat	2,716	2.13	5,785	2,151	2.06	4,436	1,666	2.10	3,498	6,533	2.10	13,719
Candaba	4,704	2.48	11,666	3,726	2.42	9,000	1,900	1.90	3,610	10,330	2.35	24,276
Mexico	2,321	2.28	5,292	1,839	2.21	4,068	750	1.27	951	4,910	2.10	10,311
Minalin	1,521	2.23	3,392	1,204	2.16	2,603	155	1.27	197	2,880	2.15	6,192
San Fernando	254	2.28	579	202	2.21	447	380	2.03	771	836	2.15	1,797
San Luis	2,491	2.28	5,679	1,974	2.21	4,367	335	1.53	514	4,800	2.20	10,560
San Simon	1,236	2.23	2,756	979	2.16	2,117	375	1.86	696	2,590	2.15	5,569
Sta. Ana	949	1.90	1,803	751	2.24	1,682	800	1.89	1,515	2,500	2.00	5,000
Sto. Tomas	632	2.23	1,409	501	2.16	1,084	30	2.20	66	1,163	2.20	2,559
Total	19,504	2.29	44,739	15,449	2.25	34,711	6,464	1.85	11,989	41,417	2.21	91,439
Pampanga Prov.	36,389	2.33	84,939	28,828	2.28	65,652	10,069	1.81	18,263	75,286	2.24	168,854
Share (%)	53.60		52.67	53.59		52.87	64.20		65.65	55.01		54.15

Source: BAEcon
HA: Harvested Area
UY: Unit Yield
TP: Total Production

Table 2.13 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF PADDY IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (1978)

Municipality	Irrigated Land						Non-irrigated Land			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)
Apalit	2,391	2.09	4,997	1,879	2.46	4,621	40	2.00	80	4,310	2.25	9,698
Arayat	3,072	1.87	5,745	2,414	2.19	5,285	290	1.80	522	5,776	2.00	11,552
Candaba	4,023	2.19	8,810	3,161	2.97	8,134	1,950	1.85	3,608	9,134	2.25	20,552
Mexico	1,982	1.83	3,629	1,558	2.14	3,333	800	2.15	1,720	4,341	2.00	8,682
Minalin	1,353	1.71	2,314	1,063	2.02	2,142	130	1.15	254	2,546	1.85	4,710
San Fernando	190	1.68	319	149	1.99	296	400	2.25	900	739	2.05	1,515
San Luis	2,315	1.96	4,537	1,819	2.29	4,171	110	1.85	204	4,244	2.10	8,912
San Simon	1,249	1.67	2,086	981	1.96	1,919	60	1.95	117	2,290	1.80	4,122
Santa Ana	823	1.56	1,284	647	1.82	1,178	740	1.75	1,295	2,210	1.70	3,757
Santo Tomas	567	2.04	1,157	446	2.41	1,073	15	2.13	32	1,028	2.20	2,262
Total	17,966	1.94	34,878	14,117	2.28	32,152	4,535	1.92	8,732	36,618	2.07	75,762
Pamapnga Prov.	32,448	1.97	63,792	25,496	2.31	58,869	8,800	1.94	17,045	66,744	2.09	139,706
Share (%)	55.4		54.7	55.4		54.6	51.5		51.2	54.9		54.2

Source: BAEcon
HA: Harvested Area
UY: Unit Yield
TP: Total Production

Table 2.14 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF PADDY IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (1979)

Municipality	Irrigated Land						Non-irrigated Land			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)
Apalit	2,003	2.34	4,687	1,834	2.88	5,289	-	-	-	3,837	2.60	9,976
Arayat	2,554	2.10	5,363	2,388	2.59	6,051	250	1.65	413	5,142	2.30	11,827
Candaba	2,801	2.67	7,479	2,564	3.29	8,430	2,800	1.90	5,320	8,165	2.60	21,229
Mexico	916	2.50	2,290	838	3.09	2,588	2,110	1.90	4,009	3,864	2.30	8,887
Minalin	1,125	1.90	2,138	1,031	2.35	2,423	110	1.80	198	2,266	2.10	4,759
San Fernando	136	2.79	379	125	3.43	429	390	1.85	722	651	2.35	1,530
San Luis	1,962	2.16	4,238	1,796	2.67	4,792	20	1.85	37	3,778	2.40	9,067
San Simon	1,064	1.89	2,011	974	2.34	2,278	-	-	-	2,038	2.10	4,289
Sta. Ana	286	2.22	635	261	2.74	716	1,420	1.75	2,485	1,967	1.95	3,836
Sto. Tomas	473	2.16	1,022	434	2.67	1,159	8	1.90	15	915	2.40	2,196
Total	13,320	2.27	30,242	12,195	2.80	34,155	7,108	1.86	13,199	32,623	2.38	77,596
Pampanga Prov.	24,259	2.32	56,323	22,214	2.86	63,625	12,968	1.88	24,349	59,441	2.43	144,297
Share (%)	54.9		53.7	54.9		53.7	54.8		54.2	54.9		53.8

Source: BAEcon
HA: Harvested Area
UY: Unit Yield
TP: Total Production

Table 2.15 NUMBER OF LIVESTOCK AND POULTRY
CY-1979

	Carabao	Cow	Chicken	Duck	Pig
1. Pampanga Province	38,810	2,670	387,930	337,160	95,910
2. Ten Municipalities Related to the Irrigation Development Area	17,090	1,910	186,200	231,980	38,050
1) Apalit	830	720	12,400	42,000	3,850
2) Arayat	3,600	150	3,400	1,800	3,900
3) Candaba	2,600	120	30,000	100,000	5,000
4) Mexico	3,960	110	37,250	6,200	5,640
5) Minalin	390	10	15,000	36,000	1,700
6) San Fernando	2,100	70	52,000	9,000	8,300
7) San Luis	1,420	100	13,250	16,120	3,470
8) San Simon	500	30	10,000	5,800	2,500
9) Santa Ana	1,300	600	8,000	15,000	3,000
10) Santo Tomas	390	-	4,900	60	690
3. Irrigation Development Area/1	4,900	550	53,440	66,580	10,920

/1: Number of livestock and poultry in ten municipalities related to the irrigation development area x 0.287

$$0.287 = \frac{\text{Total farm households in the irrigation project area}}{\text{Total farm households in ten municipalities}}$$

$$= \frac{4,600}{16,400}$$

Table 2.16 RESULTS OF FARM ECONOMIC SURVEY ON TENURIAL STATUS AND ESTIMATED VALUE IN THE IRRIGATION DEVELOPMENT AREA

Farm Size (ha)	Owner Operator		Amortized Owner		Lessee		Share-tenant		Total Farm Households		Total Area		Average Farm Size (ha)
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	(No.)	(%)	(ha)	(%)	
Below 0.25	1	0.18	-	-	-	-	-	-	1	0.7	0.18	0.1	0.18
0.25 - 0.75	-	-	-	-	4	2.00	-	-	4	2.9	2.00	0.6	0.50
0.75 - 1.25	4	4.00	5	4.96	13	13.25	-	-	22	15.7	22.21	6.5	1.01
1.25 - 1.75	4	6.00	9	13.06	14	22.80	1	1.50	28	20.0	43.36	12.6	1.55
1.75 - 2.25	2	4.00	9	17.33	9	18.70	-	-	20	14.3	40.03	11.6	2.00
2.25 - 2.75	4	10.00	2	5.00	8	20.00	-	-	14	10.0	35.00	10.2	2.50
2.75 - 3.25	3	9.00	7	20.81	9	27.25	-	-	19	13.6	57.06	16.6	3.00
3.25 - 3.75	1	3.50	3	9.50	1	3.50	1	3.50	6	4.3	20.00	5.8	3.33
3.75 - 4.25	3	12.30	2	8.00	4	16.00	-	-	9	6.4	36.30	10.6	4.03
4.25 - 4.75	-	-	4	18.25	-	-	-	-	4	2.9	18.25	5.3	4.56
4.75 - 5.25	-	-	6	30.00	2	10.00	-	-	8	5.7	40.00	11.6	5.00
5.25 - 5.75	1	5.50	1	5.50	1	5.50	-	-	3	2.1	16.50	4.8	5.50
5.75 - 6.27	-	-	1	6.00	-	-	-	-	1	0.7	6.00	1.7	6.00
6.25 - 6.75	-	-	-	-	-	-	-	-	-	-	-	-	-
Over 6.75	1	7.00	-	-	-	-	-	-	1	0.7	7.00	2.0	7.00
Total	24	61.48	49	138.41	65	139.00	2	5.00	140	100.0	343.89	100.0	2.46
Share (%)	17.1	17.9	35.0	40.2	46.5	40.4	1.4	1.5	-	-	-	-	-
Estimated value in the Irrigation Development Area	790	2,060	1,610	4,620	2,140	4,650	170						

Table 2.17 M-99 PROGRAM IN PAMPANGA PROVINCE AND TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA

Municipality	Phase XIII (May 1979 - Oct. 1979)					Phase XIV (Nov. 1979 - Mar. 1980)				
	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Re-payment	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Re-payment
1. Apalit*	38	96.0	14,348	4,276	30	104	227.36	44,714	37,232	83
2. Arayat*	32	64.50	63,210	12,100	19	16	31.50	37,800	25,300	67
3. Bacolor	3	4.0	4,800	1,300	27	-	-	-	-	-
4. Candaba*	125	279.5	335,400	201,700	60	-	-	-	-	-
5. Floridablanca	441	718.7	679,140	639,390	94	440	751.40	604,876	386,824	64
6. Guagua	213	450.2	363,805	264,377	73	155	341.70	328,915	140,459	43
7. Lubao	38	59.5	57,715	25,020	43	8	13.0	11,570	9,630	83
8. Mabalacat	30	65.5	10,784	5,982	55	3	8	9,600	7,300	76
9. Macabebe	130	294.14	33,000	32,800	94	91	223.55	217,961	103,700	48
10. Magalang	455	1,103.32	1,185,400	1,000,979	84	166	357.45	317,180	233,490	74
11. Masantol	-	-	-	-	-	-	-	-	-	-
12. Mexico*	62	132.0	9,150	9,150	100	19	19.50	23,400	15,340	66
13. Minalin*	39	89.0	88,110	25,072	28	38	70.50	63,450	20,500	32
14. Porac	35	49.5	30,236	26,772	86	6	5.70	8,024	2,347	30
15. San Fernando*	46	87.0	52,770	33,418	63	10	17.0	3,660	3,660	100
16. San Luis*	143	287.95	271,550	129,770	48	153	354.6	414,355	225,560	54
17. San Simon*	117	237.80	285,360	110,350	39	63	148.0	177,600	88,730	50
18. Sta. Ana*	83	259.50	230,955	109,780	48	-	-	-	-	-
19. Sta. Rita	76	158.15	113,564	90,612	80	31	64.0	38,075	23,598	82
20. Sto. Tomas*	-	-	-	-	-	-	-	-	-	-
21. Sexmoan	-	-	-	-	-	-	-	-	-	-
22. Angeles City	145	217.4	394,330	241,650	61	158	231.8	215,180	88,514	41
Pampanga Province	2,251	4,653.7	4,223,627	2,464,498	-	1,461	2,864.8	2,516,360	1,412,211	-
*Ten Municipalities related to the Irrigation Development Area	685	1,533.25	1,350,853	635,616	48.3	403	868.46	764,979	416,322	64.6

Source: BAEx

Note: with credit only

(to be continued)

Table 2.17 M-99 PROGRAM IN PAMPANGA PROVINCE AND TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (Cont'd)

Municipality	Phase XV (May 1980 - Oct. 1980)					Phase XVI (Nov. 1980 - Apr. 1981)				
	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Re-payment	No. of Farmers	Area of Planted (ha)	Total Loan Granted (₱)	Total Loan Repaid (₱)	% Re-payment
1. Angeles City	175	246.45	198,790	165,815	83	117	173.0	-	-	-
2. Apalit*	2	5.0	-	-	-	105	303.80	-	-	-
3. Arayat*	-	-	-	-	-	9	24.50	-	-	-
4. Bacolor	-	-	-	-	-	-	-	-	-	-
5. Candaba*	-	-	-	-	-	-	-	-	-	-
6. Floridablanca	546	895.5	553,520	521,590	94	366	617.70	-	-	-
7. Guagua	155	358.5	336,951	229,247	68	77	182.50	-	-	-
8. Lubao	-	-	-	-	-	13	21.50	-	-	-
9. Mabalacat	18	34.0	-	-	-	-	-	-	-	-
10. Macabebe	-	-	-	-	-	-	-	-	-	-
11. Magalang	371	953.24	1,113,990	930,598	83	5	12.0	-	-	-
12. Masantol	-	-	-	-	-	153	360.13	-	-	-
13. Mexico*	-	-	-	-	-	50	94.0	-	-	-
14. Minalin*	-	-	-	-	-	-	-	-	-	-
15. Porac	9	10.80	18,089	16,116	89	4	8.0	-	-	-
16. San Fernando*	23	56.50	54,924	44,836	81	1	3.0	-	-	-
17. San Luis*	-	-	-	-	-	5	16.0	-	-	-
18. Santa Ana*	-	-	-	-	-	-	-	-	-	-
19. Santa Rita	25	59.25	54,685	46,878	85	26	53.75	-	-	-
20. Santo Tomas*	-	-	-	-	-	-	-	-	-	-
21. San Simon*	-	-	-	-	-	296	740.80	-	-	-
22. Banay Pare	-	-	-	-	-	3	8.0	-	-	-
Pampanga Province	1,324	2,619.24	-	-	-	1,230	2,618.68	-	-	-
*Ten Municipalities related to the Irrigation Development Area	25	61.5	-	-	81.0	466	1,182.10	-	-	-

Source: Provincial Executive Office, Ministry of Agriculture, San Fernando, Pampanga

Note: with credit only

Table 2.18 LOAN STATUS - M-99 AS OF JULY 1981
(PAMPANGA PROVINCE)

Banks	Number of Farmers	Area Finance	Amt. of Loan Approved	Amt. of Loan Released	Repayment	% Repayment	Remarks
PNB	33,445	65,196	78,684,768	76,618,269	61,904,465	78	Cumulative Phase 1 to 17
RB	78,479	170,111	152,836,325	147,599,793	109,933,374	74	- do -
ACA	4,356	10,952	9,620,831	9,620,831	3,406,140	35	- do -
CRB	Data included with rural bank						
Total	116,280	246,259	241,141,924	235,838,893	175,243,979	74	Phase 1 to 17

Source: Ministry of Agriculture, Provincial Executive Office

Table 2.19 DISTRIBUTION AND NUMBER OF PRODUCTION TECHNICIANS INVOLVED IN MASAGANA-99 PROGRAM - TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA

Municipality	Number of Production Technician	Supervise Farmers with Credit	Supervise Farmers without Credit	Total Hectarage	
				Irrigated	Rainfed
	(Person)	(Person)	(Person)	(ha)	(ha)
1. Apalit	12	15	843	1,610	-
2. Arayat	16	-	2,188	2,740	1,910
3. Candaba	10	1,622	-	2,760	1,410
4. Mexico	10	-	1,436	860	2,870
5. Minalin	5	-	187	420	-
6. San Fernando	6	24	341	400	310
7. San Luis	9	50	628	1,690	-
8. Sta. Ana	7	-	1,045	530	1,730
9. Sto Tomas	3	-	491	270	880
10. San Simon	7	95	485	1,310	-
Total	85	1,806	7,644	12,590	9,110
Pampanga Province Grand Total	200	4,136	18,605	30,820	13,100

Table 2.20 MASAGANA-99 PHASE XV (MAY 1980 - OCT. 1980)
PAMPANGA PROVINCE

I. Total Target Area (ha) 48,533.50

Irrigated 32,931.22
Rainfed 15,602.28

II. Target Area Financed (ha) 6,204.51

III. Planting & Harvesting Performance

Particulars	Without Credit	With Credit	Total
1. No. of farmer	21,889	1,324	23,213
Irrigated	14,889	1,121	16,010
Rainfed	7,000	203	7,203
2. Area planted (ha)	42,613.88	2,619.24	45,233.12
Irrigated	28,183.73	2,061.52	30,245.25
Rainfed	14,430.15	557.72	14,987.87
3. Area harvested (ha)	37,505.57	2,461.24	39,966.81
Irrigated	24,238.77	1,941.73	26,180.50
Rainfed	13,266.80	519.51	13,786.31
4. Production (cav)	2,374,154	193,235	2,567,389
Irrigated	1,585,690	155,649	1,741,339
Rainfed	788,464	37,586	826,050
5. Yield/ha (cav/ha)	63	79	64
Irrigated	65	80	66
Rainfed	59	72	60

IV. Evaluation/Analysis

1. Total area planted vs. total area targeted 93%
2. Total area harvested vs. total area planted 88%
3. Total area financed vs. total target area financed 42%
4. Total area financed vs. area planted 6%
5. Percentage of farmer awaiting loan 5.7%

V. Problem Encountered

Typhoon Orang and Aring

Total area affected was 11,952 ha and around 8,264 ha was completely damaged.

Source: Ministry of Agriculture, Provincial Executive Office

Table 2.21 NUMBER AND CLASS OF RICEMILL AND THE CAPACITY, MILLING RECOVERY, INPUT CAPACITY AND MILLING FEE - TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA

Municipality	Class of Mill	Number of Units	Input Capacity (50 kg bag/ hour)	Percent of Milling Recovery (%)	Milling Fee (₱/50 kg bag)
I. Arayat	Multi	1	8.33	62	4.00
	Single	1	5.00	60	4.00
	Multi	1	16.66	66	6.00
	Single	1	8.33	66	5.00
	Single	1	6.66	65	5.00
	Single	1	6.66	70	3.00
	Single	1	5.00	63	4.00
	Single	1	5.00	64	2.50
	Single	1	15.00	65	3.00
	Single	3	8.00	64	5.00
	Multi	1	9.16	66	8.00
	Single	1	5.83	65	3.00
Total		13	99.63		
II. Sta. Ana	Single	1	4.16	50	2.50
	Single	1	4.16	65	3.00
	Single	1	3.33	62	3.00
	Multi	1	16.66	66	7.00
	Multi	1	8.33	66	7.00
	Single	1	8.33	66	7.00
	Multi	1	2.50	66	4.00
	Multi	1	5.00	80	3.00
	Single	1	12.00	80	3.00
	Multi	1	16.66	65	6.00
	Single	1	5.83	63	4.00
	Multi	1	15.41	65	4.00
	Single	1	4.16	63	2.50
Total		13	106.53		
III. Candaba	Single	1	2.66	70	3.00
	Single	1	7.50	65	4.00
	Single	1	3.33	63	3.00
	Single	1	3.33	63	4.00
	Multi	1	8.33	69	2.50
	Single	1	4.16	63	2.50
	Single	1	16.66	67	3.00
	Single	1	8.33	67	3.00
	Single	1	3.33	63	3.00
	Single	1	4.16	65	3.00
	Multi	1	8.33	68	2.50
	Single	1	4.16	75	3.00
	Single	1	5.00	68	2.00
Total		13	79.28		

(to be continued)

Table 2.21 NUMBER AND CLASS OF RICEMILL AND THE CAPACITY, MILLING RECOVERY, INPUT CAPACITY AND MILLING FEE - TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (Cont'd)

Municipality	Class of Mill	Number of Units	Input Capacity (50 kg bag/ hour)	Percent of Milling Recovery (%)	Milling Fee (₱/50 kg bag)
IV. Mexico	Single	1	2.05	65	2.50
	Multi	1	5.83	60	3.00
	Single	1	4.16	50	2.50
	Multi	2	16.66	65	3.00
	Single	1	5.00	65	2.50
	Single	1	4.16	65	5.00
	Single	1	6.66	65	4.00
	Single	1	2.50	68	2.50
	Single	1	4.16	75	3.00
Total		10	51.18		
V. San Luis	Multi	1	6.66	68	3.10
	Multi	1	16.66	65	3.50
	Single	1	4.16	70	3.00
	Single	1	2.50	63	4.00
	Single	1	2.50	65	3.50
	Multi	1	8.33	67	3.00
Total		6	40.81		
VI. San Fernando	Multi	1	5.00	65	3.00
	Single	1	7.50	63	4.00
	Multi	1	8.33	63	3.00
	Multi	1	8.33	80	2.80
	Single	1	6.66	63	4.00
	Single	1	6.00	64	4.00
	Multi	1	10.00	63	4.00
	Multi	1	5.00	63	4.00
	Multi	1	11.00	63	4.00
	Single	1	8.33	65	5.00
	Single	1	4.16	63	5.00
Total		11	80.31		
VII. San Simon	Single	1	11.00	63	2.25
	Single	1	4.16	65	2.50
	Single	2	5.83	65	4.00
	Single	1	4.16	63	2.50
	Single	1	4.16	63	2.50
Total		6	29.31		

(to be continued)

Table 2.21 NUMBER AND CLASS OF RICEMILL AND THE CAPACITY, MILLING RECOVERY, INPUT CAPACITY AND MILLING FEE - TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA (Cont'd)

Municipality	Class of Mill	Number of Units	Input Capacity (50 kg bag/ hour)	Percent of Milling Recovery (%)	Milling Fee (₱/50 kg bag)
VIII. Sto. Tomas	Multi	2	20.83	65	4.00
	Multi	1	8.33	64	4.00
	Multi	1	10.00	66	5.00
	Multi	1	16.66	66	5.00
	Multi	1	33.33	65	3.00
	Multi	1	8.33	68.5	2.40
	Single	2	4.16	63	2.40
	Single	1	3.75	65	2.50
	Multi	2	16.00	65	4.00
	Single	1	6.25	63	4.00
	Single	1	8.33	65	5.00
	Multi	1	8.33	65	3.00
	Multi	2	27.08	70	1.50
	Multi	1	15.00	67	4.00
	Multi	1	16.66	64	3.00
Total		19	203.04		
IX. Minalin	Single	1	3.33	65	3.50
	Single	1	5.83	70	3.00
	Single	1	2.50	63	3.50
	Single	1	4.16	65	3.00
	Single	1	6.66	63	2.50
	Multi	2	-	-	-
Total		7	22.48		
X. Apalit	Single	1	4.16	63	2.50
	Single	1	5.83	70	1.00
	Multi	1	8.33	70	4.00
	Multi	1	19.16	65	2.00
	Multi	1	12.50	65	3.00
	Single	1	4.16	63	2.50
	Multi	1	10.00	65	2.50
	Single	1	4.16	63	2.50
Total		8	68.30		
Grand Total		107	780.87		

Source: NFA, San Fernando

Table 2.22 PROCESSING AND WAREHOUSES OWNED BY PRIVATE, NFA AND LEASED BY NFA FOR RICE AND CORN-1981, REGIONAL LEVEL

Province	NFA-Owned								NFA-Leased		Private			
	Warehouse		Rice Mill		Grader		Drier		Warehouse		Warehouse	Drier	Rice Mill	Thresher
	No.	Capacity (t)	No.	Capacity (t/hr)	No.	Capacity (t/hr)	No.	Capacity (t/hr)	No.	Capacity (t)	No.	No.	No.	No.
Aurora	1	2,500	-	-	-	-	4	1.3	1	400	4	1	91	20
Bataan	2	6,500	-	-	-	-	4	1.0	1	600	46	-	93	20
Bulacan	7	57,500	1	10.0	1	2.1	19	18.5	14	63,400	362	7	325	21
Nueva Ecija	22	82,300	5	25.9	5	14.0	7	42.5	18	31,100	308	10	450	42
Pamanga	3	12,800	1	1.5	3	18.0	8	2.3	8	14,400	112	8	184	5
Tarlac	6	19,000	3	8.8	2	10.0	12	6.9	4	8,300	84	4	268	104
Zambales	1	2,500	-	-	-	-	7	1.8	3	1,900	26	1	194	130
Total	42		10		11		61		49		942	31	1,605	342

Source: NFA, Regional Office (Reg. III), Cabanatuan

Table 2.23 NUMBER AND CAPACITY OF PRIVATE WAREHOUSES IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA - (NFA REGISTERED)

Municipality	No. of Units	Total Capacity (Bags of 50 kg)
Apalit	4	56,603
Arayat	4	29,275
Candaba	7	21,287
Mexico	8	122,764
Minalin	5	18,609
San Fernando	6	65,751
San Luis	4	37,442
San Simon	0	-
Sta. Ana	6	52,785
Sto. Tomas	14	74,942
Total	58	479,458 (23,973 tons)

Source: National Food Authority, Pampanga Office

Table 2.24 SUPPORT PRICE FOR PALAY

Year	Support Price		Application
	₱/Cavan/1	₱/kg	
1972	27.2	0.54	
1973	35.0	0.70	Sept.
1974	50.0	1.00	Nov.
1975	50.0	1.00	
1976	55.0	1.10	May
1977	55.0	1.10	
1978	55.0	1.10	
1979	65.0	1.30	Apr.
1980	72.5	1.45	Oct.
1981	77.5	1.55	June

/1: 1 cavan = 50 kg

Source: National Food Authority, Manila

Table 2.25 LOCATION AND NUMBER OF RICE WHOLESALERS AND RETAILERS IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA

	Location	Retailers	Wholesalers	Combined (Retailer & Wholesaler)	Total
1.	Sto. Tomas	7	4	15	26
2.	Candaba	13	3	17	33
3.	San Fernando	78	7	34	119
4.	Apalit	22	7	15	44
5.	Minalin	15	1	7	23
6.	Arayat	20	5	30	55
7.	Mexico	13	3	6	22
8.	Sta. Ana	15	-	10	25
9.	San Luis	8	6	18	32
10.	San Simon	9	1	4	14
	Total	200	37	156	393

Source: National Food Authority, Pampanga

Table 2.26 NUMBER OF SEED GROWERS, LOCATION AND HECTARAGE COVERED IN TEN MUNICIPALITIES RELATED TO THE IRRIGATION DEVELOPMENT AREA

Number of Seed Growers	Location of Farm (Municipality/Barangay)	Farm Area	Cropping Season		Total Hectarage
			1st Cropping	2nd Cropping	
		(ha)			(ha)
1	Magalang				
	- San Agustin	20.0	20.0	20.0	40.0
	- Sta. Maria	15.0	15.0	15.0	30.0
1*	Arayat				
	- Buenoseso	4.0	4.0	4.0	8.0
1*	Sta. Ana				
	- San Jose	30.0	30.0	30.0	60.0
1*	Candaba				
	- Lanang	5.0	5.0	5.0	10.0
2	Angeles				
	- Pandan	1.5	1.5	1.5	3.0
	- Sta. Maria	13.0	13.0	13.0	26.0
2	Porac				
	- Palat	5.0	5.0	5.0	10.0
	- Sta. Cruz	9.0	9.0	9.0	18.0
1	Sta. Rita				
	- Becuran	15.0	15.0	15.0	30.0
2	Floridablanca				
	- San Pedro	32.5	32.5	32.5	65.0
	- San Antonio	8.5	8.5	8.5	17.0
4	Guagua				
	- Sto. Cristo	5.0	5.0	5.0	10.0
	- Betis	25.0	25.0	25.0	50.0
	- Ebus	10.0	10.0	10.0	20.0
	- Masle	10.0	10.0	10.0	20.0
3	Lubao				
	- Sta. Cruz	5.0	5.0	5.0	10.0
	- San Pedro	10.0	10.0	10.0	20.0
	- San Miguel	6.0	6.0	6.0	12.0
1*	Mexico				
	- San Vicente	15.0	15.0	15.0	30.0
5*	Sto. Tomas				
	- Sto. Rosario	16.0	16.0	16.0	32.0
	- San Vicente	10.0	10.0	10.0	20.0
	- Poblacion	5.0	5.0	5.0	10.0
	- Balangcas	6.0	6.0	6.0	12.0
2*	Minalin				
	- Sto. Domingo	15.0	15.0	15.0	30.0
2*	Apalit				
	- San Juan	10.0	10.0	10.0	20.0
	- Sucad	27.0	27.0	27.0	54.0
1	Macabebe				
	- San Juan	15.0	15.0	15.0	30.0
Pampanga Province		348.5	348.5	348.5	697.0
Irrigation Development Area		143.0	143.0	143.0	286.0

* Related to the irrigation development area

Source: Ministry of Agriculture, Provincial Office, San Fernando, Pampanga

Table 2.27 NUMBER AND LOCATION OF AGRO-CHEMICAL DEALERS (1981)

Location	Number of Dealers
1. Apalit*	2
2. Angeles	1
3. Arayat*	1
4. Bacolor	1
5. Candaba*	6
6. Floridablanca	6
7. Guagua	4
8. Lubao	5
9. Mabalacat	1
10. Macabebe	1
11. Magalang	6
12. Masantol	1
13. Mexico*	1
14. Porac	2
15. San Fernando*	9
16. San Luis*	3
17. Sta. Rita	5
18. Sto. Tomas*	1
Pampanga Province	56
Irrigation Development Area	23

*: Municipalities related to the irrigation development area.

Source: Ministry of Agriculture, Provincial Office

Table 2.28 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF RICE

(Unit: Peso/ton)

	1980		1985
	Financial	Economic	Economic
Export price F.O.B. Manila	2,620	2,620	3,225
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	3,075
Rice equivalent (63%)	1,540	1,560	1,937
Procurement costs	85	70	70
Farm-gate price	1,455	1,490	1,867 (≒1,870)

Table 2.29 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 CIF Manila	1,730	1,730	2,190	2,000	2,000	2,800	1,120	1,120	1,280
Import 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	1,620	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 2.30 SURVEY ITEMS OF QUESTIONNAIRE FOR FARM ECONOMIC SURVEY

1. Family Size
2. Farm Size
3. Tenurial Status
4. Cropping Pattern and Farming Practices
   1) Cropping pattern
   2) Farming practices and inputs requirement
      - Seed
      - Fertilizer
      - Agro-chemicals
      - Labor requirement
      - Animal power and machinery requirement
5. Production and Disposition of Products
6. Livestock Inventory
7. Inventory of Farm Machinery and Equipment
8. Market and Farmgate Prices
9. Gross Income
   1) Farm income
   2) Off-farm income
10. Production Cost
   1) Farm inputs
   2) Irrigation fee
   3) Land rent and amortizing fee
   4) Labour cost
   5) Animal power and machinery
11. Living Expenses
   1) Food consumption
      - Rice
      - Other food
   2) Living expenses except food
12. Farmer's Intension

Table 2.31 RESULTS OF FARM ECONOMIC SURVEY

(Unit: ₱/Household)

Farm Size	No. of Farm House-holds	Average Family Size	Income			Living Expenses			
			Net Farm Income	Off-farm Income /1	Total	Foods: Rice	Foods: Other Foods	Living Expenses Except Foods	Total
(ha)		(person)							
Below 0.25	1	10.0	242	19,774	20,016	3,240	6,570	10,206	20,016
0.25 - 0.75	4	7.3	817	7,162	7,979	2,397	2,119	3,463	7,979
0.75 - 1.25	22	7.2	1,573	7,113	8,686	1,954	3,199	3,533	3,686
1.25 - 1.75	28	6.7	1,506	7,309	8,815	1,948	3,449	3,418	8,815
1.75 - 2.25	20	7.4	1,178	8,836	10,014	2,539	3,464	4,011	10,014
2.25 - 2.75	14	7.5	2,696	10,717	13,413	2,835	4,543	6,035	13,413
2.75 - 3.25	19	7.6	3,209	7,301	10,510	2,542	3,429	4,539	10,510
3.25 - 3.75	6	6.8	3,022	11,321	14,343	1,990	5,408	6,945	14,343
3.75 - 4.25	9	7.3	3,693	7,359	11,052	1,786	3,943	5,323	11,052
4.25 - 4.75	4	7.5	3,555	10,157	13,712	2,250	6,135	5,327	13,712
4.75 - 5.25	8	4.8	3,397	7,531	10,928	1,978	5,490	3,460	10,928
5.25 - 5.75	3	8.3	5,695	15,955	21,650	2,520	10,733	8,397	21,650
5.75 - 6.25	1	2.0	5,471	-	5,471	780	2,880	744	4,404
6.25 - 6.75	0	-	-	-	-	-	-	-	-
Over 6.75	(1) /2	(6.0)	(8,935)		(204,000)	(2,880)	(18,000)	(183,120)	(204,000)
Average 2.5	139	7.1	2,286	8,334	10,620	2,232	3,968	4,410	10,610

Remarks: /1: Includes incomes of wage earning from farm work and non farm work and remittance from their family working at other place such as Metro Manila, abroad, etc.

/2: Excluded from farm budget analysis because of extremely high income and living expenses as compared with other farmers.

Table 2.32 RESULTS OF FARM ECONOMIC SURVEY ON THE GROSS FARM INCOME, PRODUCTION COST AND NET FARM INCOME

(Unit: ₱/Household)

Farm Size (ha.)	No. of Farm House-holds	Gross Farm Income			Production Cost				Net Farm Income
		Crop	Livestock	Total	Farm Inputs	Repayment for Amortizing	Land rent	Total	
Below 0.25	1	331	75	406	164	-	-	164	242
0.25 - 0.75	4	1,432	531	1,963	857	-	289	1,146	817
0.75 - 1.25	22	4,809	499	4,308	2,336	133	266	2,735	1,573
1.25 - 1.75	28	4,765	370	5,135	2,943	352	334	3,629	1,506
1.75 - 2.25	20	6,229	326	6,555	3,842	848	687	5,377	1,178
2.25 - 2.75	14	8,253	454	8,707	5,085	209	717	6,011	2,696
2.75 - 3.25	19	11,075	564	11,639	6,831	586	1,013	8,430	3,209
3.25 - 3.75	6	8,957	1,038	9,995	5,536	937	500	6,973	3,022
3.75 - 4.25	9	11,140	671	11,811	6,885	400	832	8,118	3,693
4.25 - 4.75	4	14,674	176	14,850	9,037	2,258	-	11,295	3,555
4.75 - 5.25	8	14,711	522	15,233	9,086	1,801	949	11,836	3,397
5.25 - 5.75	3	17,980	844	18,824	11,105	1,056	968	13,129	5,695
5.75 - 6.25	1	18,858	789	19,647	11,676	2,500	-	14,176	5,471
6.25 - 6.75	0	-	-	-	-	-	-	-	-
Over 6.75	(1)	(23,324)	-	(23,324)	(14,389)	-	-		(8,935)
Average 2.5	139	7,748	486	8,234	4,779	591	578	5,948	2,286

Table 2.33 RESULTS OF FARM ECONOMIC SURVEY ON THE LIVING EXPENSES OF FARMER

(Unit: ₱/year/farmer)

Farm Size (ha)	No. of Sampling Farmers (No.)	Average Family Size (Persons)	Living Expenses for Food				Living Expenses Except Food (₱)	Total Living Expenses (₱)	Living Expenses per Person (₱)
			Rice		Other Food (₱)	Total (₱)			
			Per-capita Consumption (kg)	Value (₱)					
Below 0.25	1	10.0	120	3,240	6,570	9,810	10,210	20,020	2,000
0.25 - 0.75	4	7.3	117	2,400	2,120	4,520	3,460	7,980	1,090
0.75 - 1.25	22	7.2	106	1,950	3,200	5,150	3,530	8,680	1,210
1.25 - 1.75	28	6.7	120	1,950	3,450	5,400	3,420	8,820	1,320
1.75 - 2.25	20	7.4	129	2,540	3,460	6,000	4,010	10,010	1,350
2.25 - 2.75	14	7.5	140	2,840	4,540	7,380	6,040	13,420	1,790
2.75 - 3.25	19	7.6	129	2,540	3,430	5,970	4,540	10,510	1,380
3.25 - 3.75	6	6.8	102	1,990	5,410	7,400	6,950	14,350	2,110
3.75 - 4.25	9	7.3	99	1,790	3,940	5,730	5,320	11,050	1,510
4.25 - 4.75	4	7.5	120	2,250	6,140	8,390	5,330	13,720	1,830
4.75 - 5.25	8	4.8	155	1,980	5,490	7,470	3,460	10,930	2,280
5.25 - 5.75	3	8.3	120	2,520	10,730	13,250	8,400	21,650	2,610
5.75 - 6.25	1	2.0	150	780	2,880	3,660	740	4,400	2,200
6.25 - 6.75	0	-	-	-	-	-	-	-	-
Over 6.75	(1)	(6.0)	(200)	(2,880)	(18,000)	(20,880)	(183,120)	(204,000)	(34,000)
Average	(139)	7.1	122	2,230	3,970	6,200	4,410	10,610	1,490

Table 2.34(1) TYPICAL FARM BUDGET AT PRESENT CONDITION (FARM SIZE 1.5 HA)

(1) Single Crop of Paddy in Rainfed Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					13,844
1) Farm Income					4,851
- Wet season paddy	1.50	1.87	2.81	1,455	4,089
- Diversified crop	0.15	0.40	0.06	4,600	276
- Livestock					486
2) Off-farm Income					8,993
II) Gross Outgo					13,844
1) Production Costs					3,474
- Seed					222
- Fertilizer					395
- Agro-chemicals					96
- Hired labor		46 man-days x ₱12/man-day			552
- Hired animal		1.5 days x ₱15/day			23
- Hired machinery		2.9 days x ₱190/day			551
- Harvesting and threshing		2.81 t x 1/6 x ₱1,455/t			682
- Land rent/1					852
- Miscellaneous					101
2) Living Expenses					10,370
III) Net Reserve (I-II)					0

/1: (₱4,089 - ₱682) x 25% = ₱852

Table 2.34(2) TYPICAL FARM BUDGET AT PRESENT CONDITION (FARM SIZE 1.5 HA)

(2) Single Crop of Paddy in Irrigated Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					14,358
1) Farm Income					5,479
- Wet season paddy	1.50	2.16	3.24	1,455	4,714
- Diversified crop	0.15	0.40	0.06	4,600	276
- Livestock					486
2) Off-farm Income					8,879
II) Gross Outgo					14,358
1) Production Costs					3,988
- Seed					222
- Fertilizer					415
- Agro-chemicals					123
- Hired labor		46 man-days x ₱12/man-day			552
- Hired animal		1.5 days x ₱15/day			23
- Hired machinery		2.9 days x ₱190/day			551
- Irrigation fee		3 ca.			218
- Harvesting and threshing		3.24t x 1/6 x ₱1,455/t			786
- Land rent/1					982
- Miscellaneous					116
2) Living Expenses					10,370
III) Net Reserve (I-II)					0

/1: (₱4,714 - ₱786) x 25% = ₱982

Table 2.34(3) TYPICAL FARM BUDGET AT PRESENT CONDITION (FARM SIZE 1.5 HA)

(3) Double Crop of Paddy in Irrigated Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					18,561
1) Farm Income					10,482
- Wet season paddy	1.50	2.16	3.24	1,455	4,714
- Dry season paddy	1.50	2.42	3.63	1,455	5,282
- Livestock					486
2) Off-farm Income					8,079
II) Gross Outgo					18,561
1) Production Costs					8,191
- Seed					425
- Fertilizer					876
- Agro-chemicals					243
- Hired labor		82 man-days x ₱12/man-day			984
- Hired animal		3 days x ₱15/day			45
- Hired machinery		5.7 days x ₱190/day			1,083
- Irrigation fee		7.5 ca.			547
- Harvesting and threshing		6.87t x 1/6 x ₱1,455/t			1,666
- Land rent/1					2,083
- Miscellaneous					239
2) Living Expenses					10,370
III) Net Reserve (I-II)					0

/1: (₱9,996 - ₱1,666) x 25% = ₱2,083

Table 2.35 RESULTS OF FARMER'S INTENTION SURVEY

Ranking	Item	Class in Farm Size/1															Total	Percentage (%)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	a	0	2	14	21	14	8	12	6	8	4	7	3	1	-	1	101	87.8
	b	1	1	1	4	1	1	0	0	0	0	0	0	0	-	0	9	7.8
	c	0	0	1	0	1	0	0	0	1	0	0	0	0	-	0	3	2.6
	d	0	0	0	1	0	0	0	0	0	0	0	0	0	-	0	1	0.9
	e	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
	f	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
	g	0	0	0	1	0	0	0	0	0	0	0	0	0	-	0	1	0.9
2	a	0	0	1	0	0	0	0	6	1	0	0	0	0	-	0	8	6.9
	b	0	1	1	6	5	0	2	0	3	0	0	0	0	-	0	18	15.7
	c	1	1	12	16	10	9	7	0	4	3	6	2	1	-	1	73	63.5
	d	0	1	1	3	1	0	1	0	0	1	1	1	0	-	0	10	8.7
	e	0	0	0	1	0	0	1	0	1	0	0	0	0	-	0	3	2.6
	f	0	0	1	1	0	0	1	0	0	0	0	0	0	-	0	3	2.6
	g	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
3	a	0	0	0	2	1	0	0	0	0	0	1	0	0	-	0	4	3.5
	b	0	0	6	7	5	2	5	2	3	3	4	2	0	-	1	40	34.7
	c	0	1	0	6	1	0	1	0	0	0	2	0	0	-	0	11	9.6
	d	1	1	4	9	6	3	4	1	4	0	0	0	0	-	0	33	28.7
	e	0	0	2	2	2	2	1	1	2	1	0	0	1	-	0	14	12.2
	f	0	0	2	0	1	2	1	2	0	0	0	1	0	-	0	9	7.8
	g	0	1	2	1	0	0	0	0	0	0	0	0	0	-	0	4	3.5
4	a	0	0	0	1	0	1	0	0	0	0	0	0	0	-	0	2	1.7
	b	0	0	0	2	0	0	0	0	0	0	0	1	0	-	0	3	2.6
	c	0	0	3	3	2	0	3	0	3	1	1	0	0	-	0	16	13.9
	d	0	0	5	7	5	1	1	3	1	1	3	1	0	-	0	28	24.3
	e	1	2	5	8	5	5	7	2	2	1	1	1	0	-	1	41	35.8
	f	0	1	2	4	4	0	1	1	3	1	2	0	1	-	0	20	17.4
	g	0	0	1	2	0	2	0	0	0	0	0	0	0	-	0	5	4.3
5	a	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
	b	0	1	2	1	1	0	0	1	0	1	2	0	0	-	0	9	7.8
	c	0	0	0	2	2	0	0	0	0	0	0	1	0	-	0	5	4.3
	d	0	0	1	2	3	3	3	0	4	1	1	1	0	-	1	20	17.5
	e	0	1	5	7	5	1	0	2	3	1	3	1	0	-	0	29	25.2
	f	1	0	5	10	3	4	5	3	1	1	0	0	0	-	0	33	28.7
	g	0	1	3	5	2	1	4	0	1	0	1	0	1	-	0	19	16.5
6	a	1	1	1	1	1	0	0	0	0	0	0	0	0	-	0	5	4.3
	b	0	0	4	4	3	3	4	0	2	0	1	0	0	-	0	21	18.3
	c	0	0	0	0	0	0	0	1	1	0	0	0	0	-	0	2	1.7
	d	0	0	3	3	0	2	2	0	0	1	1	0	1	-	0	13	11.3
	e	0	0	3	4	2	1	3	1	0	1	1	1	0	-	0	17	14.9
	f	0	2	4	8	5	3	2	0	3	1	4	0	0	-	1	33	28.7
	g	0	0	1	7	5	0	1	4	3	1	0	2	0	-	0	24	20.8
7	a	0	1	0	2	0	0	0	0	0	0	0	0	0	-	0	3	2.6
	b	0	0	3	3	1	3	2	2	1	0	0	0	1	-	0	16	13.9
	c	0	1	0	1	0	0	0	0	0	0	0	0	0	-	0	2	1.7
	d	0	0	3	2	1	0	1	1	0	0	0	0	0	-	0	8	7.0
	e	0	0	0	3	2	0	0	1	0	0	0	0	0	-	0	6	5.2
	f	0	0	1	5	3	0	2	0	3	1	1	2	0	-	0	18	15.7
	g	1	1	9	11	9	6	7	2	5	3	6	1	0	-	1	61	53.9
Total		1	3	16	27	16	9	12	6	9	4	7	3	1		1	115	100.0

/1: 1: Below 0.25 ha
2: 0.25 - 0.75 ha
3: 0.75 - 1.25 ha
4: 1.25 - 1.75 ha
5: 1.75 - 2.25 ha
6: 2.25 - 2.75 ha
7: 2.75 - 3.25 ha
8: 3.25 - 3.75 ha
9: 3.75 - 4.25 ha
10: 4.25 - 4.75 ha
11: 4.75 - 5.25 ha
12: 5.25 - 5.75 ha
13: 5.75 - 6.25 ha
14: 6.25 - 6.75 ha
15: Over 6.75 ha

Table 3.1 LABOR, ANIMAL POWER AND MECHNICAL POWER REQUIREMENTS (WITH PROJECT)

Requirements	Wet Season Paddy			Dry Season Paddy		
	F/1	H/2	T/3	F/1	H/2	T/3
Labour Force (Man-day/ha)	61.6	63.4	125.0	61.6	63.4	125.0
- Nursery Preparation	4.0	1.0	5.0	4.0	1.0	5.0
- Land Preparation	16.0	8.0	24.0	16.0	8.0	24.0
- Transplanting	2.0	18.0	20.0	2.0	18.0	20.0
- Fertilizing	4.8	1.2	6.0	4.8	1.2	6.0
- Spraying	4.8	1.2	6.0	4.8	1.2	6.0
- Weeding	16.0	4.0	20.0	16.0	4.0	20.0
- Irrigating	8.0	-	8.0	8.0	-	8.0
- Harvesting and Threshing	3.0	27.0	30.0	3.0	27.0	30.0
- Hauling and Others	3.0	3.0	6.0	3.0	3.0	6.0
Animal Power (Day/ha)	7.7	1.4	9.1	7.7	1.4	9.1
- Nursery Preparation	0.4	0.1	0.5	0.4	0.1	0.5
- Land Preparation	7.3	1.3	8.6	7.3	1.3	8.6
Mechanical Power (Day/ha)	0.7	2.7	3.4	0.7	2.7	3.4
- Nursery Preparation	-	0.2	0.2	-	0.2	0.2
- Land Preparation/Threshing	0.7	2.5	3.2	0.7	2.5	3.2

/1 : Family
/2 : Hired
/3 : Total

Table 3.2 LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENTS (WITHOUT PROJECT)

Requirements	Irrigated Paddy						Rainfed Paddy		
	Wet Season			Dry Season					
	F/1	H/2	T/3	F/1	H/2	T/3	F/1	H/2	T/3
Labour Force (Man-day/ha)	44.0	52.0	96.0	45.2	52.8	98.0	39.2	47.8	87.0
- Nursery Preparation	4.0	1.0	5.0	4.0	1.0	5.0	4.0	1.0	5.0
- Land Preparation	13.0	5.0	18.0	13.0	5.0	18.0	13.0	5.0	18.0
- Transplanting	2.0	18.0	20.0	2.0	18.0	20.0	2.0	18.0	20.0
- Fertilizing	3.6	0.4	4.0	4.0	1.0	5.0	2.4	0.6	3.0
- Spraying	2.4	0.6	3.0	3.2	0.8	4.0	1.6	0.4	2.0
- Weeding	8.0	2.0	10.0	8.0	2.0	10.0	8.0	2.0	10.0
- Irrigating	4.0	-	4.0	4.0	-	4.0	3.0	-	3.0
- Harvesting and Threshing	3.0	24.0	27.0	3.0	24.0	27.0	2.0	20.0	22.0
- Hauling and Others	4.0	1.0	5.0	4.0	1.0	5.0	3.2	0.8	4.0
Animal Power (Day/ha)	5.4	1.0	6.4	5.4	1.0	6.4	5.4	1.0	6.4
- Nursery Preparation	0.3	-	0.3	0.3	-	0.3	0.3	-	0.3
- Land Preparation	5.1	1.0	6.1	5.1	1.0	6.1	5.1	1.0	6.1
Mechanical Power (Day/ha)	0.5	1.9	2.4	0.5	1.9	2.4	0.5	1.9	2.4
- Nursery Preparation	-	0.1	0.1	-	0.1	0.1	-	0.1	0.1
- Land Preparation/Threshing	0.5	1.8	2.3	0.5	1.8	2.3	0.5	1.8	2.3

/1 : Family /2 : Hired /3 : Total

Table 3.3 MONTHLY LABOR REQUIREMENT WITH PROJECT

(Unit: 1,000 man-days)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A) With Project													
I) Diversion Dam Scheme	168	112	246	182	112	358	252	168	115	338	376	323	2,750
1) Wet Season Paddy - 11,000 ha	-	-	-	-	112	358	252	168	115	282	88	-	1,375
2) Dry Season Paddy - 11,000 ha	168	112	246	182	-	-	-	-	-	56	288	323	1,375
II) Pump Scheme	126	99	119	183	56	288	323	168	114	252	337	247	2,312
1) Wet Season Paddy - 11,000 ha	-	-	-	-	56	288	323	168	112	246	182	-	1,375
2) Dry Season Paddy - 7,300 ha	119	95	119	183	-	-	-	-	-	-	152	245	913
3) Diversion Crop - 400 ha	7	4	-	-	-	-	-	-	2	6	3	2	24
B) Labor Force Available/1	336	336	336	336	336	336	336	336	336	336	336	336	4,032
C) Balance													
1) Diversion Dam Scheme (B-I)	168	224	90	154	224	-22	84	168	221	-2	-40	13	1,282
2) Pump Scheme (B-II)	210	237	217	153	280	48	13	168	222	84	-1	89	1,720

/1: See Table 2.3.

Table 3.4 FUTURE CROP PRODUCTION AT FULL STAGE FOR THE IRRIGATION PROJECT

(unit: ton of paddy)

	With Project		Without Project	Increment	
	Pump Scheme	Diversion Dam Scheme		Pump Scheme	Diversion Dam Scheme
(1) Paddy	86,000/1	104,500/2	25,100	56,800	75,300
Irrigated land					
wet season paddy	49,500	49,500	13,000	36,500	36,500
dry season paddy	36,500	55,000	12,100	24,400	42,900
Rainfed land					
wet season paddy	0	0	4,100	-4,100	-4,100
(2) Diversified Crop (Mongo beans)	200	0	300	-100	-300

1: equivalent to 65,800 tons of milled rice

2: equivalent to 54,200 tons of milled rice

Table 3.5 PRIMARY PROFIT PER HA FOR WET SEASON PADDY WITH PROJECT

Item			(Unit: Peso)
A) Gross Income			
	4.5 tons x 1,870 ₱/ton		8,415
B) Production Cost			3,206
1) Farm Inputs			
	- Seed	60kg x 1.8 ₱/kg	108
	- Fertilizer	N = 70kg x 6.2 ₱/kg	434
		P = 20kg x 7.4 ₱/kg	148
	- Chemicals	2ℓ x 70 ₱/ℓ	140
2) Labour Cost		125 man-days x 12 ₱/man-day	1,500
3) Animal Power		9.1 days x 15 ₱/day	137
4) Mechanical Power		3.4 days x 190 ₱/day	646
5) Miscellaneous			93
C) Primary Profit (A-B)			5,209

Table 3.6 PRIMARY PROFIT PER HA FOR DRY SEASON PADDY WITH PROJECT

Item		(Unit: Peso)
A) Gross Income		
5.0 tons x 1,870 ₱/ton		9,350
B) Production Cost		3,334
1) Farm Inputs		
- Seed	60kg x 1.8 ₱/kg	108
- Fertilizer	N = 90kg x 6.2 ₱/kg	558
	P = 20kg x 7.4 ₱/kg	148
- Chemicals	2ℓ x 70 ₱/ℓ	140
2) Labour Cost	125 man-days x 12 ₱/man-day	1,500
3) Animal Power	9.1 days x 15 ₱/day	137
4) Mechanical Power	3.4 days x 190 ₱/day	646
5) Miscellaneous		97
C) Primary Profit (A-B)		6,016

Table 3.7 PRIMARY PROFIT PER HA FOR WET SEASON PADDY IN IRRIGATED LAND WITHOUT PROJECT

Item		(Unit: Peso)
A) Gross Income		
2.36 tons x 1,870 ₱/ton		4,413
B) Production Cost		2,422
1) Farm Inputs		
- Seed	95kg x 1.8 ₱/kg	171
- Fertilizer	N = 51kg x 6.2 ₱/kg	316
	P = 9kg x 7.4 ₱/kg	67
	K = 3kg x 3.1 ₱/kg	9
- Chemicals	1.2 ℓ x 70 ₱/ℓ	84
2) Labour Cost	96 man-days x 12 ₱/man-day	1,152
3) Animal Power	6.4 days x 15 ₱/days	96
4) Mechanical Power	2.4 days x 190 ₱/day	456
5) Miscellaneous		71
C) Primary Profit (A-B)		1,991

Table 3.8 PRIMARY PROFIT PER HA FOR DRY SEASON PADDY IN IRRIGATED LAND WITHOUT PROJECT

Item		(Unit: Peso)
A) Gross Income		
2.62 tons x 1,870 ₱/ton		4,899
B) Production Cost		2,534
1) Farm Inputs		
- Seed	99kg x 1.8 ₱/kg	178
- Fertilizer	N = 53kg x 6.2 ₱/kg	329
	P = 14kg x 7.4 ₱/kg	104
	K = 5kg x 3.1 ₱/kg	16
- Chemicals	1.5ℓ x 70 ₱/ℓ	105
2) Labour Cost	98 man-days x 12 ₱/man-day	1,176
3) Animal Power	6.4 days x 15 ₱/day	96
4) Mechanical Power	2.4 days x 190 ₱/day	456
5) Miscellaneous		74
C) Primary Profit (A-B)		2,365

Table 3.9 PRIMARY PROFIT PER HA FOR WET SEASON PADDY IN RAINFED LAND WITHOUT PROJECT

Item		(Unit: Peso)
A) Gross Income		
2.07 tons x 1,870 ₱/ton		3,871
B) Production Cost		2,273
1) Farm Inputs		
- Seed	95kg x 1.8 ₱/kg	171
- Fertilizer	N = 51kg x 6.2 ₱/kg	316
	P = 7kg x 7.4 ₱/kg	52
	K = 3kg x 3.1 ₱/kg	9
- Chemicals	0.9ℓ x 70 ₱/ℓ	63
2) Labor Cost	87 man-days x 12 ₱/man-day	1,044
3) Animal Power	6.4 days x 15 ₱/day	96
4) Mechanical Power	2.4 days x 190 ₱/day	456
5) Miscellaneous		66
C) Primary Profit (A-B)		1,598

Table 3.10 PRIMARY PROFIT PER HA FOR DIVERSIFIED CROP (MONGO) WITH AND WITHOUT PROJECT

Item		(Unit: Peso)
A) Gross Income		
0.4 tons x 4,600 ₱/ton		1,840
B) Production Cost		1,097
1) Farm Inputs		
- Seed	20kg x 5.4 ₱/kg	108
- Fertilizer	N = 0	
	P = 0	
	K = 0	
- Chemicals	1.7ℓ x 70 ₱/ℓ	119
2) Labour Cost	60 man-days x 12 ₱/man-day	720
3) Animal Power	1.5 days x 15 ₱/day	23
4) Mechanical Power	0.5 days x 190 ₱/day	95
5) Miscellaneous		32
C) Primary Profit (A-B)		743

Table 3.11 IRRIGATION BENEFIT AT FULL STAGE

Item	With Project			Without Project			Benefit ₱ 10^3
	Area (ha)	Primary Profit (₱/ha)	Total Profit (₱ 10^3)	Area /1 (ha)	Primary Profit (₱/ha)	Total Profit (₱/ha)	
A. Diversion Dam Scheme			123,475			25,026	98,449
1) Paddy							
Irrigated (wet season)	11,000	5,209	57,299	5,500	1,991	10,951	46,348
Irrigated (dry season)	11,000	6,016	66,176	4,600	2,365	10,879	55,297
Rainfed (wet season)	0	-	0	2,000	1,598	3,196	3,196
2) Diversified crop (Mongo bean)	0	-	0	600	743	470	-470
B. Pump Scheme			101,513			25,375	76,138
1) Paddy							
Irrigated (wet season)	11,000	5,209	57,299	5,500	1,991	10,951	46,348
Irrigated (dry season)	7,300	6,016	43,917	4,600	2,365	10,879	33,038
Rainfed (wet season)	0	-	0	2,000	1,598	3,196	-3,196
2) Diversified crop (Mongo bean)	400	743	297	600	743	349	-52

/1: The area is composed of 10,100 ha of paddy field and 1,000 ha of swamp/grassland. Swamp/grassland is not utilizable for agricultural production.

Note: Based on the estimation of future land use mentioned in section 3.2, planted area without project by season is estimated as follows:

(Unit: ha)

Item	Present Condition	Without Project
Irrigated Field	9,200	8,100
1) Single crop area - wet season	4,000	3,500
- dry season	2,900	2,600
2) Double crop area	2,300	2,000
(wet season)	(2,300)	(2,000)
(dry season)	(2,300)	(2,000)
Rainfed Field - wet season	2,300	2,000

Table 3.12(1) TYPICAL FARM BUDGET WITHOUT PROJECT
(FARM SIZE 1.5 HA)

(1) Single Crop of Paddy in Rainfed Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					14,280
1) Farm Income					5,287
- Wet season paddy	1.50	2.07	3.11	1,455	4,525
- Diversified crop	0.15	0.40	0.06	4,600	276
- Livestock /1					486
2) Off-farm Income /1					8,993
II) Gross Outgo					14,024
1) Production Cost					3,654
- Seed					222
- Fertilizer					395
- Agro-chemicals					96
- Hired labor	47 man-days x ₱12/man-day				564
- Hired animal	1.5 days x ₱15/day				23
- Hired machinery	2.9 days x ₱190/day				551
- Harvesting and threshing	3.11 t x 1/6 x ₱1,455/t				754
- Land rent /2					943
- Miscellaneous					106
2) Living Expenses /1					10,370
III) Net Reserve (I - II)					256

/1 Estimated under the same present condition.

/2 Land rent: (₱ 4,525 - ₱ 754) x 25% = ₱ 943

Table 3.12(2) TYPICAL FARM BUDGET WITHOUT PROJECT (FARM SIZE 1.5 HA)

(2) Single Crop of Paddy in Irrigated Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					14,792
1) Farm Income					5,913
- Wet season paddy	1.50	2.36	3.54	1,455	5,151
- Diversified crop	0.15	0.40	0.06	4,600	276
- Livestock /1					486
2) Off-farm Income /2					8,879
II) Gross Outgo					14,551
1) Production Cost					4,181
- Seed					222
- Fertilizer					415
- Agro-chemicals					123
- Hired labor	48 mand-days x ₱ 12/man-day				576
- Hired animal	1.5 days x ₱15/day				23
- Hired machinery	2.9 days x ₱190/day				551
- Harvesting and threshing	3.54 t x 1/6 x ₱1,455/t				858
- Irrigation fee	3 Ca.				218
- Land rent/2					1,073
- Miscellaneous					122
2) Living Expenses /1					10,370
III) Net Reserve					241

/1 Estimated under the same present condition

/2 Land rent: (₱5,151 - ₱ 858) x 25% = ₱ 1,073

Table 3.12(3) TYPICAL FARM BUDGET WITHOUT PROJECT (FARM SIZE 1.5 HA)

(3) Double Crop of Paddy in Irrigated Land - Lessee

Item	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					19,434
1) Farm Income					11,355
- Wet season paddy	1.50	2.36	3.54	1,455	5,151
- Dry season paddy	1.50	2.62	3.93	1,455	5,718
- Livestock /1					486
2) Off-farm Income /1					8,079
II) Gross Outgo					18,934
1) Production Cost					8,564
- Seed					425
- Fertilizer					876
- Agro-chemicals					243
- Hired labor	85 man-days x ₱12/man-day				1,020
- Hired animal	3 days x ₱15/day				45
- Hired machinery	5.7 days x ₱190/day				1,083
- Harvesting and threshing	7.47 t x 1/6 x ₱1,455/ha				1,811
- Irrigation fee	7.5 Ca.				547
- Land rent/2					2,265
- Miscellaneous					249
2) Living Expenses /1					10,370
III) Net Reserve					500

/1 Estimated under the same present condition

/2 Land rent: (₱10,869 - ₱1,811) x 25% = ₱2,265

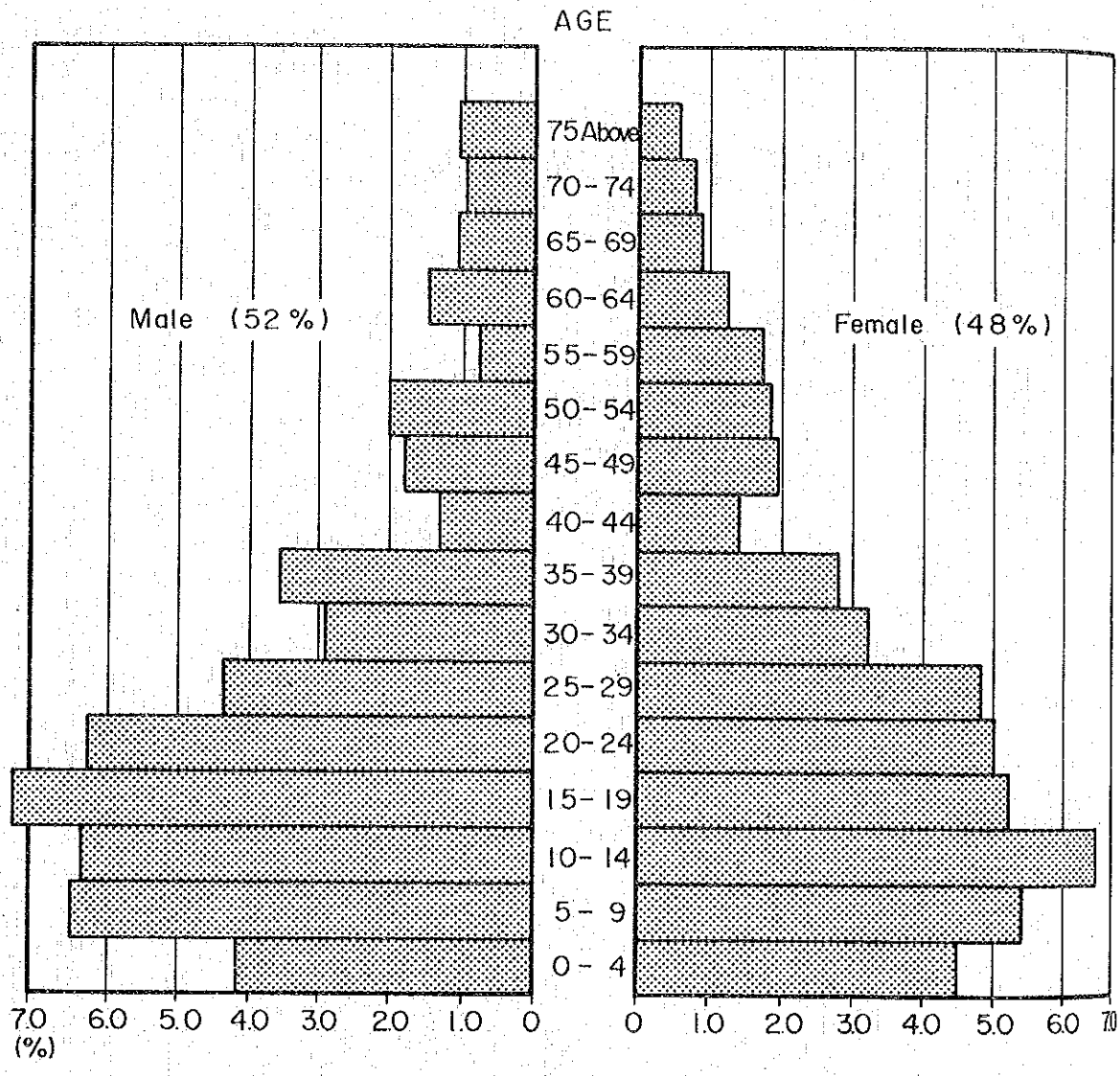
Table 3.13 TYPICAL FARM BUDGET WITH PROJECT

Item	Diversion Dam Scheme					Pump Scheme				
	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)	Area (ha)	Unit Yield (t/ha)	Production (t)	Unit Price (₱/t)	Amount (₱)
I) Gross Income					29,870					26,508
1) Farm Income					21,220					17,858
- Wet season paddy	1.5	4.5	6.75	1,455	9,821	1.5	4.5	6.75	1,455	9,821
- Dry season paddy	1.5	5.0	7.50	1,455	10,913	1.0	5.0	5.00	1,455	7,275
- Diversified crop	-	-	-	-	-	0.15	0.4	0.06	4,600	276
- Livestock					486					486
2) Off-farm Income /1					8,650					8,650
II) Gross Outgo					26,501					24,358
1) Production Cost					13,021					10,878
- Seed					264					234
- Fertilizer					1,332					1,088
- Agro-chemicals		6 ℓ x 60 ₱/ℓ			360		5 ℓ x 60 ₱/ℓ			300
- Hired labour		109 man-days x 12 ₱			1,308		97 man-days x 12 ₱			1,164
- Hired animal		4.2 days x 15 ₱			63		3.5 days x 15 ₱			53
- Hired machinery		8.1 days x 190 ₱			1,539		6.9 days x 190 ₱			1,311
- Harvesting and threshing		14.25 t x 1/6 x ₱1,455/t			3,456		11.75 t x 1/6 x ₱1,455/t			2,849
- Land rent					4,320					3,562
- Miscellaneous					379					317
2) Living Expenses /2					13,480					13,480
III) Capacity To Pay (I - II)					3,369					2,150

/1 Estimated at average of off-farm income of 3-typical farms at present condition.

/2 Living expenses with project are assumed as follows:
Living expenses at present (₱10,370/household) x Increasing rate (1.3)
= ₱13,480

Fig. 2.1 AGE DISTRIBUTION OF THE POPULATION IN THE PAMPANGA IRRIGATION DEVELOPMENT AREA



Source : Results of Farm Economic Survey (1981).

Fig. 2.2 SOIL AND LAND CAPABILITY MAP IN THE IRRIGATION PROJECT AREA

LEGEND
(LAND CAPABILITY)

Class	Mapping Symbol		Area (ha)	Proportional Extent (%)
Class I	I	Quingua clay loam	400	2.9
Class II	IIj	La Paz clay loam	500	3.5
Class III	IIIdgj	San Fernando clay	7,400	52.9
	IIId	Tagulad clay	5,500	39.3
	IIIgj	Masantol clay	200	1.4
Total			14,000	100.0

LEGEND
(SOIL)

Soil Mapping Symbol	Soil Mapping Unit	Area (ha)	Proportional Extent (%)
SFc	San Fernando clay	7,400	52.9
Tc	Tagulad clay	5,500	39.3
Qcl	Quingua clay loam	400	2.9
Lcl	La Paz clay loam	500	3.5
Mc	Masantol clay	200	1.4
Total		14,000	100.0

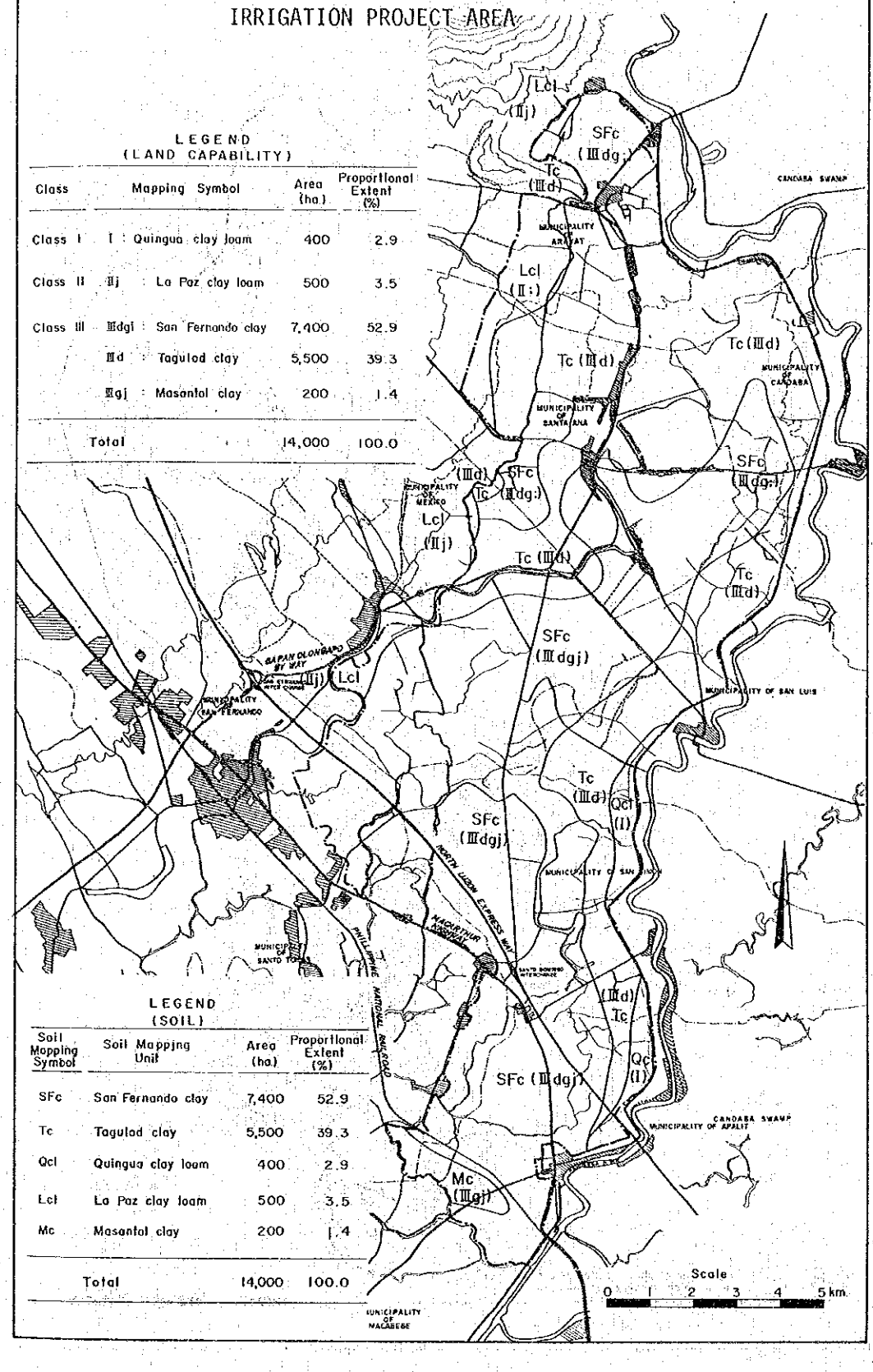
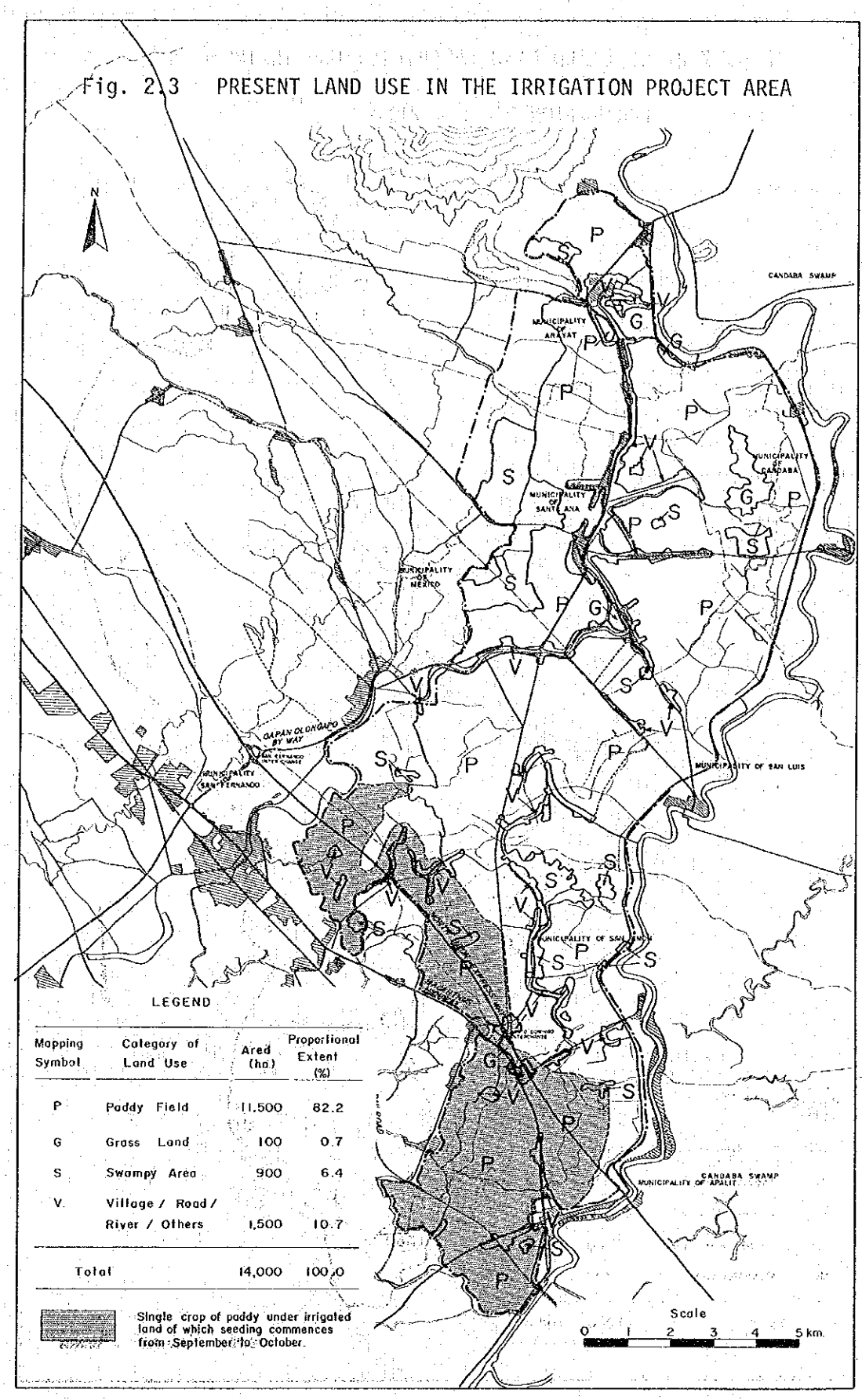


Fig. 2.3 PRESENT LAND USE IN THE IRRIGATION PROJECT AREA



Mapping Symbol	Category of Land Use	Ared (ha)	Proportional Extent (%)
P	Paddy Field	11,500	82.2
G	Grass Land	100	0.7
S	Swampy Area	900	6.4
V	Village / Road / River / Others	1,500	10.7
Total		14,000	100.0

Single crop of paddy under irrigated land of which seeding commences from September to October.

Fig. 2.4 PRESENT CROPPING PATTERN

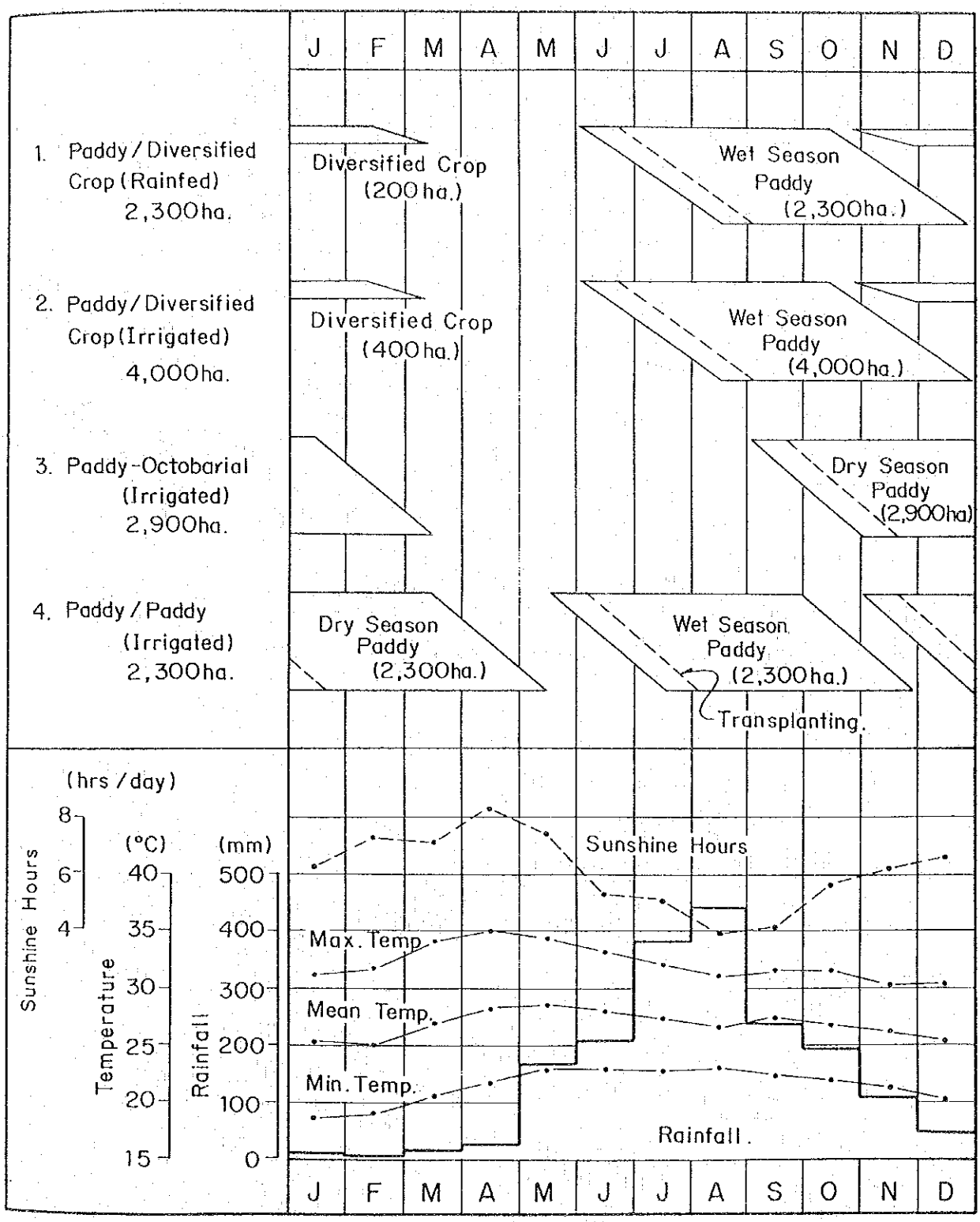


Fig. 2.5 LOCATION MAP OF SAMPLING SITE FOR RICE YIELD SURVEY

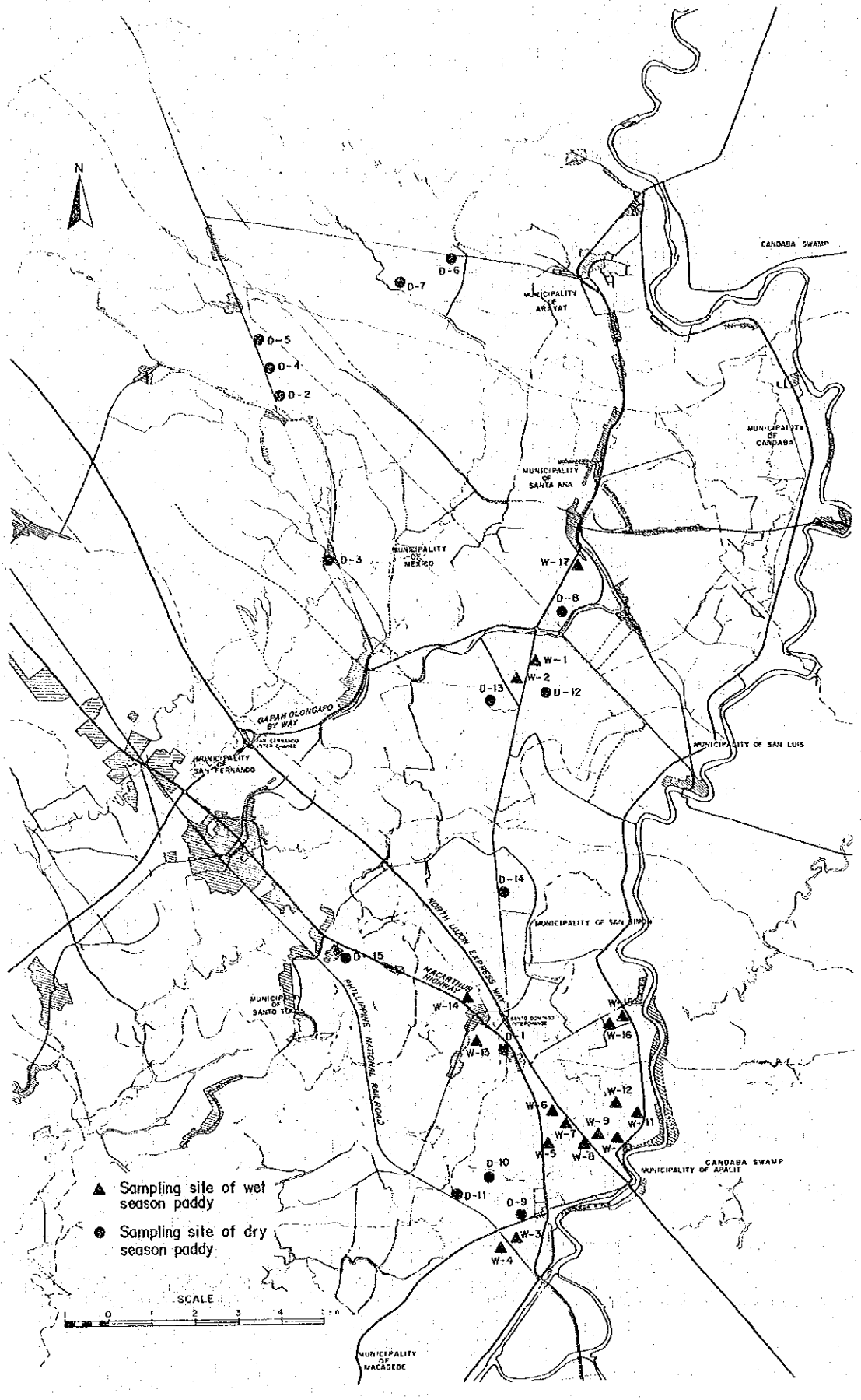


Fig. 2.6 PROCEDURE OF YIELD SURVEY AND ANALYSIS

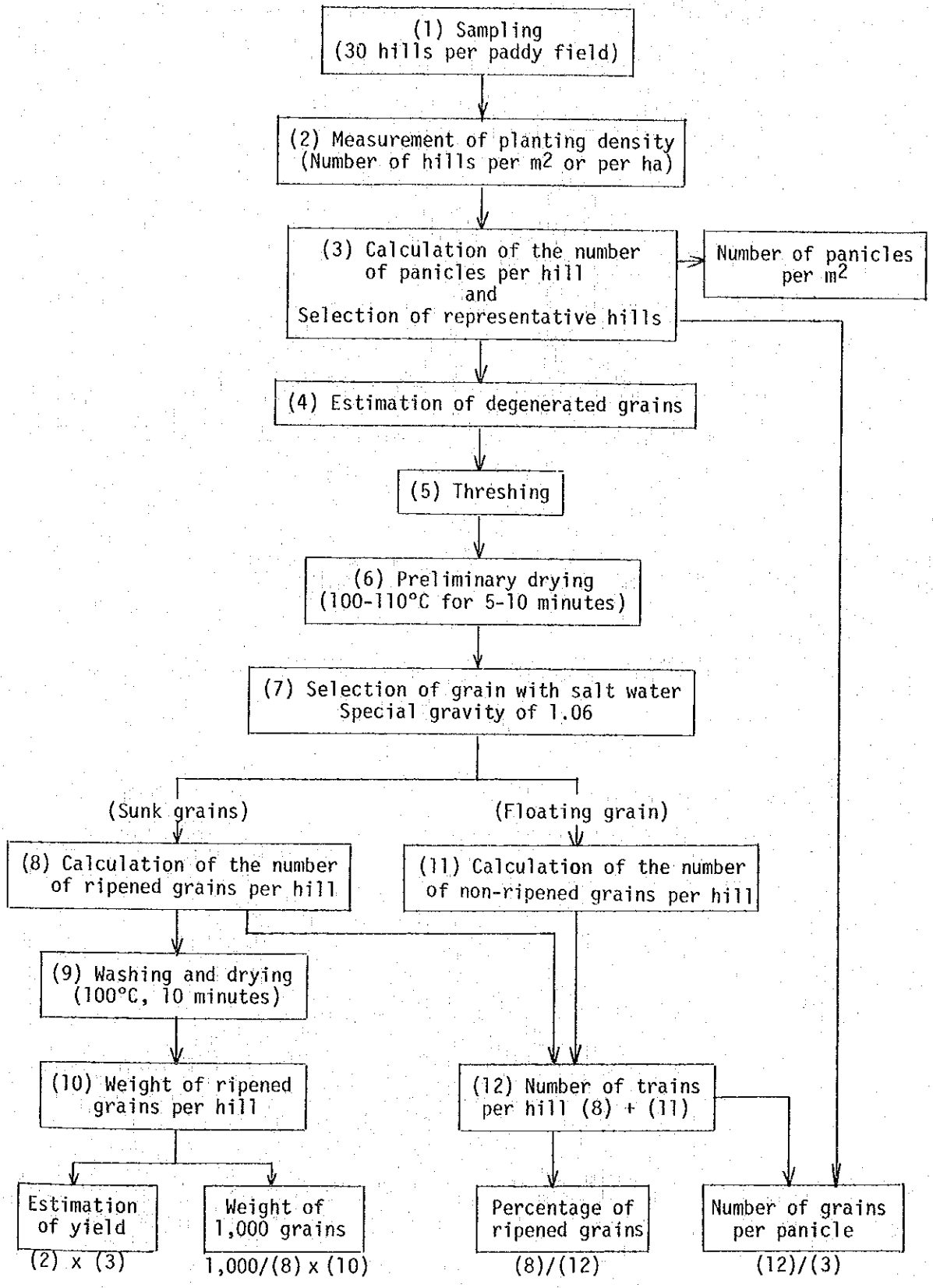
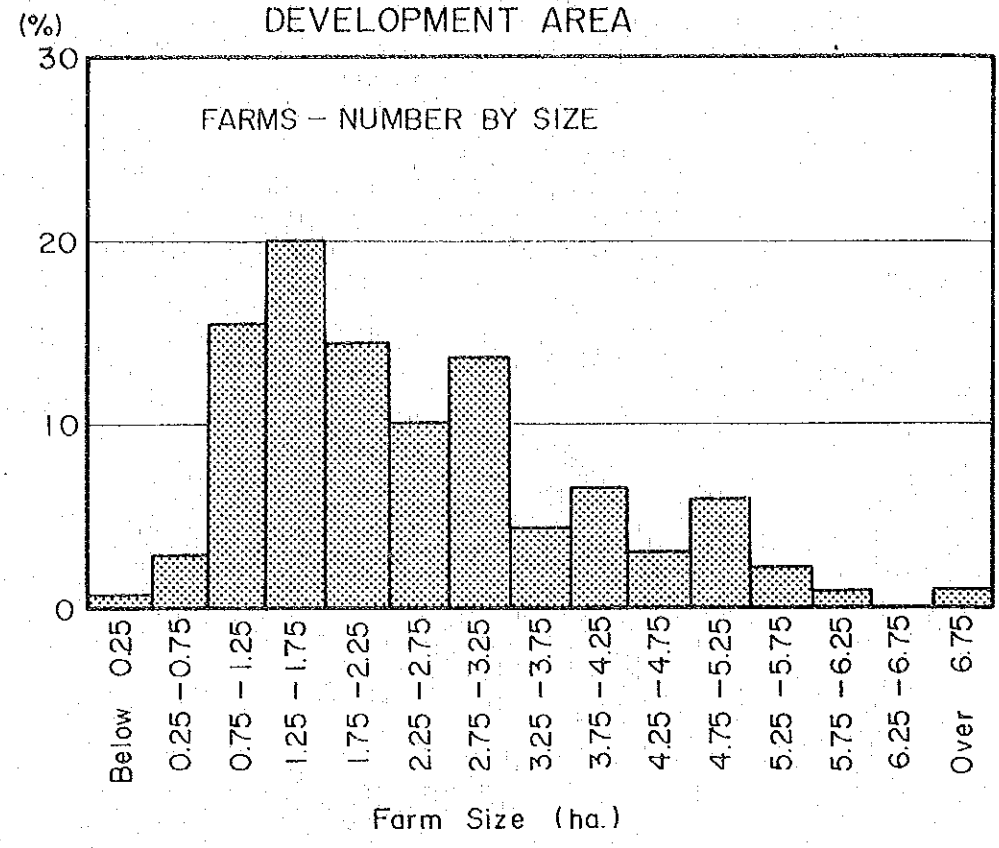


Fig. 2.7 FRAGMENTATION OF FARM SIZE IN THE PAMPANGA IRRIGATION DEVELOPMENT AREA



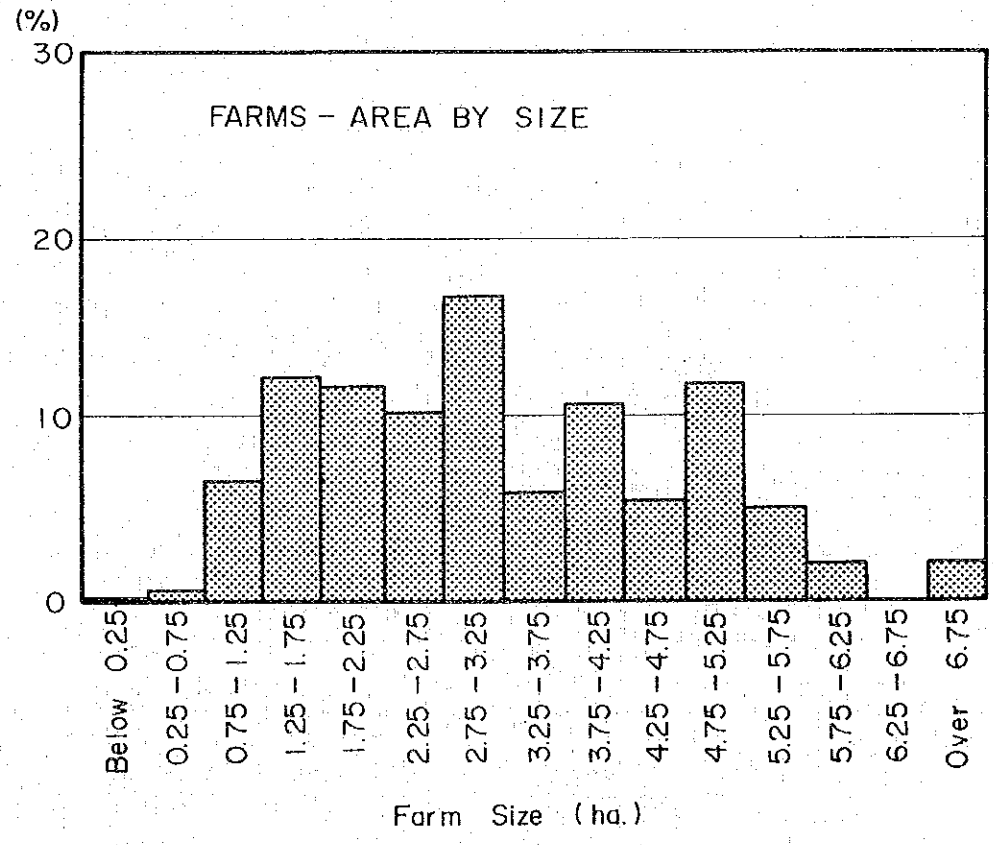
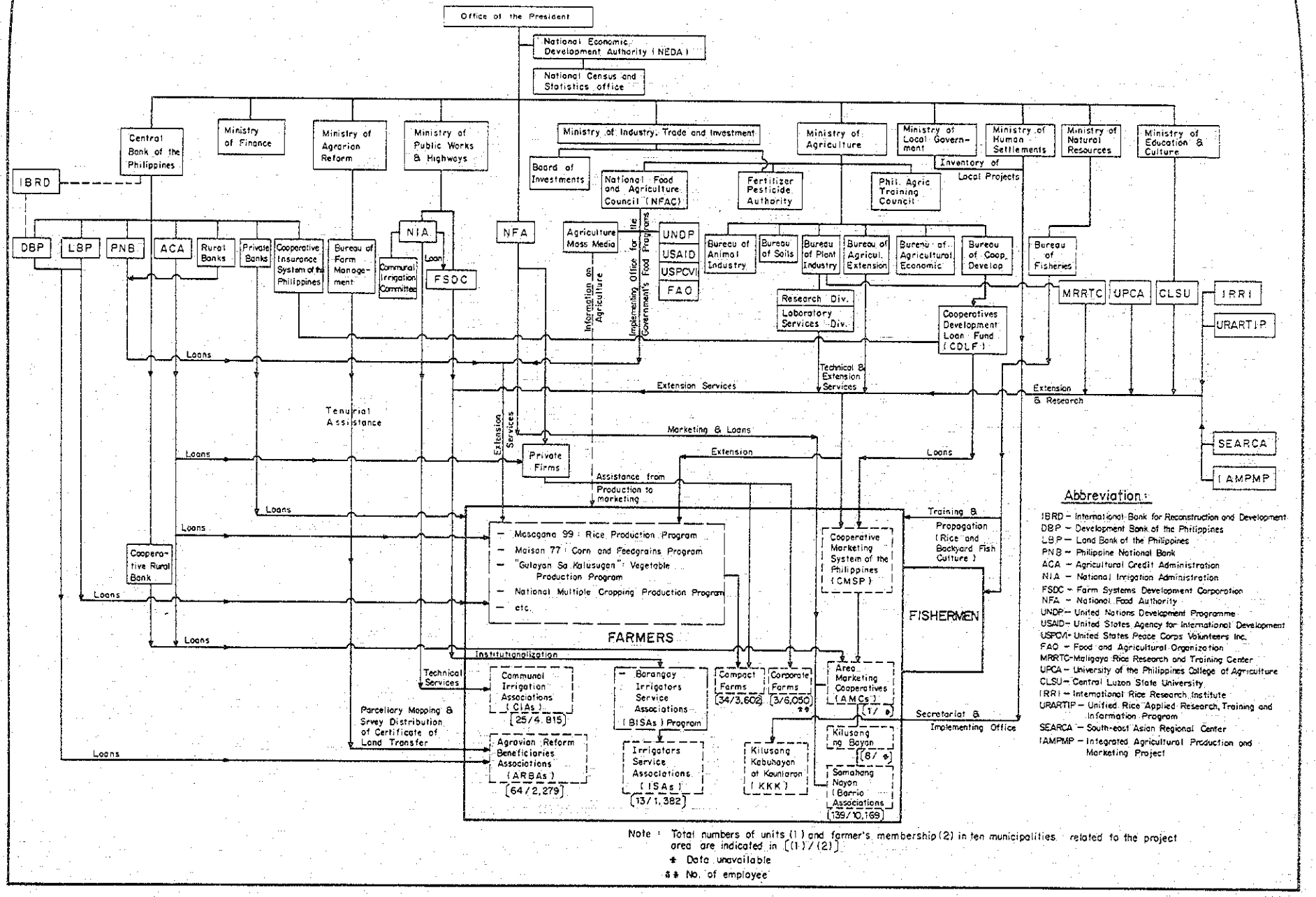


Fig. 2.8 NATIONAL DEVELOPMENT ORGANIZATION FOR AGRICULTURAL & FOOD PRODUCTION PROGRAMS

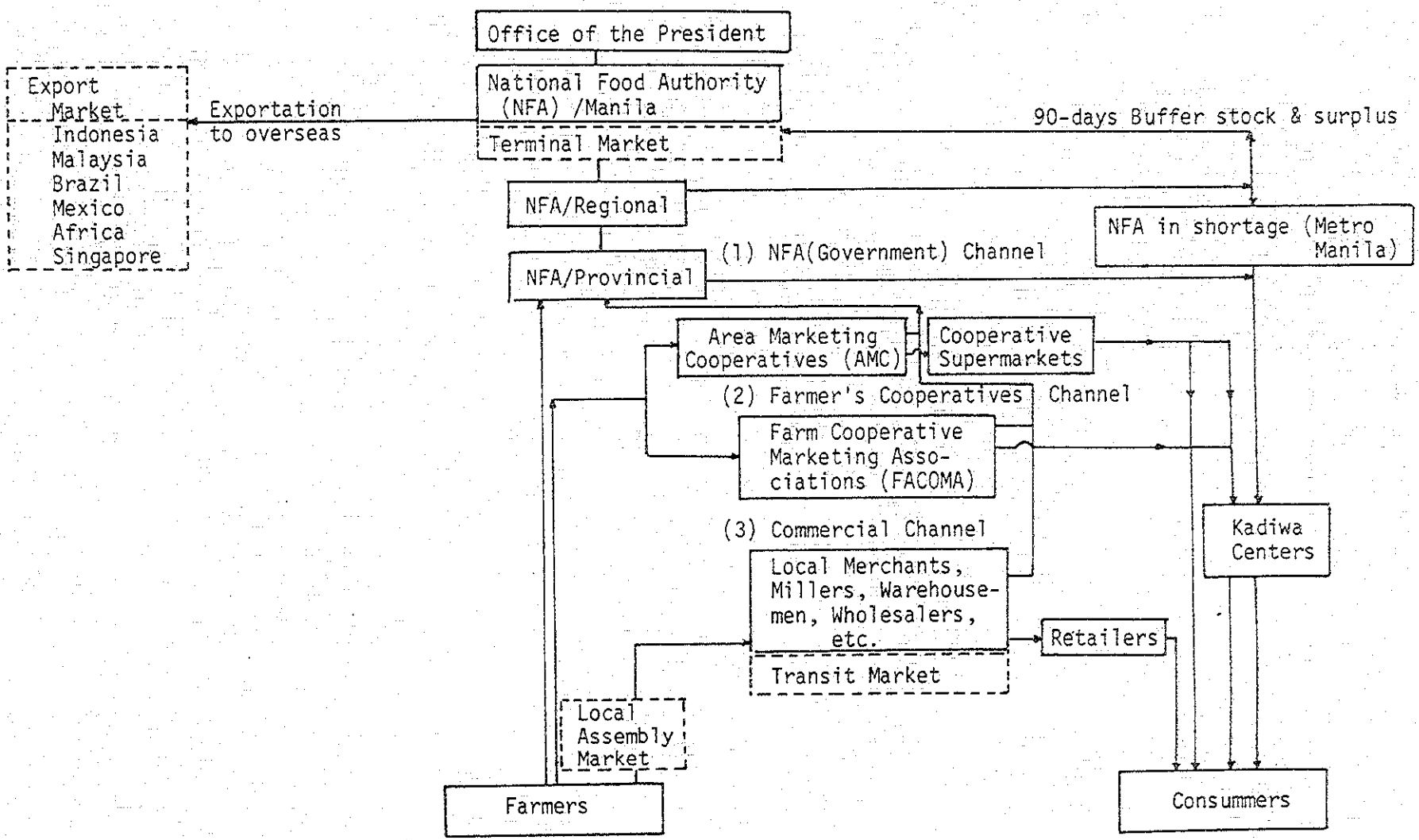


Note : Total numbers of units (1) and farmer's membership (2) in ten municipalities related to the project area are indicated in [(1)/(2)]

* Data unavailable

** No. of employee

Fig.2.9 MARKETING FLOW CHART OF RICE (OR PADDY)



Source: National Food Authority, Statistics Department, Manila

Fig. 2.10 DETERMINATION OF REPRESENTATIVE FARM

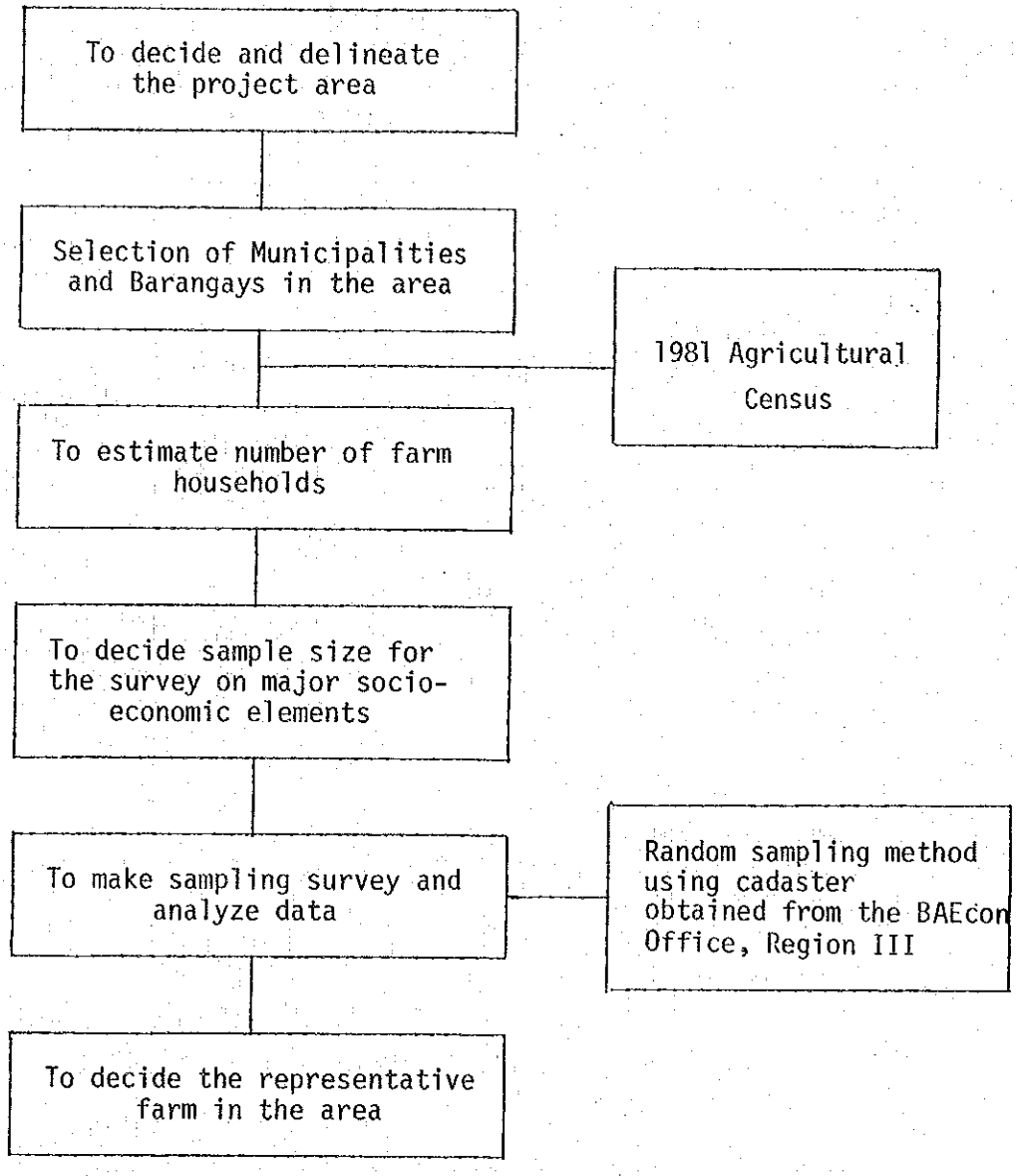


Fig. 2.11 LIVING EXPENSES PER PERSON AT PRESENT IN THE IRRIGATION DEVELOPMENT AREA

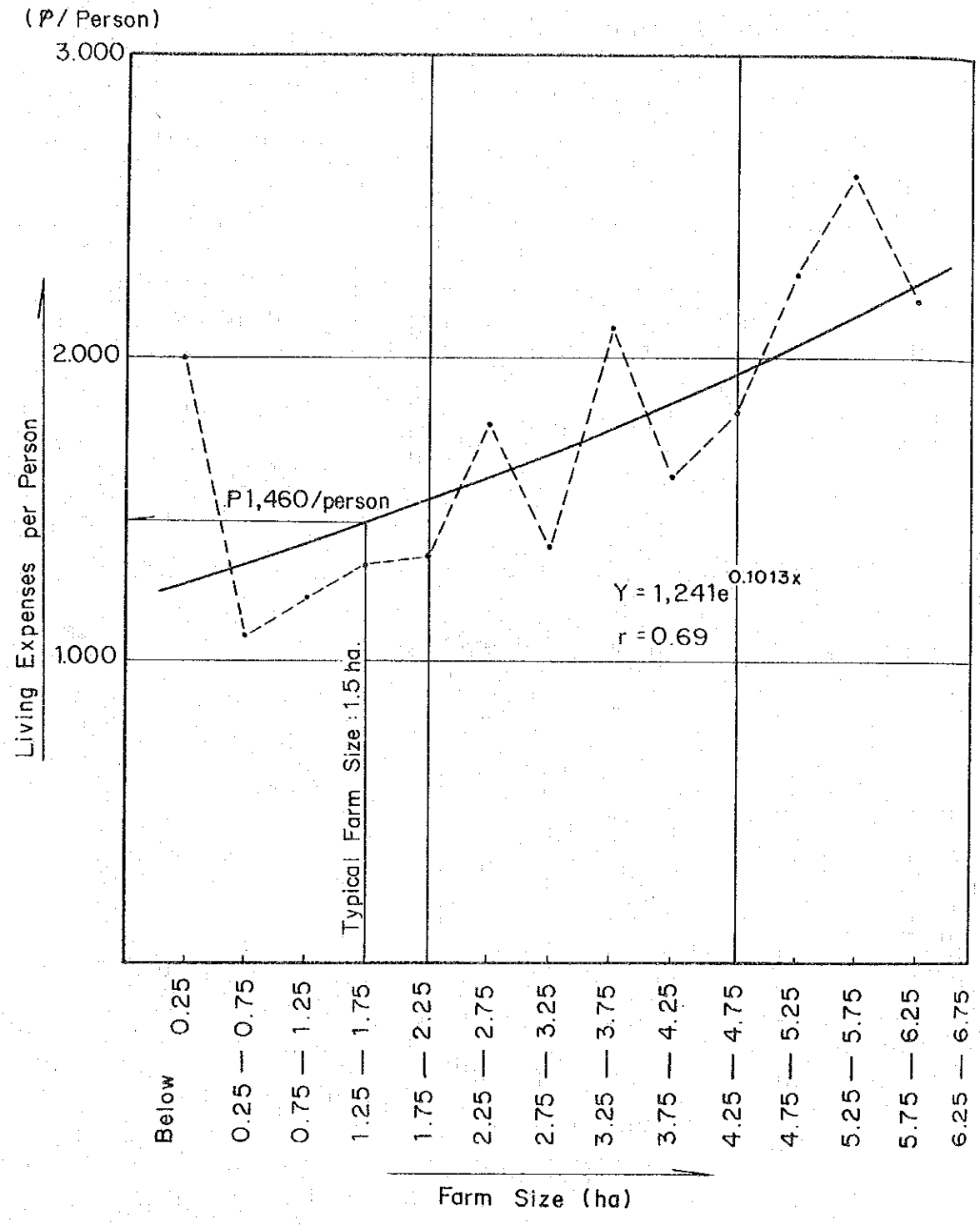
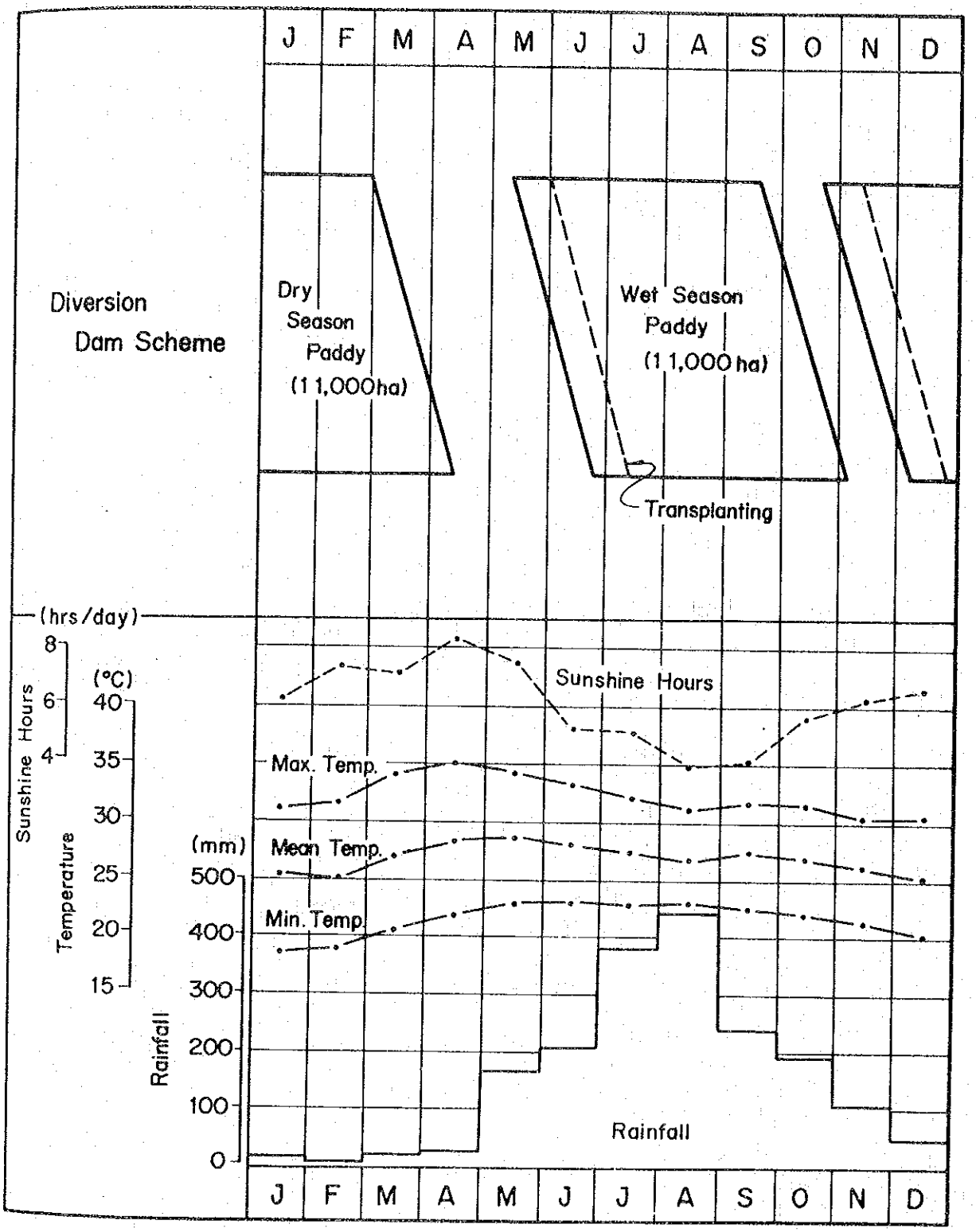


Fig. 3.1 PROPOSED CROPPING PATTERN



APPENDIX VI
IRRIGATION AND DRAINAGE

APPENDIX VI IRRIGATION AND DRAINAGE

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APPENDIX VI IRRIGATION AND DRAINAGE

CHAPTER 1 EXISTING IRRIGATION AND DRAINAGE SYSTEM

1.1 Existing Irrigation System

1.1.1 General

The irrigation systems in the Philippines are classified into the following four categories: a) National Irrigation System, b) Communal Irrigation System (CIS), c) Pump Irrigation System (PIS), and d) Private and other irrigation system.

In the Project area for the irrigation development, there are no existing national irrigation systems but a few communal irrigation systems and many pump irrigation systems covering about 3,930 ha of paddy fields or approximately 36% of the area to be served by the Project.

1.1.2 Communal Irrigation System

The water sources of communal irrigation system (CIS) are usually dependant on the discharge of small rivers and streams. CIS is operated by gravity with diversion dam and canal systems commanding generally less than 100 ha of field. CIS has been constructed by NIA on provincial basis and operation and maintenance are conducted by irrigators association with guidance of Farm Systems Development Corporation (FSDC) and NIA.

In the irrigation development area, the following five CIS exist.

Name of CIS	Source of Water	Service Area (ha)	
		Wet Season	Dry Season
San Juan Baño	Baño Creek	365	130
Gatiawin	Buracan Creek	129	10
Lacmit	Lacmit Creek	405	80
Inumang Baca	Inuman Baca Creek	115	0
San Isidro	Inuman Baca Creek	60	0
Total		1,074	220

Only 9.8% and 2.0% of the irrigation development area are irrigated by CIS during wet and dry season respectively. The service area of the above CIS is shown on Fig. 1.1.

1.1.3 Pump Irrigation System

Pump irrigation has been developed to increase the irrigable area by NIA and FSDC. In the irrigation development area of the Project, many pump irrigation systems exist. The potential service area of those PIS is reported at about 2,860 ha or 26% of the development area by 107 systems and 214 systems of surface water pump and ground water pump respectively as shown in Table 1.1 in detail. Major pump stations in the development area are shown on Fig. 1.1. Those potential service areas, however, are not always irrigated mainly due to high cost required for operation and maintenance especially fuel and sometimes due to sea-water intrusion during dry season in the lower area.

1.1.4 Private and Other Irrigation System

In addition to the above mentioned irrigation systems, there are some private and other irrigation systems constructed and operated by private personnel or association such as Mother Milaros Foundation and Philippine Business for Special Progress without any financial assistance from the Government agencies. The number of the private irrigation systems and their service area are not clarified in the irrigation development area.

1.1.5 Water Right

For making use of the existing river discharge, the discharge corresponding to the water right authorized in the downstream is to be assured always.

The existing water rights in the Pampanga River authorized by National Water Resource Council (NWRC) in the downstream of Arayat are 10 places amounting 2.8 m^3/s in all as shown in Table 1.2. The purpose of water use of these water rights are all for irrigation. However, since 4 places amounting 1.46 m^3/s of water rights are to be integrated to the Project, the remaining water rights, 6 places and 1.34 m^3/s, are to be considered for the Project planning.

1.2 Present Drainage Condition

The irrigation development area of the Project is protected from the flood of the Pampanga River by the existing set back levee. While, there is no direct drainage outlet from the area to the Pampanga River since the water surface elevation during flood in the River is higher than the ground elevation in the area. Accordingly, all drainage courses flow into the Guagua River Basin. No drainage facilities but natural drainage courses are available in the development area at present.

Discharge capacities of major drainage courses such as, the Pau River and the Masalusa River are not adequate since discharges of these major drainage course are rather big due to inflow from the outside of the development area. In accordance with the survey results the discharge capacity of the Pau River and the Masalusa River at their narrowest sections is only 15 m^3/sec and 10 m^3/sec respectively. The inadequate drainage capacity as well as lack of drainage ditches in the field courses not only inundation of wide area more than 2,000 ha but also low productivity of paddy and crop damages during wet season.

Accordingly, the drainage plan for the whole development area is essential so as to make the agricultural development plan with year round irrigation.

1.3 Water Management of Existing Facilities

1.3.1 Water Management System for CIS and PIS

The construction of CIS and PIS facilities is commenced after the irrigators association is organized by the benefited farmers with assistance of FSDC and an agreement for the amortization of the construction cost in installment in maximum 50 years without interest is made between the association and NIA or FSDC. After the completing the construction, operation and maintenance of facilities and the collection of amortization area conducted by the association for which a technical assistance is provided by NIA and FSDC.

Operation and maintenance for private or other system are conducted by private personal or associations obtaining a technical assistance from NIA and FSDC.

1.3.2 Water Management System for National Irrigation System

Although there is no national irrigation system existing in the irrigation development area, water management system for national irrigation system is explained hereinafter for reference.

The construction of the National Irrigation System is directly managed by NIA. After completion of the construction of the National Irrigation System, operation and maintenance of the system are conducted by NIA from the reservoir dam and/or the diversion dam to turnout on lateral and sublateral canals. Operation and maintenance of field ditch after turnout are conducted by irrigators association organized on every turnout and field ditch assisted by management technician or irrigation technician.

The irrigation fee is collected from benefited farmers for payment of operation and maintenance cost of the system. The irrigation fee charged to the farmers is 2.0 to 2.5 cavans or ₱130 to 162.5 per hectare for wet season and 3 to 3.5 cavans or ₱195 to 227.5 per hectare for dry season.

In UPRP including PRIS, AMRIS and TISIP, irrigation management technologist and technician are assigned for every 2,500 ha and 500 ha respectively, so that water management of the irrigation system is to be properly conducted and the limited irrigation water is to be efficiently utilized. The water management technician who is to be a graduate of agricultural college is assigned in the field after completing one year training course.

1.4 Existing Development Plan

1.4.1 Irrigation System

There is no existing irrigation development plan of CIS and PIS in the irrigation development area of the Project except some rehabilitation of PIS under FSDC.

1.4.2 Drainage System

In the development area, there are a few plans for improving the Matubig River under MPWH. These plans, however, aim to improve the drainage conditions mainly in towns and residential areas and the improvements are not entire river course but only place to place. Since the design criteria of the improvement is not clear, the drainage plan of the Project shall be made separately.

CHAPTER 2 IRRIGATION AND DRAINAGE DEVELOPMENT PLAN

2.1 General

The previous study in the Second Interim Report concluded that the objective area for the agriculture and irrigation development is lying south of Mt. Arayat and west of the Pampanga River in Pampanga Province and the water source of the irrigation is the discharge of the Pampanga River at Arayat in lieu of the San Antonio Reservoir. Further, the present discharge of the River is only considered as the water source for the irrigation development plan not taking return flows into account since these return flows be not expected soon until the irrigation projects with reservoir proposed in the upstream of Mt. Arayat shall be completed.

For the drainage plan, the drainage facilities from on-farm level is made to improve present worse drainage condition of the area. The main drainage courses in the plan are of the enlarged existing rivers flowing from the development area to the Guagua River because the water surface elevation of the Pampanga River during the design flood is being higher than the ground elevation in the development area for one week or more.

2.2 Irrigation Development Area

Demarcation of the irrigation development area is basically determined by taking the aspects to be discussed hereinafter into consideration.

(1) Intake Water Surface Elevation

The intake water surface elevation shall not be higher than EL. 8.50 m for the diversion dam scheme and for the pump scheme as discussed in Chapter 3 in detail.

(2) Soil Condition and Land Use

As discussed in the Appendix I and V, soils in the project area are clay and clay loam for the area of which ground elevation is lower than EL. 10 m and sandy loam for the area of which ground elevation is between EL. 10 m to 40 m. These soils are suitable for paddy cultivation. Sandy loam, however, requires more irrigation water since the percolation is more than 3 mm/day while the percolation of clay and clay loam is limited at 2 mm/day or less.

Major crops of the project area are mainly paddy in lower area and sugarcane in higher area. Taking the project goal and the land tenure system of sugar land into consideration, it is advisable to give a priority of the development to paddy land.

(3) Topographic Condition

In demarcation of boundary of the southern part of the irrigation service area, land with lower than about EL. 1.5 m is excluded from the service area. As such the land has extremely flatness with considerable microrelief higher head of irrigation water is required to irrigate the land. Further many small rivers and creeks are developed in the land. Implementation of irrigation water supply systems to the land therefore will require huge amount of construction cost, which indicates that irrigation development for the land on a large scale is not economically feasible.

Accordingly, the irrigation development area is demarcated at 14,000 ha with 11,000 ha of the irrigation service area as illustrated on Fig. 2.1. Ground elevation of the irrigation service area varies between about EL. 1.5 m to 8.0 m.

2.3 Water Source

2.3.1 General

The water source for the irrigation development is the discharge of the Pampanga River at Arayat. Average annual mean discharge for 14 years from 1965 to 1978 to Arayat is 250 m^3/s. Since the seasonal fluctuation of the river discharge is very big, the irrigation development plan is examined based on 10 day mean discharge corresponding to the water requirement calculation. 10-day mean discharges at Arayat for 14 years are shown in Table 2.1.

In the irrigation development area there are creeks and rivers on which a few communal irrigation systems are operated at present. However, since the discharges of these creeks and rivers are very small during dry season, these discharges are neglected for irrigation development plan.

2.3.2 Available Discharge of the River

When making use of the river discharge, the minimum discharge released to the downstream is to be determined to maintain the basic functions of river in addition to the discharge to cover the water right existing in the downstream.

(1) River Maintenance Flow

At present there is no certain criteria to determine the river maintenance flow in the Philippines except NIA criteria which aims the maximum use of the river discharge. In accordance with NIA criteria, 90% of the river discharge, which is equivalent to the annual minimum monthly mean discharge in 5-year return period, can be used for the irrigation purpose. For making the irrigation development plan of the Project, the river maintenance flow is to

be determined at the annual minimum 10 day mean discharge in 10 year return period. It is estimated at 5.2 m^3/s by the probability analysis of the data for 14 years from 1965 to 1978.

(2) Water Right

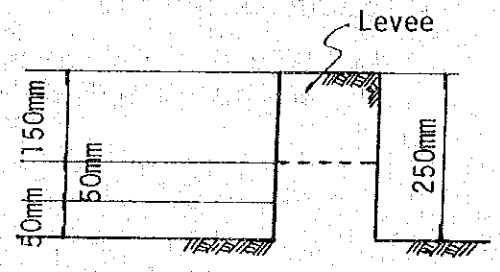
The existing water rights in the downstream of Arayat bridge authorized by NWRC are shown in Table 1.2. All of the water rights are authorized for irrigation purpose. Among those water rights, rights at Sta. Lucia, Cupan and Matao in Arayat, Mandasig in Candaba and Sta. Rita in San Luis located at the right bank of the river will be integrated in the Project because the service area of these water rights are to be covered by the Project. Accordingly, the discharge corresponding to water rights at left bank, 1.34 m^3/s, is to be secured with the Project. Since the discharge from the remaining drainage area in the downstream of Arayat is about 30% of the discharge at Arayat, the discharge of 1 m^3/s will be released at Arayat to correspond the water rights in the downstream. The remaining 0.34 m^3/s will be covered by the discharge from the remaining drainage area.

Accordingly, the minimum discharge of the river to be released to the downstream at Arayat is 6.2 m^3/s. Further, the available discharge at Arayat for irrigation purpose is the discharge deducting 6.2 m^3/s from the actual discharge as shown in Table 2.2.

2.4 Irrigation Method

One irrigation block is assumed as 50 ha of area. The rotational irrigation is applied within this irrigation block. Daily irrigation period is considered for 24 hours for both pump and diversion dam schemes because it takes more than 24 hours for irrigation water to reach from pump station or intake to the tail of the service area.

The levee of paddy field is assumed to be 25 cm in height. The distribution of water depth in the field is illustrated as follows:



Detained Depth

Water Depth for Irrigation Application and Effective Rainfall Foregoing Irrigation Depth

The irrigation water is applied when the water depth in the field will be less than 50 mm. Effective rainfall of a rain is to be 50 mm or less. When heavy rainfall takes place, 150 mm out of the rainfall depth is to be detained in the field.

2.5 Irrigation Water Requirement

2.5.1 General

The two different cropping calendars of paddy as shown on Fig. 1.2 in Appendix V are considered for pumping scheme and diversion dam scheme respectively so as to maintain the maximum utilization of the available discharge in the river and the effective volume of the reservoir discussed in Section 2.6. Irrigation water requirement of paddy is estimated by pan method in ten day basis for 11 years from 1968 to 1978.

The water requirement calculation is conducted by electronic computer in accordance with the programme prepared based on the block diagram and the flow chart as shown on Fig. 2.2 and Fig. 2.3. There are three rainfall stations, namely; San Fernando, Apalit and Arayat, available in the development area. The water requirement calculation is conducted for these three stations for the period of which daily rainfall data are available. The weighted average of the requirement of each station is used as the irrigation water requirement of the Project.

(1) Evapo-transpiration

Evapo-transpiration of paddy is estimated on the basis of the surface water evaporation from the standard class-A pan and the crop coefficient.

(2) Crop Water Requirement

Crop water requirement on daily basis is calculated by adding percolation loss and water requirement for a nursery period and land preparation work to evapotranspiration.

(3) Irrigation Water Requirement

Irrigation water requirement is calculated by deducting effective rainfall from the crop water requirement.

(4) Diversion Water Requirement

Diversion water requirement is calculated by adding operation and conveyance losses to irrigation water requirement.

2.5.2 Estimation of Evapo-transpiration of Paddy

Evapo-transpiration of paddy is estimated in accordance with the following formula on daily basis:

$$ET = KcPE(D)$$

$$PE(D) = PE(M)/tm$$

where, ET: crop evapo-transpiration (mm)
Kc: crop coefficient
PE(D): daily pan evaporation (mm)
PE(M): monthly pan evaporation (mm)
tm: number of days in month

(1) Pan Evaporation

Pan evaporation data are available in San Miguel, Tarlac (1968-1979), Baliwag, Bulacan (1970-1989) and Cabanatuan City adjacent to the irrigation development area. The average of monthly pan evaporation at San Miguel and Baliwag is used for the study as shown in Table 2.3. Pan evaporation at Baliwag for 1968 and 1969 is estimated from the data at San Miguel by the method of correlation and regression analysis.

(2) Crop Coefficient (Kc) of Paddy

In the agricultural research station of NIA Region III at Sabang, Baliwag, Bulacan, evaporation and evapo-transpiration of paddy has been observed by NSDB - NIA water management improvement project since 1970. The crop coefficient (Kc) of paddy is determined based on the analysis of the data obtained through the aforesaid project for 15 crops, 6 crops for wet season and 9 crops for dry season, as shown on Fig. 2.4. As the growing period varies depending on varieties of paddy, Kc is determined for the percentage of the total duration from seeding to harvesting for each crop.

The crop coefficient relative to the respective growing stages obtained from the said figure is as follows:

Percentage of Growing Stage	10	20	30	40	50	60	70	80	90	100
Crop Coefficient	0.80	0.83	0.93	1.04	1.12	1.20	1.21	1.15	1.01	0.85

2.5.3 Crop Water Requirement

Crop water requirement is estimated as follows:

Evapo-transpiration + deep percolation water
+ water requirement needed for land preparation and nursery bed

(1) Deep Percolation

Water loss due to deep percolation is assumed at 2.0 mm per day for the study depending on the soil texture found as very fine and fine in the development area as discussed in Annex V and NIA standard based on UPRP study./1

(2) Land Preparation

The water requirement for land preparation in paddy field is calculated in the following formula:

$$LP = SS + Kc \times (t\ell/tm)\ PE + t\ell P + SP$$

where,
- LP: water requirement for land preparation (mm)
- SS: water requirement for land soaking (mm) 140 mm for wet and dry seasons
- Kc: coefficient for evaporation from muddy or shallow basin of water, 0.7
- $t\ell$: number of days for land preparation, 25 days
- tm: number of days in month
- PE: pan evaporation (mm/month)
- P: deep percolation loss, 2.0 mm/day
- SP: depth of ponding for transplanting, 25 mm

(3) Nursery Water Requirement

5% of total paddy field is considered necessary for nursery. Nursery water requirement is same with actual field in principle for land preparation and crop. However, as more losses due to seepage, application and so on are to be considered, 50% more water than actual field is applied for nursery.

(4) Crop Water Requirement

Daily crop water requirement is calculated in accordance with the above procedure and field in the computer memory for the period of which daily rainfall data are available.

/1: Refer the Report of Land Classification and Supporting Studies on UPRP, NIA Dec. 1971.

2.5.4 Irrigation Water Requirement

The irrigation water requirement is estimated by deducting effective rainfall from the crop water requirement on daily basis and summarized for each 10 days.

(1) Irrigation Method

Field condition is considered as follows as discussed in Section 2.4:

- Height of levee is at 250 mm above field surface in average.
- Water depth in the field is kept at 50 mm in minimum and 100 mm in maximum, accordingly, in the daily balance calculation, when the water level is lower than 50 mm, the irrigation water will be applied up to 100 mm.

(2) Effective Rainfall

- All rainfalls are considered as a potential effective rainfall, however, when the water depth in the field will exceed 100 mm, the excess will be drained and not effective.
- The average annual effective rainfalls are 758 mm and 729 mm for diversion dam scheme and pump scheme respectively.

(3) Irrigation Water Requirement

- Irrigation water requirement on 10 day basis is calculated at San Fernando, Apalit, Arayat as shown in Tables 2.4 to 2.9. The irrigation water requirement of the Project, the weighted average at the above stations, is tabulated in Table 2.10 and Table 2.11. Average annual irrigation water requirements for diversion dam scheme and pump scheme are 1,401 mm and 1,424 mm.

2.5.5 Diversion Water Requirement

Diversion water requirement for irrigation is estimated by dividing the irrigation water requirement by the overall irrigation efficiency.

The irrigation efficiencies are assumed as follows for this study:

(Unit: %)

System Component	Rice	
	Wet Season	Dry Season
Field Application	70	80
Conveyance System	80	80
System Operation	85	85
Overall	48	54