Table 3.5 RESULTS OF FERTILITY TESTS ON SOIL SAMPLES IN THE PROPOSED EXTENSION AREA

Sample No.	Result of Analysis				Sample No.	Result of Analysis			
	pH	OM (%)	P_2O_5 (ppm)	Potassium (ppm)		pH	OM (%)	P_2O_5 (ppm)	Potassium (ppm)
FS-1	5.0	2.87	69.5	60	FS-29	4.9	2.75	72.5	60
2	5.3	0.59	67.5	135	30	4.9	1.84	57.5	70
3	4.9	2.41	71.5	75	31	5.1	2.11	40.5	75
4	5.2	2.03	80.5	60	32	5.2	3.58	27.0	75
5	5.4	1.92	44.0	20	33	5.5	2.55	35.0	170
6	4.7	2.76	93.5	35	34	6.3	2.03	39.0	110
7	5.2	2.71	132.0	90	35	5.5	1.54	46.0	60
8	5.9	2.55	53.5	35	36	-	-	-	-
9	6.3	1.13	51.0	40	37	5.6	2.79	44.0	75
10	5.4	2.36	49.0	50	38	6.1	2.52	46.0	40
11	-	-	-	-	39	6.5	1.81	39.0	185
12	5.9	2.63	55.0	20	40	7.2	1.98	67.0	80
13	5.6	1.87	55.0	20	41	6.2	3.14	55.0	120
14	5.1	2.76	29.0	20	42	5.3	2.44	30.0	110
15	5.5	2.98	50.0	80	43	5.9	1.98	25.0	110
16	4.9	3.06	68.0	20	44	5.2	2.41	26.0	10
17	5.0	2.14	61.5	75	45	-	-	-	-
18	4.9	1.98	60.5	110	46	5.5	1.81	30.0	80
19	5.1	2.57	70.5	60	47	5.8	2.06	22.0	10
20	4.8	2.74	61.5	50	48	6.0	4.42	24.0	80
21a	5.0	2.74	60.5	80	49	6.1	1.81	31.0	130
21b	5.0	1.57	70.5	60	50	5.3	2.71	34.0	160
22	5.1	3.52	46.0	330	51	5.6	1.84	31.0	140
23a	5.6	1.92	56.5	120	52	-	-	-	-
23b	6.0	2.03	39.0	170	53	5.5	2,57	51.0	110
24	5.3	3.39	52.0	120	54	5.8	3.42	35.0	350
25	5.5	4.48	51.0	50	55	-	-	-	-
26	5.6	3.04	55.0	50	56	-	-	-	-
27	5.2	2.11	34.0	60	57	5.8	2.60	44.0	120
28	5.7	1.81	57.5	70					

Remarks:
- pH: Soil-water ratio is 1:1.
- OM: Organic matter
- P_2O_5: Available phosphorus on Olsen method
- Potassium: Extracted by (Cold) H_2SO_4

Table 3.6 RESULTS OF FERTILITY TESTS ON SOIL SAMPLES AND NUTRIENT REQUIREMENT FOR HIGH YIELDING VARIETIES OF PADDY RICE IN THE EXISTING SERVICE AREAS OF IRRIGATION SYSTEMS

Sample No.	Result of Analysis				Nutrient Requirement (kg/ha)			
	pH	OM (%)	P_2O_5 (ppm)	Potassium (ppm)	N(M)	N(D)	P	K
FS-3	6.4	5.73	10.0	85	60	70	20	0
5	5.5	2.19	12.5	25	70	80	0	45
6	4.8	2.98	18.0	30	70	80	0	45
7	6.2	3.33	22.5	41	60	70	0	30
8	7.0	1.89	12.5	40	80	100	0	30
9	6.2	2.82	20.0	50	70	80	0	30
10	7.1	4.23	18.0	135	60	70	0	0
11	5.5	4.45	19.0	165	60	70	0	0
12	5.5	2.30	11.5	30	70	80	0	45
13	5.4	2.33	18.0	110	70	80	0	0
14	5.5	2.00	11.5	25	80	100	0	45
15	5.1	1.92	22.5	45	80	100	0	30
16	5.0	2.55	18.0	45	70	80	0	30
17	5.1	1.89	20.0	40	80	100	0	30
18	6.4	1.92	12.5	30	80	100	0	45
19	6.3	2.98	22.5	45	70	80	0	30
20	7.0	2.85	20.0	70	70	80	0	0
21	5.7	1.87	18.0	55	80	100	0	0
23	5.9	3.69	20.0	165	60	70	0	0
24	4.8	1.27	17.0	30	80	100	0	45
25	4.7	2.47	18.0	30	70	80	0	45
26	5.3	1.11	20.0	150	80	100	0	0
27	5.2	3.01	25.5	60	70	80	0	0
28	6.3	1.27	15.6	125	80	100	0	0
29	5.2	2.06	27.5	45	80	100	0	30
30	6.5	1.13	20.0	55	80	100	0	0
31	4.8	2.03	10.0	55	80	100	0	0
32	5.0	2.11	22.5	80	70	80	0	0
33	6.3	2.25	14.5	30	70	80	0	45
34	6.0	1.73	12.5	125	80	100	0	0
35	5.6	3.44	19.0	85	60	70	0	0
37	5.8	1.81	20.0	60	80	100	0	0
38	6.5	2.49	22.5	100	70	80	0	0
39	6.6	3.33	25.5	25	60	70	0	45
40	5.1	2.06	19.0	30	80	100	0	45
41	5.1	2.09	29.6	25	80	100	0	45
42	5.1	2.60	15.6	30	70	80	0	45
43	4.5	2.19	10.0	30	70	80	20	45
44	5.0	3.06	8.0	40	70	80	20	30
45	5.5	3.14	10.0	60	60	70	20	0
46	6.8	2.52	10.0	25	70	80	20	45
51	5.4	2.68	28.5	30	70	80	0	45
54	6.5	1.38	18.0	40	80	100	0	30
55	5.4	3.28	22.5	30	60	70	0	45
56	5.6	2.00	21.0	30	80	100	0	45
57	5.0	2.76	29.6	25	70	80	0	45
58	5.8	3.82	19.0	40	60	70	0	30
61	5.4	2.25	29.6	120	70	80	0	0
62	6.2	2.44	22.5	-	70	80	0	0

Remarks:
pH: Soil-water ratio is 1:1.
OM: Organic matter
P_2O_5: Available phosphorus on Olsen method
Potassium: Extracted by (Cold) H_2SO_4

Table 3.7(1) RESULTS OF SCREENING TESTS ON SOIL SAMPLES IN THE PROPOSED EXTENSION AREA

Borehole No.	Depth (cm)	pH	EC	Borehole No.	Depth (cm)	pH	EC
(1) Borehole with a depth of 1.5 m							
1	0 - 20	6.0	0.11	26	0 - 30	5.5	0.09
	20 - 60	6.0	0.10		30 - 70	6.2	0.09
	60 - 80	6.6	0.08		70 - 110	6.3	0.07
2	0 - 30	4.6	0.53		110 - 150	6.1	0.05
	90 - 120	5.8	0.04	28	0 - 30	6.4	0.08
4	0 - 30	5.0	0.04		30 - 65	6.4	0.05
	70 - 110	5.6	0.02		65 - 90	6.2	0.07
7	0 - 20	4.8	0.09		90 - 150	6.2	0.09
	20 - 70	6.7	0.05	31	0 - 25	6.1	0.13
	70 - 150	6.3	0.06		25 - 80	6.3	0.10
8	0 - 15	5.2	0.10		80 - 115	5.6	0.07
	15 - 40	6.2	0.08		115 - 150	5.7	0.07
	40 - 65	6.6	0.05	33	0 - 30	5.2	0.09
9	0 - 25	6.0	0.07		30 - 105	5.8	0.04
	25 - 90	6.0	0.06		105 - 150	6.1	0.06
	90 - 120	6.1	0.14	35	0 - 35	6.1	0.18
	120 - 150	5.9	0.24		35 - 65	6.5	0.12
10	0 - 35	5.3	0.13	37	0 - 20	6.4	0.15
					20 - 65	6.3	0.10
12	0 - 30	5.6	0.06		65 - 105	6.3	0.08
	30 - 60	5.8	0.04		105 - 150	5.1	0.08
15	30 - 85	6.0	0.06	41	20 - 70	7.2	0.08
	85 - 150	5.9	0.07		70 - 150	6.4	0.06
17	25 - 95	5.7	0.06	42	0 - 30	5.7	0.13
	95 - 150	6.0	0.04		30 - 70	5.7	0.07
18	0 - 20	5.9	0.24		70 - 120	5.4	0.07
	20 - 45	6.0	0.10		120 - 150	6.1	0.06
	45 - 110	6.0	0.06	43	30 - 65	6.2	0.05
	110 - 150	6.2	0.07		120 - 150	6.0	0.06
19	0 - 25	6.0	0.20	45	30 - 60	6.7	0.03
	90 - 150	6.0	0.10	46	0 - 15	5.9	0.07
20	0 - 15	6.2	0.09		15 - 35	5.8	0.06
	15 - 45	6.2	0.09	47	90 - 120	6.2	0.01
21	0 - 50	5.4	0.11	50	35 - 115	5.1	0.06
	50 - 110	6.1	0.02		115 - 150	6.3	0.06
	110 - 150	6.0	0.06	51	20 - 60	6.1	0.07
22	40 - 85	6.4	0.05		60 - 130	6.8	0.06
	85 - 150	6.1	0.06		130 - 150	7.0	0.08
23	0 - 35	6.1	0.20	52	0 - 35	5.9	0.04
	35 - 80	6.5	0.08		35 - 85	7.0	0.08
	80 - 150	6.1	0.08		85 - 110	6.9	0.05
25	0 - 40	5.1	0.06		110 - 150	6.8	0.04
	40 - 90	5.4	0.03	57	35 - 90	5.4	0.03
	90 - 150	5.4	0.06	130	25 - 60	6.4	0.09
					60 - 75	6.4	0.06

Remarks: pH: Soil-water ratio is 1:1.
EC: Electric conductivity, at 25°C for sample with soil-water ratio of 1:1, expressed by mmho/cm.

Table 3.7(2) RESULTS OF SCREENING TESTS OF SOIL SAMPLES IN THE PROPOSED EXTENSION AREA

Borehole No.	Depth (cm)	pH	EC	Borehole No.	Depth (cm)	pH	EC
(2) Borehole with a depth of 3.0 m							
6	0 - 40	4.8	0.06	32	0 - 40	5.7	0.29
	70 - 130	5.7	0.10		40 - 90	6.9	0.09
	180 - 270	6.4	0.03				
				36	0 - 40	5.7	0.29
16	0 - 25	4.9	0.48		40 - 90	6.9	0.09
	25 - 65	6.6	0.11		90 - 120	6.8	0.09
	65 - 175	6.2	0.10		120 - 180	5.7	0.41
	175 - 200	6.4	0.11		180 - 260	6.4	0.09
	200 - 300	6.5	0.11				
				39	40 - 65	6.9	0.10
24	0 - 30	5.2	0.11		65 - 90	7.0	0.10
	30 - 60	5.6	0.04		90 - 180	6.3	0.10
	60 - 180	6.1	0.02		180 - 210	6.6	0.10
	180 - 250	6.2	0.04		210 - 260	6.8	0.08
27	0 - 20	4.6	0.16	44	0 - 30	6.4	0.15
	20 - 45	6.2	0.07		30 - 70	6.1	0.09
	45 - 130	5.9	0.07		70 - 120	6.6	0.03
	130 - 185	5.8	0.08		120 - 210	6.7	0.02
	185 - 255	6.5	0.09		210 - 240	6.4	0.05
	255 - 300	6.3	0.06				

Remarks: pH: Soil-water ratio is 1:1.

EC: Electric conductivity, at 25°C for sample with soil-water ratio of 1:1, expressed by mmho/cm.

Table 3.8 RESULTS OF SCREENING TESTS ON SOIL SAMPLES IN THE EXISTING SERVICE AREAS OF IRRIGATION SYSTEM

Borehole No.	Depth (cm)	pH	EC (mmho/cm)	Borehole No.	Depth (cm)	pH	EC (mmho/cm)
1	0 - 15	5.6	1.13	33	0 - 40	5.8	0.23
	15 - 30	7.0	0.28		40 - 90	6.6	0.12
	30 - 90	7.1	0.18		90 - 150	6.7	0.11
	90 - 200	7.3	0.13	34	0 - 30	6.1	0.08
3	0 - 45	6.6	1.13		30 - 50	6.5	0.08
	45 - 75	6.8	1.50		50 - 90	6.3	0.05
	75 - 120	7.4	0.93		90 - 150	6.7	0.04
	120 - 200	7.7	1.75	35	0 - 20	6.7	3.15
7	0 - 30	6.3	0.61		20 - 70	7.5	1.13
	30 - 60	7.0	0.21		70 - 110	7.3	0.79
	60 - 120	6.9	0.15		110 - 200	7.2	0.23
	120 - 200	7.3	0.17	36	0 - 30	6.2	0.31
11	0 - 30	6.3	1.97		30 - 90	7.4	0.16
	30 - 60	7.3	0.22		90 - 150	7.5	0.22
	60 - 130	7.3	0.16	41	0 - 20	5.3	0.32
	130 - 200	7.0	0.30		20 - 60	7.4	0.33
13	0 - 20	5.3	3.94		60 - 80	6.3	0.14
	20 - 100	7.5	1.31		80 - 200	5.7	0.92
	100 - 150	7.1	2.63	45	0 - 20	6.7	0.43
14	0 - 20	6.3	0.30		20 - 90	6.1	0.20
	20 - 50	6.5	0.12		90 - 150	7.4	0.17
	50 - 90	6.0	0.10	51	0 - 15	5.3	0.21
	90 - 150	6.2	0.07		15 - 30	6.8	0.10
17	0 - 30	5.7	0.14		30 - 150	6.6	0.15
	30 - 90	5.4	0.05	53	0 - 20	6.5	0.33
	90 - 150	6.1	0.04		20 - 70	6.3	0.57
18	0 - 20	5.5	0.09		70 - 110	6.4	0.23
	20 - 60	6.3	0.05		110 - 150	7.1	0.21
	60 - 110	6.4	0.06	56	0 - 30	5.3	0.17
	110 - 150	6.4	0.05		30 - 90	6.2	0.08
20	0 - 20	5.0	0.08		90 - 150	6.2	0.08
	20 - 150	5.5	0.05		150 - 200	6.6	0.07
	150 - 200	6.4	0.04	57	0 - 15	5.2	0.15
29	0 - 25	4.8	0.38		15 - 90	6.5	0.10
	25 - 50	6.5	0.07		90 - 150	6.3	0.07
	50 - 80	6.6	0.08	58	0 - 15	5.8	0.12
30	0 - 30	5.4	0.06		15 - 50	5.3	0.11
	30 - 45	5.5	0.05		50 - 80	5.4	0.05
	45 - 90	6.0	0.03		80 - 115	5.9	0.06
	90 - 100	6.2	0.03		115 - 150	6.4	0.09
31	0 - 20	5.5	0.17	62	0 - 20	6.7	0.09
	20 - 45	6.3	0.13		20 - 90	6.5	0.06
	45 - 90	6.5	0.08		90 - 120	6.6	0.06
	90 - 120	6.5	0.18		120 - 150	6.9	0.04
	120 - 180	6.7	0.05				
32	0 - 45	6.1	0.10				
	45 - 75	7.9	0.24				
	75 - 120	7.9	0.18				
	120 - 180	8.1	0.15				

Remarks: pH: Soil-water ratio is 1:1.

EC: Electric conductivity, at 25°C for sample with soil-water ratio of 1:1, expressed by mmho/cm.

Table 3.9 PRESENT LAND USE CONDITION IN THE STUDY AREA

(Unit: ha)

Land Use Category	Existing Irrigation Area			Extension Area	Study Area	Proportional Extent (%)
	PGRIS	CRIS	Total			
Paddy Field						
Irrigated	5,540*	745	6,285	955	7,240	30.5
Rainfed	3,690	245	3,935	725	4,660	19.7
Sub-total	9,230	990	10,220	1,680	11,900	50.2
Upland Field						
Sugarcane	2,650	190	2,840	3,960	6,800	28.7
Perennial crop	30	-	30	20	50	0.2
Sub-total	2,680	190	2,870	3,980	6,850	28.9
Grass/Bush Land	60	5	65	235	300	1.3
Residential Area	1,070	5	1,075	225	1,300	5.5
Miscellaneous Land**	1,235	10	1,245	2,105	3,350	14.1
Total	14,275	1,200	15,475	8,225	23,700	100.0

Remarks: *: Including the existing communal irrigation system of 540 ha.

**: Including rivers, creeks, river wash, road, fish ponds, etc.

Table 3.10 AREA EXTENT OF SOIL SERIES IN THE STUDY AREA

(Unit: ha)

Soil Series	Mapping Unit	PGRIS	CRIS & Extension	Study Area	Proportional Extent (%)
San Fernando					
Silty clay loam					
0 - 3% slope					
Slightly flooded	SfA1	350	-	350	1.5
Moderately flooded	SfA2	980	300	1,280	5.4
Severely flooded	SfA3	70	-	70	0.3
Sub-total		1,400	300	1,700	7.2
La Paz					
Sandy loam					
0 - 3% slope					
Non-flooded	LpA	2,120	3,000	5,120	21.6
Moderately flooded	LpA2	-	70	70	0.3
3 - 5% slope	LpB	-	360	360	1.5
Sub-total		2,120	3,430	5,550	23.4
San Manuel					
Sandy loam					
0 - 3% slope					
Non-flooded	SmA	4,220	-	4,220	17.8
Slightly flooded	SmA1	-	250	250	1.0
Silt loam, 3 - 5% slope	SmB	85	75	160	0.7
Sub-total		4,305	325	4,630	19.5
Quingua					
0 - 3% slope					
Fine sandy loam					
Non-flooded	QgA	3,725	2,485	6,210	26.2
Silt loam					
Silty flooded	QgA1	420	540	960	4.1
Sub-total		4,145	3,025	7,170	30.3
Residential Area		1,070	230	1,300	5.5
Miscellaneous Land		1,235	2,115	3,350	14.1
Total		14,275	9,425	23,700	100.0

Table 3.11 SIGNIFICANT SOIL PHYSICAL AND CHEMICAL CHARACTERISTICS IN THE STUDY AREA

Item	Soil Series			
	San Fernando	La Paz	San Manuel	Quingua
(1) Physical Characteristics				
Area	1,700 ha	5,550 ha	4,630 ha	7,170 ha
Parent material	Recent alluvial deposit	Recent allvial Deposit	Alluvial deposit	Alluvial deposit
Slope range	0 - 1%	0 -	0 - 3%	0 - 2%
Relief	Nearly level	Nearly level	Nearly level to slightly undulating	Nearly level
Soil depth	Deep	Deep	Moderately deep	Deep
Textural class	Silty clay loam	Loam to sandy loam	Silt loam to sandy loam	Sandy loam to silt loam
Color range	Dark brown to nearly block	Brownish gray to gray	Grayish brown to pale brown	Brown to dark brown
(2) Drainability				
External	Fair	Good	Good	Fair
Internal	Poor	Fair to well drained	Well drained	Good
(3) Chemical Characteristics				
pH*	Neutral reaction	Moderately acid to moderately alkaline	Slightly acid to moderately alkaline	Moderately acid to moderately alkaline
EC	Low	Low	Low	Low
Organic matter*	High	Medium to low	Medium	Medium
Available phosphate	Medium	Medium to high	Medium to high	High
Exchangeable potassium	Low	Low to medium	Low to medium	Low to medium
CEC	Low	Low	Low	Low
ESP	0.69	0.62	0.70	0.74
Inherent fertility	Low to medium	Medium	Medium	Medium

Remarks: *: Surface soil

Table 3.12 RESULTS OF INFILTRATION TEST IN THE STUDY AREA

Test Site No.	Location	Soil Texture and Depth of Surface & Sub-soil (cm)	Land Class and Land Use	Infiltration		
				Cumulative* I cm =	Average (t = 5 hr)	Class
1.	Natividad, Guagua, Pampanga	SL (0-30) & FS (30-90)	1R (2do) Vegetables	$1.95t^{0.75}$	28.11	Very slow
2.	Balsic, Hermosa, Bataan	CL (0-30) & FSCL (30-60)	1R (2do) Paddy rice	$0.10t^{0.62}$	0.69**	Very slow
3.	Pabanlag, Floridablanca, Pampanga	CL (0-30) & SiCL (30-90)	1R (2do) Paddy rice	$0.40t^{0.62}$	2.75	Medium
4.	Gutad, Floridablanca, Pampanga	SiCL (0-30) & SiCL (30-90)	1R (2do) Paddy rice	$0.21t^{0.60}$	1.29	Slow
5.	San Pedro, Palcarangan, Lubao, Pampanga	SiCL (0-30) & SiCL (30-90)	1R (2do) Paddy rice	$0.46t^{0.42}$	1.01	Very slow
6.	Pulong Mangga, Lubao, Pampanga	FSCL (0-30) & FS (30-90)	1R (2do) Paddy rice	$0.06t^{0.63}$	0.58**	Very slow
7.	Kabangcalan, Floridablanca, Pampanga	VFSL (0-30) & FSL (30-80)	1R (2do) Paddy rice	$0.17t^{0.67}$	1.55	Medium
8.	San Agustin, Lubao, Pampanga	SCL (0-20) & SiCL (20-60)	1R (2do) Paddy rice	$0.05t^{0.97}$	2.53	Medium
9.	San Vicente, Lubao, Pampanga	SCL (0-30) & SL (30-50)	1R (2do) Paddy rice	$0.16t^{0.82}$	3.44	Medium
10.	Santiago, Lubao, Pampanga	SCL (0-30) & FSL (30-90)	1R (2do) Sugarcane	$0.21t^{0.63}$	1.53	Medium
11.	San Anton, Guagua, Pampanga	SiCL (0-30) & SiCL (30-60)	2Rd (f) Paddy rice	$0.76t^{0.77}$	12.88***	Very rapid
12.	Valdes, Floridablanca, Pampanga	FSCL (0-15) & FSL (15-60)	1R (2do) Paddy rice	$0.54t^{0.51}$	1.98	Medium
13.	Pulong Masle, Guagua, Pampanga	FSL (0-30) & SL (30-60)	1R (2do) Paddy rice	$1.10t^{0.48}$	3.44	Medium
14.	Becuran, Santa Ana, Pampanga	FSL (0-30) & SCL (30-60)	1R (2do) Paddy rice	$0.64t^{0.52}$	2.48	Medium

Remarks: *: I = cm, t = min.
**: Depth of water table was 60 cm
***: Presence of large cracks

Table 3.13 AREA EXTENT OF LAND CLASSES IN THE STUDY AREA

(Unit: ha)

Land Class	Existing Irrigation Area			Extension Area	Study Area	Proportional Extent (%)
	PGRIS	CRIS	Total			
1. Arable Land						
(1) Rice land						
1R	1,655	900	2,555	75	2,630	11.1
2R	1,070	-	1,070	60	1,130	4.7
3R	110	-	110	-	110	0.5
Sub-total	2,835	900	3,735	135	3,870	16.3
(2) Dual class land						
1R(2d)	6,370	270	6,660	4,770	11,430	48.2
2Rs(2s)	560	-	560	-	560	2.4
2Rt(2t)	90	-	90	-	90	0.4
Sub-total	7,040	270	7,310	4,770	12,080	51.0
(3) Diversified crop						
1	80	-	80	150	230	1.0
2	920	20	940	960	1,900	8.0
3	825	-	825	145	970	4.1
Sub-total	1,825	20	1,845	1,255	3,100	13.1
Total	11,970	1,190	13,160	5,890	19,050	80.4
2. Non-arable Land						
(1) Class M	1,070	5	1,075	225	1,300	5.5
(2) Class 6	1,235	10	1,245	2,105	3,350	14.1
Total	2,305	15	2,320	2,340	4,650	19.6
Grand Total	14,275	1,200	15,475	8,225	23,700	100.0

APPENDIX IV

AGRICULTURE AND AGRO-ECONOMY

APPENDIX IV AGRICULTURE AND AGRO-ECONOMY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX IV AGRICULTURE AND AGRO-ECONOMY

CHAPTER 1 GENERAL

This report gives a full account of the present agricultural and agro-economic conditions in the study area of a gross area of 23,700 ha, and of the proposed agricultural development plan for the proposed project area having a net area of 16,750 ha.

Data and information used in this study were provided by the following governmental authorities and private associations.

1) Bureau of Agricultural Economics (BAEcon)
2) Bureau of Agricultural Extension (BAEx)
3) National Economic and Development Authority (NEDA)
4) National Irrigation Administration (NIA)
5) National Food Authority (NFA)
6) National Census and Statistic Office (NCSO)
7) Philippine Sugar Commission (PHILSUCOM)
8) National Sugar Trading Corporation (NASTRA)
9) National Sugar Development Corporation (NASUDECO)
10) Provincial Development Staff Office, Pampanga and Bataan Provinces (PDSO)
11) Region III Office, Ministry of Human Settlement
12) Philippine Port Authority (PPA)
13) Fertilizer and Pesticide Authority (FPA)
14) Maligaya Rice Research and Training Center (MRRTC)
15) University of the Philippines, Los Baños (UPLB)
16) Region III Office, Ministry of Agrarian Reform (MAR)
17) Special Study Division, Ministry of Agriculture
18) Del Carmen Sugar Producer's Cooperation Marketing Association Inc. (DCSPCMAI)

19) Porac Sugar Producer's Cooperative Marketing Association Inc. (PSPCMAI)

20) Land Bank of the Philippines

Aside from data collection, related investigations such as the farm economic survey, rice yield survey and field reconnaissance were conducted so as to confirm the collected data with more practical information. List of data collected during survey period is presented in Table 4.1.

CHAPTER 2 PRESENT CONDITIONS

2.1 Location

The study area is located in the southwestern part of the Pampanga River Basin in Central Luzon about 70 km northwest of Metro Manila, and its gross area is about 23,700 ha. Administratively, the study area overlaps over two (2) Provinces, Pampanga and Bataan of Region III, and includes six (6) municipalities as shown below:

Pampanga Province	Bataan Province
1) Guagua	1) Dinalupihan
2) Floridablanca	2) Hermosa
3) Lubao	
4) Santa Rita	

About 80% of the study area belongs to the Pampanga Province.

2.2 Human Resources

According to data obtained from NCSO and BAEcon, the main demographic features in the study area are estimated as given in Table 4.2 to 4.4.

The population in 1983 was estimated to have been 168,000 comprising 51% of male and 49% of female. The annual population growth rate averages 2.24% between 1975 and 1980. Population density is 710 persons per km^2. As for the age distribution, 29% of the total population are fourteen years old and under, and only 5% are sixty years old and over. Total household and average family size in 1983 were estimated to be about 27,100 and 6.2 persons, respectively.

Out of total households, farm households account for 20%, and 18% are landless laborer households who make their living primarily as farm laborers with emphasis on farming of paddy and sugarcane. These landless workers play an important role in the supply of labor. The remaining 62% are government servants, private employees, businessmen, vendors, ordinary laborers, etc.

On the assumption that the age of farm laborer ranges between 15 and 59 years old, the family labor force per farm household is estimated to be 4 persons. Furthermore, pupils and students of the ten years old and over who amount to about 15% of the average family, usually do part time farm work, so that the average farm family labor force is rather more than 4.

2.3 Climate

The climate in and around the study area is characterized by the distinct wet and dry seasons. The wet season, caused by tropical monsoon, extends usually from May to October and the dry season during the remaining months of the year. General climatic characteristics such as rainfall, air temperature, relative humidity, sunshine duration, wind velocity and evaporation are summarized in Table 4.5.

In the study area, the mean annual rainfall is about 2,400 mm at the north-western part, about 2,000 mm at the eastern part and about 2,600 mm at the southern part, out of which about 90% occur in the wet season. The annual mean temperature is 27.1 °C, with a maximum monthly mean of 28.7 °C in May and the minimum of 25.6 °C in January. The relative humidity varies between about 79% during the wet season and about 69% during the dry season. The annual mean percentage of sunshine is about 55.8% with a monthly mean ranging from 31.7% in August to 75.6% in April. The monthly mean wind velocity varies from 2.5 m/sec in October to 3.5 m/sec in February with an annual mean of 3.2 m/sec. The annual mean A-pan evaporation is 1,785 mm equivalent to a daily mean of about 4.9 mm. The maximum monthly mean evaporation of 221 mm (7.4 mm/day) occurs in April and the minimum of 102 mm (3.3 mm/day) in August.

Except for the uneven distribution of rainfall, the other climatic characteristics are suitable for profitable agricultural development.

2.4 Soils

As mentioned in Appendix III, most of the land in the study area consist of soils of Quingua and La Paz soil series having sandy loam to fine sandy loam for soil texture. Where this is feasible, two crops of rice a year can be achieved, giving high yields under good management by involving the use of high yielding varieties, regular fertilizer application, and proper irrigation and drainage. Diversified crops such as sugarcane, vegetables, etc. can also be grown by adopting the above farming practices.

2.5 Land Use

The study on present land use was carried out on the basis of topographic maps on a scale of 1:4,000 prepared by JICA in December, 1983 and land use map on scale of 1:25,000 prepared by NIA in 1983. The present land use map in the study area is presented in Appendix XII. Areas for each land use category are summarized below:

Land Use Category	Area (ha)	Proportional Extent (%)
Paddy Field	11,900	50.2
- Irrigated area	7,240	30.5
- Rainfed area	4,660	19.7
Upland Field	6,850	28.9
- Sugarcane area	6,800	28.7
- Perennial crop area	50	0.2
Grass/Bush Land	300	1.3
Residential Area	1,300	5.5
Miscellaneous Area	3,350	14.1
Total	23,700	100.0

As shown in the above table, the land in the study area is classified into five land use categories, namely paddy field, upland field, grass/bush land, residential area and miscellaneous area including rivers, roads, creeks, right of way, etc. The farm land comprising paddy field and upland field amounts to 18,750 ha or 79% of the total. Paddy field occupies 11,900 ha or 50% of the total of which 7,240 ha or 61% are land under irrigation and the remaining 4,660 ha or 39% are rainfed. The irrigated paddy field are presently served by the three types of irrigation system as shown in the following table.

(Unit: ha)

Irrigation System	Wet Season	Dry Season	Total
1) National Irrigation System/1			
- Porac-Gumain	4,890	3,810	8,700
- Caulaman	540	480	1,020
2) Communal Irrigation System/1	540	250	790
3) Pump Irrigation System/2	1,270	1,140/3	2,410
Total	7,240	5,680	12,920

/1: The area was estimated on an average from 1980 to 1982 on the basis of the data obtained from NIA.

/2: See Table 4.6.

/3: Estimated at 90% of the area in the wet season.

The upland fields are mostly used for sugarcane or perennial crops such as mango, coconut and banana which are grown in very limited areas and are located in and around the residential areas. Such perennial crops can be disregarded in this study because the area is small and negligible compared to the study area.

2.6 Cropping Pattern and Farming Practices

2.6.1 Cropping Pattern

The main crops grown in the study area are rice, followed by sugarcane. Diversified crops such as vegetables, mongo beans, corn are found in limited areas. The cropping seasons of these crops are affected by the seasonal distribution of rainfall, and planting and harvesting vary from year to year depending on availability of water.

The present cropping pattern prevailing in the study area is classified into the following five types. The details are presented in Fig. 4.1.

Cropping Pattern		Area (ha)	Proportional Extent (%)
1) Paddy - Paddy	(Irrigated)	5,480	29.3
2) Paddy - Diversified Crops	(Irrigated)	200	1.1
3) Single Cropping of Paddy	(Irrigated)	1,560	8.3
4) Single Cropping of Paddy	(Rainfed)	4,660	24.9
5) Sugarcane	(Rainfed)	6,800	36.4
- Plant Cane		(2,940)	(15.7)
- Ratoon Cane		(3,860)	(20.7)
Total		18,700	100.0

In the wet season, rice is planted at the onset of the monsoon, generally from June to August, and harvested from October to November. In the dry season, it is planted in the period between December and January, and harvested from March to April. The cropping pattern of sugarcane includes plant cane and ratoon cane, and the harvesting period lasts from November to early April. As far as diversified crops in the study area are concerned, most of these are fruit vegetables which are grown in paddy fields in the dry season under irrigation with the use of pumps. Mongo beans and corn are cultivated under rainfed condition, and planted just after harvest of the wet season paddy to take advantage of the soil which is still moist.

Cropping areas by crops are summarized in the following table. The present multi-cropping index is estimated at 1.3.

(Unit: ha)

Crops	Cropping Area			Land Area	Multi-Cropping Index
	Wet Season	Dry Season	Total		
I) Paddy Field	11,900	5,680	17,580	11,900	1.48
Paddy	11,900	5,480	17,380		
- Gravity Irrigation	(5,970)	(4,540)	(10,510)		
- Pump Irrigation	(1,270)	(940)	(2,210)		
- Rainfed	(4,660)	(-)	(4,660)		
Diversified Crops		200	200		
II) Sugarcane Field			6,800	6,800	1.00
- Plant Cane			(2,940)		
- Ratoon Cane			(3,860)		
Total/Average			24,380	18,700	1.30

2.6.2 Farming Practices

In the study area, rice cultivation is carried out in labor extensive form from the stage of seeding to harvesting. Improved high yielding varieties of rice have been widely grown through the extension of Masagana 99. The predominant varieties are IR 36, IR 42 and IR 46 which are early maturing and high yielding varieties. Local varieties such as Milagrosa, Dacut Manuel, etc. are still used mainly for home consumption and the local market. Paddy crop seed is selected from the last harvest or is provided through seed growers. The seed is sown at a rate of about 80 kg per ha in the nursery which is prepared in the size of about 1/20 of the paddy field. The seedings are generally grown for 20 days. Application of fertilizers and agro-chemicals is practiced over the area, and these dosage varies largely depending on location. The estimated dosages of fertilizer per ha range from 46 kg to 79 kg for N and 3 kg to 6 kg for P_2O_5 and K_2O. As for agro-chemicals, dosages per ha average 2.3 ℓ for liquid type and 5.5 kg for granular type, and they are applied to the field by the use of knapsack type sprayers. In spite of such a relatively high dosage of fertilizers and agro-chemicals, productivity is still low as mentioned later, because the application timing and volume of these inputs are not appropriate. The farmers could not get these materials at the right time or sometime they are not fully aware of the optimum fertilization period. Land preparation consists of plowing, harrowing and puddling of the field using both animal power and machine power. Threshing is mostly carried out by machine, but other farming work is done by manpower. Hired labor accounts for about 50% of the total labor input. In particular more than 90% of farm work on transplanting and harvesting is carried out by hired labor.

The present cropping pattern for sugarcane in the study area consists of plant cane and one ratoon, as mentioned before. Plowing and harrowing are the most important elements in land preparations for plant cane, comprising one plowing and two harrowings done with the use of a moldboard or disc plows and a disc harrow pulled by a tractor. Land preparation by the use of animal power is common for small holders. Planting is carried out immediately after furrowing to conserve moisture. Furrows are spaced 1 to 1.2 m apart. During early planting, the rate of seed pieces is usually 30,000 cane points per ha, and the rate during the dry season is increased up to 40,000 taking into account seed pieces that may not germinate. The most prevalent variety is PHIL 58260 which accounts for 75% of total planted area.

Cultivation of plant cane after planting is the same with ratoon cane except for stable shaving. Fertilizing consists of basal and side applications, and the total application amounts of fertilizer per ha range from 100 kg to 110 kg for N. No agro-chemicals are used, since no significant damage from pests and diseases is found in the study area. Cultivating is one of the important practices in growing sugarcane and it primarily loosens the soil for aeration and controls the weeds. Cultivating is carried out usually 3 to 4 times either by use of machine or manual, during the 3 months after planting or stable shaving for ratoon cane. Sugarcane in the study area is usually harvested manually by cana knife. After harvesting, stable shaving is usually done manually in order to ensure ratooning.

Vegetables are cultivated labor intensively under irrigation. Use of pump irrigation is wide spread in the study area but irrigation period is very limited to ensuring high yields because of high operation costs. Fertilizer and agro-chemicals are commonly applied at 370 kg/ha for N, 110 kg/ha for P_2O_5, 80 kg/ha for K_2O and 6.8 l/ha for liquid type chemicals. For the diversified crops such as mongo beans, corn, etc., simple farming is still common without use of fertilizers or agro-chemicals. Farming operation is entirely dependent on man power, and management work consists solely of weeding which is done one or two times during the growing period.

Farm inputs requirements by each crop grown in the study area are summarized as shown in Table 4.7 and 4.8.

2.7 Agricultural Production

2.7.1 Crop Yield and Production

Crop yields and production in the study area fluctuate from year to year due to variations in rainfall and unexpected damage caused by pests and diseases. Therefore, the present yield and production were estimated on an average value during the past five years from 1978 to 1982 on the basis of data obtained from the BAEcon and NASUDECO Sugar Mill as shown in Table 4.9 to 4.11, and are summarized below:

Crops	Harvested Area (ha)	Unit Yield (t/ha)	Total Production (ton)
1) Paddy	17,380	2.53	44,020
Wet Season Paddy			
- Irrigated	7,240	2.70	19,550
- Rainfed	4,660	1.96	9,130
Dry Season Paddy			
- Irrigated	5,480	2.80	15,340
2) Sugarcane	6,800	34.22	232,700
- Plant Cane	2,940	38.13	112,100
- Ratoon Cane	3,860	31.25	120,600
3) Diversified Crops (Ampalaya)	200	10.90	2,180

As shown above, the average unit yield of paddy is estimated to be 2.53 t/ha which is higher than the national average yield of 2.4 t/ha/1 in 1982. This unit yield, however, is still on the low side as compared with the targeted yield of the Masagana 99 Program of 5.0 t/ha. Full exploitation to reach its production potential as mentioned later has not been realized. The limiting factors for increase in yield and production of paddy are considered to derive from the following major constraints encountered in the area:

i) No or insufficient irrigation water in terms of volume and time when it is required,

ii) Limited extent on proper farming, and

iii) Unexpected damage by pests and diseases.

/1: 1983 Philippine Statistical Yearbook, NEDA.

In addition to the above study, rice yield survey was carried out in 36 sample sites in order to clarify the defects of present rice cultivation. The location of sampling sites and the procedure of analysis are presented in Fig. 4.2 and 4.3. The results of survey are shown in Table 4.12, and are summarized below:

	Irrigated Paddy	Rainfed Paddy
1) Yield		
- Maximum yield (t/ha)	5.0	5.0
- Average (t/ha)	2.4	1.8
2) Yield Components		
- Number of panicles per m^2	224	172
- Number of grains per panicle	69	70
- Percentage for ripened grains (%)	73	69
- The weight of 1,000 grains (g)	21.9	21.6
3) Number of Hill per m^2	12.6	12.1
4) Correlation between Yield and Yield Component		
- Number of panicles per m^2 (r)	0.69	0.73
- Number of grains per panicle (r)	0.07	0.33
- Percentage of ripened grains (r)	0.24	0.15
- The weight of 1,000 grains (r)	0.52	0.35

It can be concluded from the above survey and analyses that the rice yield in the study area is clearly governed by the number of panicles per m^2. Through the field reconnaissance, the major reasons for this few number of panicles are considered as follows; i.e. i) low planting density, ii) low tillering activities due to water shortage and iii) iii) untimely supply of nitrigenous fertilizers. As the results, five tons per ha of maximum yield as shown in the above table suggest a higher production potential in the study area. An increase in number of panicles is essential for full exploitation of its potential.

The unit yield of sugarcane averages about 34 tons cane per ha for both plant cane and ratoon cane during the recent five years from 1978/79 to 1982/83, and these yields are extremely low as compared with the national average yield or the yield of sugarcane production in other areas, as shown below:

	(ton cane/ha)
Whole Country	57
North & Central Luzon	43
South Luzon	48
Panay	55
North Negros	74
South Negros	55
Eastern Visayas	59
Mindanao	54
Study Area	34

According to the information from the Luzon Experimental Station of PHILSUCOM, NASUDECO Sugar Mill, DCSPCHAI and PSPCHAI, the major reason of this low yield is water shortage or drought damage.

With regard to diversified crops, ampalaya (Bitter gourd) was taken up as representative crop, being widely grown among them. The unit yield of ampalaya was estimated to be 10.9 t/ha after pests and diseases have inflicted considerable damage estimated to more than 20% of the yield.

2.7.2 Livestock Production

Based on the result of the farm economic survey, the number of livestock raised per farm household in the study area is estimated as below:

Livestock	No./Farm Household
Carabao	1.5
Cattle	0.1
Hogs	1.5
Chicken	8.6
Ducks	1.8

The most common livestock in the study area consists of carabaos, cattle, hogs and poultry particularly chicken and ducks. The large livestock are usually utilized as farm animals in land preparation, hauling and other jobs. They are raised on available farm feeds.

Carabaos are sturdy for lowland and upland farming while cattle is specifically used for upland operation. Hogs and poultry are raised with farm grown feeds such as whole grain corn, corn bran and by-products from milling.

Livestock production in the study area is still insignificant. As far as livestock raising in the study is concerned, it is not an important activity in the agricultural sector, and most livestock is grazed on a small scale in and around the farm land or home yard. However, livestock plays an important role not only in farm operation as motive power but also in protein food supplies to the local people. Live hogs, chicken and ducks and eggs are sold in the local markets or used for home consumption.

2.8 Marketing and Prices

2.8.1 Marketing Structure

(1) Farm Inputs

Total requirements of paddy seed in the study area amount to about 1,600 ton, and most of these requirements have been obtained by retention from the products themselves. Farms can also get registered and/or certified seeds from seed growers under the control of BPI, however, the planted area for seeds are very small. Seed cane have been distributed through the Pasumil Hill District Office. There exist 15 fertilizer and pesticide dealers in and around the study area, and agricultural inputs such as fertilizer and agro-chemicals are distributed to the farmers through these dealers.

(2) Rice

There are three marketing channels for rice distribution from farmers to consumers, as shown in Fig. 4.4.

The first is through National Food Authority (NFA), the government agency primarily responsible for price and supply stabilization, and the overall marketing phase of cereal industry. NFA proures rice from farmer-producers in large quantities at government support price. Rice procured by NFA is delivered to consumers through its own selling agencies (Kadiwa Centers). NFA is the sole authorized exporting agent. The main determinant of export volume is the country surplus after reserving a quantity equivalent to 90-day buffer stock level, and the volume comes from existing NFA inventory as well as those purchased from the private sector.

The second is through farmers' cooperatives, such as the Area Marketing Cooperative (AMC), Farm Cooperative Marketing Association (FACOMA), etc. These organizations are composed of small farmers, and the farmers deliver rice to AMC or FACOMA which in turn sells it through its supermarkets or Kadiwa Centers (stores selling essential food items at much lower prices than the ordinary outlets) or directly to consumers.

The third is through commercial channel via middlemen such as local assemblers, millers, warehousemen, wholesalers, viajeros (merchant-truckers) and retailers. There are about 440 rice wholesalers and retailers in and around the study area, as shown in Table 4.13.

About 10% to 15% of the total rice is marketed through NFA and the remainder through commercial and other organizations.

(3) Sugar

Marketing of sugar in the Philippines consists of withdrawal by traders/industrial users for the domestic market and withdrawal by the National Sugar Trading Corporation (NASUTRA) for the export market, as shown in Fig. 4.5.

Domestic sugar distribution is handled by accredited domestic traders, and marketing is under government control. The domestic trader is the primary distributor of sugar for the local market and obtains his stock from mill warehouses and/or refineries upon presentation of delivery order issued by NASUTRA. In addition, industrial users are also given sugar allocation by PHILSUCOM/NASUTRA for the manufacture of sugar-containing products. Sugar in the domestic market is consumed in three various grades or types; i.e. i) centrifugal sugar (97.8° polarization), ii) washed sugar (99° polarization), iii) and refined sugar with an average marketing ratio of 35%, 5% and 60%, respectively.

All sugar for export is handled by NASUTRA which is the government agency having overall function of organizing sugar movement from mill site warehouse to final buyer. Sugar exported to the world market have sharply decrease from 1,640,000 tons in 1974 to 960,000 tons in 1983. Importing countries are USA, Japan, USSR, the Rep. of Korea, etc. In 1983, 29% of total exports went to USA, 21% to Japan, 17% to USSR, etc.

(4) Vegetables

For vegetables produced in the study area, there are two marketing channels: The one through local markets in and around the project area, and the other to Metro Manila through middlemen. No government agency or organizations exist for vegetable marketing.

2.8.2 Supply and Demand of Agricultural Products

(1) Rice

Rice is the most important crop as staple food in the Philippines. According to the NIA Corporate Plan in 1983, the supply and demand of rice are forecasted as below. The details are as shown in Table 4.14.

(Unit: 1,000 t)

	1984	1995	2000
I) Supply			
- Production of palay/1	8,815	11,828	12,658
- Less; seed, waste, etc. (10.8%)	952	1,277	1,367
- Palay/1 available for milling	7,863	10,551	11,291
- Milling recovery ratio	0.654	0.665	0.670
- Rice available for consumption	5,142	7,016	7,565
II) Demand for rice	4,705	6,315	7,164
III) Surplus	437	701	401

As shown in the above table, the Philippines will increase its recent annual rice surplus over domestic demand to about 440,000 tons of milled rice in 1984, about 700,000 tons in 1995, and still be running a surplus of over 400,000 tons in 2000. The surpluses will peak between 1990 and 1995, and will continue to about 2005 as shown in Fig. 4.6. Unless export or new domestic outlets are established, the cumulative milled rice surplus from 1984 to 2000 will exceed 10.9 million tons. The probable growth of rice supply and a considerable amount of rice surplus have been estimated on the basis of expected change in the irrigation area expanding from 1.11 million ha in 1984 to 1.65 million ha in 2000 through the newly implementing or ongoing irrigation project such as Lower Agno, Balog-Balog, Jalaur, etc., and in the milling recovery rate increasing from 63%/2 at present level to 67% in 2000 through the improvement of milling plant.

The sensitivity analyses of rice supply and demand projection are examined on the basis of the following assumptions: i.e., i) deferral of the implementation of irrigation project and ii) lower milling recovery rate. The results are shown in Table 4.15, and are summerized below:

/1: Rough rice

/2: Milling recovery rate on an average of private mills representing 95% of total capacity.

(Unit: 1,000 t)

Test Case	1984	1995	2000
I) Deferral of 50% for the implementation of irrigation project	437	256	-116
II) Lower milling recovery rate (63%)	249	332	-51
III) Case I + Case II	249	-90	-537

The analyses show that in case that about 50% of the implementation of irrigation projects are deferred until 2000 and the rice milling recovery rate stays at present level, a deficit of 537,000 tons will result. Considering the aggravation of the recent Philippine's economy, it can be assumed that this case will likely occur because of insufficient funds for the implementation of irrigation project and for the improvement of rice mill plant.

(2) Sugar

The supply and demand of sugar of the Philippines are forecasted as follows, on the basis of those past trend from 1967 to 1982. The details are as shown in Table 4.16.

(Unit: 1,000 t)

	1984	1995	2000
1) Supply	2,600	2,860	2,950
2) Demand	2,540	3,180	3,530
- Domestic consumption	(1,250)	(1,890)	(2,240)
- Export	(1,290)	(1,290)	(1,290)
3) Surplus	60	-320	-580

Owing largely to natural calamities such as floods and typhoons, the sugar supply trend of the Philippines have been erratic but generally in an upward trend. This increasing trend will continue until 2000, and total sugar supply will reach about 2.95 million tons.

The demand of sugar consists of domestic consumption and export, and the total sugar allocation for domestic market during the past 16 years has averaged about 40% of total demand. The domestic consumption has also increased year by year, and will attain about 2.24 million tons in 2000. For sugar export, on the other hand, it has stagnated at a level of 1.29 million tons since 1978, though 2.5 million tons estimated at almost twice the quantity of a normal year were exported in 1977. It seems that this export situation will unlikely continue, considering that the sugar trade in the world market has witnessed an oversupply situation and sweetener such as isomer fructose, stevia, etc. is wedging its way in the sugar market.

As a result of the above forecasts, a deficit of 0.58 million tons coming from the increase in domestic consumption will occur in 2000. Some increase in sugar production is expected, in accordance with the increase in domestic consumption.

(3) Vegetables

With regard to the supply and demand forecasts for vegetables, these were examined for Pampanga and Bataan Provinces. Region III and Metro Manila. Table 4.17 and 4.19 show those results which were studied on the basis of the program thrust and targets for vegetable production by the BAEx Region III Office and data/1 obtained from the Ministry of Agriculture. Pampanga and Bataan in 2000 will have a deficit condition in vegetables estimated at about 19,600 tons for fruit vegetables and 37,100 tons for leafy vegetables. On the other hand, Region III will have a surplus of 6,700 tons of fruit vegetable and a deficit of 88,800 tons of leafy vegetable in the same year. Metro Manila is the largest consumer city for vegetables, and its total demand in 1984 is estimated at 102,000 tons for fruit vegetables and 67,000 tons for leafy vegetables. In 2000, it is forecasted that these demands will reach a level of 179,000 tons and 117,000 tons, respectively.

As mentioned in Section 3.1, Region III including the study area has played an important role as a vegetable and rice supply source to Metro Manila. About 40% of fruit vegetables consumed in Metro Manila come from Region III, though most leafy vegetables are supplied by other regions. Assuming that this high marketing share will continue until 2000, it is expected that Region III will continue to supply fruit vegetables estimated at 72,000 tons in 2000. Considering the supply capacity of Region III and the demand in Metro Manila for fruit vegetable, increase production will be required to Region III, as much as possible.

(4) Legumes

Although the production of legumes such as mongo beans and peanut is insignificance in the study area at present, the introduction of these crops will be envisaged in the proposed cropping pattern in the development plan, as mentioned later. Therefore, supply and demand forecasts for legumes are also studied. Results are shown in Table 4.18 and 4.19.

Legumes have been in much demand in and around the study area and at Metro Manila. The scarcity of legumes at Pampanga, Bataan and Region III including those provinces are forecasted in 2000. Their production will amount to 3,190 tons, 1,770 tons and 17,370 tons, respectively. The demand at Metro Manila will reach the level from 27,300 tons in 1984 to 47,900 tons in 2000.

/1: Food Consumption Patterns, Special Studies Division, Ministry of Agriculture, 1983.

2.8.3 Prices of Agricultural Inputs and Outputs

According to data obtained from BAEcon, BAEx, NFA, NASUTRA and FPA, the prices of agricultural inputs and outputs are as follows:

Item	Unit	Price (₱)
Paddy/1 (farm gate price)	(kg)	1.74
Rice/1 (retail price)	(kg)	3.06
Sugar/2 (producer price)	(kg)	2.64
Sugarcane/2 (farm gate price)	(kg)	0.184
Ampalaya/3 (farm gate price)	(kg)	2.60
Tomato/3 (farm gate price)	(kg)	2.00
Fertilizer/3 - (45:0:0)	(kg)	3.30
- (21:0:0)	(kg)	2.30
- (16:20:0)	(kg)	2.88
- (14:14:14)	(kg)	2.96
Agro-chemicals/3		
- Furadan 3G	(kg)	14.1
- Machete 5G	(ℓ)	86.3
- Azodrin 202R	(ℓ)	90.9
- 2-4 D	(ℓ)	49.7
Hired labor/3	(day)	25.0
Hired animal/3	(day)	35.0
Hired machinery/3		
- Hand tractor	(day)	175.0
- 4-wheel tractor	(day)	400.0

The farm gate price of paddy has been raised from ₱1.56/kg in 1982 to ₱1.74/kg in 1983, as shown in Table 4.20. The producer price of sugar controlled by NASUTRA, on the other hand, still remains at the level of ₱2.6/kg, due to low world market price. The prices of ampalaya and tomato fluctuate monthly depending on supply and demand. The highest price appears in July to August and the lowest in January to March.

/1: Average price in 1983

/2: Controlled price by NASUTRA in 1983/1984 (sugar year)

/3: As of Feb., 1984

2.9 Processing and Storage Facilities

There are 86 rice mills in and around the study area, as shown in Table 4.13. The milling capacity was estimated at about 607 t/day which would be sufficient at present outputs. The total number of warehouses located in and around the study area is 77, and total storage capacity is about 33,900 tons.

In the study area, there is one sugar mill owned by National Sugar Development Corporation (NASUDECO) and managed by the government through the Philippine National Bank (PNB). This sugar mill has a maximum milling capacity of 5,000 ton cane per day or 126,600 ton cane per month. According to data obtained from NASUDECO, annual sugarcane ground and production of sugar are estimated to have averaged 268,000 tons and 24,000 tons from 1978/79 to 1982/83, as shown in Table 4.21. Due to inactive export trade and shortage of raw materials (sugarcane), the capacity utilization or rate of operation of the sugar mill remains at around 41% of capacity.

2.10 Agricultural Support System

Various organizations play an important role in support for agricultural development through extension and research works, credit services, construction and/or improvement of infrastructures, agriculture and food programs, land reform, etc. Furthermore, a number of agricultural cooperatives and associations which were organized by the government, also contributed to the agricultural development and improvement of farmer's livelihood. These support systems are illustrated in Fig. 4.7, and details are described below:

2.10.1 Research and Extension

Some agencies directly or indirectly responsible for research work are the following: International Rice Research Institute (IRRI) at los Baños, Maligaya Rice Research and Training Center (MRRTC) at Muñoz, National Irrigation Administration (NIA), Bureau of Plant Industry (BPI), Bureau of Agricultural Extension (BAEx), Bureau of Animal Industry (BAI), Philippine Sugar Commission (PHILSUCOM), and Luzon Experimental Station (LES).

Only IRRI undertakes hybridization of rice that is both high yielding and resistant to diseases and pests. It also identifies unusual performance stability when grown in varying environments of hot and cold. MRRTC which is operated by BPI, conducts researches on rice varieties and improvement, crop production and processing, intensification of cultural and management practices, seed certification, etc. It also trains technicians and farmers who will directly apply the know-how to farm works.

NIA whose main function is to supply irrigation water, also undertakes water management, studies of land classification, irrigation extension and agro-economic research. BPI carries out research and field trails on rice and diversified crops such as legumes, vegetables, fiber, spices, etc. In addition, BPI carries out studies with regard to climate condition, cultural practices and control of pests and diseases of the plant. BAI helps to disseminate animals and increase animal production. BAEx maintains extension works. In Pampanga and Bataan Provinces, there are 233 specialists for M-99, and 12 specialists for M-77 serving in extension work. Their workloads are estimated to be 244 ha per one specialist for M-99, and 92 ha per specialist for M-77.

Aside from its main functions of research and development encompassing various aspects of the industry and regulating the distribution of sugar, PHILSUCOM provides technology transfer to both planters and millers. PHILSUCOM operates two major research centers, namely; the La Granja Sugarcane Experiment Station and the Luzon Experiment Station occupying 90 ha and 256 ha of experimental farm, respectively.

In addition, there are two research and development farms, 27 model farms, 15 soil testing laboratories and 34 district offices in areas where sugar mills and located. As for government institutions related to the study area, there are the Luzon Experiment Station as mentioned above and the Pasumil Mill District Office having 11,300 ha of sugarcane fields to be processed by the NASUDECO sugar mill. In this district area, about 6,800 ha including 1,400 ha of the NASUDECO sugarcane fields are located within the study area. Total extension workers are 5 persons and their workloads are around 2,260 ha per one extension worker.

2.10.2 Credit Services

Credit services extended usually by banking institutions to farmers and cooperatives in the study area usually include:

i) Loans to farmers
   - Crop loans (in cash)
   - Commodity loans (in kind)

ii) Loans to cooperatives
   - Marketing loans
   - Facilities loans
   - Operating capital loans

Under the Masagana program, the Philippine National Bank (PNB) can release crop loans of ₱500 to ₱1,700 per hectare of crop land to farmers who are willing to participate in the program and adopt the rice or corn technology package. Interest rate is 12% per annum of 1% per month. The Agricultural Credit Administration (ACA) also assists in the financing crop and commodity loans to farmers as well as the marketing, facility and operating capital loans to cooperatives.

Special financial assistance for purchase of processing and storage facilities and irrigation are granted in programs of the Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP), Farm Systems Development Corporation (FSDC) and National Irrigation Administration (NIA).

2.10.3 Agriculture and Food Programs

Recognizing the need for the development of agriculture and food production, the government has been extending assistance to the numerous agriculture and food programs such as Masagana 99 (national rice program), Maisan 77 (corn and feedgrains program), Gulayan Sa Kalusugan (vegetable production), Rice-Fish Culture, Barangay Irrigation Service Association (BISA), etc.

The Masagana 99 is a nationwide rice production program launched in May 1973 as a top national priority program and now in Phase XXI of operation. In the six municipalities related to the study area, about 274 farmers took part in Masagana (with credit only) in Phase XX (November 1982 to April 1983), and 288 farmers in Phase XXI (May to October 1983). The total loan amounts reached ₱878 thousand in Phase XX and ₱653 thousand in Phase XXI. Repayments of loans are, however relatively low, being 66% on an average for Phases XX and XXI.

2.10.4 Farmers' Organizations

In the national development scheme, the government has been stepping up efforts to organize farmers into cooperatives or associations. As a result, some kinds of farmers' organizations were established in almost every province, municipality and barangay in the country.

In the six municipalities related to the study area, there are the following farmers' organizations:

Designation	No. of Unit	No. of Member	Characteristics (Promoter)
FIO	9	891	Farmer-irrigators' organization (NIA-PGRIS)
CIA	12	467	Communal irrigation association (NIA, FSDC)
KKK	5	39	National livelihood program (MHS)
Kilusang Bayan	4	1,194	Market and supply organization (BAEx)
Samahang Nayon	62	2,876	Barrio-based organization (BAEx)
ARBA	110	7,044	Group of agrarian reform beneficiaries (MAR)

In addition to the above farmers' organizations established by the government, there are two private cooperatives for sugarcane planters, so called OCSPCMAI and PSPCMAI. The purposes and main activities of these two cooperatives are as follows:

i) To stimulate capital fromation for production, marketing and investment activities,

ii) To increase the income and purchasing power of the members,

iii) To advance the cooperative movement as a technique for improving the economic status of the members, and

iv) To undertake continuous educational activities for the members.

These farmers' organizations which number seven (7) in and around the study area, do not compete with one another, even though they may seem to have similar legitimate objectives in the same area. These organizations were all set up to answer the needs of the farmers of various types and levels as shown in Fig. 4.7. However, farmers have pointed out that they experienced many inconveniences and problems.

Firstly most programs, lack an integrated approach in transferring modern technology as well as in extending financial assistance to the farmers. Traditional banking and credit facilities are readily available from the banks, while technology transfers are separately carried out by the government and private research institutions. Secondly, farmers are periodically faced with natural calamities, usually beyond their means of control; such as typhoon damage, prolonged drought or infestations of rats, pests and diseases. Thirdly, farmers complain of the weak farmers' organization as a result of which they have serious operational and financial troubles. Above all farmers want farm inputs, irrigation water, etc. to be delivered on schedule.

2.11 Land Tenure and Land Holding

Farmers in the study area are classified into the following two farming types; namely rice cultivation farmer and sugarcane planter. Out of the total farm household, rice cultivation farmer accounts for 95% or 5,230 households and the remaining 5% or 250 households are sugarcane planter.

According to data/1 obtained from PHILSUCOM and the results of the farm economic survey, the distribution pattern by land tenure and farm size of those farmers are estimated as follows:

/1: Planters Directory, Pasumil Hill District, CY - 1981-82, PHILSUCOM

Farm Size	Land Tenure (%)				Average Farm Size (ha)
	Owner	Amortizing Owner	Lessee	Total	
A) Rice Cultivation Farmer					
Below 1 ha	6.7	4.2	10.1	21.0	0.6
1 - 2 ha	5.9	10.1	21.0	37.0	1.3
2 - 3 ha	5.5	10.9	16.8	30.2	2.3
Above 3 ha	2.5	3.4	5.9	11.8	3.9
Total/Average	17.6	28.6	53.8	100.0	2.3
B) Sugarcane Planter					
Below 10 ha	38.4	-	12.1	50.5	4
10 - 20 ha	11.6	-	4.6	16.2	13
20 - 30 ha	4.6	-	2.0	6.6	23
30 - 40 ha	4.6	-	1.0	5.6	34
40 - 50 ha	4.6	-	1.0	5.6	43
50 - 60 ha	2.0	-	0.5	2.5	51
60 - 70 ha	1.0	-	0.5	1.5	63
70 - 80 ha	1.5	-	1.5	3.0	73
Above 80 ha	8.5	-	0	8.5	154
Total/Average	76.8	-	23.2	100.0	27

As shown in the above table, the survey results indicate that the typical farm size is 1.3 ha for rice cultivation farmer and 4.0 ha for sugarcane planter. On the other hand, their average farm sizes are estimated at 2.3 ha and 27.0 ha, respectively. As for land tenurial status in the study area, about 54% of total rice cultivation farmers are occupied by lessees and 77% of total sugarcane planter are owner operators.

As a result, the representative or typical farmer in the study area can be considered to be the lessee having 1.3 ha for rice cultivation farmer and the owner operator having 4.0 ha for sugarcane planter.

2.12 Farmers' Economy and Intention

2.12.1 Farmers' Economy

In order to grasp economic activities of farmers in the study area, a farm budget analysis was made for typical farmers, on the basis of the results of the farm economic survey which was conducted on 120 sample farmers. As mentioned in Section 2.11, typical farmers in the study area are the lessee having 1.3 ha for paddy fields and the owner operator having 4 ha for sugarcane fields. The results of farm budget analyses are presented in Table 4.22, and are summarized as below.

(Unit: ₱)

(Farm Size)	Lessee for Rice Cultivation Farmer: Irrigated Area (1.3 ha)	Lessee for Rice Cultivation Farmer: Rainfed Area (1.3 ha)	Owner Operator for Sugarcane Planter (4.0 ha)
I) Gross Income	32,530	25,920	41,550
1) Farm Income	13,330	5,320	26,050
2) Off-farm Income	19,200	20,600	15,500
II) Gross Outgo	32,500	25,900	41,500
1) Production Cost	10,000	3,400	20,600
2) Living Expenses	22,500	22,500	20,900
III) Net Reserve/Capacity to Pay	30	20	50

The characteristics of the farm economy may be summarized as follows:

i) A considerable amount of income was derived from off-farm consisting of wage earned from work on other farm and non-farm activity, and remittances from families working in Metro Manila, abroad, etc.

ii) In spite of adequate family labor estimated at 4 persons/farm household, harming activity such as transplanting, harvesting and threshing, which requires intensive labor, has been traditionally carried out by hired labors. This is reflected in the increase of production cost.

iii) The food expenses amount for some 50% of total living expenses.

iv) The net reserve is negligibly small which indicates that the typical farmers in the study area have no reinvestment funds for improvement of their farming activities.

The study of farm budget makes it clear that farm economy in the study area remains at the subsistence level.

2.12.2 Farmers' Intention

In order to achieve an effective development plan, one must first identify the farmer's intentions. For this purpose, a farmers' intention survey carried out in parallel with the farm economic survey of 120 sample farmers selected at random. The questions consist of the following two items, and their answers are as shown in Table 4.24.

i) Stress on the improvement of their present farm management

ii) Cultivation crops after the implementation of the irrigation project

The results of this survey showed that about 90% of the sample farmers put stress on acquiring additional irrigation water, followed by prevention of pests and diseases. As for cultivation crops, more than 80% of the sample farmers want to cultivate paddy for both wet and dry seasons.

An additional survey of sugarcane planters was also carried out, because most of sample farmers of for the above intention survey consist of rice cultivation farmers. According to the survey for sugarcane planter, the major constraints encountered for sugarcane production in the area are considered to be the drought damage with rainfed condition.

It was concluded from the above that double cropping of rice under year round irrigation could be easily introduced in the irrigation development, and that irrigation of sugarcane coincides with the intention of sugarcane planters.

CHAPTER 3 AGRICULTURAL DEVELOPMENT PLAN

3.1 General

3.1.1 Basic Concept for Agricultural Development

The basic concepts for agricultural development to the project area are set to i) increase rice, vegetables and sugarcane production by increase of these unit yield, ii) improve and stabilize farmers' economy through the introduction of high profitable crops, iii) increase the productivity of sugar and iv) promote crop diversification, taking the following aspects into consideration.

(1) Improvement of Farmers' Economy

Farmers in the project area get their farm incomes from rice and sugarcane cultivation. However, farm income is low due to the low unit yield of those crops. In order to raise their farm incomes, it is essential to increase the unit yield of rice and sugarcane through improved irrigation farming.

(2) Profitability of Crop

The profitabilities of rice, vegetables and sugarcane under with irrigated condition are the highest as compared with other food crops such as corn, sorghum, mongo beans, etc. Considering the subsistence level of the farm economy in the project area, introduction of rice, vegetables and sugarcane cultivations will produce good results to improve their farm economy.

(3) Farmers' Intention

It is confirmed through the farmers' intention survey that they have strong intention to produce rice, vegetables and sugarcane whenever provision of available irrigation water be permitted.

(4) Marketing of Rice and Vegetables

Region III including the project area plays an important role as a rice supply base to Metro Manila. As shown in Table 4.25 and 4.26, about 40% of rice and fruit vegetables consumed at Metro Manila have been supplied from Region III. Under such situations, Region III is expected to keep the role of rice and vegetable supply base to Metro Manila for the projected future, since demand of rice and vegetables in Metro Manila will increase due to higher population growth. Especially, it has been forecasted by NIA that rice deficit of Region IV including Metro Manila will increase rapidly from 876,000 tons in 1984 to 1,293,000 tons in 2,000, as shown in Table 4.27.

(5) Productivity of Sugar

Sugar is one of the important commodities as export oriented crop of the Philippines, as well as coconut and banana. However, its exportation has gone into a slump, due to stagnant price in the world market. Under such circumstance, it must be envisaged to make the sugar industry competitive through increase in productivity. On the other hand, productivity of sugar, which is widely grown in the project area, is very low and unstable, due to drought damage caused by uneven rainfall and lack of irrigation facilities. Artificial irrigation to sugarcane fields will bring favorable effects for increasing the productivity of this crop.

(6) Crop Diversification

Since the crop diversification as a policy for agricultural development has been promoted by the Government, the introduction of vegetables coincide with it.

3.1.2 Strategy for Agricultural Development

In order to accomplish the basic concept mentioned before, the strategies for agricultural development are formulated as follows:

(1) Unit yield and production of crops should be increased and stabilized through the introduction of improved irrigation farming,

(2) Planted area of crops with year-round irrigation system must be expanded in as large area as possible and thereby the total production of crops be maximized, and

(3) Cropping intensity should be increased to the maximum extent to make maximum use of newly exploited water resources to be provided by the project.

3.2 Proposed Land Use

A net irrigated area of 16,750 ha was determined as the optimum project scale from both technical and economic considerations, as discussed in Appendix V. Out of the total study area, about 21,600 ha or 91% were selected as the project area including the proposed irrigated area of the above. The land use in the project area under present and future with project conditions are delineated as below:

(Unit: ha)

Land Use Category	Present Land Use		Proposed Land Use in the Project Area
	Study Area	Project Area	
1) Paddy Field	11,900	11,130	11,000
- Irrigated (Gravity)	5,970	5,970	11,000
(Pump)	1,270	1,100	-
- Rainfed	4,660	4,060	-
2) Upland	6,850	5,950	5,800
Sugarcane	6,800	5,900	5,750
- Irrigated (Gravity)	(-)	(-)	(5,750)
- Rainfed	(6,800)	(5,900)	(-)
Perennial Crop	50	50	50
3) Grass/Bush Land	300	270	270
4) Residential Area	1,300	1,200	1,200
5) Miscellaneous Area	3,350	3,050	3,330
Total	23,700	21,600	21,600

In the above table, 770 ha of paddy field and 900 ha of sugarcane field in the study area were topographically excluded from the proposed project area. In the proposed project area, 5,030 ha of pump irrigated and rainfed paddy fields and 5,750 ha of sugarcane fields would be converted into gravity irrigation, and the remaining 130 ha and 150 ha would be converted into lands for rights of way on the newly installed irrigation facilities, respectively. The proposed irrigated area would consist of 11,000 ha for paddy fields and 5,750 ha for sugarcane fields. With regard to the land use under the future without project condition, no substantial change from present use would be expected, because land use in the project area is governed by water availability.

3.3 Proposed Cropping Pattern

In the formulation of the proposed cropping pattern, the following basic criteria were applied:

(1) The cropping pattern must make effective use of irrigation water to be provided by the project;

(2) The cropping pattern must provide the maximum benefit to the farmers as well as to the nation as a whole; and

(3) The cropping pattern must be acceptable to the farmers.

In addition to the above, the optimum cropping calendar are studied taking the following conditions into consideration: i.e. climate, agronomic characteristics, irrigation water supply and operation of sugar mill.

3.3.1 Selection of Crop

As mentioned in Section 3.1, rice, vegetables and sugarcane were taken to be the most suitable crops to be introduced in the project area, from such consideration as farmers' economy, profitability of crops, farmers' intentions, marketability, etc. As for vegetables, ampalaya and tomato are recommended. The commonest vegetable grown in the project area at present is ampalaya, and farmers have a superior ability in its cultivation. Tomatoes are also cultivated in farmers' home yards for home consumption, and this vegetable has high marketability at Metro Manila. Intercrops to be introduced to sugarcane cultivation are legumes such as mongo beans and peanuts as mentioned later.

3.3.2 Proposed Cropping Pattern

The cropping pattern to be adopted into the project area is proposed as shown in Fig. 4.8.

The climatic condition in the project area is favorable for the cultivation of rice, fruit vegetables and sugarcane. Since there is no limiting factor for germination through the year, seeding of these crops can be practiced at any time. However, setting of harvesting period shall be considered so as to exclude the period with high rainfall intensity and long rain days for the smooth operation of harvest and processing.

As for paddy cultivation, the plant physiological factor for attaining a high yield of this crop is how to increase the photosynthetic efficiency. Critical growth periods in terms of sunlight requirement for paddy are two weeks just before heading and three to four weeks after heading. Therefore, the framework of the cropping calendar for paddy should be designed so as to get as much sunny weather during these periods as possible. Fruit vegetable cultivation is proposed in the dry season, because cultivation in the wet season suffers great damage from pests and diseases damage.

The cropping pattern for sugarcane proposed is for two ratoon cane cultivations after harvest of plant cane to reduce production cost. In the viewpoint of effective land use and improvement of soil fertility, intercropping system would be recommended for introduction into sugarcane cultivation. Sugarcane is favorable to intercropping because of its initial slow growth particularly during the dry season, and its long crop cycle. Legumes such as mongo beans and peanut are best for intercropping with sugarcane, since they fit into the cultural practices in cane growing. Growth cycle peaks of legumes and sugarcane do not coincide, so competition is minimized. Such leguminous crops contribute to the fertility of the soil and decomposed legume may add organic matter to the soil. Intercropping is considered an important source of additional income. Intercrops are referred to as cash crops because they give quick returns, thus aiding the farmer in paying for his daily expenditures while waiting for the major-crop income.

In addition to the above studies, special attention should be made on expansion of irrigation area as much as possible, taking into account the balance of consumptive use of crops and effective rainfall.

3.3.3 Cropping Area

Through the study on the optimization of the project scale, the annual cropping area in the project area was determined as shown below:

Crops	Cropping Area (ha)	Physical Area (ha)	Multi-cropping Index
1) Paddy Field	18,800	11,000	1.71
- Wet Season Paddy	11,000		
- Dry Season Paddy	6,000		
- Diversified Crops (Fruit Vegetables)	1,800		
2) Sugarcane Field	5,750	5,750	1.00
- Sugarcane	5,750	5,750	1.00
- Intercrops	(5,750)		
Total/Average	24,550	16,750	1.47

As for the cropping area of fruit vegetables, this was estimated at 1,800 ha on the basis of the following assumptions:

1) A shortage of fruit vegetables estimated to be 19,560 tons in Pampanga and Bataan Provinces by 2000 would be supplied from the project area.

2) About nine percent of fruit vegetables consumed in Metro Manila have been supplied by Pampanga Province as shown in Table 4.26, and this market share is expected to continue in the future.

The details for the calculation are shown in the following table.

1)	Scarcity of fruit vegetables in Pampanga and Bataan Provinces in 2000	19,560 tons/1
2)	Supply to Metro Manila in 2000	
	- Total demand at Metro Manila	178,500 tons/2
	- Market share of Pampanga Province	9%/3
	- Supply by Pampanga Province	16,070 tons
3)	Production target of the project area in 2000 (1 + 2)	35,630 tons
4)	Cropping area in the project area (35,630 tons/19.5 tons/4	1,800 ha

Multi-cropping index under with project condition is estimated at 1.47 on an average of paddy field and sugarcane field.

3.4 Proposed Farming Practices

Porper farming practice is one of the essential factor for realizing full exploitation of agricultural potentiality in the project area. Based on data obtained from BAEx, MRRTC, PHILSUCOM nad PCARRD, the proposed farming practices and farm inputs in the future with project are designed as below, and the details are presented in Table 4.28. With regard to the future without project condition, on the other hand, it is forecasted that there will be no substantial changes in the farming practices and farm inputs.

(1) Paddy

In regard to rice varieties, the IR series such as IR 36, 42, 46, 50, 52, etc. are recommended in order to ensure the anticipated high yields in the future with project. The germination percentage of seeds at present is very low, therefore, the pre-germination practice is recommendable for its increase. Moreover, it is recommended that seeds have to be certificated extension seeds and be selected by the use of a solution of 1.13 specific gravity before pre-germination. The selected seeds must also be disinfected by the use of adequate disinfectant like Benrate.

/1: See Table 4.17

/2: See Table 4.19

/3: See Table 4.26

/4: Average yield of fruit vegetables under the future with project condition.

The recommended land preparation consists of one plowing, two times of harrowing and one puddling. The nursery area is set to be 1/20 to 1/25 of the planting area. Fertilization to nursery bed is essential for healthy growth of seedling. The recommended dosage is 2 kg of N. The spacing of transplanting is set to be 30 cm x 10 cm with three seedlings per hill.

Soils in the project area are generally poor. The fertilizer requirement for sustaining the target yeild is estimated at 80 to 90 kg/ha of N and 30 kg/ha of P_2O_5 and K_2O, on the basis of the recommended farm inputs of Masagana 99, fertilizer response test by MRRTC and results of soil chemical analyses as shown in Table 4.29 and 4.30 and Fig. 4.9.

Weeds may be eradicated by chemical and manual method. The proposed weeding consists of one application of herbicide during the period between puddling time and rooting stage, and two manual weedings depending on the state of weed growth after herbicide application. With regard to plant protection, intensive application of insecticides is required for control of stem borers, plant hoppers, etc. The recommended dosage is 2 ℓ/ha of insecticides and 1 ℓ/ha of fungicides.

Harvesting is carried out by manual labor, and harvested paddy is dried on the ground. In future, articicial dryer have to be considered because a lot of harvested grains are damaged by unexpected rains.

(2) Sugarcane

The recommended varieties of sugarcane are PHIL 58260, PHIL 5333, PHIL 56226, PHIL 62120, etc. Planting in proposed sugarcane farming consists of the following four practices, i.e. i) selection of seed pieces, ii) soaking, iii) incubation, and iv) planting. Seed pieces contain three well-developed and viable buds or eyes. They msut be taken from disease-free plantation and must come from vigorous plants. Soaking of seed pieces in running water for about 48 hours is recommended to hasten germination. Seed pieces are treated with fungicides like Benlate and Fungitox right after they are cut. Incubation can be done by placing the seed pieces under shade and covering them with moist rice straw or any similar materials. Planting should be done immediately after furrowing to conserve moisture. The distance of furrow is from 75 cm to 150 cm apart, and about 25 cm of planting depth is recommended for better germination percentage. As for the rate of planting, it is recommended for 35,000 cane points per hectare.

The proposed land preparation consists of plowing, two times of harrowing and one furrowing, and deep plowing and harrowing at 45 - 60 cm are recommended.

The proposed amount of fertilizer is estimated at 200 kg/ha of N, 100 kg/ha of P_2O_5 and 220 kg/ha of K_2O on the basis of the recommendation of the Pasumil Extension Office and the results of fer-

tilizer response test by PHILUSUCOM as shown in Table 4.31 and Fig. 4.10. In order to insure that fertilizer added is utilized for the most part by sugarcane, it is recommended for the split application consisting of basic dressing and side dressing. The first half of N and K_2O and the full amount of P_2O_5 are applied as basic dressing and the remainings are side dressing appling after three months from planting time.

The proposed cultivation would consist of ridge busting, two times of off-barring and two times of hilling up. The ridge busting is the first operation in cultivating. This is usually done 3 - 4 weeks after planting and is timed to cover the exposed portion of the seed pieces. The first off-barring is done 3 - 7 weeks after planting. The first hill up follows 3 weeks later when the plant is about 10 weeks old. The second off-barring is done 3 months after planting. Final hilling up is done to close the field. Weeding would be carried out parallel with cultivation.

The pest and disease control must always be integrated in sugarcane growing. Generally, the use of resistant varieties is considered the most economical and satisfactory method of controlling pest and disease. However, it would be forecasted for the appearance or outbreak of pest and disease, especially for the infestation of pests such as white grubs, termites, heat borers, etc., due to the proposed haavy manuring culture. Therefore, spraying of pesticide estimating at 2 ℓ/ha for dosage is recommended.

Harvesting is carried out by manual labor. Harvested cane must be milled at the sugar mill factory as soon as possible because delayed cane will cause sucrose deterioration. In this context, the harvesting schedule commensurate with the daily milling capacity would be required between sugar mill and sugarcane planters. After the harvesting, stable shaving is done in order to ensure the ratooning.

With regard to the farming practices of ratoon cane, it is the same practices with the plant cane except for land preparation and planting.

Intercropping refers to the simultaneous growing of secondary crops along with sugarcane within the same area. Leguminous field crops mature in three to four months after planting. At this stage of sugarcane growth, sugarcane starts to close-in.

(3) Fruit Vegetables

With regard to the varieties of fruit vegetables, recommended varieties are Makiling and Sta. Rita for ampalaya and Improved Rope, Marikit, VF Rome, etc. for tomato. The land preparation consisting of one plowing, two times of harrowing and one furrowing is proposed for both ampalaya and tomato.

The cultivation method of direct seeding and trellis training is recommended for ampalaya. The rate of seed is estimated at 3 kg/ha and seeding space is 1.5 m x 1.5 m with 3 - 4 seeds per one seeding point. The amount of fertilizers for ampalaya is estimated at

120 kg/ha each of N, P_2O_5 and K_2O elements. The exhaustive split dressing is recommended in order to control overgrowth consisting of a basic dressing and side dressing applied 7 times at two weeks interval. The control of pests and diseases is the most important practices in the cultivation of fruit vegetables. The dosage for ampalaya is estimated to be 8 ℓ/ha for pesticides and 2 ℓ/ha for fungicides. A 10-day irrigation interval to ampalaya is proposed with cultivation, and weeding being, carried out four times at intervals of three weeks after seeding of ampalaya. Ten to twelve times of harvesting would be possible for ampalaya.

As for the cultivation of tomato, the introduction of setting and support practices are recommended. The rate of seed is 1 kg/ha per planting area, and setting of seedling is carried out within one month after seeding. The space of setting is 75 cm x 45 cm. The application amount of fertilizers is estimated at 100 kg of N, 190 kg of P_2O_5 and 100 kg of K_2O, on the basis of the PCARRD's recommendation for fertilizer usage. The split dressing of fertilizer is recommended as for ampalaya. The dosage of pesticides and fungicides are estimated at 8 ℓ/ha and 4 ℓ/ha respectively. The irrigating, cultivating and weeding are carried out the same practices with ampalaya. The harvesting of tomato is done 10 to 12 times.

The recommended farm inputs, labor force, animal power and mechanical power requirements are as shown in Table 4.32 and 4.33.

3.5 Anticipated Unit Yields and Production

3.5.1 Anticipated Unit Yields

The anticipated unit yields of crops were estimated both for the future without project and the future with project conditions.

The anticipated unit yields of crops under the future without project condition are analyzed statistically on the basis of those past trends in the project area, as shown in Table 4.34. The unit yields of wet season paddy under irrigated condition and ratoon cane have increased gradually during the past five year from 1978 to 1982, of which increasing trend of those yields indicates a high correlation coefficient estimated at 0.78 - 0.90. Under the future without project condition, some increase in unit yields of these crops would be possible due to more farmers adopting improved cultural practices which include more fertilizers and chemicals use, but not in optimum or recommended amounts due to the less-assurance of dependable water supply. An average yield increase of 10 percent is adopted for those two crops. Other crops such as dry season paddy under irrigated condition, rainfed paddy, plant cane and tomato have a low correlation coefficiency, and the trend of these unit yields shows no tendency. Therefore, the unit yields of these crops under the future without project condition are set as same value of the present unit yields which are estimated on an average from 1978 to 1982. As for ampalaya, the present yield estimated at 10.9 ton/ha on the basis of the results of farm economic survey conducted in 1984 is adopted for the yield under the future without project condition, because no data are available for past yield.

It will seems that this present yield is high, and more increase in yield cannot be expected in the future without project condition.

After completion of the project, it is expected that unit yield of crops would increase rapidly on account of sufficient irrigation water and introduction of proper irrigation farming. Unit yield levels for paddy and sugarcane under the future with project condition are projected on the best judgment based from the results of the yield survey, soil capability and the experimental data of MRRTC, PHILSUCOM and UPLB. As shown in Table 4.30, 4.31 and 4.35, the unit yields of paddy and sugarcane show a good response with an advance of sufficient irrigation water and proper fertilization. The record of the highest yield is 5.3 t/ha for wet season paddy, 7.4 t/ha for dry season paddy and 100 t/ha for sugarcane. These high unit yields are possible from experimental plots of small size, therefore, some adjustment of the experimental results will be necessary for the estimation of unit yield under farmer's level. With regard to unit yields of ampalaya and tomato, data from India/1 and USA/2 were referred in their estimation, because no data are available for the experimental results and actual unit yield on farmer's field under well irrigated condition. The unit yields of intercrops are estimated on the basis of data/3 obtained from PHILSUCOM and UPLB.

The anticipated unit yields under the future with and without project conditions are summarized as below:

(Unit: t/ha)

Crops	Present	Without Project	With Project
Irrigated paddy			
- Wet season paddy	2.70	2.97	4.50
- Dry season paddy	2.80	2.80	5.00
Rainfed paddy	1.96	1.96	-
Sugarcane	34.22	36.00	80.00
Diversified crops (fruit vegetables)			
- Ampalaya	10.90	10.90	14.00
- Tomato	9.85	9.85	25.00
Intercrops			
- Mongo beans	-	-	0.50
- Peanut	-	-	0.75

/1: TOSHIKICHI IWASA, Vegetables in the Tropics, Tokyo, 1980.

/2: OSCAR A. L. & DONALD N.M., Knott's Handbook for Vegetable Growers, USA, 1980

/3: (1) Handbook on Sugarcane Growing, PHILSUCOM, 1981
(2) ABADAY L.C., Evaluation of the Effects of Irrigation Practices on the Yield of Sugarcane Intercropped with Legumes (Unpablished), UPLB, 1980.

In order to achieve the anticipated unit yield under the future with project condition, optimum application of farm inputs must be required together with effective water management. The unit yields will increase gradually from the present level, and to reach the target yield in the 5th year after completion of the irrigation facilities.

3.5.2 Crop Production

The production of crops under the future without and with project conditions were estimated by multiplying the anticipated unit yield with the future cropping area, and are summarized in the following table. The details are presented in Table 4.36.

(Unit: t)

Crops	Present	Without Project	With Project
Paddy	42,060	43,970	79,500
Fruit vegetables	1,850	1,850	35,100
Sugarcane	201,900	212,400	460,000
Intercrops (Legumes)	-	-	3,600

3.6 Processing Facilities and Marketing

3.6.1 Processing Facilities

The present milling capacity of paddy was estimated at 607 tons per day, as shown in Table 4.13. On the other hand, annual paddy production at the full development stage is estimated at 79,500 tons. Assuming that working days for milling are 220 days in the year, about 133,500 tons of paddy can be milled with the present milling facilities which indicate a sufficient milling capacity for paddy production in the future with project condition.

As for the milling of sugarcane produced in the project area under the future with project, the NASUDECO sugar mill has sufficient capacity for its production. The milling operation of NASUDECO under the future with project condition is estimated as follows:

		Present/1	With Project
1) Milling Capacity	(t/day)	5,000	5,000
2) Daily Sugarcane Ground			
- Annual Sugarcane Ground	(t)	268,000	526,100/2
- Milling Duration	(day)	130,000	125/3
- Daily Sugarcane Ground	(t)	2,060	4,210
3) Capacity Utilization	(%)	41	84

The annual sugarcane ground under the future with project condition is estimated at 4,210 tons which account for 84% of the maximum milling capacity.

3.6.2 Marketing of Agricultural Products

The marketable surplus of crops produced in the project area and market demand to be expected in 2000 were analyzed to assess the potential market for these crops.

As shown in Table 4.37, the marketable rice produced in the project area in 2000 is expected to be about 20,100 tons which would be equivalent to about 1.6% of the rice deficit of Region IV including Metro Manila. With completion of the project, sugar production would rapidly increase from 19,800/4 tons at present to 45,100/4 tons under full development, but this increment would only account for 7.8% of

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/1: See Table 4.21

/2: Annual sugarcane ground is estimated as below:

- Present sugarcane ground of NASUDECO	268,000 tons
- Increase in production in the project area	258,100 tons
(With project)	(460,000 tons)
(Present condition)	(201,900 tons)
Total	526,100 tons

/3: 5 months x 25 days/month

/4: Assuming that milling recovery rate from sugarcane to sugar will increase up to 9.8%, the sugar production in the project area is estimated as below:

- Present condition: 201,900 tons x 0.098 = 19,800 tons
- With project : 460,000 tons x 0.098 = 45,100 tons

the shortage of sugar estimated to be 580,000 tons for the whole country in 2000 as shown in Table 4.16. Table 4.38 shows the supply and demand forecasts in the future. In 2000, the scarcity of fruit vegetables in Pampanga Province will disappear with the increase in production in the project area, but the market share of this province in Metro Manila estimated at 9% will remain in the future. As for intercrops such as mongo beans and peanuts, no marketable surplus from Pampanga and Bataan Provinces are forecasted as shown in Table 4.38, while the scarcity of legumes in these provinces will continue in the future.

In short the marketable surplus of crops produced in the project area would be marketed in Metro Manila or the whole country with no marketing dislocation, because they are all so much in demand.

3.7 Price Forecast

Economic and financial prices of farm outputs and inputs were forecasted in order to evaluate the expected monetary benefits and effects. Economic prices for trade goods such as rice, sugar and fertilizer were estimated on the basis of the projected world market prices of these commodities forecasted by the World Bank in the long term range for the period of 1983 to 1995. The details of those forecasts are presented in Table 4.39 to 4.42 and Fig. 4.11. Non-trade goods such as fruit vegetables, animal power, etc. are valued at their financial price. Financial prices of farm outputs and inputs were estimated on the basis of current market or farmgate prices prevailing in the project area as of March 1984.

Financial and economic prices of all outputs and inputs are shown in Table 4.43, and are summarized as below:

Farm Outputs and Inputs		Financial Prices as of March, 1984	Economic Prices in 1995 (1984 constant)
Paddy	(₱/t)	1,740	3,186
Sugarcane	(₱/t)	184	528
Ampalaya	(₱/t)	2,600	2,600
Tomato	(₱/t)	2,000	2,000
Mongo Beans	(₱/t)	5,000	5,000
Peanut	(₱/t)	4,000	4,000
Fertilizers			
-N	(₱/kg)	7.3	10.6
-P_2O_5	(₱/kg)	7.0	9.1
-K_2O	(₱/kg)	7.0	4.1

Farm Outputs and Inputs		Financial Prices as of March, 1984	Economic Prices in 1995 (1984 constant)
Agro-chemicals			
-Liquid	(₱/kg)	91	109
-Granular	(₱/ℓ)	14	17
Labor	(₱/day)	25	11
Animal power	(₱/day)	35	35
Machinery	(₱/ha)		
-4-wheel tractor		400	400
-Hand tractor		175	175

Labor is valued at a shadow price of ₱11.0 per man day, on the basis of the conversion factor (0.44) forecasted by the World Bank/1.

3.8 Irrigation Benefit

Irrigation benefit to be expected is defined as the difference of the net return from crops between the future with project and the future without project conditions. The net return per ha for each crop was calculated as below, on the basis of estimated gross income and production cost. The details are as shown in Table 4.44 and 4.45.

(Unit: ₱/ha)

Crops	With Project	Without Project
Wet Season Paddy		
- Gravity Irrigation Area	10,050	5,876
- Pump Irrigation Area	-	5,131
- Rainfed Area	-	3,213
Dry Season Paddy		
- Gravity Irrigation Area	11,430	5,248
- Pump Irrigation Area	-	4,219
Diversified Crops (Fruit vegetables)		
- Ampalaya	29,003	18,216
- Tomato	41,222	-
Sugarcane	34,831	15,488
Intercrops	1,542	-

/1: Shadow Wage Rate x Consumption Factor = 0.52 x 0.84 = 0.44

Source: Philippines, Social Cost-Benefit Analysis, Estimates of Shadow Prices and Country Parameters, World Bank, December 1978.

Applying the net return per ha for each crop estimated in the above table to the cropped area, the total net return to accrue from the agricultural production was calculated on both the future with project and without project conditions. Based on this results, irrigation benefit is calculated as shown in Table 4.46. The irrigation benefit at full development stage was estimated at about ₱276 million. The benefit may be expected to increase linearly year by year, and to reach its full benefit about five years after completion of the project.

3.9 Farmers' Economy

The number of farm households in the project area amounts to 4,830/1 households for rice cultivation farmer and 210/1 households for sugarcane planter. As mentioned in Section 2.11, their average farm sizes are estimated at 2.3 ha and 27.0 ha, and typical farm sizes are 1.3 ha and 4.0 ha, respectively.

After the implementation of the irrigation project, year round irrigation would be provided to all farmers in the project area, thereby making possible an increase in yield and production of crops. As a result, a significant increase in farm income would be expected in the future with project condition. On the other hand, no substantial increase in farm income will be incurred in the future without project condition.

The typical farm budgets for both future without and with project conditions are analyzed as shown in Table 4.47 and 4.48, and are summarized below:

/1: The number of farm household in the project area is estimated as below:

$$\left\{\begin{array}{c}\text{Total farm household} \\ \text{in the study area}\end{array}\right\} \times \left\{\frac{\text{Farm land in the project area}}{\text{Farm land in the study area}}\right\}$$

Rice cultivation farmer: 5,230 households x 11,000 ha/11,900 ha
= 4,830 households

Sugarcane planter : 250 households x 5,750 ha/6,800 ha
= 210 households

	Farm Size (ha)	Net Farm Income/1 (₱)	Net Reserve/2 (₱)
I) Without Project			
Rice Cultivation Farmer (Lessee)			
- Irrigated Land	1.3	3,740	440
- Rainfed Land	1.3	1,920	20
Sugarcane Planter (Owner Operator)	4.0	6,470	1,070
II) With Project			
Rice Cultivation Farmer (Lessee)	1.3	11,720	9,120
Sugarcane Planter (Owner Operator)	4.0	16,770	11,370

The net farm income under the future with project condition would be expected to increase 3 to 6 times as compared with the future without project condition, and the net reserve would also increase remarkably from ₱500 to ₱10,200 on an average. The increase in net reserve would enable the farmers to pay the fixed irrigation fee and would also offer to them incentives for further development.

3.10 Agricultural Support System

The major objectives of this project are to increase agricultural production and to improve and stabilize the farmers' economy through irrigation development. For this purpose, the project will provide necessary infrastructures such as irrigation and drainage facilities. However, in order to realize the project objectives, there would remain some ancillary works which should be carried out by the governmental authorities concerned and the farmers themselves.

Such ancillary works include agronomic research, extension work, farmers cooperatives movement and credit services. Although most of the agricultural support systems for these services have already been established in and around the project area with Government promotion, it is recommended that the following matters should be realized in order to accomplish the project objectives.

/1: Farm income - Production cost

/2: Gross income - (Production cost + Living expenses)

1) To strengthen agronomic research on irrigated crops, especially on vegetables and sugarcane, and to propagate improved farming practices to the farmers through existing extension channels,

2) To train field extension workers in improved practical techniques of irrigation farming,

3) To promote the establishment of water users' association comprising farmers in the benefited area, and

4) To strengthen the credit services not only for rice cultivation but also for vegetables and sugarcane cultivations.

It is expected that the strengthening and promotion of such agricultural support services will be carried out in parallel with the project construction.

Table 4.1(1) LIST OF COLLECTED DATA ON AGRICULTURE AND ECONOMY

No.	Title	Issued	Year
I.	NATIONAL AND REGIONAL ECONOMY		
1.	1983 Philippines Statistical Yearbook	NEDA	1983
2.	Five-Year Philippine Development Plan 1983-1987	NEDA	1982
3.	Regional Development Investment Program CY-1983-1987	NEDA Region III	
4.	Philippine Development Report, 1982	NEDA	1983
5.	Philippine Economic Indicator, 1983	NEDA	1983
6.	The National Income Accounts, CY-1978-1980	NEDA	1981
7.	Summary of the Five Year Philippines Development Plan, 1978-1982 (Including the Ten-Year Development Plan, 1978-1987)		1977
II.	AGRICULTURE AND AGRO-ECONOMY		
1.	Annual Report of Irrigated and Benefit Areas, CY-1982	NIA Region III	1983
2.	Research and Development Annual Report (1980-1982)	PHILSUCOM	1981-1983
3.	Food and Nutrition Plan (Objective and Strategies)		
4.	The Philippine Food Balance Sheet 1976	NEDA	1979
5.	18th Annual Report of the MRRTC 1983	MRRTC	1983
6.	Major Characteristics of Seedboard Recommend Irrigated Lowland Rice Varieties	MRRTC	1983
7.	Monthly Wholesale, Retail and Farmgate Price of Rice	NFA Region III	1984
8.	Inventory of Irrigation Pump in Pampanga and Bataan Province	NIA	1984
9.	Farmer's Organization and Irrigation System in Pampanga and Bataan Province	NIA	1984
10.	Market Price of Farm Inputs 1983	BAEcon Pampanga	1983
11.	Harvested Area, Unit Yield and Total Production of Crops in Pampanga Province 1980-1983	BAEcon Pampanga	1984

(to be continued)

Table 4.1(2) LIST OF COLLECTED DATA ON AGRICULTURE AND ECONOMY

No.	Title	Issued	Year
12.	Data Base CY-1977-1981	MA Region III	1982
	Program Thrust & Targets CY-1983-1987		
	Food Balance Sheet CY-1981-1987		
	Financial Requirement CY-1983-1987		
	Resource Requirement CY-1983-1987		
13.	Pasmil Mill District Brochure	PHILSUCOM	1979
14.	Annual Report of PASMIL MILL DISTRICT CY-1980-1981, CY-1981-1982, CY-1982-1983	PHILSUCOM PASMILL MILL DISTRICT	1983
15.	Philippine Sugar Commission Quartery No. 1 - No. 7	PHILSUCOM	
16.	Philsucom Journal 1979-1983		
17.	Sugarcane Farmers Bulletin 1972-1975	PHILSUGIN	1972 1975
18.	National Sugar Development Corporation Annual Report, 1979	Plaridel, C. Austin	
19.	Statistical Series on Sugar	Research and Development Office	1982
20.	A Climatological Approach in Predicting the Yield of Sugarcane Crop	R.C. Mejia	1983
21.	Handbook on Sugarcane Growing	PHILSUCOM	1981
22.	An Obstract of the Proposed Work Program for Crop Year 1978-1979 of Pasmil Mill District		
23.	Selling Prices of Domestic Sugar by Type, Users and Distribution	NASUTRA	
24.	Planters Directory Pasmil Mill District CY-1981-1982	PASMIL	
III.	SOCIO-ECONOMY AND INSTITUTION		
1.	1980 Census of Population by Province, Municipality and Barangay Region III - Central Luzon	NCSO	
2.	Population Dimension of Planning	NEDA	1975
3.	Socio-economic Profile Bataan		1982

Table 4.2 BASIC SOCIO DATA IN THE STUDY AREA

Municipality	No. of Barangay	Population 1975	Population 1980	Annual Population Growth Rate (%)	Area (km2)	Population Density (person/km2)	Total Household in 1980 (No.)	Family Size	No. of Farm Household in 1980	Percentage of Farm Household (%)
A) Municipalities related to the Study Area										
Floridablance	32	45,419	51,648	2.60	125	413	8,219	6.3	2,000	24.4
Guagua	30	65,336	72,609	2.13	62	1,171	12,444	5.8	1,260	10.1
Lubao	43	69,903	77,502	2.09	156	497	12,637	6.1	2,730	21.6
Sta. Rita	10	22,167	24,995	2.43	33	757	3,898	6.4	960	7.6
Dinalupihan	39	36,302	41,415	2.67	45	920	6,590	6.3	1,760	26.7
Hermosa	21	23,246	25,672	2.01	157	164	4,140	6.2	1,480	35.7
Total:	175	262,373	293,841	2.29	578	508	47,919	6.1	10,190	21.3
B) Study Area	92	140,900	157,400	2.24	237	664	25,400	6.2	5,400	21.3
(Estimated in 1983)			(168,200)	(2.24)	(237)	(710)	(27,100)	(6.2)	(5,480)	(20.2)

Source: (1) 1980 Census of Population by Province, Municipality and Barangay, NCSO
(2) Socio-economic Profile (1982), Provincial Development Staff Office, Pampanga
(3) Socio-economic Profile (1982), Provincial Development Staff Office, Bataan
(4) 1975 Integrated Census of the Population and Its Economic Activities, Bataan and Pampanga, NCSO

Table 4.3 FARM HOUSEHOLD AND LANDLESS HOUSEHOLD IN THE STUDY AREA (1983)

Municipality	No. of Barangay Related to the Project Area	Total Household	Farm Household	Landless Laborer Household	Others
Floridablance	28	7,320	1,410	1,620	4,290
Guagua	10	4,100	700	410	2,990
Lubao	40	12,590	2,470	2,090	8,030
Santa Rita	5	980	150	220	610
Dinalupihan	6	1,310	540	260	510
Hermosa	3	800	210	130	460
Total	92	27,100	5,480	4,730	16,890
(%)		(100.0)	(20.2)	(17.5)	(62.3)

Source: Data obtained from BAEcon Provincial Office of Pampanga

Table 4.4 AGE DISTRIBUTION OF THE POPULATION IN THE STUDY AREA (AS OF JANUARY 1984)

Age	Male (%)	Female (%)	Total (%)
0 - 4	2.3	1.8	4.1
5 - 9	4.8	4.9	9.7
10 - 14	7.2	7.8	15.0
15 - 19	8.3	7.8	16.1
20 - 24	9.3	6.7	16.0
25 - 29	3.3	4.1	7.4
30 - 34	2.5	2.0	4.5
35 - 39	1.6	2.2	3.8
40 - 44	1.4	1.9	3.3
45 - 49	2.7	2.8	5.5
50 - 54	3.0	2.3	5.3
55 - 59	1.9	2.0	3.9
60 - 64	1.3	1.2	2.5
65 - 69	1.2	0.7	1.9
70 Above	0.6	0.4	1.0
Total	51.4	48.6	100.0

Source: Result of Farm Economic Survey

Table 4.5(1) MEAN MONTHLY RAINFALL

Station/1 No.	Name	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1.	Basa Air Base	6.5	6.7	9.8	26.9	145.9	344.7	519.2	632.1	376.4	151.0	59.0	22.7	2,300.9
2.	Pasumil	31.3	25.9	35.7	51.1	147.6	320.7	530.1	571.9	416.3	250.8	130.0	86.4	2,497.8
3.	Santa Cruz Porac	7.1	11.1	14.9	32.9	165.5	211.2	483.6	442.9	293.1	202.9	101.4	43.7	1,878.7
4.	Santa Rita	6.3	3.1	27.3	13.3	207.0	246.1	305.9	542.2	310.9	171.9	74.6	34.9	1,533.4
5.	Cabanbagan Bacolor	6.3	7.9	16.3	29.9	124.8	266.4	460.3	480.7	256.9	194.8	85.6	36.5	1,960.1
6.	Lubao	6.2	2.9	25.3	1.1	274.2	238.4	505.9	807.4	378.0	253.4	106.0	75.7	2,329.7
7.	Armeria Dam Tarlac	7.8	0.7	14.6	34.1	84.5	208.1	407.2	360.7	247.0	160.6	90.8	9.3	1,625.4
8.	Carangian, Tar.	14.1	4.8	13.5	40.2	319.8	285.9	269.3	478.8	292.4	245.2	85.3	26.3	2,075.6
9.	Hashienda Luisita	10.3	0.9	13.7	53.4	143.5	226.4	370.9	340.8	297.8	153.4	80.4	21.9	1,656.8
10.	Amucao Tarac	10.7	4.8	6.4	16.3	178.5	287.4	268.3	421.1	335.3	122.9	65.5	19.1	1,736.3
11.	La Paz	10.2	1.6	8.9	25.0	200.7	182.0	286.5	334.5	329.5	171.2	32.9	16.8	1,429.8
12.	Dolores Capas	17.5	0.8	3.5	29.2	232.1	219.0	322.3	373.3	348.0	163.7	67.3	19.3	1,796.0
13.	Clark Air Base	11.8	10.3	24.9	42.7	169.6	245.9	369.3	444.5	313.8	166.0	97.6	55.2	1,951.6
14.	San Agustin Arayat	15.3	3.6	21.7	31.4	165.2	225.7	379.5	409.4	268.8	170.2	118.5	53.3	1,811.6
15.	San Fernando	7.2	6.3	18.9	22.1	145.2	230.5	423.1	455.3	270.2	188.9	82.5	38.2	1,743.2
16.	San Matias	2.8	0.0	21.6	14.5	323.4	431.2	148.2	310.2	189.3	167.9	61.2	77.7	1,122.4
17.	Cansinara Apalit	3.1	1.4	10.9	10.0	106.1	161.7	360.4	399.5	164.8	153.6	91.5	36.7	1,386.4
18.	Masantol	11.2	3.3	20.3	18.8	113.9	212.7	356.6	513.4	270.3	210.4	88.1	41.8	1,815.9
19.	Talisai Balanga	14.6	7.9	16.6	25.0	218.4	270.6	643.3	840.5	332.8	257.6	120.7	50.0	2,797.8
20.	Iba	3.2	3.0	12.5	18.9	277.4	542.5	798.7	1,061.6	608.2	218.8	84.1	23.7	3,652.6
21.	San Marcelino	4.4	6.4	26.8	35.1	239.2	498.7	592.4	993.6	522.6	291.9	96.4	37.1	3,344.6
22.	Cabanatuan	6.5	5.3	13.7	31.0	171.8	256.4	319.5	397.9	313.5	173.7	138.7	40.1	1,850.3
23.	Pasbol	-	-	-	-	-	-	-	-	-	-	-	-	-
24.	Nabuclud	-	-	-	-	-	-	-	-	-	-	-	-	-

Remarks: /1: See Fig. 1.5 in Appendix I

Table 4.5(2) SUMMARY OF CLIMATIC CONDITIONS

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average Total
Mean Temperature (°C)													
Basa Air Base (1958-1981)	25.6	26.0	27.1	28.6	28.7	27.8	27.3	26.8	27.1	27.0	26.7	26.2	27.1
Mean Maximum Temeprature (°C)													
Basa Air Base (1963-1981)	30.6	31.4	32.8	34.3	33.8	32.2	31.3	30.5	31.5	31.7	31.3	30.6	31.8
Hacienda Luisita (1963-1980)	31.4	32.1	34.0	35.3	34.9	33.2	32.5	32.7	32.2	33.0	32.2	31.8	32.9
Mean Minimum Temperature (°C)													
Basa Air Base (1963-1981)	20.6	20.6	21.5	23.0	23.8	23.4	23.3	23.1	22.8	22.8	22.3	21.8	22.4
Hacienda Luisita (1968-1980)	19.2	19.8	20.5	22.0	23.0	23.3	22.6	22.5	22.6	21.6	20.8	19.3	21.4
Mean Relative Humidity (%)													
Basa Air Base (1970-1974)	67.1	67.9	67.9	66.7	70.9	78.8	82.9	82.5	79.0	78.8	73.0	72.5	74.0
Hacienda Luisita (1968-1980)	66.5	61.9	58.6	57.5	68.7	75.9	79.4	82.3	79.7	74.3	68.8	67.2	70.1
Mean Sunshine Duration (%)													
Hacienda Luisita (1969-1983)	63.4	71.2	67.4	75.6	64.1	46.2	41.9	31.7	41.3	50.5	58.9	57.6	55.8
Mean Wind Speed (m/sec)													
Basa Air Base (1958-1981)	3.3	3.5	3.3	3.4	3.0	3.3	3.1	3.2	2.8	2.5	3.2	3.2	3.2
Hacienda Luisita (1968-1980)	3.3	3.1	3.4	3.1	2.5	2.4	2.3	2.2	2.0	2.4	3.3	3.5	2.8
Mean Evaporation (mm)													
Hacienda Luisita (1958-1983)	154.0	169.4	213.0	221.0	182.5	129.5	115.7	102.3	104.7	122.7	128.3	141.5	1,784.6

Table 4.6 PUMP IRRIGATION AREA IN THE STUDY AREA

City/Municipality	No. of Pump	Area/1 (ha)	Water/1 Resources	Study Area (ha)
1) Pampanga Province				
Angeles City	4	17	G	-
Apalit	60	565	R/G	-
Arayat	136	833	R/G	-
Bacolor	289	1,071	R/G	-
Candaba	134	1,234	R/G	-
Floridablance	160	496	G	496
Guagua	235	633	G	317/3
Lubao	57	204	R/G	204
Mabalacat	6	25	G	-
Macabebe	68	840	R/G	-
Magalang	55	310	R/G	-
Masantol	16	133	R/G	-
Mexico	302	1,368	R/G	-
Minalin	29	358	R/G	-
Porac	172	441	G	-
San Fernando	70	381	R/G	-
San Luis	83	824	R/G	-
San Simon	101	1,116	R/G	-
Santa Ana	82	353	R/G	-
Santa Rita	321	1,016	G	102/4
Santo Tomas	26	267	R/G	-
Sexmoan	4	15	R/G	-
2) Bataan Province				
Abucay	23	81	R/G	-
Bagac	3	15	R	-
Balanga	21	81	R/G	-
Dinalupihan	47	171	R/G	86/3
Hermosa	58	136	R/G	68/3
Limay	3	9	R	-
Maribeles	-	-	-	-
Morong	3	13	R	-
Orani	16	59	R/G	-
Orion	21	121	R/G	-
Pilar	12	67	R/G	-
Samal	96	310	R/G	-
Total	2,713	13,563		1,273

Remarks: /1: Irrigation area in the wet season.
/2: R: River, G: Ground water
/3: 50% of total area in the Municipality.
/4: 10% of total area in the Municipality.

Source: NIA Provincial Office of Pampanga and Bataan.

Table 4.7(1) LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (PRESENT CONDITION)

Item	Irrigated Paddy (Gravity Irrigation Area) (W.S.)/1			(D.S.)/2			Irrigated Paddy-Pumping Irrigation Area (W.S.)			Rainfed Paddy (W.S)		
	F/3	H/4	T/5	F	H	T	F	H	T	F	H	T
1) Labor Force (M-D/ha)	39	45	84	40	45	85	39	45	84	48	28	76
- Nursery Preparation	3	-	3	3	-	3	3	-	3	3	-	3
- Land Preparation	11	3	14	11	2	13	11	3	14	14	1	15
- Transplanting	-	18	18	-	18	18	-	18	18	4	13	17
- Fertilizing	3	-	3	3	-	3	3	-	3	2	-	2
- Weeding	8	-	8	7	-	7	8	-	8	7	-	7
- Spraying	3	1	4	3	1	4	3	1	4	3	-	3
- Irrigating	4	-	4	6	-	6	4	-	4	-	-	-
- Harvesting	1	15	16	1	15	16	1	15	16	7	10	17
- Threshing	2	5	7	2	6	8	2	5	7	3	3	6
- Drying	2	1	3	2	1	3	2	1	3	3	-	3
- Hauling and Others	2	2	4	2	2	4	2	2	4	2	1	3
2) Animal Power (day/ha)	11.8	2.1	13.9	11.8	2.3	14.1	11.8	2.1	13.9	15.6	0.2	15.8
- Nursery Preparation	1.0	0.1	1.1	1.1	0.1	1.2	1.0	0.1	1.1	1.7	-	1.7
- Land Preparation	10.8	2.0	12.8	10.7	2.2	12.9	10.8	2.0	12.8	13.9	0.2	14.1
3) Mechanical Power (day/ha)	0.6	1.8	2.4	0.6	1.8	2.4	0.6	1.8	2.4	-	2.5	2.5
- Land Preparation	0.6	0.8	1.4	0.6	0.8	1.4	0.6	0.8	1.4	-	1.5	1.5
- Threshing	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0	-	1.0	1.0

Remarks: /1: Wet season paddy, /2: Dry season paddy, /3: Family Labor, /4: Hired labor, /5: Total labor

Source: Results of farm economic survey

Table 4.7(2) LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (PRESENT CONDITION)

Item	Sugarcane						Fruit Vegetables					
	Plant Cane			Ratoon Cane			Ampalaya			Tomato		
	F	H	T	F	H	T	F	H	T	F	H	T
1) Labor Force (M-D/ha)	7	93	100	6	51	57	136	46	182	144	29	193
- Land Preparation	2	1	3	-	-	-	21	-	21	21	-	21
- Seeding and Planting	-	38	38	-	-	-	12	-	12	13	-	13
- Fertilizing	-	10	10	-	10	10	16	-	16	16	-	16
- Weeding and Cultivating	4	1	5	4	1	5	8	7	15	8	7	15
- Spraying	-	-	-	-	-	-	36	-	36	39	-	39
- Irrigating	-	-	-	-	-	-	4	-	4	4	-	4
- Harvesting and Hauling	-	40	40	-	37	37	21	21	42	25	24	49
- Stable Shaving	-	-	-	1	1	2	-	-	-	-	-	-
- Others	1	3	4	1	2	3	18	18	36	18	18	36
2) Animal Power (day/ha)	4.4	-	4.4	3.0	-	3.0	19.2	-	19.2	20.8	-	20.8
- Land Preparation	1.4	-	1.4	-	-	-	19.2	-	19.2	20.8	-	20.8
- Cultivating	3.0	-	3.0	3.0	-	3.0	-	-	-	-	-	-
3) Mechanical Power (day/ha)	1.4	1.8	3.2	0.9	1.2	2.1	0.5	-	0.5	-	-	-
- Land Preparation	0.7	0.8	1.5	-	-	-	0.5	-	0.5	-	-	-
- Cultivating	0.7	1.0	1.7	0.7	1.0	1.7	-	-	-	-	-	-
- Stable Shaving	-	-	-	0.2	0.2	0.4	-	-	-	-	-	-

Table 4.8 FARM INPUTS, LABOR FORCE, ANIMAL POWER AND MECHANICAL POWER REQUIREMENTS (PRESENT CONDITION)

Item		Irrigated Paddy/7 (W.S.)/1	Irrigated Paddy/7 (D.S.)/2	Rainfed Paddy (W.S.)	Sugarcane P.C./3	Sugarcane R.C./4	Fruit Vegetables Ampalaya/5	Fruit Vegetables Tomato
1) Farm Inputs								
Seed	(kg)	80	80	85	35,000	-	2.7	1.0
Fertilizer								
- N	(kg)	73	79	46	100	110	370	8.0
- P_2O_5	(kg)	6	6	3	-	4	110	-
- K_2O	(kg)	6	6	3	-	3	80	-
Agro-chemicals								
- Liquid	(ℓ)	2.2	2.3	2.4	-	-	6.8	8.4
- Granular	(kg)	5.5	5.0	-	-	-	0.8	-
2) Labor Force	(man-day)	84	85	76	100	57	182	193
3) Animal Power	(day)	13.9	14.1	15.8	4.4	3.0	19.2	20.8
4) Mechanical Power	(day)	2.4	2.4	2.5	3.2	2.1	0.5	-

Remarks: /1: Wet season, /2: Dry season, /3: Plant cane, /4: Ratoon cane
/5: Bitter Ground, /6: Pieces, /7: Includes gravity and pumping irrigation area

Source: (1) Results of farm economic survey
(2) Data obtained from the BAEx and PHILSUCOM Luzon Experimental Station

Table 4.9 HARVESTED AREA, UNIT YIELD AND TOTAL PRODUCTION OF PADDY IN FOUR (4) MUNICIPALITIES RELATED TO THE STUDY AREA

Year	Irrigated Land						Rainfed Land			Total		
	Wet Season Paddy			Dry Season Paddy			Wet 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)
1978	7,430	2.00	14,850	5,840	2.35	13,720	1,870	1.95	3,650	15,140	2.13	32,200
1979	5,290	2.46	12,990	4,840	3.03	14,670	3,340	1.91	6,370	13,470	2.53	34,030
1980	6,910	3.00	20,730	5,740	2.89	16,590	3,340	1.96	6,560	15,990	2.74	43,880
1981	7,790	2.72	21,150	7,100	2.60	18,440	2,060	2.05	4,220	16,950	2.58	43,810
1982	7,790	3.24	25,270	6,460	3.16	20,420	1,960	1.90	3,730	16,210	3.05	49,420
(Average) (1978-1982)	7,040	2.70	19,000	6,000	2.80	16,770	2,510	1.96	4,910	15,550	2.62	40,680

Remarks: (1) HA: Harvested Area, UY: Unit Yield, TP: Total Production

(2) Four municipalities related to the study area are as below:

- Floridablanca
- Lubao
- Guagua
- Santa Rita

As for municipalities in Bataan Province, no data is available.

Source: BAEcon Pampanga Provincial Office

Table 4.10 HARVESTED AREA, UNIT YIELD AND PRODUCTION OF SUGARCANE IN PASUMIL MILL DISTRICT AREA

Crop Year	Harvested Area			Unit Yield of Cane			Production of Sugarcane
	P.C. (ha)	R.C. (ha)	Total (ha)	P.C. (ton/ha)	R.C. (ton/ha)	AII (ton/ha)	(ton)
1971/72	7,825	9,251	17,076	33.63	28.53	30.87	527,086
1972/73	5,780	6,979	12,759	31.85	28.47	30.00	382,785
1973/74	2,425	8,497	10,922	40.70	36.80	37.67	411,387
1974/75	4,579	4,963	9,542	42.61	33.49	37.87	361,322
1975/76	6,791	7,911	14,702	44.00	33.00	38.08	559,867
1976/77	7,512	7,836	15,347	40.00	34.00	36.94	566,904
1977/78	5,869	8,326	14,195	38.00	28.00	32.13	456,150
1978/79	4,125	6,607	10,732	38.92	29.86	33.34	357,827
1979/80	4,664	5,106	9,770	33.84	26.82	30.17	294,762
1980/81	4,874	5,684	10,558	31.78	27.56	29.51	311,586
1981/82	4,637	6,214	10,851	41.22	34.01	37.09	402,485
1982/83	4,181	5,966	10,147	46.11	37.20	40.87	414,732
Average							
(1971/72-1982/82)	5,272	6,945	12,217	38.26	31.51	34.43	420,574
(1978/79-1982/83)	4,496	5,915	10,411	38.13	31.25	34.22	356,276

Remarks: P.C.: Plant cane, R.C.: Ratoon cane

Source: National Sugar Development Cooperation (NASUDECO)

Table 4.11 HARVESTED AREA, UNIT YIELD AND PRODUCTION OF FRUIT VEGETABLES IN PAMPANGA PROVINCE

	1978	1979	1980	1981	1982	Average
Area (ha)	609	712	578	520	472	577
(1) Eggplant	87	81	67	65	47	69
(2) Squash	284	328	195	125	10	188
(3) Tomato	96	60	37	37	211	88
(4) Others	142	243	279	293	204	232
Production (t)	8,210	7,515	6,100	4,840	3,708	6,074
(1) Eggplant	1,495	801	1,382	1,651	611	1,188
(2) Squash	5,409	5,626	3,625	2,224	125	3,401
(3) Tomato	1,029	598	511	347	1,850	867
(4) Others	277	490	582	618	1,122	618
Unit Yield (t/ha)	13.48	10.55	10.55	9.31	7.86	10.53
(1) Eggplant	17.18	9.89	20.63	25.40	13.00	17.22
(2) Squash	19.05	17.15	18.59	17.79	12.50	18.09
(3) Tomato	10.72	9.97	13.81	9.38	8.77	9.85
(4) Others	1.95	2.02	2.09	2.11	5.50	2.66

Source: BAEx Region III Office

Table 4.12(1) RESULTS OF YIELD SURVEY (IRRIGATED PADDY)

Sample No.	Sampling Place		Name of Variety	No. of Hill per Ha	No. of Grain per Hill	No. of Panicle per Hill	No. of Panicle per m^2	No. of Grain per Panicle	Wt. of Ripened Grains per Hill (g)	Wt. of 1,000 Grains (g)	No. of Ripened Grains per Hill	Percentage of Ripened Grain (%)	Unit Yield (t/ha)
	Municipality	Barangay											
1.	Floridablanca	Valdez	IR-50	137,200	1,087	15	210	71	22.9	25.6	893	82	3.14
2.	Floridablanca	Valdez	IR-42	92,200	1,256	17	160	72	20.2	20.6	900	78	1.86
3.	Lubao	Dimson	IR-46	154,300	742	9	139	82	15.3	25.0	652	89	2.36
4.	Guagua	J.A. Santos	IR-46	166,700	1,366	22	361	62	28.9	26.4	1,093	80	4.82
5.	Guagua	Rizal	IR-46	173,900	1,366	24	417	58	28.9	25.4	1,141	82	5.03
6.	Guagua	San Matias	IR-42	86,500	1,127	18	156	63	20.1	20.4	980	87	1.74
7.	Floridablanca	San Antonio	IR-42	107,800	1,288	17	179	76	20.9	20.9	996	76	2.25
8.	Floridablanca	Cabangcalan	IR-36	115,200	986	23	265	43	12.4	19.6	633	64	1.43
9.	Floridablanca	Gutad	MRC	104,200	1,064	18	184	59	18.2	22.0	843	76	1.90
10.	Guagua	Ibas	IR-42	107,500	730	13	140	56	13.2	20.8	648	89	1.42
11.	Sta. Rita	Becuran	IR-50	198,800	1,131	29	437	39	15.0	19.4	776	68	2.98
12.	Sta. Rita	Becuran	IR-50	138,900	1,505	22	306	68	17.5	17.4	887	60	2.43
13.	Lubao	Dimson	IR-36	148,800	1,061	15	218	71	15.4	25.1	614	59	2.29
14.	Guagua	Maquiapo	IR-36	101,400	986	12	122	82	10.8	23.5	463	47	1.10
15.	Lubao	Del Carmen	IR-42	105,000	1,777	18	189	99	26.1	20.5	1,277	72	2.74
16.	Lubao	San Antonio	IR-42	114,900	1,297	19	215	68	18.8	19.6	957	74	2.16
17.	Guagua	Sta. Monica	IR-98	119,000	1,032	20	238	52	19.0	19.5	969	94	2.26
18.	Lubao	Sto. Tomas	IR-56	128,200	1,228	15	196	82	18.6	24.1	775	63	2.38
19.	Lubao	Sta. Cruz	IR-54	143,700	1,484	20	287	74	16.6	21.8	770	53	2.39
20.	Lubao	Santiago	IR-42	112,200	1,436	15	172	96	17.7	22.2	784	54	1.99
21.	Dinalupihan	Torres	IR-42	79,400	1,004	13	103	77	15.2	19.9	763	76	1.21
	Average			125,500	1,009	18	224	69	18.7	21.9	852	73	2.38

Table 4.12(2) RESULTS OF YIELD SURVEY (RAINFED PADDY)

Sample No.	Sampling Place		Home of Variety	No. of Hill per Ha	No. of Grain per Hill	No. of Panicle per Hill	No. of Panicle per m^2	No. of Grain per Panicle	Wt. of Ripened Grains per Hill (g)	Wt. of 1,000 Grains (g)	No. of Ripened Grains per Hill	Percentage of Ripened Grains (%)	Unit Yield (t/ha)
	Municipality	Barangay											
1.	Lubao	Lambac	IR-46	104,200	659	7	73	94	13.1	24.4	537	81	1.37
2.	Floridablanca	Sulib	Milagrosa	147,900	813	9	133	91	7.7	12.7	604	74	1.14
3.	Lubao	Del Carmen	IR-42	89,100	588	12	110	49	9.5	20.2	466	79	0.85
4.	Lubao	Sta. Rita	IR-36	86,500	638	11	95	58	9.6	19.7	490	78	0.83
5.	Lubao	San Antonio	IR-46	197,600	1,362	15	294	91	25.1	24.5	1,024	75	4.96
6.	Lubao	San Matias	IR-56	116,600	850	11	128	77	14.0	23.9	583	69	1.63
7.	Lubao	San Juan	IR-42	111,200	1,082	18	196	60	11.2	17.7	629	58	1.25
8.	Lubao	Sta. Cataline	IR-42	114,900	1,434	19	218	76	14.2	19.1	736	53	1.63
9.	Lubao	Remedios	IR-54	104,500	1,154	14	146	82	12.1	23.8	507	44	1.26
10.	Lubao	Baruya	IR-42	137,200	1,330	19	261	70	18.8	21.1	897	65	2.58
11.	Lubao	San Isidro	IR-1000-4	166,700	821	18	300	46	13.3	23.6	564	67	2.22
12.	Lubao	Prado	IR-36	104,200	696	18	188	39	15.5	25.6	613	86	1.62
13.	Hermosa	Balsic	Dacut Manuel	123,200	1,152	13	156	87	20.0	23.0	873	77	2.46
14.	Floridablanca	San Jose	IR-42	95,800	724	12	112	62	9.3	23.3	397	55	0.89
	Average			121,400	950	14	172	70	13.8	21.6	637	69	1.76

Table 4.13 CROP PRODUCTION INFRASTRUCTURE SERVICES (1983)

Municipality	No. of Retailers (No.)	No. of Wholesalers (No.)	Warehouses		Rice Mills	
			No. of Unit (No.)	Total Capacity (t)	No. of Unit (No.)	Input Capacity (t/12 hrs)
1. Floridablance	46	18	3	1,600	6	27
2. Guagua	78	22	9	2,400	13	88
3. Lubao	75	71	26	14,600	31	269
4. Sta. Rita	10	8	9	4,500	12	76
5. Dinalupihan	52	20	16	5,800	14	69
6. Hermosa	26	12	14	5,000	10	78
Total	287	151	77	33,900	86	607

Source: (1) NFA Pampanga Provincial Office
(2) NFA Bataan Provincial Office

Table 4.14 RICE SUPPLY AND DEMAND PROJECTION

Crop Year		1984	1985	1990	1995	2000
Supply						
Yield (t/ha)						
Irrigated: Wet Season (W.S.)		2.78	2.87	3.16	3.41	3.66
Dry Season (D.S.)		3.20	3.25	3.50	3.70	3.90
Lowland rainfed:	W.S.	2.04	2.08	2.19	2.32	2.44
	D.S.	1.78	1.80	1.92	2.07	2.22
Upland:	W.S.	1.15	1.16	1.24	1.36	1.49
	D.S.	1.44	1.48	1.71	1.86	2.01
Rice Area (1,000 ha)						
Irrigated:	W.S.	1,106	1,174	1,398	1,595	1,647
	D.S.	777	824	984	1,114	1,148
Lowlang rainfed:	W.S.	981	903	661	402	344
	D.S.	530	530	530	402	344
Upland:	W.S.	250	250	350	350	350
	D.S.	15	15	14	14	14
Palay Production (1,000 t)						
Irrigated:	W.S.	3,075	3,369	4,418	5,439	6,028
	D.S.	2,486	2,678	3,444	4,122	4,477
Lowland rainfed:	W.S.	2,001	1,878	1,448	933	839
	D.S.	943	954	1,018	832	764
Upland:	W.S.	288	290	434	476	522
	D.S.	22	22	24	26	28
Total:		8,815	9,191	10,786	11,828	12,658
Less: Seed, Waste (10.8%)		952	993	1,165	1,277	1,367
Palay Available for Consumption		7,863	8,198	9,621	10,551	11,291
Milling Recovery Ratio		0.654	0.655	0.660	0.665	0.670
Rice Available for Consumption		5,142	5,370	6,350	7,016	7,565
Demand for Rice						
Population (1,000)		53,768	55,199	62,227	68,865	76,215
National Income Growth (%)		5.5	5.5	5.5	5.5	5.5
Income Elasticity of Demand		0.10	0.10	0.10	0.10	0.10
Per Capita Consumption (kg)		87.5	87.8	89.4	91.7	94.0
Total Demand (1,000 t)		4,705	4,846	5,563	6,315	7,164
Surplus (1,000 t)		437	524	787	701	401
As Percent of Supply (%)		8.51	9.76	12.38	9.99	5.30
As Percent of Demand (%)		9.30	10.81	14.13	11.10	5.59

Source: Corporate Plan 1983-1992, Version 3.1/1983, NIA, May, 1983.

Table 4.15 SENSITIVITY ANALYSIS ON RICE SUPPLY AND DEMAND

Case		1984	1985	1990	1995	2000
I) Supply						
Case-1: Deferral for 50% of the Implementation of Irrigation Project						
1) Rice Area (1,000 ha)						
Irrigated:	WS	1,106	1,140	1,252	1,351	1,377
	DS	777	801	881	946	963
Rainfed :	WS	981	937	807	647	615
	DS	530	530	530	467	426
Upland :	WS	250	250	350	350	350
	DS	15	14	14	14	14
2) Palay Production (1,000 t)		8,815	9,089	10,283	11,077	11,793
3) Less: Seed, Waste (10.8%)		952	982	1,111	1,196	1,274
4) Milling Recovery Ratio		0.654	0.655	0.660	0.665	0.670
5) Rice Supply (1,000 t)		5,142	5,310	6,054	6,571	7,048
Case-2: Low Milling Recovery Ratio						
1) Palay Production (1,000 t)		8,815	9,191	10,786	11,828	12,658
2) Less: Seed, Waste (10.8%)		952	993	1,165	1,277	1,367
3) Milling Recovery Ratio		0.630	0.630	0.630	0.630	0.630
4) Rice Supply (1,000 t)		4,954	5,165	6,061	6,647	7,113
Case-1 and 2						
1) Palay Production (1,000 t)		8,815	9,089	10,283	11,077	11,793
2) Less: Seed, Waste (10.8%)		952	982	1,111	1,196	1,274
3) Milling Recovery Ratio		0.630	0.630	0.630	0.630	0.630
4) Rice Supply (1,000 t)		4,954	5,107	5,778	6,225	6,627
II) Demand (1,000 t)		4,705	4,846	5,563	6,315	7,164
III) Surplus (1,000 t)						
Case-1		437	464	491	256	-116
Case-2		249	319	498	332	-51
Case-1 and 2		249	261	215	-90	-537

Table 4.16 SUPPLY AND DEMAND FORECAST FOR SUGAR

	Year	Supply/4	Demand/4					Surplus/4
			Domestic			Export	Total Demand	
			Population	Per-capita Consumption	Total			
		(1,000t)	(1,000)	(kg)	(1,000t)	(1,000t)	(1,000t)	(1,000t)
I)	Actual							
(1)	1967/1	1,560	33,494	16.8	562	1,020	1,582	-22
(2)	1968	1,595	34,525	18.1	624	1,021	1,645	-50
(3)	1969	1,597	35,588	18.2	649	1,020	1,669	-72
(4)	1970	1,927	36,684	15.5	569	1,179	1,748	179
(5)	1971	2,056	37,703	16.0	602	1,444	2,046	10
(6)	1972	1,816	38,751	18.2	709	1,262	1,971	-155
(7)	1973	2,245	39,827	19.9	793	1,455	2,248	-3
(8)	1974	2,446	40,934	20.0	820	1,636	2,456	-10
(9)	1975	2,394	42,071	20.8	875	1,006	1,881	513
(10)	1976	2,875	43,213	16.9	726	1,515	2,241	634
(11)	1977	2,670	44,385	20.5	911	2,491	3,402	-732
(12)	1978	2,335	45,590	22.0	1,001	1,113	2,114	221
(13)	1979	2,349	46,827	23.2	1,087	1,146	2,233	116
(14)	1980	2,268	48,098	22.9	1,103	1,722	2,825	-557
(15)	1981	2,223	49,403	21.1	1,041	1,224	2,265	-42
(16)	1982	2,440	50,743	20.9	1,058	1,246	2,304	136
II)	Projected							
(18)	1984	2,600/2	53,768/3	23.2/2	1,250	1,290/5	2,540	60
(19)	1985	2,630	55,199	23.6	1,300	1,290	2,590	40
(24)	1990	2,750	62,227	25.5	1,590	1,290	2,880	-130
(29)	1995	2,860	68,865	27.5	1,890	1,290	3,180	-320
(34)	2000	2,950	76,215	29.4	2,240	1,290	3,530	-580

Remarks: /1: Year in order

/2: The supply and per-capita consumption in the future were forecasetd as follows on the basis of the trend from 1967 to 1981.

Supply: $y = 1{,}460.7x^{0.1994}$
(y: Supply, x: Year in order, r = 0.85)

Pre-capita consumption: $y = 16.115 + 0.392x$
(y: Pre-capita consumption, x: Year in order, r = 0.78)

/3: Forecasted by the NIA.

/4: Indicating by raw sugar.

/5: Average from 1978 to 1982.

Source: (1) Quarterly Vol. I, No. 1, PHILSUCOM, 1980
(2) Data obtained from the NASUTRA

Table 4.17(1) SUPPLY AND DEMAND FORECASTS FOR VEGETABLES (PAMPANGA AND BATAAN PROVINCES)

(Unit: ton)

Year	Pampanga Province			Bataan Province			Total
	Supply	Demand	Surplus	Supply	Demand	Surplus	Surplus
Fruit Vegetables							
1982	5,360	29,410	-24,050	230	8,320	-8,090	-32,140
1983	6,720	30,130	-23,410	310	8,660	-8,350	-31,760
1984	7,800	30,860	-23,060	400	8,450	-8,050	-31,110
1985	9,820	31,510	-21,690	510	8,630	-8,120	-29,810
1986	10,660	32,170	-21,510	640	8,810	-8,170	-29,680
1987	12,320	32,810	-20,490	780	8,980	-8,200	-28,690
1995	23,370	38,280	-14,910	1,630	9,820	-8,190	-23,100
2000	30,320	41,680	-11,360	2,180	10,380	-8,200	-19,560
Leafy Vegetables							
1982	11	21,090	-21,079	24	5,960	-5,936	-27,015
1983	12	21,600	-21,588	33	6,210	-6,177	-27,765
1984	13	22,130	-22,117	42	6,060	-6,018	-28,135
1985	14	22,600	-22,586	51	6,190	-6,139	-28,725
1986	15	23,060	-23,045	60	6,310	-6,250	-29,295
1987	17	23,530	-23,513	69	6,440	-6,371	-29,884
1995	26	27,450	-27,424	140	7,040	-6,900	-34,324
2000	31	29,890	-29,859	190	7,450	-7,260	-37,119

Remarks: (1) Supply and demand from 1982 to 1987 were forecasted by BAEx, Region III office (Food Blance Sheet CY1982 - 1987, 1982).

(2) Supply and demand in 1995 and 2000 were estimated on their trend from 1982 to 1987 forecasted by BAEx of the above.

Table 4.17(2) SUPPLY AND DEMAND FORECASTS FOR VEGETABLES (REGION III)

(Unit: ton)

Year	Supply	Demand	Surplus
Fruit Vegetables			
1982	87,020	120,520	-33,500
1983	91,670	123,350	-31,680
1984	95,820	125,920	-30,100
1985	101,660	128,580	-26,920
1986	106,190	131,230	-25,040
1987	111,300	133,870	-22,570
1995	150,180	155,160	-4,980
2000	174,580	168,450	6,130
Leafy Vegetables			
1982	19,650	86,410	-66,760
1983	20,450	88,730	-68,280
1984	21,110	90,280	-69,170
1985	21,730	92,190	-70,460
1986	22,160	94,090	-71,930
1987	23,150	95,980	-72,830
1995	28,350	111,030	-82,680
2000	31,670	120,440	-88,770

Remarks: (1) Supply and demand from 1982 to 1987 were forecasted by BAEx, Region III office (Food Blance Sheet CY1982 - 1987).

(2) Supply and demand in 1995 and 2000 were estimated on the basis of their trend from 1982 to 1987 forecasted of the above.

Table 4.18(1) SUPPLY AND DEMAND FORECASTS FOR LEGUMES (PAMPANGA AND BATAAN PROVINCES)

(Unit: ton)

Year	Pampanga Province			Bataan Province			Total
	Supply	Demand	Surplus	Supply	Demand	Surplus	Surplus
1982	1,120	5,390	-4,270	39	1,300	-1,261	-5,531
1983	1,660	5,560	-3,900	53	1,340	-1,287	-5,187
1984	1,850	5,740	-3,890	69	1,390	-1,321	-5,211
1985	1,970	5,920	-3,950	98	1,430	-1,332	-5,282
1986	2,070	6,090	-4,020	113	1,480	-1,367	-5,387
1987	2,540	6,270	-3,730	132	1,520	-1,388	-5,118
1995	4,400	7,780	-3,380	290	1,900	-1,610	-4,990
2000	5,610	8,800	-3,190	380	2,150	-1,770	-4,960

Remarks: (1) Supply from 1982 to 1987 was forecasted by BAEx, Region III office (Food Blance Sheet CY1982 - 1987, 1982).

(2) Supply in 1995 and 2000 was estimated on the basis of its trend from 1982 to 1987 forecasted by BAEx of the above.

(3) Demand from 1982 to 2000 was estimated on the basis of population projection by NEDA and per capita consumption estimating at 4 kg by Ministry of Agriculture.

Source: (1) Population Dimension of Planning, NEDA, 1975.

(2) Food Consumption Patterns, MOA, 1983.

Table 4.18(2) SUPPLY AND DEMAND FORECASTS FOR LEGUMES (REGION III)

(Unit: ton)

Year	Supply	Demand	Surplus
1982	8,560	22,050	-13,490
1983	9,490	22,730	-13,240
1984	10,060	23,440	-13,380
1985	10,450	24,170	-13,720
1986	10,810	24,880	-14,070
1987	11,420	25,600	-14,180
1995	15,730	31,690	-15,960
2000	18,390	35,760	-17,370

Remarks: (1) Supply from 1982 to 1987 was forecasted by BAEx, Region III office (Food Blance Sheet CY1982 - 1987, 1982).

(2) Supply in 1995 and 2000 was estimated on the basis of its trend from 1982 to 1983 forecasted by BAEx of the above.

(3) Demand from 1982 to 2000 was estimated on the basis of population projection by NEDA and per capita consumption estimating at 4 kg by Ministry of Agriculture.

Source: (1) Population Dimension of Planning, NEDA, 1975.

(2) Food Consumption Pattern, MOA, 1983.

Table 4.19 DEMAND FORECAST FOR VEGETABLES AND LEGUMES IN METRO MANILA

Year	Population /1 (1,000)	Per Capita Consumption /2 (kg)	Demand (t)
Fruit Vegetables			
1975	4,970	14.9	74,100
1980	5,926	14.9	88,300
1984	6,830	14.9	101,800
1995	10,050	14.9	149,700
2000	11,980	14.9	178,500
Leafy Vegetables			
1975	4,970	9.8	48,700
1980	5,926	9.8	58,100
1984	6,830	9.8	66,900
1995	10,050	9.8	98,500
2000	11,980	9.8	117,400
Legumes			
1975	4,970	4.0	19,880
1980	5,926	4.0	23,700
1984	6,830	4.0	27,300
1995	10,050	4.0	40,200
2000	11,980	4.0	47,900

Remarks: /1: Annual population growth rate: 3.58%.

/2: Average per capita consumption in whole country.

Source: Food Consumption Patterns, Special Studies Division, Ministry of Agriculture, 1983.

Table 4.20 MONTHLY WHOLESALE, RETAIL AND FARMGATE PRICE OF RICE IN REGION III

(Unit: P/kg)

Month	Farmgate				Wholesale				Retail			
	1980	1981	1982	1983	1980	1981	1982	1983	1980	1981	1982	1983
Jan.	1.15	1.42	1.52	1.45	2.10	2.40	2.58	2.54	2.30	2.53	2.75	2.78
Feb.	1.16	1.50	1.56	1.46	2.10	2.39	2.55	2.69	2.30	2.55	2.78	2.92
Mar.	1.18	1.52	1.62	1.49	2.10	2.42	2.62	2.62	2.30	2.56	2.80	2.88
Apr.	1.24	1.52	1.57	1.56	2.13	2.43	2.60	2.58	2.30	2.56	2.80	2.85
May	1.24	1.52	1.61	1.61	2.15	2.43	2.63	2.58	2.32	2.56	2.80	2.85
Jun.	1.25	1.54	1.65	1.64	2.19	2.48	2.72	2.68	2.33	2.60	2.90	2.90
Jul.	1.35	1.66	1.69	1.81	2.26	2.62	2.82	2.84	2.35	2.79	3.00	3.00
Aug.	1.42	1.67	1.71	1.86	2.38	2.67	2.82	2.89	2.49	2.81	3.00	3.04
Sep.	1.54	1.67	1.59	1.89	2.45	2.67	2.80	2.96	2.56	2.82	3.00	3.15
Oct.	1.44	1.54	1.39	1.94	2.44	2.66	2.76	3.15	2.57	2.82	2.95	3.24
Nov.	1.39	1.45	1.35	1.97	2.46	2.61	2.68	3.25	2.56	2.80	2.90	3.42
Dec.	1.41	1.48	1.40	2.18	2.41	2.60	2.58	3.60	2.53	2.79	2.80	3.76
Average	1.31	1.54	1.56	1.74	2.26	2.53	2.68	2.86	2.41	2.70	2.85	3.06

Source: NFA Region III Office

Table 4.21 MILLING RECORD OF NASUDECO

Crop Year	Cane Ground/1 (10^3 ton) (1)	Sugar Produced (10^3 ton) (2)	Molasses Produced (10^3 ton) (3)	Recovery Rate (%) (4)=(1)/(2)	Capacity Utilization/2 (%) (5)	Milling Duration (day) (6)
1971 - 72	527.1	43.3	20.4	8.2	49	214
1972 - 73	382.8	27.2	14.7	7.1	48	160
1973 - 74	411.3	26.0	21.5	6.3	46	177
1974 - 75	361.3	27.8	13.5	7.7	46	156
1975 - 76	449.2	34.5	18.5	7.7	39	229
1976 - 77	262.3	22.0	8.4	8.4	45	117
1977 - 78	275.6	22.9	*/3	8.3	38	146
1978 - 79	214.6	21.0	6.6	9.8	37	116
1979 - 80	217.5	17.4	8.1	8.0	33	130
1980 - 81	229.3	17.9	8.9	7.8	41	113
1981 - 82	322.9	28.9	8.4	9.0	50	130
1982 - 83	356.5	32.7	9.9	9.2	45	160
Average (1971/72-1982/83)	334.2	26.8	12.6	8.0	40	153
(1978/79-1982/83)	268.2	23.6	8.4	8.8	41	130

Remarks: /1: Total cane ground by the NASUDECO Sugar Mill.
/2: (5) = (1)/(2)/Maximum Milling Capacity (5,000 ton cane/day)
/3: *: No data

The total sugarcane production in the PASUMIL Mill District area is estimated at 356,300 ton on an average from 1978/79 to 1982/83. Out of this total production, 268,200 ton are grounded by NASUDECO sugar mill, and remaining 88,100 ton are by PASUDECO sugar mill located at San Fernando.

Source: NASUDECO

Table 4.22(1) TYPICAL FARM BUDGET AT PRESENT CONDITION

(1) Rice Cultivation Farmer (Lessess)
Irrigated Land
Farm Size: 1.3 ha

Item		Amount (₱)
I) Gross Income		32,530
1) Farm Income		13,330
- Wet Season Paddy (1.3 ha x 2.7 t x ₱1,740)		6,110
- Dry Season Paddy (1.3 ha x 2.8 t x ₱1,740)		6,330
- Livestock		890
2) Off-farm Income/1		19,200
II) Gross Outgo		32,500
1) Production Cost		10,000
- Seed	(208 kg x ₱2.18)	453
- Fertilizers		
N	(198 kg x ₱7.3)	1,445
P_2O_5	(16 kg x ₱7.0)	112
K_2O	(16 kg x ₱7.0)	112
- Agro-chemicals		
Liquid	(5.9 ℓ x ₱91)	537
Granular	(13.7 kg x ₱14)	192
- Hired Labor/2	(64 man-days x ₱25)	1,600
- Hired Animal	(5.7 days x ₱35)	200
- Machinery	(3.6 days x ₱175)	630
- Harvesting and Threshing	(7.15 t x 1/7 x ₱1,740)	1,777
- Irrigation Fee/3		266
- Land Rent		2,144
- Interest		56
- Miscellaneous		476
2) Living Expenses/4		22,500
- Food		12,800
- Non-food		9,700
III) Net Reserve/Capacity to Pay		30

Remarks: /1: Includes wage earning from work on other farm and non-farm work, and remittance from their family working at Metro Manila, abroad, etc.

/2: Excludes harvesting and threshing.

/3: 6.5 Cavans x ₱87/Cavan x 47% (Collection Efficiency).

/4: See Table 4.23.

Table 4.22(2) TYPICAL FARM BUDGET AT PRESENT CONDITION

(2) Rice Cultivation Farmer (Lessess)
Rainfed Land
Farm Size: 1.3 ha

Item		Amount (₱)
I) Gross Income		25,920
1) Farm Income		5,320
- Wet Season Paddy (1.3 ha x 1.96 t x ₱1,740)		4,430
- Livestock		890
2) Off-farm Income/1		20,600
II) Gross Outgo		25,900
1) Production Cost		3,400
- Seed	(111 kg x ₱2.18)	242
- Fertilizers		
N	(60 kg x ₱7.3)	438
P_2O_5	(4 kg x ₱7.0)	28
K_2O	(4 kg x ₱7.0)	28
- Agro-chemicals		
Liquid	(3.1 ℓ x ₱91)	282
- Hired Labor/2	(20 man-days x ₱25)	500
- Hired Animal	(0.3 days x ₱35)	11
- Machinery	(2.0 days x ₱175)	350
- Harvesting and Threshing	(2.55 t x 1/7 x ₱1,740)	634
- Land Rent		652
- Interest		56
- Miscellaneous		179
2) Living Expenses/3		22,500
- Food		12,800
- Non-food		9,700
III) Net Reserve/Capacity to Pay		20

Remarks: /1: Includes wage earning from work on other farm and non-farm work, and remittance from their family working at Metro Manila, abroad, etc.

/2: Excludes harvesting and threshing.

/3: See Table 4.23.

Table 4.22(3) TYPICAL FARM BUDGET AT PRESENT CONDITION

(3) Sugarcane Planter (Owner Operator)
Farm Size: 4.0 ha

Item		Amount (₱)
I) Gross Income		41,550
1) Farm Income		26,050
- Plant Cane	(1.7 ha x 38.13 t x ₱184)	11,930
- Ratoon Cane	(2.3 ha x 31.25 t x ₱184)	13,230
- Livestock		890
2) Off-farm Income/1		15,500
II) Gross Outgo		41,500
1) Production Cost		20,600
- Seed Cane	(59,500 piecex s ₱5/1000 pieces)	298
- Fertilizers		
N	(423 kg x ₱7.3)	3,088
P_2O_5	(9 kg x ₱7.0)	63
K_2O	(7 kg x ₱7.0)	49
- Hired Labor	(275 man-days x ₱25)	6,875
- Machinery	(10.3 days x ₱400)	4,120
- Transportation Cost/3	(137 t x ₱20)	2,740
- Tax, Insurance, etc./3	(137 t x ₱11)	1,507
- Interest/4		933
- Miscellaneous		927
2) Living Expenses/5		20,900
- Food		9,400
- Non-food		11,500
III) Net Reserve/Capacity to Pay		50

Remarks: /1: Includes wage earning from work on other farm and non-farm work, and remittance from their family work at Metro Manila, abroad, etc.

/2: Transportation of sugarcane from farm to mill.

/3: Cost for Quedan.

/4: 9% (half year interest) of costs for fertilizers, machinery and hired labor excluding harvesting.

/5: See Table 4.23.

Table 4.23 RESULTS OF FARM ECONOMIC SURVEY ON THE LIVING EXPENSES OF FARMER

Farm Size (ha)	No. of Sampling Farmers	Average Family Size (Persons)	Expenses for Food				Living Expenses Except for Food (₱)	Total Living Expenses (₱)	Living Expenses per Person (₱)
			Rice Consumption		Other Food (₱)	Total (₱)			
			Pre-capita Consumption (kg)	Value (₱)					
Below 0.5	5	5.6	141	2,416	7,728	10,144	8,832	18,976	3,389
0.5 - 1.0	20	7.2	128	2,820	7,473	10,293	7,857	18,150	2,521
1.0 - 1.5	29	7.4	137	3,102	9,692	12,794	9,656	22,450	3,034
1.5 - 2.0	16	6.8	120	2,497	8,322	10,819	8,436	19,255	2,832
2.0 - 2.5	27	6.0	134	2,460	8,374	10,834	9,041	19,875	3,313
2.5 - 3.0	9	8.0	162	3,906	6,894	10,860	9,919	20,779	2,597
Over 3.0	14	7.0	142	3,042	6,404	9,446	11,497	20,943	2,992
Average	(120)	6.9	136	2,872	8,168	11,040	9,255	20,295	2,941

Table 4.24 FARMERS' INTENTION TO THE IRRIGATION PROJECT IN THE STUDY AREA

Item	No. of Answer (No.)	Percentage of Total Sample Farmer (%)
(Number of Sample Farmer)	(120)	
1) Which item do you want to improve present farm management?/2		
a) To acquire irrigation water	105	87.5
b) To drain out excess water	7	5.8
c) To prevent pests and diseases	85	70.8
d) To introduce mechanization for deducting farm labor	48	40.0
e) To get high improved varieties	49	40.8
f) To improve fertilization in volume at right time	42	35.0
g) To improve farm road for transport of farm products	43	35.8
Total Answer	379/1	
2) After implementation of the project, irrigation water becomes available for both wet and dry seasons, and drainage condition also becomes well in wet seasons.		
a) In such case, which kind of crops do you want to cultivate?/2		
Wet Season	192/1	
- Paddy	103	85.8
- Vegetables	54	45.0
- Water melon	12	10.0
- Peanuts	11	9.2
- Sugarcane	4	3.3
- Others	8	6.7
Dry Season	207/1	
- Paddy	100	83.3
- Vegetables	57	47.5
- Water melon	18	15.0
- Mongo bean	12	10.0
- Sugarcane	5	4.2
- Others	15	12.5

Remarks: /1: Multiple answer
/2: Question to sample farmer

Source: Results of farm economic survey

Table 4.25 INFLOW OF RICE SUPPLY TO METRO MANILA THROUGH THE CHANNEL OF NFA METRO MANILA

(Unit: t)

Region	1980	1981	1982	Average	Proportional Extent (%)
Region III	19,231	14,645	24,270	19,382	30.5
(Nueva Ecija)	-	6,434	13,771	6,735	10.6
(Pampanga)	5,356	598	-	1,985	3.1
(Tarlac)	5,853	4,403	6,079	5,445	8.6
(Bulacan)	8,022	3,210	4,182	5,138	8.1
(Bataan)	-	-	238	79	0.1
(Zambares)	-	-	-	-	-
Other Regions	71,194	49,405	11,950	44,183	69.5
Region I	11,312	2,043	-	4,452	7.0
Region II	25,825	24,307	11,891	20,674	32.5
Region IV	24,727	15,966	40	13,578	21.4
Region V	2,546	-	-	849	1.3
Region VI	342	-	-	114	0.2
Region XI	4,813	7,089	19	3,974	6.3
Region XII	461	-	-	154	0.2
Others	1,168	-	-	389	0.6
Total	90,425	64,050	36,220	63,565	100.0

Source: NFA

Table 4.26(1) ANNUAL VOLUME OF VEGETABLES AND LEGUMES PURCHASED BY DEALERS AT GREATER MANILA MARKET (1979 - 1980)

Fruit Vegetables		Patola/1	Upo/2	Okra	Onion	Tomato	Ampalaya/3	Eggplant	Squash	Total/ Average/4
Volume Purchased	(t)	323	1,082	576	6,654	8,012	1,031	1,624	2,185	21,487
No. of Dealers	(No.)	17	18	17	34	29	16	23	21	175
Volume per Dealers	(t)	19	60	34	196	276	64	71	104	123
Source	(%)									
Region III		3	49	36	66	25	63	65	38	44
Pampanga		2	49	-	-	-	58	11	-	9
N. Ecija		-	-	4	66	25	1	11	32	29
Bulacan		1	-	32	-	-	3	43	3	6
Tarlac		-	-	-	-	-	1	-	-	*/5
Bataan		-	-	-	-	-	-	-	3	*/5
Other Regions		97	51	64	34	75	37	35	62	56
Pangasinan		11	1	9	19	12	15	23	1	13
Cavite		5	1	45	2	-	18	2	-	4
Batangas		81	45	10	-	-	4	5	3	7
Other Provinces		-	4	-	13	63	-	5	58	32

Remarks: /1: Gourd, Dishrag, /2: Bottle Gourd, /3: Bitter Gourd,
/4: Weight average, /5: Less than 0.5%

Source: Market Demand for Selected Vegetables in Metro Manila, Special Study Division, Ministry of Agriculture, 1980.

Table 4.26(2) ANNUAL VOLUME OF VEGETABLES AND LEGUMES PURCHASED BY DEALERS AT GREATER MANILA MARKET (1979 - 1980)

Leafy Vegetables		Native Cabbage	Cabbage	Chinese Cabbage	Total/ Average/1
Volume Purchased	(t)	1,248	283	2,731	4,262
No. of Dealers	(No.)	9	46	31	86
Volume per Dealers	(t)	139	6	88	50
Source	(%)				
Region III		6	3	-	3
Pampanga		2	-	-	1
N. Ecija		2	3	-	1
Bulacan		2	-	-	1
Tarlac		-	-	-	-
Bataan		-	-	-	-
Other Regions		94	97	100	97
Pangasinan		-	97	-	6
Rizal		40	-	-	12
Albay		28	-	-	8
Benguet		-	-	100	64
Other provinces		26	-	-	7

Remarks: /1: Weight average

Source: Market Demand for Selected Vegetables in Metro Manila, Special Study Division, Ministry of Agriculture, 1980.

Table 4.26(3) ANNUAL VOLUME OF VEGETABLES AND LEGUMES PURCHASED BY DEALERS AT GREATER MANILA MARKET (1979 - 1980)

Legumes		Baguio Beans	Peanut	Mongo	Total Average/1
Volume Purchased	(t)	3,330	650	584	4,564
No. of Dealers	(No.)	37	6	13	56
Volume per Dealers	(t)	90	108	45	82
Source	(%)				
Region III		-	-	37	4
Pampanga		-	-	18	2
N. Ecija		-	-	1	-
Bulacan		-	-	-	-
Tarlac		-	-	18	2
Bataan		-	-	-	-
Other Regions		100	100	63	96
Pangasinan		-	-	39	5
Benguet		100	-	-	73
Batangas		-	100	-	14
Other Provinces		-	-	24	4

Remarks: /1: Weight average

Source: Market Demand for Selected Vegetables in Metro Manila, Special Division, Ministry of Agriculture, 1980.

Table 4.27 SUPPLY AND DEMAND FORECASTS FOR PADDY IN REGION III AND IV

Supply and Demand		1984	1995	2000
Region III				
1) Paddy Production	(1,000 t)	1,709	2,343	2,567
- Seed, Waste, etc./1	(1,000 t)	185	253	277
- Paddy for Consumption	(1,000 t)	1,524	2,090	2,290
- Milling Recovery Ratio		0.654	0.665	0.670
2) Rice for Consumption	(1,000 t)	997	1,390	1,534
3) Demand				
- Population	(1,000)	5,300	6,490	6,960
- Per Capita Consumption	(kg)	105.1	109.7	111.8
- Total Demand	(1,000 t)	557	712	778
4) Surplus	(1,000 t)	440	678	756
Region IV				
1) Paddy Production	(1,000 t)	749	1,014	1,084
- Seed, Waste, etc./1	(1,000 t)	81	110	117
- Paddy for Consumption	(1,000 t)	668	904	967
- Milling Recovery Ratio		0.654	0.665	0.670
2) Rice for Consumption	(1,000 t)	437	601	648
3) Demand				
- Population	(1,000)	13,590	17,550	19,120
- Per Capita Consumption	(kg)	96.6	100.0	101.5
- Total Demand	(1,000 t)	1,313	1,755	1,941
4) Surplus	(1,000 t)	-876	-1,154	-1,293

Remarks: /1: 10.8% of paddy production

Source: NIA

Table 4.28(1) PROPOSED FARMING PRACTICES (PADDY)

1)	Varieties	IR series (IR 36, 42, 48, 50, 52, etc.)
2)	Growth period	125 days
3)	Planting	
	- Planting method	Transplanting
	- Amount of seed	60 kg per ha for planting area
	- Area of nursery bed	1/20 - 1/25 of planting area
	- Nursery period	15 - 20 days
	- Planting density	30 cm x 15 cm, 3 seedlings/hill
	- Planting depth	3 cm from the surface
4)	Land preparation	One time of plowing, two times of harrowing and one time of puddling
5)	Fertilization	
	- Application amount	
	Nursery bed	N: 2 kg/ha of planting area
	Paddy	N: 78 kg/ha for wet season paddy 88 kg/ha for dry season paddy P_2O_5: 30 kg/ha K_2O : 30 kg/ha
	- Time of application	
	Basic dressing	Puddling/transplanting time N: 25% of total amount P_2O_5 and K_2O: 50%
	1st top dressing	Two weeks after transplanting N: 25%
	2nd top dressing	Late period of young panicle formation stage N: 25% P_2O_5 and K_2O: 50%
	3rd top dressing	Three to four weeks before harvesting N: 25%
6)	Weeding - Manual	Two times at about four weeks and eight weeks after transplanting
	- Herbicides	10 kg/ha
7)	Control of pests and diseases	3 ℓ/ha
8)	Harvesting	Manual harvesting by sickle

Table 4.28(2) PROPOSED FARMING PRACTICES (SUGARCANE)

1)	Varieties	PHIL 58260, PHIL 5333, PHIL 56226, PHIL 62120, etc.
2)	Growth period	Plant cane: 11 months RAtoon cane: 12 months
3)	Planting	
	- Rate of planting	35,000 pieces/ha
	- Soaking of seedpieces	Soaking by running water for 48 hours
	- Seed treatment	Fungicide treatment by Benlate Fungitox, etc.
	- Distance of furrow	75 cm to 150 cm
	- Depth of planting	25 cm
4)	Land preparation	One time of plowing at the depth of 45 - 60 cm and two to three times of harrowing
5)	Fertilization	
	- Application amount	N : 200 kg/ha P_2O_5: 100 kg/ha K_2O : 220 kg/ha
	- Time of application	
	First dosage	Applying at furrowing/stable shaving time N and K_2O: 50% of total amount P_2O_5 : 100%
	Second dosage	Three months after planting/stable shaving time N and K_2O: 50%
6)	Cultivating	
	- Ridge busting	Three to four week after planting
	- First hilling-up	Follows three weeks later when the plant is about ten weeks old.
	- First off-barring	Three to seven weeks after planting
	- Second off-barring	Three months after planting
	- Final hilling-up	Three to four weeks after the second off-barring or four month after planting
7)	Weeding	Carrying out parallel with cultivating
8)	Control of pests and diseases	2 ℓ per ha for insecticides such as Aldrin, Agrocide, etc.
9)	Harvesting	Manual harvesting
10)	Stable shaving	Within one month after harvesting

Table 4.28(3) PROPOSED FARMING PRACTICES (AMPALAYA)

1)	Varieties	Makiling, Sta. Rita
2)	Growth period	150 days
3)	Planting	
	- Planting method	Direct seeding
	- Seeding rate	3 kg/ha
	- Planting space	2 m x 2 m 3 - 4 seeds per one support
4)	Land preparation	One time of plowing, two time of harrowing and one time of furrowing
5)	Fertilization	
	- Application amount	N : 120 kg/ha P_2O_5 : 120 kg/ha K_2O : 120 kg/ha
	- Time of application	
	Basic dressing	All the required P_2O_5 and 1/8 of N and K_2O at furrowing time
	Top dressing	1/8 of N and K_2O with interval of two weeks after seeding time (7 times)
6)	Cultivating and weeding	Four times with interval of three weeks after seeding time
7)	Control of pests and diseases	
	- Dosage	Insecticides: 8 ℓ/ha Fungicides : 2 ℓ/ha
	- Time of application	
	Insecticides	1 ℓ per one time with interval of two weeks after one month of seeding time
	Fungicides	Upon occurrence
8)	Irrigating	Ten days interval
9)	Harvesting	12 times with interval of one week

Table 4.28(4) PROPOSED FARMING PRACTICES (TOMATO)

1)	Varieties	Improved Pope (BPI Tm-1) Marikit (UPL Tm-1) Marilag (UPL Tm-2) VF Roma VF 145
2)	Growing period	120 - 150 days
3)	Planting	
	- Planting method	Transplanting
	- Seeding rate	1 kg/ha
	- Nursery period	30 days
	- Planting space	75 x 45 cm
4)	Land preparation	One time of plowing, two time of harrowing and one time of furrowing
5)	Fertilization	
	- Application amount	N : 100 kg/ha P_2O_5: 190 kg/ha K_2O : 100 kg/ha
	- Time of application	
	Basic dressing	All the required P_2O_5 and 1/8 of N and K_2O at furrowing time
	Top dressing	Seven times with interval of two weeks after transplanting time (1/8 of N and P_2O_5 for one time)
6)	Cultivating and weeding	Four times with interval of three weeks after transplanting time
7)	Control of pests and diseases	
	- Dosage	Insecticides: 8 ℓ/ha Fungicides : 4 ℓ/ha
	- Time of application	
	Insecticides	Eight times with interval of two weeks after one month of transplanting time (1 ℓ per one time)
	Fungicides	Upon occurrence
8)	Irrigating	Ten days interval
9)	Harvesting	Manual harvesting

Table 4.29 RECOMMENDED FARM INPUT AMOUNT FOR MASAGANA 99, PHASE XXI

Item		Wet Season	Dry Season
1) Seed	(kg/ha)	46	46
2) Fertilizer	(kg/ha)/1		
- N		64	70
- P_2O_5		30	30
- K_2O		30	30
3) Agro-chemicals/2			
Pesticides	(l/ha)	1.9	1.9
	(kg/ha)	17	17
Herbicides	(l/ha)	1.1	1.1

Remarks: /1: Wet Season

Urea (45%) : 75 kg/ha
Compound (14:14:14): 215 kg/ha

Dry Season

Urea (45%) . 90 kg/ha
Compound (14:14:14): 215 kg/ha

/2: Pesticides

- Azodrin 202R: 1 quart
- Mipcin WP : 1 quart
- Furadan 3G : 17 kg

Herbicides

- Machete 5G : 1.2 quart

Source: BAEx Region III Office

Table 4.30 EFFECTS OF VARYING LEVELS OF N ON THE YIELD OF RICE VARIETIES

(I) 1982, Wet Season

N (kg/ha)	Unit Yield (ton/ha)				
	IR20	IR36	IR42	IR54	Average
0	2.6	2.7	3.5	3.5	3.1
30	3.9	3.7	3.7	3.9	3.8
50	4.0	4.4	5.5	4.8	4.7
90	4.9	4.8	6.2	5.0	5.2
120	5.0	4.4	6.3	5.4	5.3
150	5.1	4.4	6.4	4.9	5.2
Average	4.3	4.1	5.3	4.6	4.6

(II) 1983, Dry Season

N (kg/ha)	Unit Yield (ton/ha)			
	IR20	IR36	IR42	Average
0	3.94	3.97	4.29	4.10
60	5.77	6.70	6.76	6.41
90	6.31	7.80	7.65	7.25
120	7.33	7.59	7.13	7.35
150	7.70	6.84	6.76	7.10
180	7.79	6.66	7.71	7.39
Average	6.47	6.59	6.72	6.60

Source: Maligaya Rice Research and Training Center of the Philippines, 18th Annual Report, 1983.

Table 4.31(1) EFFECTS OF FOUR RATES ON N, P AND K FERTILIZATION ON THE YIELD OF THE PLANT CANE

(ton cane/ha)

N - P_2O_5 - K_2O (kg/ha)	Replication I	Replication II	Replication III	Average
0 - 0 - 0	33.66	50.00	32.00	38.55
87.5 - 52.5 - 80.0	62.00	75.66	67.00	68.22
175.0 - 105.0 - 160.0	91.33	103.33	94.66	96.44
262.5 - 157.5 - 240.0	96.33	74.66	95.66	88.88

Source: Genaro V. Urgel and Edgardo C. Ragat, Yield Responses of Plant and Ratoon Crops to Four NPK Fertilization Rates, and the Effects of Residual NPK from the Preceding Plant Crop on Yield of Subsequent Ratoon, Philippine Sugar Commission - Quarterly Vol. I, No.5, 1981.

Table 4.31(2) EFFECTS OF PHOSPHORUS FERTILIZATION ON THE DRY MATTER YIELD OF PHIL 58260

Treatments (kg P_2O_5/ha)	Dry Matter Yield (kg/plot/1)	Treatment (kg P_2O_5/ha)	Dry Matter Yield (kg/plot/1)
0	10.46	120	18.14
40	14.05	160	16.84
80	18.10	200	13.21

Remarks: /1: 6 m x 9 m

Source: O.T. Quilloy and Y.I. Samonte, Phosphate Sorption by Soils in Relation to Phosphorus Fertilization of Sugarcane, Philippine Sugar Commission - Quarterly Vol. I, No.4, 1981.

Table 4.32 FARM INPUT, LABOR FORCE, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (WITH PROJECT CONDITION)

Item		Paddy		Sugarcane		Fruit Vegetables		Inter Crops/6	
		W.S./1	D.S./2	P.C./3	R.C./4	Ampalaya/5	Tomato	Mongo	Peanut
1) Farm Inputs									
Seed	(kg)	60	60	35,000/7	0	3	1	18	80
Fertilizers									
- N	(kg)	80	90	200	200	120	100	14	14
- P_2O_5	(kg)	30	30	100	100	120	190	14	14
- K_2O	(kg)	30	30	220	220	120	100	14	14
Agro-chemicals									
- Liquid	(kg)	3	3	2	2	10	12	1.4	1.4
- Granular	(%)	10	10	-	-	-	-	-	-
2) Labor Force	(man-day)	105	110	180	120	190	275	30	35
3) Animal Power	(day)	13.9	14.1	4.4	3.0	19.2	20.8	2.8	2.8
4) Mechanical Power	(day)	2.9	3.1	3.2	2.5	0.5	-	-	-

Remarks: /1: Wet Season, /2: Dry Season, /3: Plant Cane, /4: Ratoon Cane, /5: Bitter Gourd, /6: Inter crops and sugarcane, /7: Pieces

Table 4.33(1) LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (WITH PROJECT CONDITION)

Item	Paddy						Sugarcane (Plant Cane)		
	W.S.			D.S.					
	F	H	T	F	H	T	F	H	T
1) Labor Force (M-D/ha)	50	55	105	52	58	110	22	158	180
- Nursery Preparation	5	-	5	5	-	5	-	-	-
- Land Preparation	11	3	14	11	3	14	2	1	3
- Transplanting/Planting	-	20	20	-	20	20	-	38	38
- Fertilizing	4	-	4	4	-	4	-	15	15
- Weeding/Cultivating	12	-	12	12	-	12	4	6	10
- Spraying	3	1	4	3	1	4	5	-	5
- Irrigating	4	-	4	6	-	6	10	-	10
- Harvesting	1	19	20	1	21	22	-	90	90/1
- Threshing	4	8	12	4	9	13	-	-	-
- Drying	3	2	5/1	3	2	5/1	-	-	-
- Others	3	2	5/1	3	2	5/1	1	8	9
2) Animal Power (day/ha)	11.8	2.1	13.9	11.8	2.3	14.1	4.4	-	4.4
- Nursery Preparation	1.0	0.1	1.1	1.1	0.1	1.2	1.4	-	1.4
- Land Preparation	10.8	2.0	12.8	10.7	2.2	12.9	3.0	-	3.0
- Cultivating	-	-	-	-	-	-	-	-	-
3) Mechanical Power (day/ha)	0.6	2.3	2.9	0.6	2.5	3.1	1.4	1.8	3.2
- Land Preparation	0.6	0.8	1.4	0.6	1.8	1.4	0.7	0.8	1.5
- Threshing	-	1.5	1.5	-	1.7	1.7	0.7	1.0	1.7
- Cultivating	-	-	-	-	-	-	-	-	-

Remarks: /1: Includes hauling

F = Family labor, H = Hired labor, T = Total labor

Table 4.33(2) LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (WITH PROJECT CONDITION)

Item	Sugarcane (Ratoon Cane)			Fruit Vegetables					
				Ampalaya			Tomato		
	F	H	T	F	H	T	F	H	T
1) Labor Force (M-D/ha)	17	103	120	141	49	190	167	108	275
- Land Preparation	-	-	-	21	-	21	21	-	21
- Seeding and planting	-	-	-	12	-	12	13	-	13
- Fertilizing	-	15	15	16	-	16	16	-	16
- Weeding and Cultivating	4	6	10	15	7	15	8	7	15
- Spraying	-	-	-	36	-	36	20	19	39
- Irrigating	10	-	10	6	-	6	6	-	6
- Harvesting and Hauling	-	75	75	24	24	48	62	62	124
- Stable Shaving	2	2	4	-	-	-	-	-	-
- Others	1	5	6	18	18	36	21	20	41
2) Animal Power (day/ha)	3.0	-	3.0	19.2	-	19.2	20.8	-	20.8
- Land Preparation	-	-	-	19.2	-	19.2	20.8	-	20.8
- Cultivating	3.0	-	3.0	-	-	-	-	-	-
3) Mechanical Power (day/ha)	1.1	1.4	2.5	0.5	-	-	-	-	-
- Land Preparation	-	-	-	0.5	-	-	-	-	-
- Cultivating	0.7	1.0	1.7	-	-	-	-	-	-
- Stable Shaving	0.4	0.4	0.8	-	-	-	-	-	-

Table 4.33(3) LABOR, ANIMAL POWER AND MECHANICAL POWER REQUIREMENT (WITH PROJECT CONDITION)

Item	Mongo/1			Peanut/1		
	F	H	T	F	H	T
1) Labor Force (M-D/ha)	9	21	30	9	26	35
- Land Preparation/2	3	-	3	3	-	3
- Seeding	3	-	3	3	-	3
- Fertilizing	-	1	1	-	1	1
- Weeding/Cultivating	-	10	10	-	10	10
- Spraying	2	-	2	2	-	2
- Harvesting	-	10	10	-	10	10
- Shelling	-	-	-	-	5	5
- Others	1	-	1	1	-	1
2) Animal Power (day)	2.8	-	2.8	2.8	-	2.8
- Land Preparation	2.8	-	2.8	2.8	-	2.8
3) Mechanical Power (day)	-	-	-	-	-	-

Remarks: /1: Inter crops with sugarcane.

/2: Land preparation shall consist of furrowing plus one additional harrowing. Plowing and normal harrowing to be charged against sugarcane.

Table 4.34 SECULAR TREND ANALYSIS FOR UNIT YIELD OF CROPS

Crops	Unit Yield (t/ha)						Correlation Coefficient
	1978	1979	1980	1981	1982	Average/1	
Irrigated Paddy							
- Wet Season	2.00	2.46	3.00	2.72	3.24	2.70	0.899
- Dry Season	2.35	3.03	2.89	2.60	3.16	2.80	0.572
Rainfed Paddy	1.95	1.91	1.96	2.05	1.90	1.96	0.106
Sugarcane							
- Plant Cane	38.92	33.84	31.78	41.22	46.11	38.13	0.598
- Ratoon Cane	29.86	26.82	27.56	34.01	37.20	31.25	0.783
Fruit Vegetables							
- Eggplant	17.18	9.89	20.63	25.40	13.00	17.22	0.185
- Squash	19.05	17.15	18.59	17.79	12.50	18.09	0.750
- Tomato	10.72	9.97	13.81	9.38	8.77	9.85	0.360
- Others	1.95	2.02	2.09	2.11	5.50	2.66	0.735
- Average of the above	13.48	10.55	10.55	9.31	7.86	10.53	0.953

Remarks: /1: Weight average (see Table 4.11)

Table 4.35 YIELD OF SUGARCANE IN TONS CANE PER HECTARE UNDER IRRIGATED CONDITION

(Unit: t/ha)

Treatment	Replication I	Replication II	Replication III	Average
1) Hacienda Esperanza				
L - 0	85.87	106.18	94.57	95.55
L - 1	101.96	109.46	87.68	99.70
L - 2	85.36	87.50	86.54	86.47
L - 3	85.14	96.78	70.43	84.12
2) Hacienda Fe				
L - 0	142.07	119.31	141.14	134.17
L - 1	141.03	114.08	107.85	120.99
L - 2	110.00	115.54	120.13	115.22
L - 3	120.68	146.48	138.84	134.00

Remarks: (1) Treatment indicates the following intercropping.

L - 0: No treatment
L - 1: Mongo beans
L - 2: Peanut
L - 3: Soybean

(2) Hacienda Esperanza and Fe are located at La Carlota Mill District, Negross Occidental.

(3) The soils in the experimental field are sandy loam to fine sandy loam.

(4) Application amount of fertilizer is 200 kg/ha for N, 175 kg/ha for P_2O_5 and 200 kg/ha for K_2O.

Source: ABADAY, L.C., Evaluation of the effects of irrigation practices on the yield of sugarcane intercropped with legumes, UPLB, 1980.

Table 4.36 PRODUCTION OF CROPS IN THE PROJECT AREA

Crops	Area (ha)	Unit Yield (t/ha)	Production (t)
I) Present Condition			
1) Paddy	16,490	2.55	42,060
- Irrigated (W.S.)	7,070	2.70	19,090
(D.S.)	5,360	2.80	15,010
- Rainfed (W.S.)	4,060	1.96	7,960
2) Fruit Vegetables	170	10.90	1,850
- Ampalaya	170	10.90	1,850
3) Sugarcane	5,900	34.22	201,900
- Plant cane	2,550	38.13	97,200
- Ratoon cane	3,350	31.25	104,700
II) Without Project			
1) Paddy	16,490	2.67	43,970
- Irrigated (W.S.)	7,070	2.97	21,000
(D.S.)	5,360	2.80	15,010
- Rainfed (W.S.)	4,060	1.96	7,960
2) Fruit Vegetables	170	10.90	1,850
- Ampalaya	170	10.90	1,850
3) Sugarcane	5,900	36.00	212,400
- Plant cane	2,550	38.13	97,200
- Ratoon cane	3,350	34.38	115,200
III) With Project			
1) Paddy	17,000	4.68	79,500
- Irrigated (W.S.)	11,000	4.50	49,500
(D.S.)	6,000	5.00	30,000
2) Fruit Vegetables	1,800	19.50	35,100
- Ampalaya	900	14.00	12,600
- Tomato	900	25.00	22,500
3) Sugarcane	5,750	80.00	460,000
4) Intercrops	5,750	0.63	3,600
- Mongo beans	2,875	0.50	1,440
- Peanut	2,875	0.75	2,160

Table 4.37 FORECAST OF MARKETABLE RICE IN THE PROJECT AREA

Item		1995	2000
I) Marketable Rice in the Project Area/1			
a) Rice Production			
- Paddy Production	(1,000 t)	79.5	79.5
- Less: Seed, Waste, etc.	(1,000 t)	8.6	8.6
- Paddy Available for Consumption	(1,000 t)	70.9	70.9
- Milling Recovery Ratio		0.67	0.67
- Rice Available for Consumption	(1,000 t)	47.5	47.5
b) Demand of Rice in the Project Area			
- Population	(1,000)	219	245
- Per Capita Consumption	(kg)	110	112
- Total Demand	(1,000 t)	24.1	27.4
c) Marketable Rice (a - b)	(1,000 t)	23.4	20.1
II) Deficit of Rice in Region IV/2	(1,000 t)	1,154.0	1,293.0
- As Percent of Marketable Rice/3	(%)	2.0	1.6

Remarks: /1: The marketable rice in the project area is estimated on the basis of the following assumptions.

- Annual population growth rate: 2.24%
- Waste and seed requirement: 10.8%
- Milling recovery ratio: 0.67
- Per capita consumptions: 110 kg in 1995, 112 kg in 2000 (See Table 4.27)

/2: Supply and Demand Forecasts for Rice, NIA, 1984.

/3: 20,300 t/1,293,000 t = 1.6%

Table 4.38 SUPPLY AND DEMAND FORECASTS FOR FRUIT VEGETABLES AND LEGUMES UNDER WITH PROJECT CONDITION

(Unit: ton)

Item	Fruit Vegetables			Legumes		
	1984	1995	2000	1984	1995	2000
1) Pampanga and Bataan						
- Supply	8,200	58,250	65,750	1,919	8,290	9,590
(From Project Area)/1	(1,850)	(35,100)	(35,100)	(-)	(3,600)	(3,600)
(From Other Area)/2	(6,350)	(23,150)	(30,650)	(1,919)	(4,690)	(5,990
- Demand/3	39,310	48,100	52,060	7,130	9,680	10,950
- Surplus	-31,110	10,150	13,690	-5,211	-1,390	-1,360
2) Region III						
- Supply	95,820	183,430	207,830	10,060	19,330	21,990
(From Project Area)/1	(1,850)	(35,100)	(35,100)	(-)	(3,600)	(3,600)
(From Other Area)/2	(93,970)	(148,330)	(172,730)	(10,060)	(15,730)	(18,390)
- Demand/3	125,920	155,160	168,450	23,440	31,690	35,760
- Surplus	-30,100	28,270	39,380	-13,380	-12,360	-13,770
3) Demand in Metro Manila/4	101,800	149,700	178,500	27,300	40,200	47,900
4) Market Share at Metro Manila (%)						
- Pampanga and Bataan	-	6.8	7.7	-	-	-
- Region III	-	18.9	22.1	-	-	-

Remarks: /1: Present condition (1984): Vegetables 170 ha x 10.9 t/ha = 1,850 t
With project condition (1995 - 2000): Vegetables; 1,800 ha x 19.5 t/ha = 35,100 t
Legumes ; 5,750 ha x 0.63 t/ha = 3,600 t

/2: Excluding production in the project area.

/3: See Table 4.17 and 4.18.

/4: See Table 4.19.

Table 4.39 ECONOMIC PRICE FOR PADDY, 1995 (1984 CONSTANT PRICE)

	Item	Export Parity Price
		(US$/ton)
1)	World market price/1 (5% broken)	409
2)	Less quality discount/2	57
3)	Import costs to Manila	-
4)	Export value (FOB Manila, 25 - 35% broken)	352
		(₱/ton)
		4,928/3
5)	Port charge	38
6)	NFA administration charge	60
7)	Transportation/4 (Manila - Rice mill)	130
8)	Wholesale price	4,700
9)	Milling cost/5	130
10)	Value of milling by-product	230
11)	Economic price of paddy at mill/6	3,216
12)	Costs of procurement, transportation and handling/7	30
13)	Farmgate price of paddy	3,186

Remarks: /1: World Bank long run projection for Thai, 5% broken FOB Bangkok.

/2: Estimated at 14% of world market price, as below.

Year	FOB Bangkok (US$/ton) 5%	25%	35%	Quality Discount 25% - 35%
1981	482	415	403	0.15
1982	293	249	248	0.15
1983	277	247	243	0.12
Average	351	304	298	0.14

Source: NFA Central Office

/3: US$ = ₱14.0

/4: Transportation costs are adjusted by 0.78 to reflect shadow price.
120 km x ₱1.4/km/ton x 0.78 = ₱130

/5: Milling costs are ₱6.5/bag (50 kg) for output, while by-products are valued at ₱230/ton of rice.

/6: Milling rate : 67%

(Refer 2.8.2)

/7: ₱1.5/cavan (50 kg) of paddy

Table 4.40 ECONOMIC PRICE FOR SUGARCANE, 1995
(1984 CONSTANT PRICE)

Item	Export Parity Price
	(US$/ton)
1) FOB Manila/1	447
	(₱/ton)
	6,258
2) Port charge/2	20
3) Transportation cost/3 (Floridablanca - Manila)	130
4) Ex-mill gate price of sugar	6,108
5) Milling cost/4	860
6) By-product/5	500
7) Economic price of sugarcane at mill/6	563
8) Transportation cost (Farm - Mill)	35
9) Farmgate price of sugarcane	528

Remarks: /1: Estimated on the basis of the Commodity Price Forecast by World Bank, 1983. (See Table 4.41 and Fig. 4.11)

/2: Philippine Port Authority

/3: Transportation costs are adjusted by 0.78 to reflect shadow price.

/4: Include costs of milling, storage and handling.

/5: Molases (data from NASUDECO)

/6: Recovery rate from sugarcane to sugar: 9.8%

Table 4.41 MANILA FOB PRICE OF SUGAR

(Unit: US$/ton)

Year	Workd Market Price/1		Manila FOB Price	
	Current	1984 Constant	Current/2	1984 Constant
	(1)	(2)	(3)	(2)/(1)x(3)
Actual				
1975	449	659	577	847
1976	255	368	283	408
1977	179	238	211	281
1978	172	194	170	192
1979	213	215	172	174
1980	632	590	365	341
1981	374	367	466	457
1982	186	185	342	340
Projected (Short Run)				
1983		193		223
1984		250		297
1985		297		358
Projected (Long Run)				
1990		365		447
1995		365		447/3

Remarks: /1: Commodity Price Forecast, World Bank, 1983.
/2: Data obtained from NASUTRA.
/3: See Fig. 4.11.

Table 4.42 ECONOMIC PRICE OF FERTILIZER, 1995
(1984 CONSTANT PRICE)

	Item	Import Parity Price		
		Urea	TSP	KCl
		(US$/ton)	(US$/ton)	(US$/ton)
1)	World market price/1	270	191	107
2)	Ocean freight and insurance	30	70	25
3)	CIF Manila	300	261	132
		(₱/ton)	(₱/ton)	(₱/ton)
		4,200	3,654	1,848
4)	Landing charge/2	100	100	100
5)	Bagging	-	-	100
	Land cost	4,300	3,754	2,048
6)	Transportation cost/3	109	109	109
7)	Operating expenses	120	120	120
8)	Industry margin (2%)	91	80	46
	Ex-warehouse cost	4,620	4,063	2,323
9)	Transport to dealer/3	22	22	22
10)	Handling	20	20	20
11)	Dealer's mark-up	80	80	80
12)	Transport to farmgate	20	20	20
	Economic price at farmgate	4,762	4,205	2,465
	Economic price per nutrient (₱/kg)	10.6	9.1	4.1

Remarks: /1: Workd Bank long run projection

Urea : FOB Europe
T.S.P.: FOB US Gulf

/2: Include port charge

/3: Transportation costs are adjusted by 0.78 to reflect shadow price.

100 km x ₱1.4/km/ton x 0.78 = ₱109
20 km x ₱1.4/km/ton x 0.78 = ₱22

Table 4.43 FINANCIAL AND ECONOMIC PRICES FOR AGRICULTURAL OUTPUTS AND INPUTS

Outputs and Inputs			Financial Price (1984)	Economic Price/1 (1995)
Outputs				
	- Paddy (export parity)	(₱/t)	1,740	3,186
	- Sugarcane	(")	184	528
	- Ampalaya	(")	2,600	2,600
	- Tomato	(")	2,000	2,000
	- Mongo beans	(")	5,000	5,000
	- Peanut	(")	4,000	4,000
Inputs				
(1) Seed	- Paddy	(₱/kg)	1.7	3.2
	- Sugarcane	(₱/1,000 pieces)	5.0	14.0
	- Ampalaya	(₱/kg)	83.0	83.0
	- Tomato	(")	100.0	100.0
	- Mongo beans	(")	5.0	5.0
	- Peanut	(")	4.0	4.0
(2) Fertilizer	- N	(₱/kg)	7.3	10.6
	- P_2O_5	(")	7.0/3	9.1
	- K_2O	(")	7.0/3	4.1
(3) Agro-chemicals/2	- Liquid	(₱/ℓ)	91	109
	- Granular	(₱/kg)	14	17
(4) Labor		(₱/day)	25	11/4
(5) Hired animal		(")	35	35
(6) Operation cost of farm machinery				
	- 4-wheel tractor	(₱/day)	400	400
	- Hand tractor	(")	175	175
(7) Irrigation cost				
	- Gravity: W.S.P. & D.S.P.	(₱/ha)	140/5	140/5
	- Pump : W.S.P.	(")	850	850
	: D.S.P.	(")	1,120	1,120
	: Vegetables	(")	650	650

Remarks: /1: 1984 Constant Price

/2: Economic price of agro-chemicals are estimated as below:

EP = FP x SP x IR

EP: Economic price of agro-chemicals
FP: Financial price of agro-chemicals
SP: Conversion factor for shadow price (0.83)
IR: Average increased rate of prices for fertilizers from 1984 to 1995 (1.44)

	1984 Constant Price 1984 (US$/t)	1984 Constant Price 1995 (US$/t)	Average Increased Rate
Urea	148	270	1.82
T.S.P.	155	191	1.23
KCl	84	107	1.27
Average			1.44

(Source: IBRD Price Projection)

/3: Estimated on the basis of compound fertilizer (14:14:14)

/4: Shadow wage rate: 0.44

/5: O&M cost of existing irrigation system

Table 4.44(1) NET RETURN PER HECTARE - WITHOUT PROJECT

Item	Unit	Unit Price (₱)	Irrigated Paddy: Gravity Irrigation Area (Wet Season)		Gravity Irrigation Area (Dry Season)		Pump Irrigation Area (Wet Season)	
I) Gross Income								
- Unit Yield	(ton/ha)			2.97		2.80		2.97
- Unit Price	(₱/ton)			3,186		3,186		3,186
- Gross Income	(₱)			9,462		8,921		9,462
II) Production Cost			Q'ty	Amount (₱)	Q'ty	Amount (₱)	Q'ty	Amount (₱)
1) Seed	(kg)	3.2	80	256	80	256	80	256
2) Fertilizer								
- N	(kg)	10.6	73	774	79	837	73	774
- P_2O_5	(kg)	9.1	6	55	6	55	6	55
- K_2O	(kg)	4.1	6	25	6	25	6	25
3) Agro-chemicals								
- Liquid	(ℓ)	109	2.2	240	2.3	251	2.2	240
- Granular	(kg)	17	5.5	94	5.0	85	5.5	94
4) Labor Input	(man-day)	11	84	924	85	935	84	924
5) Animal Power	(day)	35	13.9	487	14.1	494	13.9	487
6) Mechanical Power	(day)		2.4	420	2.4	420	2.4	420
7) Irrigation Cost								
- Gravity Irrigation				140		140		-
- Pump Irrigation				-		-		850
8) Miscellaneous				171		175		206
Total				3,586		3,673		4,331
III) Net Return				5,876		5,248		5,131

Table 4.44(2) NET RETURN PER HECTARE - WITHOUT PROJECT

Item	Unit	Unit Price (₱)	Irrigated Paddy Pump Irrigation Area (Dry Season)		Rainfed Paddy (Wet Season)		Sugarcane	
I) Gross Income								
- Unit Yield	(ton/ha)			2.80		1.96		36.00
- Unit Price	(₱/ton)			3,186		3,186		528
- Gross Income	(₱)			8,921		6,245		19,008
II) Production Cost			Q'ty	Amount (₱)	Q'ty	Amount (₱)	Q'ty	Amount (₱)
1) Seed	(kg)		80	256	85	272	15,050	211
2) Fertilizer								
- N	(kg)	10.6	79	837	46	488	106	1,124
- P2O5	(kg)	9.1	6	55	3	27	2	18
- K2O	(kg)	4.1	6	25	3	12	2	8
3) Agro-chemicals								
- Liquid	(ℓ)	109	2.3	251	2.4	262	-	-
- Granular	(kg)	17	5.0	85	-	-	-	-
4) Labor Input	(man-day)	11	85	935	76	836	75	825
5) Animal Power	(day)	35	14.1	494	15.8	553	3.6	126
6) Mechanical Power	(day)		2.4	420	2.5	438	2.6	1,040
7) Irrigation Cost								
- Gravity Irrigation				-		-		-
- Pump Irrigation				1,120		-		-
8) Miscellaneous				224		144		168
Total				4,702		3,032		3,520
III) Net Return				4,219		3,213		15,488

Table 4.44(3) NET RETURN PER HECTARE - WITHOUT PROJECT

Item	Unit	Unit Price (P)	Fruit Vegetables			
			Ampalaya		Tomato	
I) Gross Income						
- Unit Yield	(ton/ha)			10.90		9.85
- Unit Price	(P/ton)			2,600		2,000
- Gross Income	(P)			28,340		19,700
II) Production Cost			Q'ty	Amount (P)	Q'ty	Amount (P)
1) Seed	(kg)		2.7	224	1.0	100
2) Fertilizer						
- N	(kg)	10.6	370	3,922	80	848
- P_2O_5	(kg)	9.1	110	1,001	-	-
- K_2O	(kg)	4.1	80	328	-	-
3) Agro-chemicals						
- Liquid	(ℓ)	109	6.8	741	8.4	916
- Granular	(kg)	17	0.8	14	-	-
4) Labor Input	(man-day)	11	182	2,002	193	2,123
5) Animal Power	(day)	35	19.2	672	20.8	728
6) Mechanical Power	(day)		0.5	88	-	-
7) Irrigation Cost						
- Gravity Irrigation				-		-
- Pump Irrigation				650		650
8) Miscellaneous				482		268
Total				10,124		5,633
III) Net Return				18,216		14,067

Table 4.45(1) NET RETURN PER HECTARE - WITH PROJECT

Item	Unit	Unit Price (₱)	Irrigated Paddy				Sugarcane	
			Wet Season		Dry Season			
I) Gross Income								
- Unit Yield	(ton/ha)			4.5		5.0		80
- Unit Price	(₱/ton)			3,186		3,186		528
- Gross Income	(₱)			14,337		15,930		42,240
II) Production Cost			Q'ty	Amount (₱)	Q'ty	Amount (₱)	Q'ty	Amount (₱)
1) Seed	(kg)		60	192	60	192	11,670/1	163
2) Fertilizer								
- N	(kg)	10.6	80	848	90	954	200	2,120
- P_2O_5	(kg)	9.1	30	273	30	273	100	910
- K_2O	(kg)	4.1	30	123	30	123	220	902
3) Agro-chemicals								
- Liquid	(ℓ)	109	3	327	3	327	2	218
- Granular	(kg)	17	10	170	10	170	-	-
4) Labor Input	(man-day)	11	105	1,155	110	1,210	140	1,540
5) Animal Power	(day)	35	13.9	487	14.1	494	3.5	123
6) Mechanical Power	(day)	-	2.9	508	3.1	543	2.7	1,080
7) Irrigation Cost								
- Gravity Irrigation				-		-		-
- Pump Irrigation				-		-		-
8) Miscellaneous				204		214		353
Total				4,287		4,500		7,409
III) Net Return				10,050		11,430		34,831

Remarks: /1: Pieces

Table 4.45(2) NET RETURN PER HECTARE - WITH PROJECT

Item	Unit	Unit Price (P)	Ampalaya		Tomato	
I) Gross Income						
- Unit Yield	(ton/ha)			14		25
- Unit Price	(P/ton)			2,600		2,000
- Gross Income	(P)			36,400		50,000
II) Production Cost			Q'ty	Amount (P)	Q'ty	Amount (P)
1) Seed	(kg)		3	249	1	100
2) Fertilizer						
- N	(kg)	10.6	120	1,272	100	1,060
- P_2O_5	(kg)	9.1	120	1,092	190	1,729
- K_2O	(kg)	4.1	120	492	100	410
3) Agro-chemicals						
- Liquid	(ℓ)	109	10	1,090	12	1,308
- Granular	(kg)	17	-	-	-	
4) Labor Input	(man-day)	11	190	2,090	275	3,025
5) Animal Power	(day)	35	19.2	672	20.8	728
6) Mechanical Power	(day)		0.5	88	-	-
7) Irrigation Cost						
- Gravity Irrigation			-	-	-	-
- Pump Irrigation			-	-	-	-
8) Miscellaneous				352		418
Total				7,397		8,778
III) Net Return				29,003		41,222

Table 4.45(3) NET RETURN PER HECTARE - WITH PROJECT

Item	Unit	Unit Price (P)	Mongo		Peanut	
I) Gross Income						
- Unit Yield	(ton/ha)			0.50		0.75
- Unit Price	(P/ton)			5,000		4,000
- Gross Income	(P)			2,500		3,000
II) Production Cost			Q'ty	Amount (P)	Q'ty	Amount (P)
1) Seed	(kg)		18	90	80	320
2) Fertilizer						
- N	(kg)	10.6	14	148	14	148
- P_2O_5	(kg)	9.4	14	132	14	132
- K_2O	(kg)	4.1	14	57	14	57
3) Agro-chemicals						
- Liquid	(ℓ)	109	1.4	153	1.4	153
- Granular	(kg)	17	-	-	-	-
4) Labor Input	(man-day)	11	30	330	35	385
5) Animal Power	(day)	35	2.8	98	2.8	98
6) Mechanical Power	(day)		-	-	-	-
7) Irrigation Cost						
- Gravity Irrigation			-	-	-	-
- Pump Irrigation			-	-	-	-
8) Miscellaneous				50		65
Total				1,058		1,358
III) Net Return				1,442		1,642

Table 4.46 IRRIGATION BENEFIT

Crops	With Project			Without Project			Benefit
	Area/3 (ha)	Net Return (P/ha)	Total Value (P10³)	Area/3 (ha)	Net Return (P/ha)	Total Value (P10³)	(P10³)
Paddy Field			242,333			83,152	158,181
Wet Season Paddy							
- Gravity Irrigation Area	11,000	10,050	110,550	5,970	5,876	35,080	
- Pump Irrigation Area	-	-	-	1,100	5,131	5,644	
- Rainfed Area	-	-	-	4,060	3,213	13,045	
Dry Season Paddy							
- Gravity Irrigation Area	6,000	11,430	68,580	4,540	5,248	23,826	
- Pump Irrigation Area	-	-	-	820	4,219	3,460	
Diversified Crops (Fruit Vegetables)	1,800	35,133/1	63,203	170	18,216	3,097	
Sugarcane Field			209,145			91,379	117,766
Sugarcane	5,750	34,831/2	200,278	5,900	15,488/2	91,379	
Intercrops	(5,750)	1,542	8,867	-	-	-	
Total			451,478			175,531	275,947

Remarks: /1: Average net return of ampalaya and tomato.

/2: Average net return of plant cane and ratoon cane.

/3: See Table 4.36.

Table 4.47(1) TYPICAL FARM BUDGET UNDER WITHOUT PROJECT CONDITION

(1) Rice Cultivation Farmer (Lessess)
Irrigated Land
Farm Size: 1.3 ha

Item		Amount (₱)
I) Gross Income		33,140
1) Farm Income		13,940
- Wet Season Paddy	(1.3 ha x 2.97 t x ₱1,740)	6,720
- Dry Season Paddy	(1.3 ha x 2.80 t x ₱1,740)	6,330
- Livestock		890
2) Off Farm Income/1		19,200
II) Gross Outgo		32,700
1) Production Cost		10,200
- Seed	(208 kg x ₱2.18)	453
- Fertilizers		
N	(198 kg x ₱7.3)	1,445
P_2O_5	(16 kg x ₱7.0)	112
K_2O	(16 kg x ₱7.0)	112
- Agro-chemicals		
Liquid	(5.9 ℓ x ₱91)	537
Granular	(13.7 kg x ₱14)	192
- Hired Labor/2	(64 man-days x ₱25)	1,600
- Hired Animal	(5.7 days x ₱35)	200
- Machinery	(3.6 days x ₱175)	630
- Harvesting and Threshing	(7.5 t x 1/7 x ₱1,740)	1,864
- Irrigation Fee/3		266
- Land Rent/4		2,219
- Interest		56
- Miscellaneous		514
2) Living Expenses		22,500
- Food		12,800
- Non-food		9,700
III) Net Reserve/Capacity to Pay		440

Remarks: /1: Includes wage earning from work on other farm and non-farm work, and remittance from their family working at Metro Manila, abroad, etc.

/2: Excludes harvesting and threshing.

/3: 6.5 Cavans x ₱87/Cavan x 47% (Collection Efficiency)

/4: 17% of total gross income from rice cultivation.

Table 4.47(2) TYPICAL FARM BUDGET UNDER WITHOUT PROJECT CONDITION

(2) Rice Cultivation Farmer (Lessess)
Rainfed Land
Farm Size: 1.3 ha

Item		Amount (₱)
I) Gross Income		25,920
1) Farm Income		5,320
- Wet Season Paddy	(1.3 ha x 1.96 t x ₱1,740)	4,430
- Livestock		890
2) Off-farm Income/1		20,600
II) Gross Outgo		25,900
1) Production Cost		3,400
- Seed	(111 kg x ₱2.18)	242
- Fertilizers		
N	(60 kg x ₱7.3)	438
P_2O_5	(4 kg x ₱7.0)	28
K_2O	(4 kg x ₱7.0)	28
- Agro-chemicals		
Liquid	(3.1 ℓ x ₱91)	282
- Hired Labor/2	(20 man-days x ₱2.5)	500
- Hired Animal	(0.3 days x ₱35)	11
- Machinery	(2.0 days x ₱175)	350
- Harvesting and Threshing	(2.55 t x 1/7 x ₱1,740)	634
- Land Rent		652
- Interest		56
- Miscellaneous		179
2) Living Expenses		22,500
- Food		12,800
- Non-food		9,700
III) Net Reserve/Capacity to Pay		20

Remarks: /1: Includes wage earning from work on other farm and non-farm works, and remittance from their family working at Metro Manila, abroad, etc.

/2: Excludes harvesting and threshing.

Table 4.47(3) TYPICAL FARM BUDGET UNDER WITHOUT PROJECT CONDITION

(3) Sugarcane Planter (Owner Operator)
Farm Size: 4.0 ha

Item		Amount (₱)
I) Gross Income		42,870
1) Farm Income		27,370
- Plant Cane	(1.7 ha x 38.13 t x ₱184)	11,930
- Ratoon Cane	(1.7 ha x 34.38 t x ₱184)	14,550
- Livestock		890
2) Off-farm Income/1		15,500
II) Gross Outgo		41,800
1) Production Cost		20,900
- Seed Cane	(59,500 pieces x ₱5/1,000 pieces)	298
- Fertilizers		
N	(423 kg x ₱7.3)	3,088
P_2O_5	(9 kg x ₱7.0)	63
K_2O	(7 kg x ₱7.0)	49
- Hired Labor	(275 man-days x ₱25)	6,875
- Machinery	(10.3 days x ₱400)	4,120
- Transportation Cost/2	(144 t x ₱20)	2,880
- Tax, Insurance, etc./3	(144 t x ₱11)	1,584
- Interest/4		933
- Miscellaneous		1,010
2) Living Expenses		20,900
- Food		9,400
- Non-food		11,500
III) Net Reserve/Capacity to Pay		1,070

Remarks: /1: Includes wage earning from work on other farm and non-farm work, and remittance from their family work at Metro Manila, abroad, etc.

/2: Transportation of sugarcane from farm to mill.

/3: Cost for Quedan

/4: 9% (half year interest) of costs for fertilizers, machinery and hired labor excluding harvesting.

Table 4.48(1) TYPICAL FARM BUDGET UNDER WITH PROJECT CONDITION

(1) Rice Cultivation Farmer (Lessess)
Paddy with Fruit Vegetables
Farm Size: 1.3 ha

Item			Amount (₱)
I) Gross Income			46,220
1) Farm Income			26,320
- Wet Season Paddy		(1.30 ha x 4.5 t x ₱1,740)	10,180
- Dry Season Paddy		(0.71 ha x 5.0 t x ₱1,740)	6,180
- Fruit Vegetables/1		(0.21 ha)	9,070
- Livestock			890
2) Off-farm Income/2			19,900
II) Gross Outgo			37,100
1) Production Cost			14,600
- Seed			246
- Fertilizers:	N	(184 kg x ₱7.3)	1,343
	P_2O_5	(93 kg x ₱7.0)	651
	K_2O	(83 kg x ₱7.0)	581
- Agro-chemicals:	Liquid	(8.3 ℓ x ₱91)	755
	Granular	(20 kg x ₱14)	280
- Hired Labor/3		(73 man-days x ₱25)	1,825
- Hired Animal		(4.4 days x ₱35)	154
- Machinery		(2.9 days x ₱175)	508
- Harvesting and Threshing		(9.4 t x 1/7 x ₱1,740)	2,337
- Irrigation Fee/4			509
- Land Rent/5			4,323
- Interest/6			331
- Miscellaneous			707
2) Living Expenses			22,500
- Food			12,800
- Non-food			9,700
III) Net Reserve/Capacity to Pay			9,120

Remarks: /1: Average of gross incomes from ampalaya and tomato.

Ampalaya:	0.105 ha x 14 t x ₱2,600 =	₱3,820
Tomato :	0.105 ha x 25 t x ₱2,000 =	₱5,250
Total		₱9,070

Cultivation area of fruit vegetables was set to 16.4% of the area of wet season paddy on the basis of the cropping ratio of this crops to wet season paddy:

1,800 ha/11,000 ha = 0.164

/2: Average of farmers in irrigated land and rainfed land at present condition.

/3: Excludes harvesting and threshing for rice cultivation.

/4: 6.5 cavans x ₱87 x 0.9 (except for back payment at full payment condition).

/5: 17% of total gross income from rice and fruit vegetable cultivation.

/6: 6% of costs for seed, fertilizers, agro-chemicals, hired labor excluding harvesting and threshing, hired animal and machinery.

Table 4.48(2) TYPICAL FARM BUDGET UNDER WITH PROJECT CONDITION

(3) Sugarcane Planter (Owner Operator)
Farm Size: 4.0 ha

Item			Amount (₱)
I)	Gross Income		86,270
	1) Farm Income		70,770
	- Plant Cane	(4.0 ha x 1/3 x 90 t x ₱184)	22,080
	- Ratoon Cane	(4.0 ha x 2/3 x 75 t x ₱184)	36,800
	- Inter Crops/1		11,000
	- Livestock		890
	2) Off-farm Income/2		15,500
II)	Gross Outgo		74,900
	1) Production Cost		54,000
	- Seed/3		1,054
	- Fertilizers: N	(856 kg x ₱7.3)	6,249
	P_2O_5	(456 kg x ₱7.0)	3,192
	K_2O	(936 kg x ₱7.0)	6,552
	- Agro-chemicals	(13.6 ℓ x ₱91)	1,238
	- Hired Labor	(579 man-days x ₱25)	14,475
	- Machinery	(10.9 days x ₱400)	4,360
	- Transportation/4	(320 t x ₱20)	6,400
	- Tax, Insurance, etc./5	(320 t x ₱11)	3,520
	- Irrigation Fee/6		1,879
	- Interest/7		2,509
	- Miscellaneous		2,572
	2) Living Expenses		20,900
	- Food		9,400
	- Non-food		11,500
III)	Net Reserve/Capacity to Pay		11,370

Remarks: /1: Average of gross incomes from mongo and peanut.

Mongo :	2.0 ha x 0.5 t/ha x ₱5,000	= ₱5,000
Peanut:	2.0 ha x 0.75 t/ha x ₱4,000	= ₱6,000
Total		₱11,000

/2: Estimated at the same income as the present condition.

/3: Sugarcane: 35,000 pieces/ha x 4 ha x 1/3 x ₱5/1,000 pieces = ₱234
Mongo : 18 kg/ha x 2 ha x ₱5/kg = ₱180
Peanut : 80 kg/ha x 2 ha x ₱4/kg = ₱640

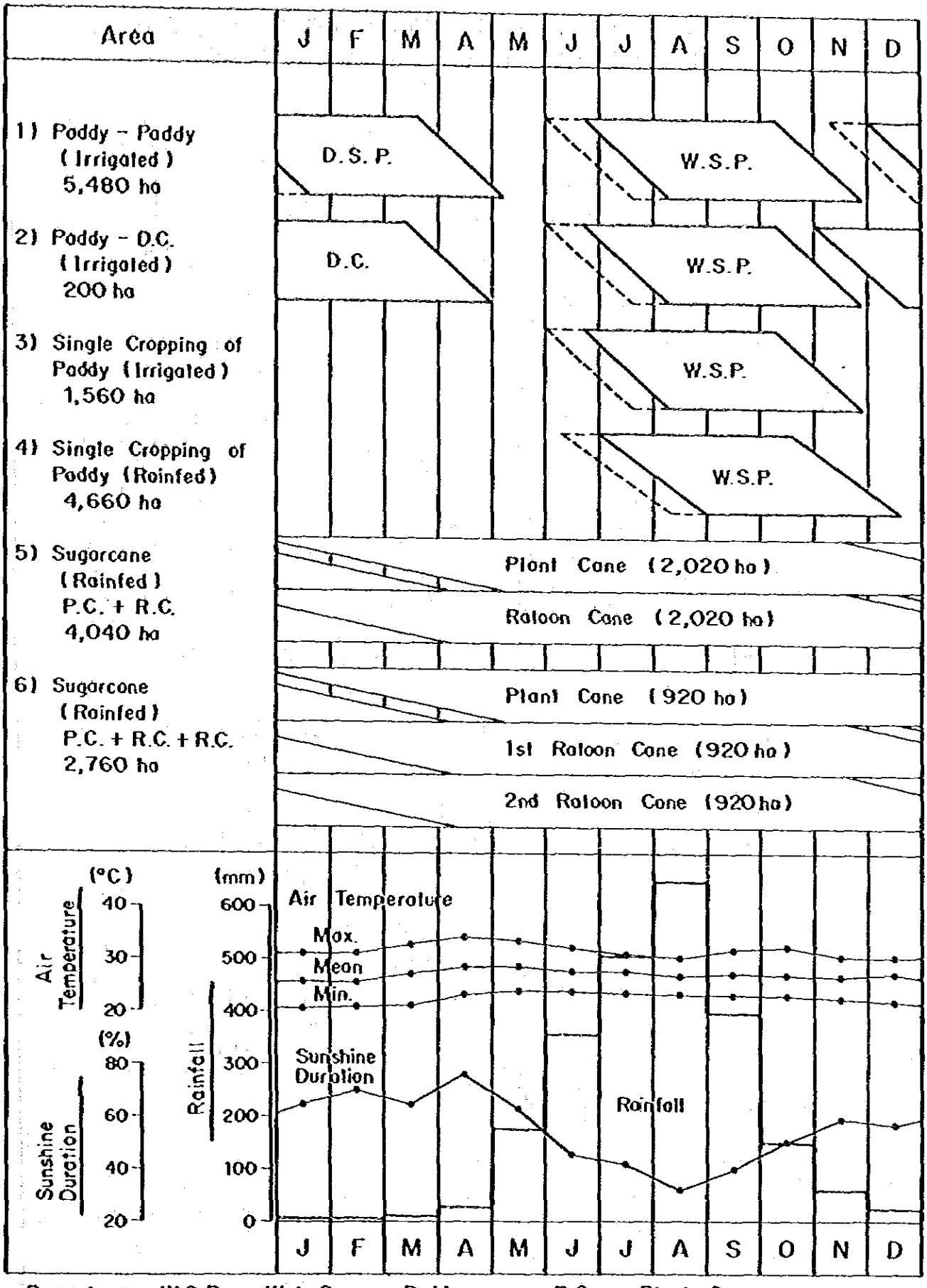
/4: Transportation from farm to sugar mill.

/5: Cost for Quedan

/6: 6 cavans x 4 ha x ₱87 x 0.9 (except for back payment at full payment condition).

/7: 9% (half year interest) of costs for seed of mongo and peanut, fertilizers, agro-chemicals, machinery and hired labor excluding harvesting.

Fig.4.1 PRESENT CROPPING PATTERN



Remarks : W.S.P. — Wet Season Paddy
D.S.P. — Dry Season Paddy
D.C. — Diversified Crops
P.C. — Plant Cane
R.C. — Ratoon Cane

Fig. 4.2 LOCATION MAP OF SAMPLING SITES FOR RICE YIELD SURVEY IN WET SEASON

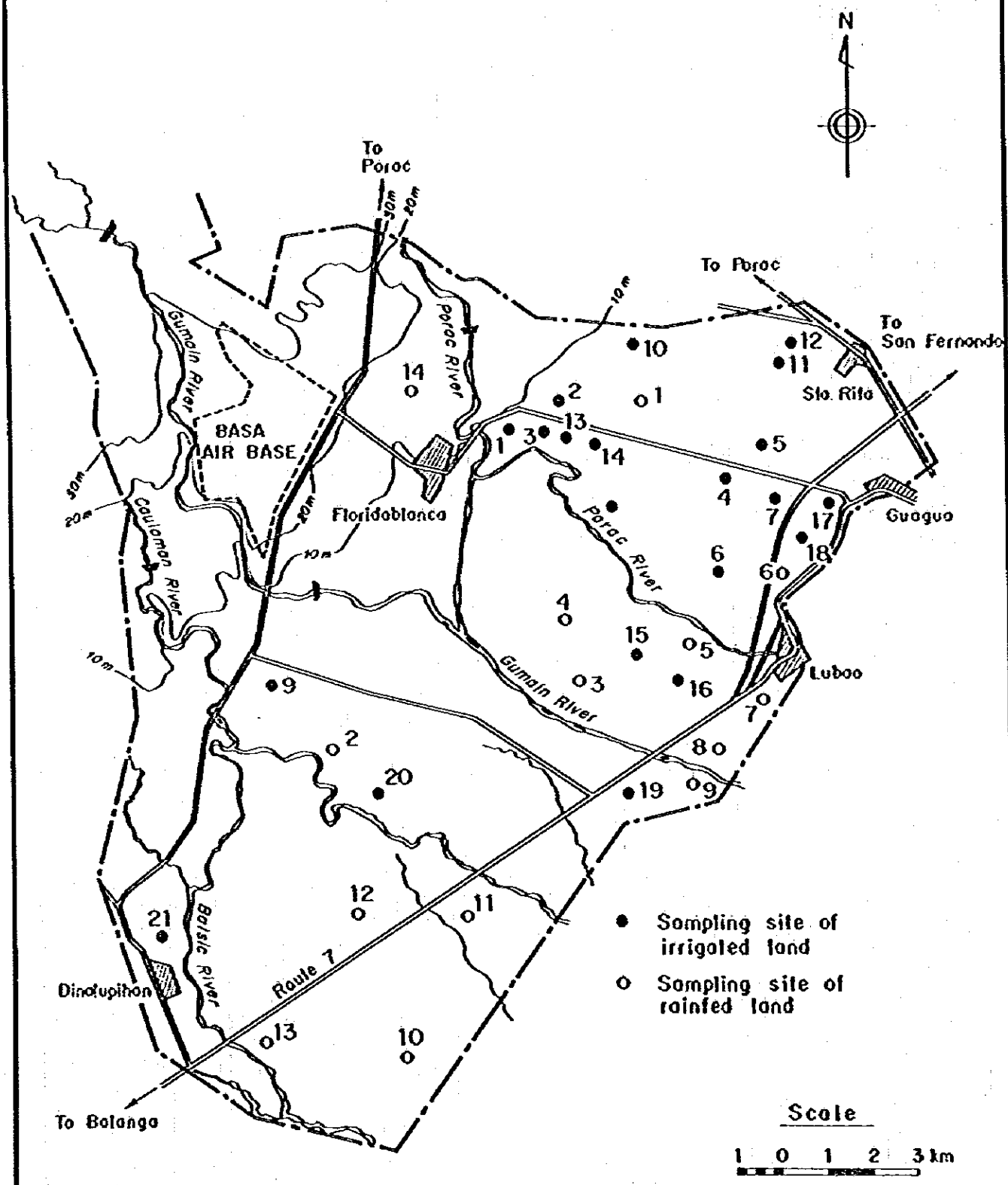


Fig. 4.3 PROCEDURE OF YIELD SURVEY AND ANALYSIS

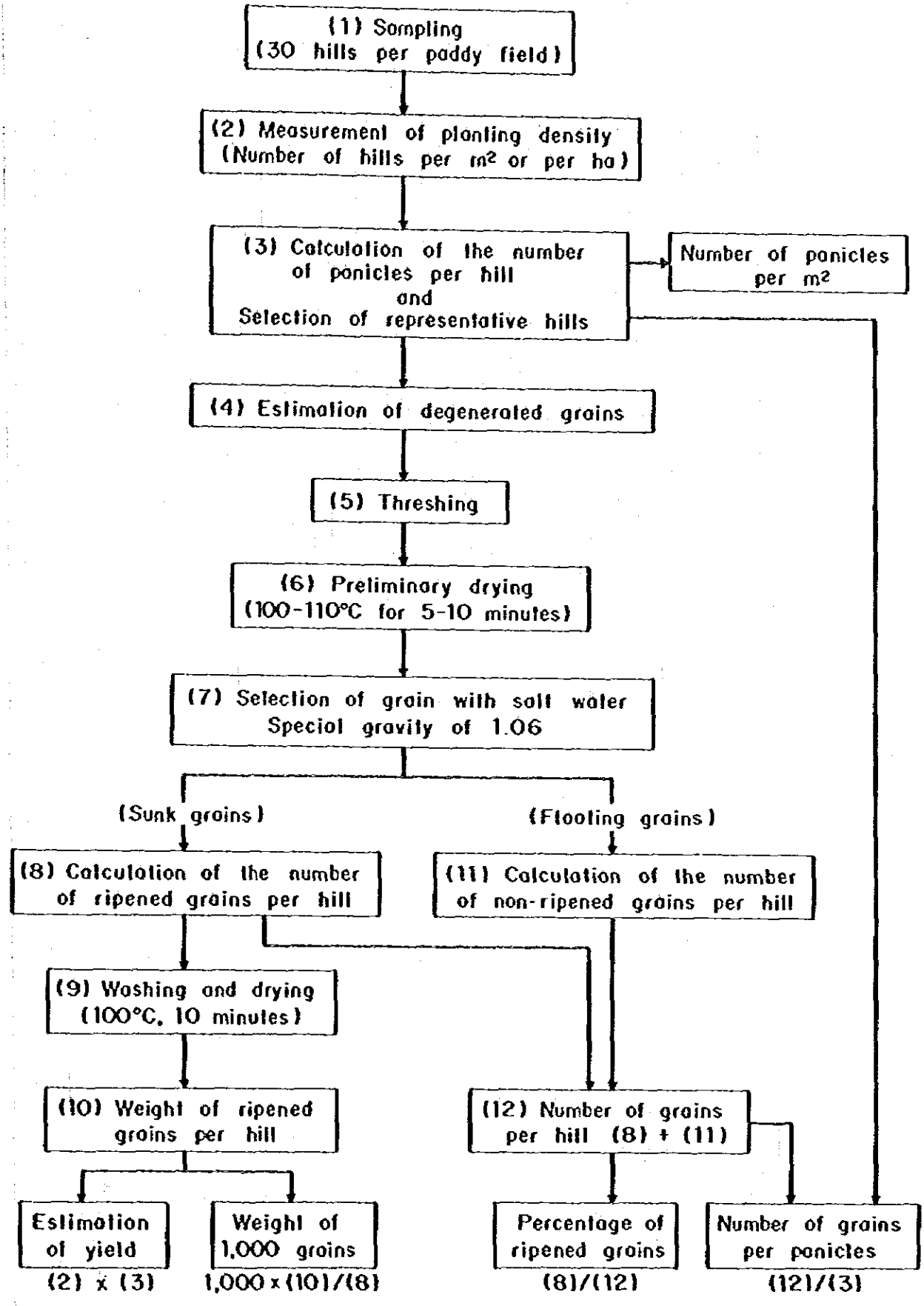
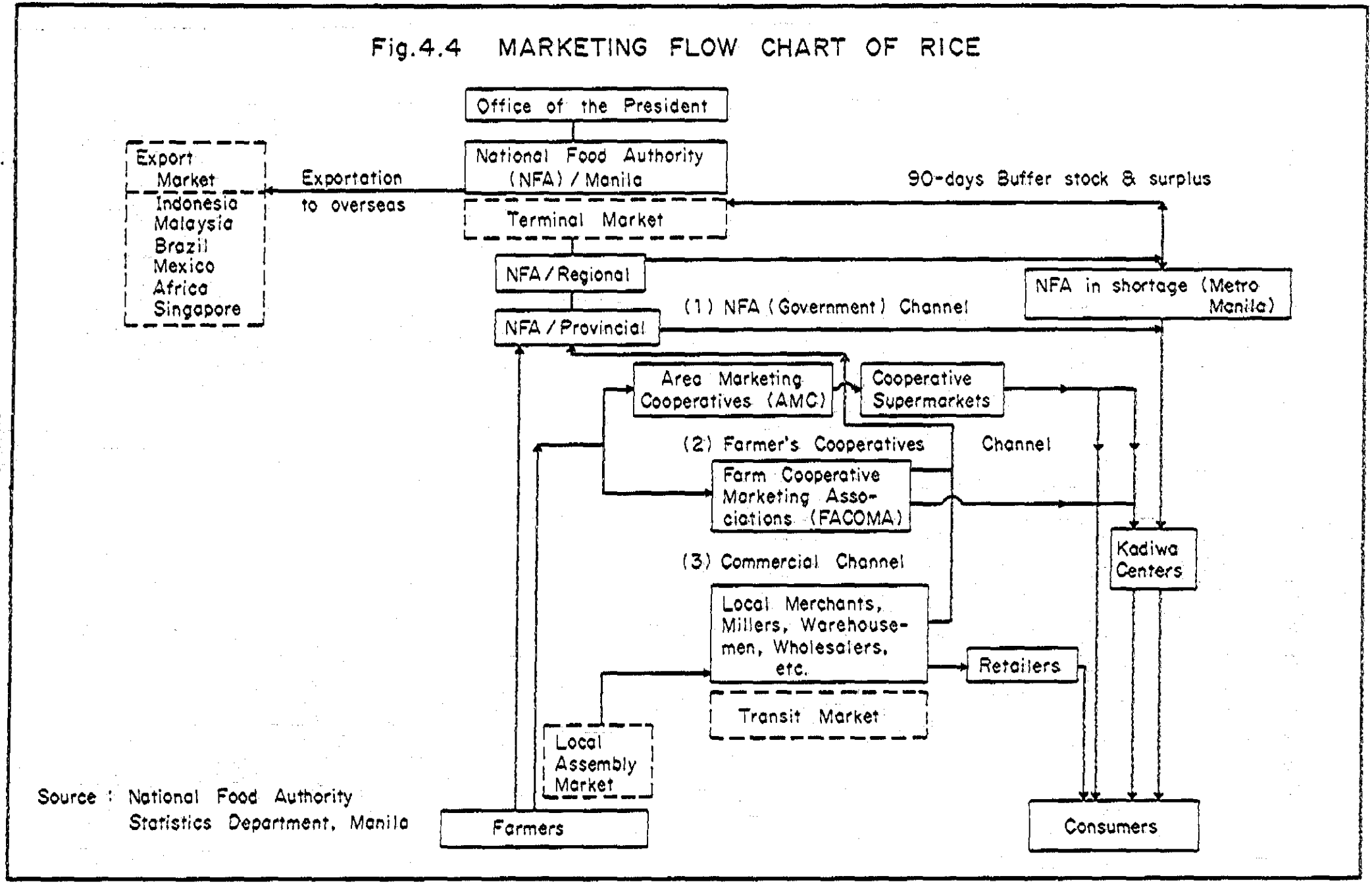


Fig.4.4 MARKETING FLOW CHART OF RICE



Source : National Food Authority
Statistics Department, Manila

Fig. 4.5 MARKETING FLOW CHART OF SUGAR

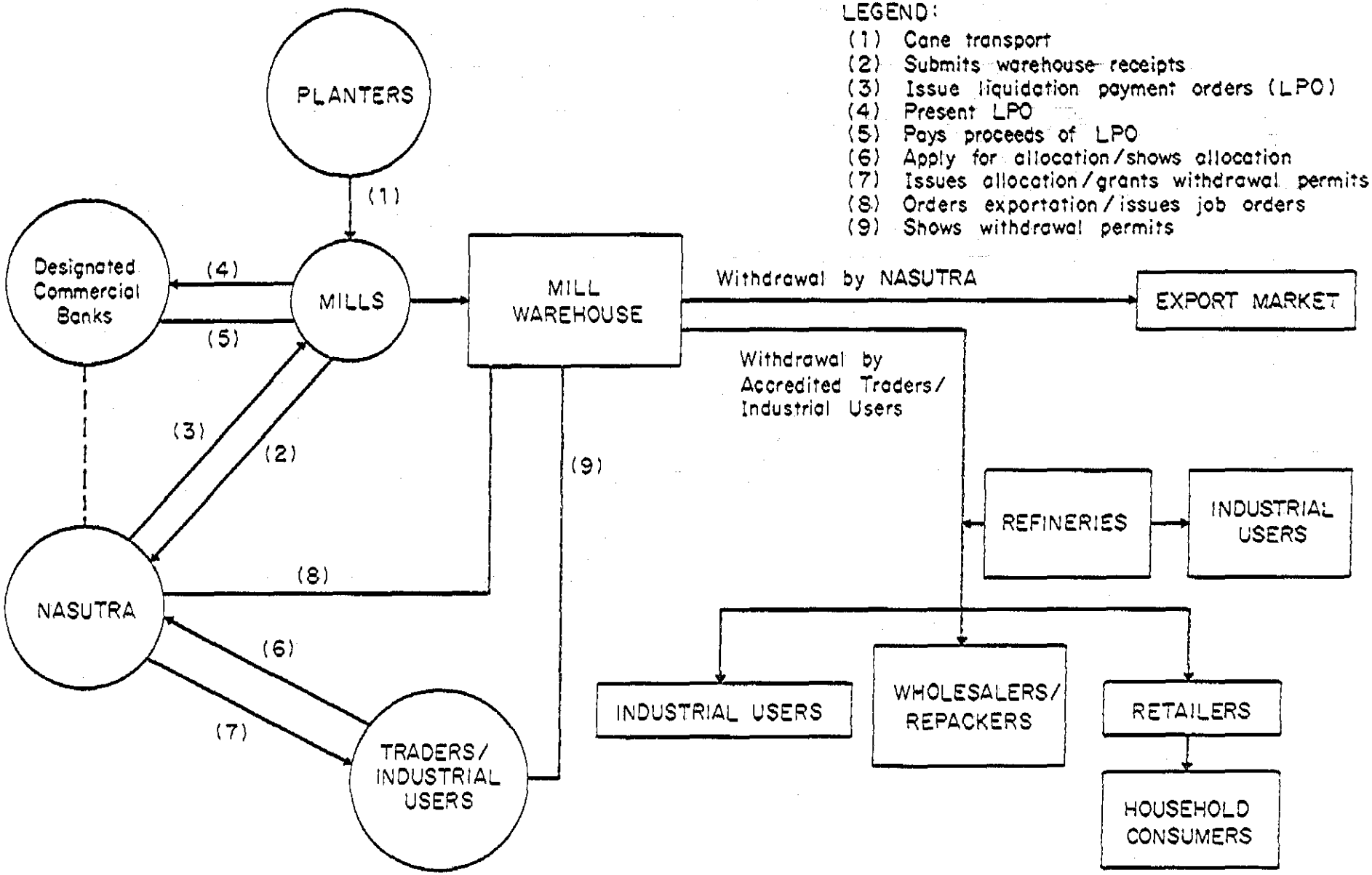
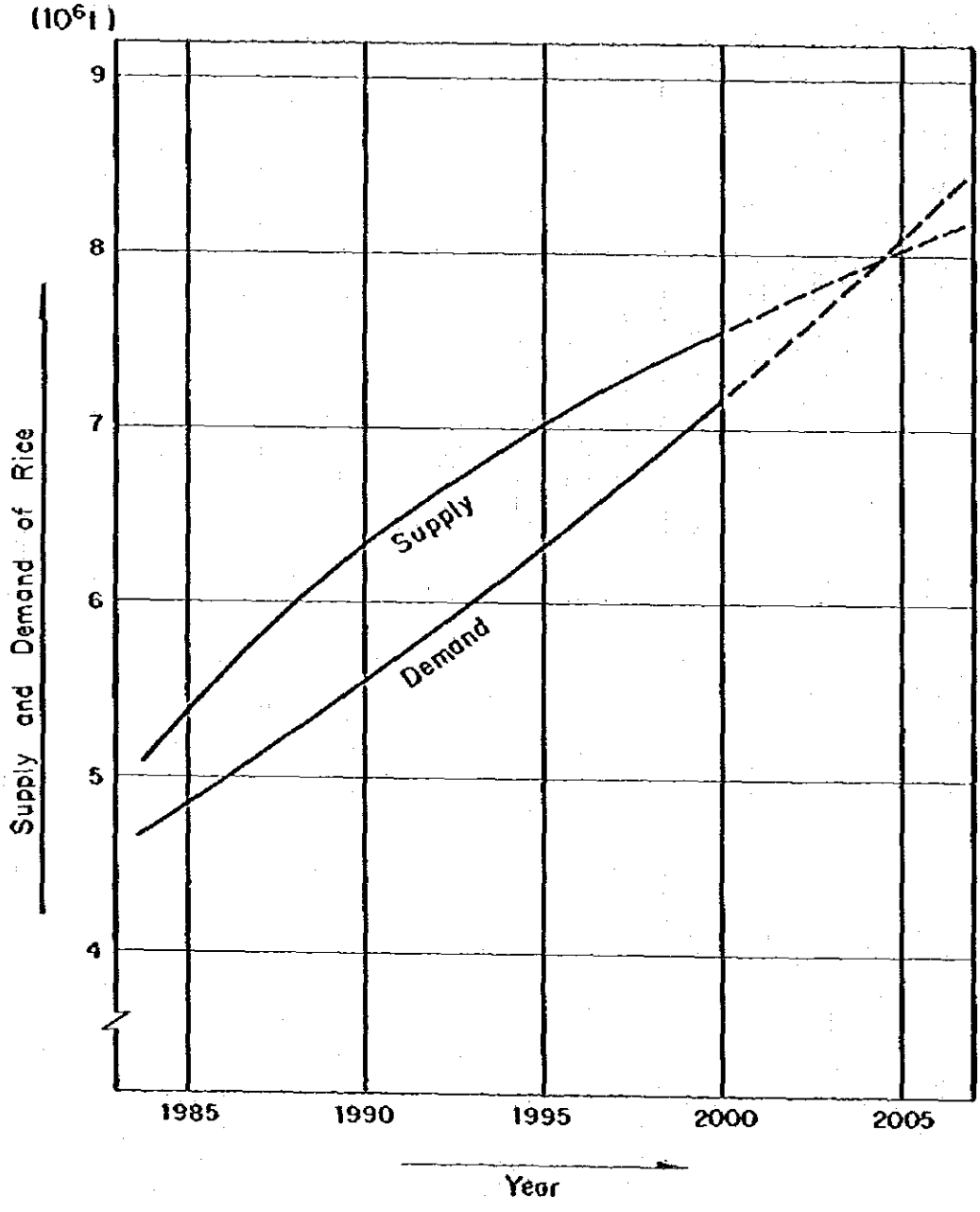


Fig. 4.6 RICE SUPPLY AND DEMAND PROJECTIONS



Source : Corporate Plan 1983 – 1992, Version 3.1/1983, NIA, May, 1983.

Fig. 4.7 OVERALL DEVELOPMENT ORGANIZATION FOR AGRICULTURAL & FOOD PRODUCTION

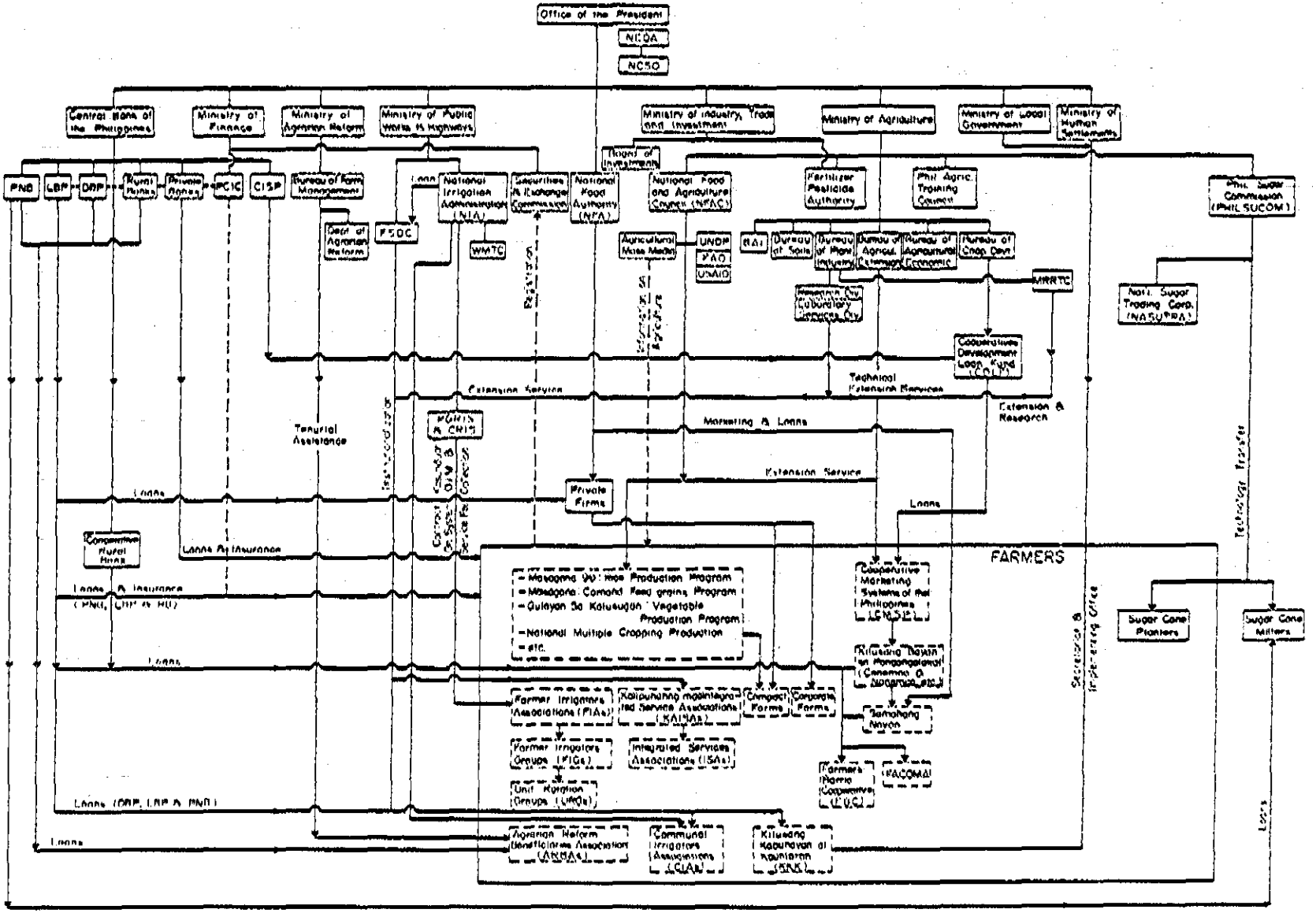
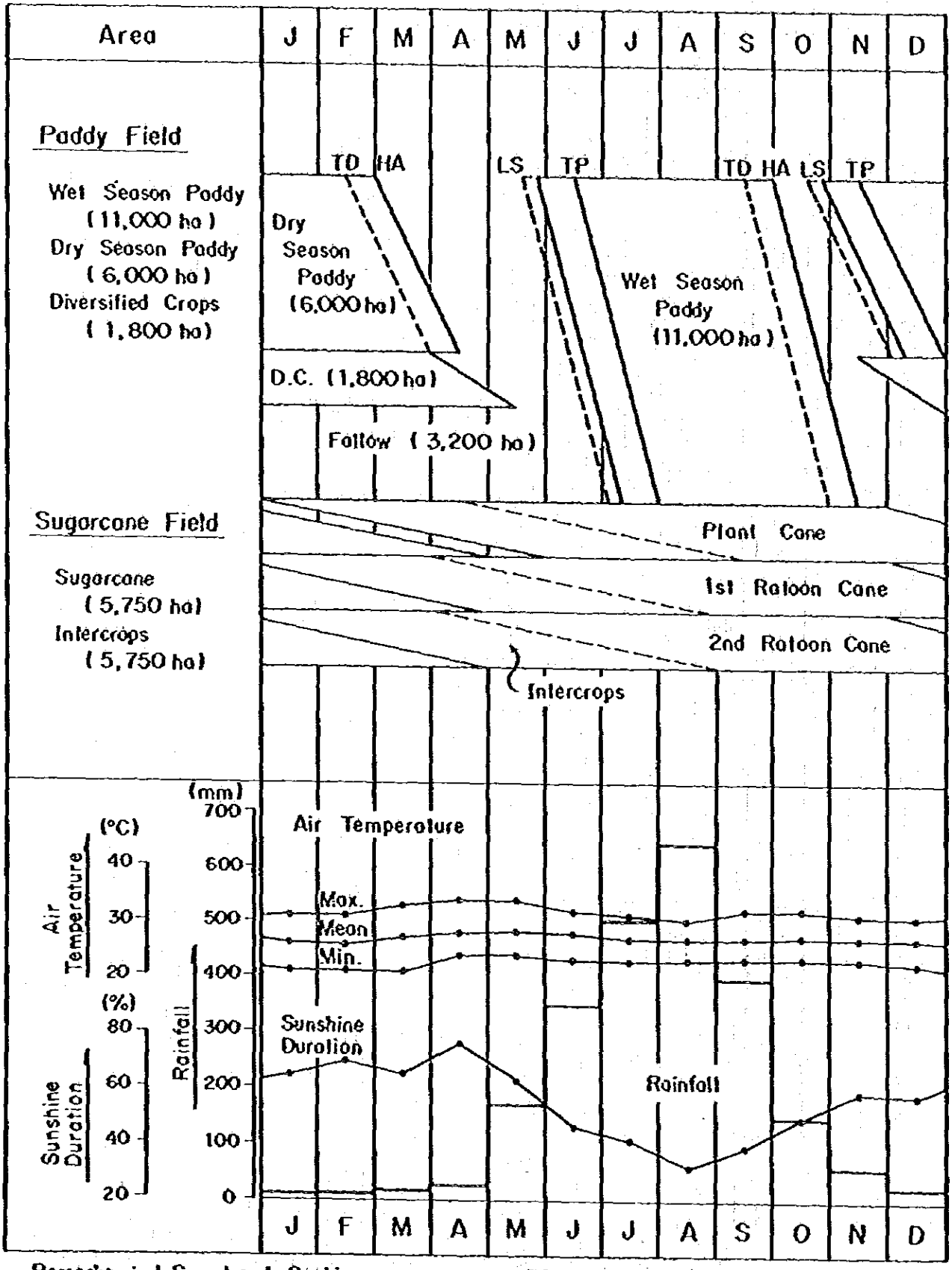


Fig. 4.8 PROPOSED CROPPING PATTERN



Remarks : LS – Land Soaking
TD – Terminal Drainage
TP – Transplanting
HA – Harvesting
D.C. – Diversified Crops (Fruit Vegetables)

Fig. 4.9 EFFECTS OF VARYING LEVELS OF "N" ON THE YIELD OF RICE VARIETIES

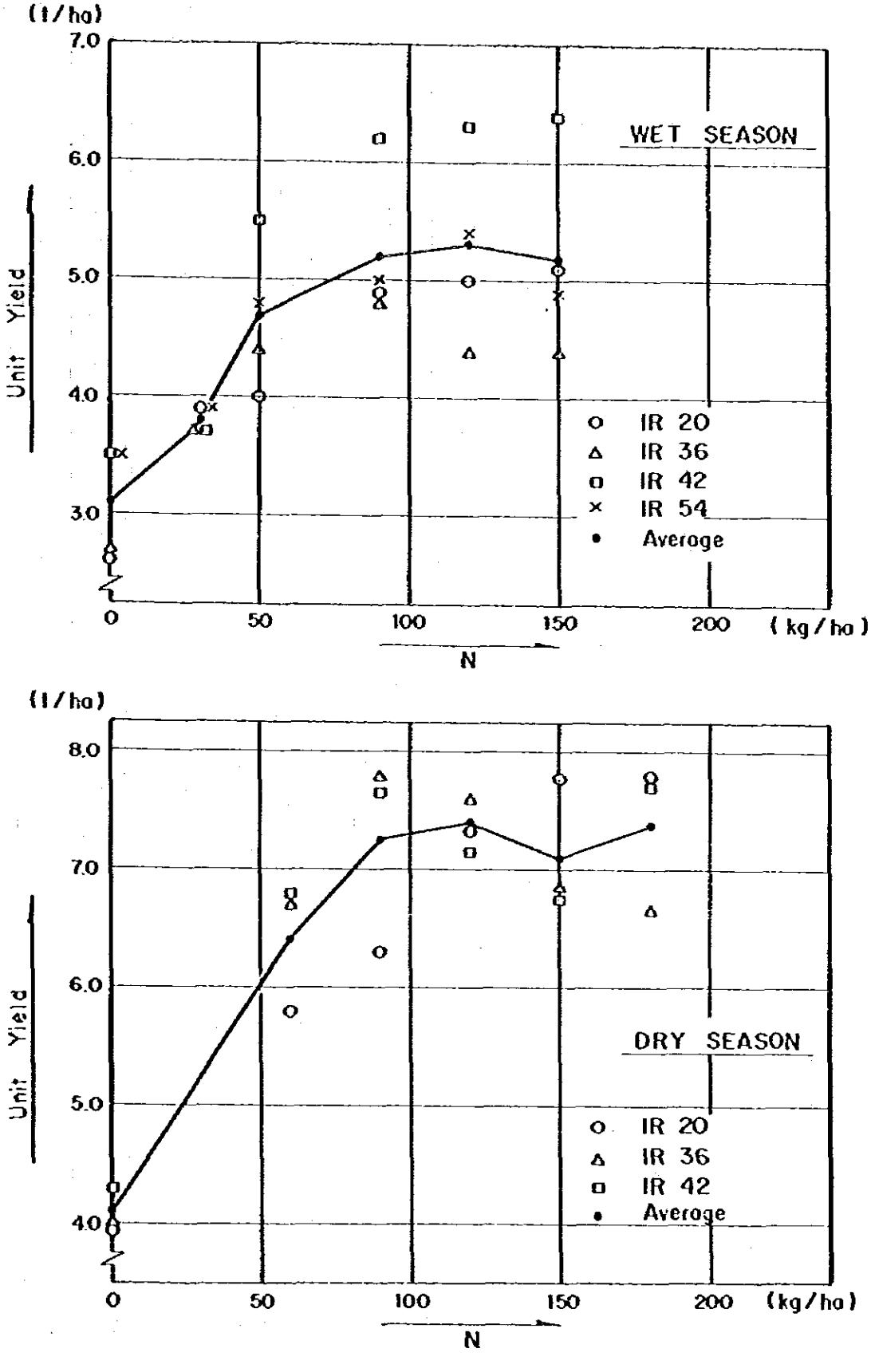


Fig. 4.10 (1) EFFECTS OF FOUR RATES ON N, P AND K FERTILIZATION ON THE YIELD OF THE PLANT CANE

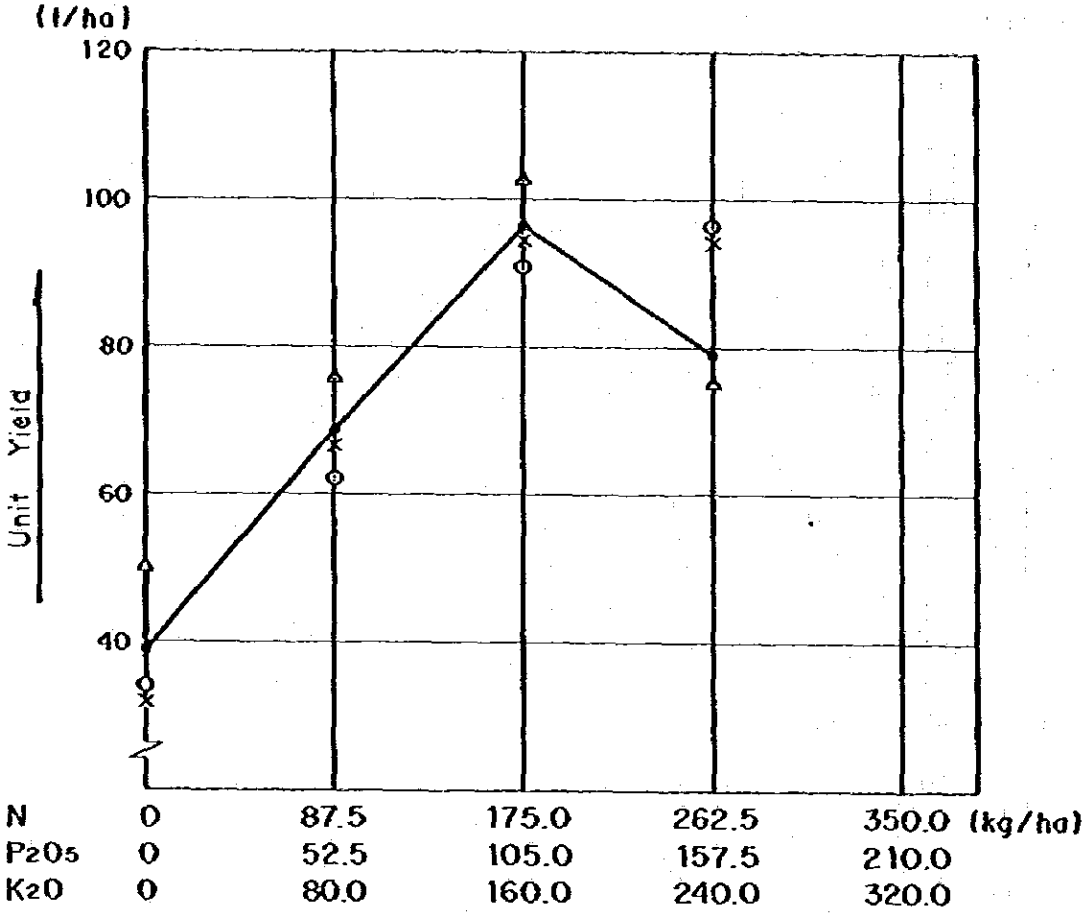


Fig. 4.10 (2) EFFECTS OF PHOSPHORUS FERTILIZATION ON THE DRY MATTER YIELD OF PHIL 58260

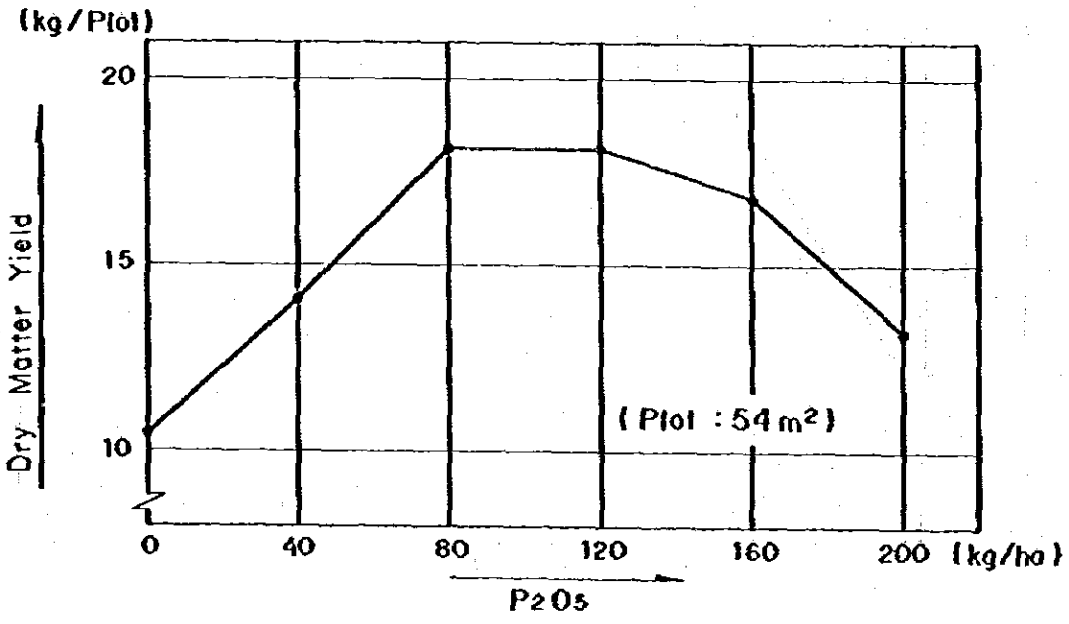
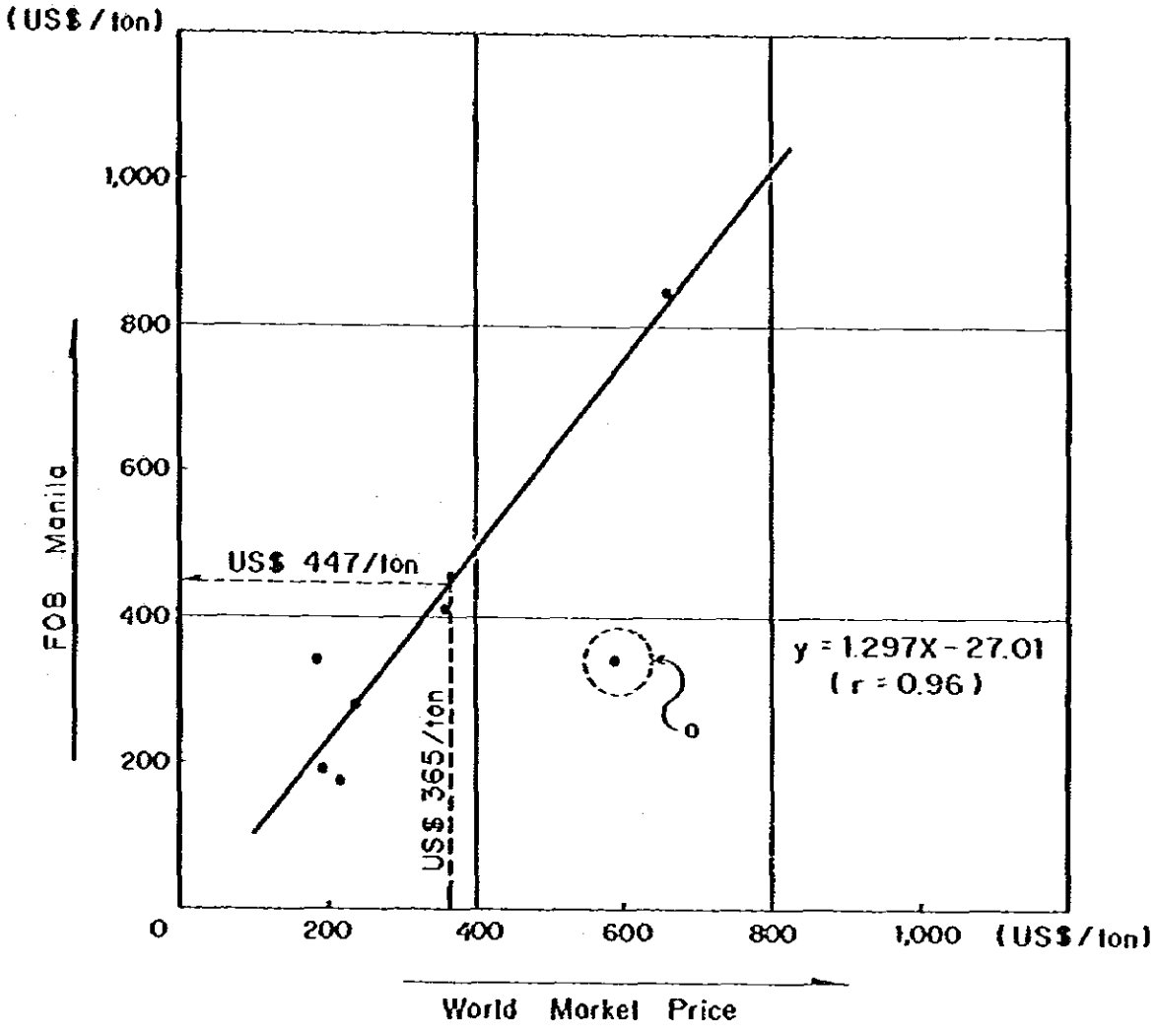


Fig. 4.11 CORRELATION BETWEEN WORLD MARKET PRICE AND MANILA FOB PRICE OF SUGAR (1984 CONSTANT)



Remark : a - Neglect as an abnormal value

Source : (1) NASUTRA
(2) Commodity Price Forecast, World Bank, 1983