

2.3.2 Kind of Crops and Their Production Pattern

Dominant agricultural production in the project area is paddy rice in low-lying area and sugar cane in higher land. Some maize, sorghum, casava, etc. are also traditionally grown in small extent. Recently, under crop diversification and intensification programme proceeding in the province, such vegetables as melon, cucumber, white gourd (*Lagenaria Leucantha Rusby*), egg-plant, tomato, radish, taro, and peanut and other legums have been introduced as the second crops in the low-lying area and these cropping areas are gradually extended particularly in the area where paddy field seriously damaged by sand-sedimentation.

The production pattern being practised by the farmers in the project area can be broadly defined according to the availability of irrigation water and probable occurrence of flooding of the river. The typical cropping pattern is summarized as below and overall pattern in whole the project area is illustrated in the following FIGURE II-4.

Prevailing Cropping Pattern

Pattern	Wet Season	Dry Season
I	Sugar cane with 2 tie ratooning/3 years	
II	Paddy-paddy	Paddy/2nd crop
III	Paddy	Paddy
IV	Paddy	2nd crop
V	Paddy	Fallow

The first pattern is predominantly practised in the upland field where irrigation water is not available topographically even in the wet season. These area are localized around the northern half of the project area (Agricultural Block I) and occupy about 48% of the farm land. The crops other than sugar cane are casava, sorghum, maize, etc. but small in extent for mainly home-consumption.

Triple cropping of paddy (pattern II) is practiced in the area where irrigation water is available throughout the year and the land is free from the flood constraints (Agricultural Block II). The first cropping is started in May and this paddy is grown mainly by rain-fed irrigation, successfully. Immediately after harvesting of the first paddy, the second cropping is practiced during the month from the mid-September to the mid-January with sustainable supplementation of irrigation water. Then the third cropping is continued to operate during the mid-January and April under full irrigated condition. Along with the paddy cultivation particularly in the dry season from December to April, some vegetables are grown in certain extent.

The third pattern is also practiced at the places where irrigation water is available throughout the year (a part of both Agricultural Blocks II and III). The first cropping is operated in the wet season by rain-fed irrigation practice, while the second cropping in the dry season with full irrigation operation.

The fourth pattern is practiced in most part of the Agricultural Block III where no irrigation facilities are provided and seasonal occurrence of flood is frequent in every wet season. Generally, the cropping schedule of paddy is properly adjusted by the farmers so as to alleviate the flood damage to the production. For this purpose, the improved varieties having short maturing period are introduced. Following the paddy cultivation, some vegetables are grown as the secondary crop. Their growing conditions are well contributed by relatively favourable soil moisture being carried-over from the former irrigation for paddy cultivation.

The last pattern is practiced mainly in the Agricultural Block IV where deep flooding is frequently occurred in every wet season. To minimize the flood damage to the production, local varieties of paddy are traditionally grown without any application of farm inputs.

As for the planting acreages of the major crops in each cropping pattern are estimated as follows based upon the information obtained from the Agricultural Extension offices in each Municipality.

Planting Acreages of Major Crops

Crops	Planting Acreages (ha)
1. Paddy:	
- Irrigated field;	
- first cropping	2,820
- second cropping	1,640
- third cropping	370
(Sub-total)	(4,830)
- Rain-fed field;	730
(Total)	(5,560)
2. Sugar cane:	5,610
3. Secondary crops	560
4. Other crops	170
Grand total	11,900
	(1.07 in crop intensity)

2.3.3 Prevailing Farming Practices

(1) Paddy

Paddy rice is the principal crop in the project area. The seasonal occurrence of floods of the Pasig-Potrero river have caused yearly destruction to the paddy and then, the farmers have adjusted their crop-

ping schedule of paddy so as not to coincide with the time of floods and heavy rain to minimize the loss of production due to flood hazard. In the riparian paddy field extending along the Guagua river, planting is done after the heavy rains of September.

Owing to recent prevalence of the MASAGANA 99, high-yielding varieties have been extensively distributed over the project area. Major varieties are IR-36, IR-42, IR-38, IR-32, IR-40, BPI-R1-2, and C-4 series. Among them, IR-36 is used most widely, representing about 60% of the total annual production. In flooding area, such local varieties as Elon-elon and Wag-wag Becol are common.

In normal cropping schedule, nursery preparation of the first paddy is carried out with the beginning of the wet season and grow nursery for 20 to 30 days. Transplanting is practised during the month from May to June and crops are harvested after 100 to 120 days from the transplanting. The second and the third cropping are practised continuously with the same condition as the first cropping.

Modernized irrigation practices have long been familiar with the farmers in the area. However, due to insufficient water in the existing facilities, the full season irrigation is practiced only in limited extent. Main cropping is, then, carried out basically under rain-fed condition properly supplemented by the irrigation operation.

Owing to dense population in the project area, major works on the farming practices are operated by labour forces with partial supplement of animal power and tractor. Fertilization for crop and plant protection are extensively practiced under the guidance of the agricultural extension office. The fertilizers and chemicals are generally applied by using the agricultural credit through MASAGANA 99 programme.

(2) Sugar cane

Sugar cane is another important crops in the project area. Generally, sugar cane field in the area is not provided any irrigation facilities due to lack of water sources, topographically. Thus, meager watered condition in the dry season caused low yield in the area.

In regular planting calendar, seedlings are transplanted to the field after soaking and suckering during the month from November to December. After 10 month growing, crops are harvested and continuously cultivated

The use of tractor for soil preparation is common in the big plantation. While the individual small planters rent tractor from the plantation or private owner for ploughing and harrowing the land by the charges at Ps 10/ha and Ps 7/ha, respectively. The use of water-buffalo, however, to till the land is still the most popular way in this area.

The prevailing sugar cane varieties in the area are the POJ series, PSA series, Hawaii 1933, Alunan and Formosa 109. The most promising varieties, which are in great demand for propagation, are the Hawaii

1933, POJ 3016 and POJ 2878. Alunan and PSA series give a high yield of cane and sucrose but they are rather susceptible to disease, besides poor ratooning characteristics, hence the planters refrain from propagating these varieties. On the other hand, POJ series and Hawaii 1933 are popular varieties among the planters. They have a resistance to drought and diseases.

To satisfactorily grow sugar cane in this area, soil fertilization is a pressing needs. The Bureau of Soil Conservation in San Fernando encourage the planters to have chemical analysis of their soils as basis for the application of fertilizers and agricultural lime in their farm.

(3) Other crops

The second crops include vegetables, leguminous crops, maize, sorghum, casava. Among the crops, maize, sorghum and casava are grown in upland field mainly for the home-consumption. They are generally planted in a small area and grown by rain-fed practice.

Vegetables and leguminous crops have been recently introduced as a cash crop. Generally, these crops are grown in the dry season with relatively favourable soil moisture being carried-over from the previous irrigation for paddy cultivation. Since the planting acreages are still small, all of the farming practices are operated by family labour.

2.3.4 Crop Yield and Production

Unit yield of major crops were studied according to the past production record in the Municipality of Bacolor, Guagua, Sta. Rita and Porac for the recent 8 years from 1971 to 1977.

The unit yield of paddy and sugar cane fluctuate yearly and locally as shown in the following TABLE II-16 to II-18. These results might be attributed to the fact that the ill-irrigated field in certain extent and occurrence of uneven distribution of rainfall.

An average yield of paddy estimated by the production record in 1977/'78 is 3.78 tons/ha in irrigated field, while 2.46 tons/ha in rain-fed field. As far as sugar cane are concerned, the yield is rather low as compared with the total average in Philippines. These might be due to lack of soil moisture and insufficient application of farm inputs. Unit yield obtained from the Sugar mill in San Fernando is about 33.8 tons/ha in terms of the cane production.

Based upon the cropping area and unit yield, the annual total production of paddy and sugar cane is estimated as follows.

Annual Total Production

Crops	Cropping area (ha)	Unit yield (t/ha)	Production (t)
<u>Paddy</u>			
- irrigated field			
- 1st cropping	2,820	3.78	10,660
- 2nd cropping	1,640	3.78	6,200
- 3rd cropping	370	3.78	1,400
(Sub-total)	(4,830)		(18,260)
- rain-fed field	730	2.46	1,800
(Total)	(5,560)		(20,060)
<u>Sugar cane</u>	<u>5,610</u>	33.8	<u>189,800</u>

2.3.5 Livestock

Major livestock raising in the project area is water buffaloes, Hogs and cattles. The total population and its distribution is as follows:

Kind of stocks	<u>Population of Livestock</u>				(heads)
	Bacolor	Guagua	Sta. Rita	Porac	Total
Water buffalo	2,720	810	820	2,460	6,810
Hog	4,360	1,170	1,240	3,570	10,340
Cattle	40	10	-	10	60

Source: Population of Livestock in pampanga provinces as of end of 1977, BAECON, Pampanga.

Among them, water buffalo provide big power for crop cultivation, particularly on the practices of soil preparation in paddy field and inner cultivation of sugar cane. Hogs are one of the farm income source in addition to the crop production. They are mostly raised dividually in the backyard by the farmers, as present. Recently, a few commercial hog farm has been developed in the area but still small heads in a farm. Cattle farming is now being developed under the livestock extension programme in Pampanga province.

Poultry raising is practised extensively in the project area. At present, population of chicken is estimated to be 70,000 birds, of which about 70 % or 49,000 birds is in the backyard of individual farms. The remaining about 30 % of the total population is raised in the commercial farms which have been exploited recently. In these commercial farms, laying purpose constitutes about 77 % and broiler, about 23 %.

Duck is another popular poultry in the project area. According to the short report on livestock population (1977) provided by the Bureau of Agricultural Economics, Pampanga, approximately 25,000 of ducks is being raised mostly in backyard of individual farms. The ducks raising in commercial base is only a few percent, at present.

In the past years, no systematic investigations have been conducted concerning to the flood and sand damages on the livestock and poultry farming. However, according to the information obtained by the field interview with the farmers, some certain extent of the stock production was damaged mainly caused by trouble on feed supply due to those transportation restricted by flooding of Pasig-Potrero river.

2.3.6 Fish Culture and Its Production

The fish-pond fishing is the second importance following to the agricultural production in the primary economic sector in the project area, although an acreage of the fish-pond is relatively small in extent. It accounts for about 10% of the Gross production values of this primary sector, while sugar cane and paddy rice production account for 64% and 26%, respectively.

At present, estimated about 1,190 ha of fish-pond has been developed in the riparian land extending mainly over the southmost of the objective area. Milk-fish is a predominant variety, representing more than 90% of the total production.

Generally, the fish harvest twice a year and at about 0.7 ton/ha on an average yield per once. This unit yield is rather low as compared with other area in Philippines. It is mainly due to the fact that the area is beset with problems of muddy flood water intrusion into the pond especially during the rainy season, which adversely affect to the growth and production of fish-food crops (plankton).

The gross fish production is estimated at about 1,670 tons per annum and its gross value per annum is at P 8,180,000 or P 6,870 per ha. The Breakdown of this estimation is shown in the following TABLE II-19.

2.3.7 Gross Values and Net Values of Agricultural Production

Based upon the current farm-gate price in 1977 and agricultural production which is expressed by the unit yield and cropping acreages, the gross agricultural values in terms of the annual value are estimated in whole the project area.

Deducting the annual total production cost from the gross values, the net agricultural production values are obtained as follows:

Annual Gross and Net Values

Major Crops	Gross Production (t)	Gross Values (P 10 ³)	Net Values (P 10 ³)
Paddy	18,650	21,450	11,950
Sugar cane	189,800	51,250	31,610
Secondary crops	330	430	280
Upland crops	170	130	70
Total		73,260	43,910

Note: Detailed breakdown is shown in the following TABLE II-20.

As seen in the above Table, the production of sugar cane itself shares greater part, representing at about 72% of the total production values. In the meanwhile, the paddy production is relatively low at only about 27%, although potential cultivable land for paddy lies at nearly half of the total objective area. It is mainly due to the seasonal occurrence of distractive flooding and sand-sedimentation problems.

Some certain amount of vegetables and fruits, further livestocks are also produced in backyard as a source of the farm income. However, those production are, at present, still small extent as compared with that of the major crops. Thus, these are disregarded from this economic evaluation.

2.3.8 Typical Farm Budget

There are several types of farming defined by land holding size and kind of crops in the project area. Among them, the following two typical farms are selected taking into account the agricultural conditions affected by the flood and sand sedimentation. One of the typical farm is taken from the area of Agricultural Block III where the land is frequently affected by seasonal flooding and the other farm from the area of Agricultural Block V where the farm land is being left to the devastation causing flood and sand-sedimentation. Since no flood and sand problems are directly influenced to the areas, the typical farms in other Agricultural Block I and II are excluded from this study.

As described in the previous Section 2.3.1, the typical farm in the Agricultural Block III is defined by average farming scale at 2.4 ha consisting of 1.22 ha of irrigated paddy field and 1.18 ha of rain-fed paddy field. The average farm scale in the Agricultural Block V is about 5.5 ha in gross, of which 0.26 ha are provided with the irrigation facilities and 0.37 ha is rain-fed paddy field. The greater remaining of 4.87 ha is now waste from the agricultural use due to deep sand deposited by flooding in 1972.

An annual farm profit of both typical farms is obtained by deduction of the production cost and such financial outgo as land rents, debt repayment and living allowance from the annual gross farm income.

Balance of Payment on Typical Farms

(P/house-hold)

Description	Agricultural Block III	Agricultural Block V
(1) Gross income	17,240	3,470
(2) Production cost	6,390	1,540
(3) Net income (1)-(2)	10,850	1,930
(4) Financial outgo	4,610	2,400
(5) Net reserve (3)-(4)	6,240	- 470

Note: Detailed breakdown is shown in the following TABLE II-21, II-22 and II-23.

The net income of the farm in Agricultural Block III is estimated at P10,850 per annum and net reserve calculated at P6,240, including land tax and other social duties.

The farm in the Agricultural Block V is still at subsistence level as seen in the above Table. A deficit of net reserve or shortage of living allowance is supplemented by wages obtained from such outside working as sugar cane harvesting or fish-pond fishing in and around the area and construction works in the public programme.

TABLE II-1 SEASONAL VARIATION OF CLIMATE
(Monthly mean by 1970 - 1975)

Month	Temperature			Relative Humidity (%)	Rain-fall (mm)	No. of Rainy Days (days)	Wind Direction	Wind Velocity (km/hr)
	Max. (°C)	Min. (°C)	Mean (°C)					
JAN.	31.2	22.0	26.6	72	8.9	2	NE	2.06
PEB.	31.5	21.0	26.3	70	14.1	2	SE	2.57
MAR.	33.0	23.0	28.0	66	20.1	3	URBL	2.06
APR.	34.0	24.0	29.0	64	39.9	5	URBL	2.06
MAY	34.0	24.0	29.0	70	185.9	12	S	2.57
JUN.	32.0	24.0	25.0	79	310.1	19	SW	3.08
JUL.	31.0	24.0	24.5	81	559.8	23	SW	2.57
AUG.	31.0	24.0	27.5	84	654.3	23	SW	2.57
SEP.	31.0	24.0	27.0	85	217.7	20	SSN	2.57
OCT.	31.0	24.0	28.0	82	206.5	15	URBL	2.06
NOV.	31.5	23.0	27.2	79	124.2	10	URBL	2.57
DEC.	31.5	22.5	27.0	82	58.4	6	URBL	2.06
Total					2,500	140		

Data Source: Seasonal weather variations by Municipality/
city covering the period 1970 - 1975:
Meteorological station at San Fernando,
Pampanga province.

TABLE II-2 SOILS IN THE PROJECT AREA

Name of Soils	Municipality Regarding to Project			Proportional Extent (%)
	M. Bacolor	M. Guagua	M. Sta Rita M. Porac	
1. Argeles Series				
(a) fine sand	4,840	660	450	12,450 24.6
(b) Sand	420	-	-	420 0.8
(c) Coarse sand	-	-	180	4,110 8.1
(d) Undifferentiated	-	-	21,300	21,300 42.2
2. La Pag series				
(a) Silt loam	790	1,160	-	1,950 3.8
(b) Fine Sand	-	2,710	2,670	7,780 15.4
3. Hydrosols				
	910	1,690	-	2,600 5.1
Total	6,960	6,220	2,300	34,130 50,610 100.0

Data Sources; (1) Soil Survey of Pampanga Province, Department of Agriculture and Natural Resources, 1956.

(2) Socio-economic Profile, 1976, Provincial office of Panpanga.

TABLE II-3 POPULATION BY MAJOR SOCIO-ECONOMIC SECTOR

Socio-Economic Sector	Municipality in the Project Area				Total
	Bacolor	Guagua	Sta. Rita	Porac	
1. Agriculture	6,284	1,490	4,016	4,279	16,069
- owner farmer	797	474	1,581	2,019	4,871
- tenant labor	5,487	1,016	2,435	2,260	11,198
2. Other primary Sector	2,215	817	509	697	4,148
3. Manufacturing	13,620	5,246	3,252	4,401	26,519
4. Commerce	10,493	4,077	2,498	3,410	20,478
5. Social Services	12,199	4,705	2,893	3,961	23,758
6. Others	1,149	417	264	367	2,197
Total	45,870	16,752	13,432	17,115	93,169

TABLE II-4 HOUSEHOLD BY MAJOR SOCIO-ECONOMIC SECTOR

Socio-Economic Sector	Municipality in the Project Area				Total
	Bacolor	Guagua	Sta. Riata	Porac	
1. Agriculture	1,018	262	672	673	2,625 (17.2)
- Owner farmer	129	83	246	318	776 (5.1)
- tenator labor	889	179	426	355	1,849 (12.1)
2. Other primary Sector	341	143	85	110	679 (4.4)
3. Manufacturing	2,204	918	540	693	4,355 (28.5)
4. Commerce	1,698	714	417	537	3,366 (22.0)
5. Social Services	1,974	824	483	625	3,906 (25.5)
6. Others	186	73	44	58	361 (2.4)
Total	7,421	2,934	2,241	2,696	15,292 (100.0)

Data Source; (1) Population statistics, Pampanga Province Feb., 1978.

TABLE II-5 POPULATION AND HOUSEHOLD IN EACH VILLAGE
(As of the end of 1977)

Municipality and Village	Household		Population		Family Size
	Non-farming	Farming	Male	Female	
M. Bacolor	7,421		45,870		6.18
1 B. Balas	100	70	587	583	6.88
2 B. Cabalantian	906	94	3,755	3,799	6.55
3 B. Cabambangan	169	1	680	800	8.71
4 B. Cabetican	480	50	1,469	1,493	5.59
5 B. Corcepcion	128	37	486	524	6.12
6 B. Dolores	62	38	312	352	6.64
7 B. Duat	140	40	604	589	6.63
8 B. Macabebe	83	20	371	347	6.97
9 B. Magliman	140	34	431	438	4.99
10 B. Maliwalu	194	36	856	823	7.30
11 B. Masaligit	50	12	209	199	6.50
12 B. Parulog	200	52	705	737	5.72
13 B. Potrero	334	150	1,598	1,530	6.45
14 B. S an Antonio	704	130	2,104	2,040	4.96
15 B. San Isidro	500	100	1,471	1,371	4.74
16 B. Sta. Barbara	204	111	869	825	5.38
17 B. Sta. Ines	430	15	1,294	1,402	6.28
18 B. San Vicente	850	49	2,444	2,371	5.36
19 B. Talba	219	4	889	789	7.52
20 B. Tinajero	510	13	1,951	1,791	7.15
Sub-total	6,403	1,018	23,085	22,785	6.18
M. Guagua	2,934		16,752		
1 B. San Agustin	320	13	918	898	5.45
2 B. San Juan	234	6	779	766	6.44
3 B. San Juan Bautista	250	2	816	826	6.51
4 B. San Miguel	201	200	1,201	1,109	5.75

(to be continued)

Municipality and Village	Household		Population		Family Size
	Non-farming	Farming	Male	Female	
M. Guagua (cont'd)					
5 B. San Nicolas I	202	2	628	661	6.30
6 B. San Nicolas II	400	5	679	1,014	4.92
7 B. San Roque	350	0	1,220	1,291	7.17
8 B. Sta. Pilomena	415	5	938	1,008	4.63
9 B. Sta. Ines	300	29	871	829	5.17
Sub-total	2,672	262	8,350	8,402	5.71
M. Sta. Rita					
	2,241		13,432		
1 B. San Agustin	180	40	832	742	7.15
2 B. San Basilio	350	300	2,289	2,098	6.75
3 B. San Isidro	355	145	1,502	1,403	5.81
4 B. San Juan	225	110	891	940	5.46
5 B. San Vicente	201	35	545	616	4.92
6 B. Sta Monica	258	42	782	792	5.25
Sub-total	1,569	672	6,841	6,591	5.99
M. Porac					
	2,696		17,115		
1 B. Babo Panglo	28	124	643	590	8.11
2 B. Calzadang Bayu	190	230	1,216	1,162	5.66
3 B. Camgatba	322	70	1,166	1,177	5.98
4 B. Hecienda Dolores	261	83	1,236	1,155	6.95
5 B. Mancatian	261	5	868	796	6.25
6 B. Manibang Paralaya	501	20	1,678	1,623	6.33
7 B. Manibaug Pasig	310	61	1,355	1,038	6.45
8 B. Mitla Proper	150	80	719	693	6.14
Sub-total	2,023	673	8,881	8,234	6.35
Total	12,667	2,625	47,157	46,012	6.09
Grand total	15,292		93,169		

TABLE II-6 LAND USE

Land Category	Pampanga Province	Project area			Total	
		Bacolor	Guagua	Sta. Rita Porac		
A. Physical area	218,070	7,090	1,420	2,090	12,940	23,540
B. Agricultural land	132,180	5,570	400	1,320	4,660	11,950
(1) Arable land	127,970	4,920	390	1,270	4,500	11,080
(a) Paddy field	93,040	2,530	170	850	0	3,550
- irrigated	71,790	1,390	140	690	0	2,220
- rain-fed	21,250	1,140	30	160	0	1,330
(b) Up land field	34,430	1,520	70	140	4,050	5,780
- Sugar cane	31,830	1,470	40	100	4,000	5,610
- Other crops	2,600	50	30	40	50	170
(b) Fallow/waste	2,900	870	150	280	450	1,750
(2) Fruit garden	410	40	-	50	100	190
(3) Meadow	1,500	540	(1.5)	-	20	560
(4) Forest growth	250	70	(3)	-	10	80
(5) Other purpose	650	-	10	(3)	30	40
C. Fish-pond	23,180	400	790	0	0	1,190
D. Village yard	11,000	980	170	660	220	2,030
E. Infrastructure	-	140	60	110	260	570
F. Forest	50,710	0	0	0	7,800	7,800

Source; (1) Socio-economic profile of pampanga province, Dec., 1976.

(2) Short report provided by the Bureau of Fishery, Forestry, Plant Industry, Sugar mills, Pampanga Province and Municipality offices.

TABLE II-7 NUMBER OF HOUSEHOLD BY FARM SIZE

Province & Municipality	Total Household	Holding Size Classes						
		Less than 1.0	1.1 - 3.0	3.1 - 5.0	5.1 - 10.0	10.1 - 25.0	25.1 - 50.0	More than 50.0
Pampanga	23,841	1,827	9,793	7,800	3,775	486	75	85
Bacolor	1,018	97	463	351	82	17	1	7
Guagua	262	34	144	55	24	2	-	3
Sta. Rita	672	96	373	163	34	4	-	2
Porac	673	38	317	204	82	24	2	6
Total	2,625	265	1,297	773	222	47	3	18
(proportion)	(100.0)	(10.1)	(49.4)	(29.4)	(8.5)	(1.8)	(0.1)	(0.7)

TABLE II-8 NUMBER OF HOUSEHOLD BY TENURE SYSTEM

Province & Municipality	Total Household	Full-owner	Part-owner	Tenant System					Other Tenure
				<u>1</u> Cash	<u>2</u> Sharing	<u>3</u> Fixed	<u>4</u> Rent Free	Other	
Pampanga	23,841	3,820	1,140	266	10,844	4,998	194	2,524	55
Bacolor	1,018	111	36	-	388	307	-	176	-
Guagua	262	60	46	19	81	32	5	19	-
Sta Rita	672	308	21	-	126	195	-	23	-
Porac	673	216	61	8	288	61	1	32	-
Total	2,625	695	164	27	883	595	6	250	5
(proportion)	(100.0)	(26.5)	(6.2)	(1.0)	(33.6)	(22.8)	(0.2)	(9.5)	(0.2)

Note: 1; Land rent by cash contracted
2; Land rent by Land-load-tenant shearing arrangement
3; Land rent by fixed amount of production
4; free of rental charges

TABLE II-9 TOTAL CULTIVATED AREA IN EACH TENURE SYSTEM

Tenure Systems	Pampanga Province	Project area				Total
		Bacolor	Guagua	Sta. Rita	Porac	
Full-owner	18,245.4	2,281.5	242.6	683.9	937.6	4,145.6
Part-owner	7,663.0	281.2	178.5	59.6	429.2	948.5
Tenant:						
- cash	1,241.6	0	37.4	0	17.4	54.8
- Sharing	33,710.1	1,340.2	270.0	220.0	548.9	2,379.3
- Fixed	14,702.6	726.4	94.1	305.3	173.2	1,299.0
- Rent free	362.8	0	4.2	0	2.4	6.6
- Others	13,698.2	941.9	83.0	51.0	106.3	1,182.2
Other tenure	492.0	0	0	0	4.9	4.9
Total	90,115.6	5,571.2	909.8	1,320.0	2,219.9	10,020.9

TABLE II-10 AVERAGE LAND-HOLDING IN EACH TENURE SYSTEM

Tenure Systems	Pampanga Province	Project Area				Total Average
		Bacolor	Guagua	Sta. Rita	Porac	
Full-owner	4.8	20.5	4.0	2.2	4.3	6.0
Part-owner	6.7	7.8	3.9	2.8	7.0	5.8
Tenant:						
- Cash	4.7	-	1.9	-	2.2	2.0
- Sharing	3.1	3.5	3.3	1.7	1.9	2.7
- Fixed	2.9	2.3	2.9	1.5	2.8	2.2
- Rent fee	1.9	-	0.8	-	2.4	2.1
- Others	5.4	5.4	4.4	2.2	3.3	4.7
Other tenure	8.9	-	-	-	1.0	1.0
Total average	3.8	5.5	3.5	1.9	3.3	3.8

TABLE II-11 INVENTORY OF RICE MILL

Location		Milling capacity (cavans/8 hr)
Sta. Rita M.		
- San Basilo	1	30 cav.
	2	40
	3	50
- San Vicente	1	350
- San Matias	1	450
Bacolor M.		
- San Vicente	1	100
	2	100
	3	60
- Cabalantian	1	50
	2	30
	3	50
- San Isidoro	1	50
	2	40
	3	50
	4	60
- Potrero	1	200
Porac M.		
- Manibaug	1	70
	2	100
- Sta. Crnz	1	50
- San. Jose	1	130
Guagua M. (to be concerning to the project area)		
- Sto. Nino	1	100
	2	120
	3	200
	4	100
Guagua M. (to be concerning to the project area)		
- Nativided	1	60
	2	100
San Frenando M. (to be concerning to the project area)		
- Dolores	1	80
	2	50
- San Juan	1	100
Angeles City	1	18
	2	180
	3	200
	4	180
	5	250
	6	120
	35	3,918
		195,900 kg/8 hr
		24,490 kg/hr

TABLE II-12 FAIRGATE PRICE OF RICE
(Central Luzon)

Year	(P per kg)	
	Fancy	Ordinary
1971	0.653	0.612
1972	0.698	0.651
1973	0.774	0.745
1974	1.065	0.982
1975	1.120	0.999
1976	1.116	1.053

Source: Bureau of Agricultural Economics,
Department of Agriculture

TABLE II-13 RETAIL PRICE OF RICE
(Pampanga Province)

Year	(P per kg)	
	Fancy	0.625
1973	0.631	0.625
1974	0.990	0.998
1975	1.170	0.916
1976	1.214	1.082
1977	1.299	1.107

Source: Bureau of Agricultural Economics,
Department of Agriculture

TABLE II-14 PRICE OF SUGAR (BROWN) PURCHASED BY PNB

Year	Peso per picul ^{/1}	US dollar per ton
1974 - 75	134.43	287.2
1975 - 76	105	224.3
1976 - 77	81	173.1
1977 - 78	90	192.3

Source: Integrated Sugar Central Company Incorporation (ISCCO)

^{/1} One picul = 63.25 kg

TABLE II-15 AGRICULTURAL LAND USE
(Present Condition)

Land Classified	Land Category	Gross Area (ha)	Net Arable Land				Fallow & Waste Land (ha)
			Paddy Field		Upland Field		
			Irrigated (ha)	Rain-fed (ha)	Sugar Cane (ha)	Other Crop (ha)	
1. Agricultural Block I	Upland field	8,670	0	0	5,610	170	0
2. Agricultural Block II	Paddy field	930	930	0	0	0	0
3. Agricultural Block III	Paddy field	2,430	1,220	1,180	0	0	0
4. Agricultural Block IV	Paddy field & fish-pond	1,250	0	50	0	0	0
5. Agricultural Block V	Paddy field	1,570	70	100	0	0	1,300
6. Agricultural Block VI	Waste land & river-bed	900	0	0	0	0	450
Total		15,740	2,220	1,330	5,610	170	1,750

Source: Short report, the Agricultural Extension offices in Pampanga province and Bacolor, Guagua, Sta. Rita, Porac Municipalities.

TABLE II-16 PAST RESULTS ON PADDY RICE CULTIVATION

Description	1971	1972	1973	1974	1975	1976	1977	Total Average
<u>M. Bacolor:</u>								
- Acreages (ha)	3,070	2,020	3,060	3,240	3,240	2,970	2,970	2,940
- Production (ton)	5,450	4,920	7,350	8,750	8,930	6,680	7,880	7,140
- Yield (ton/ha)	1.77	2.43	2.40	2.70	2.76	2.25	2.65	2.43
<u>M. Guagua:</u>								
- Acreages (ha)	1,600	2,430	2,230	2,550	2,520	2,560	2,550	2,350
- Production (ton)	3,310	4,250	4,890	6,370	5,230	5,500	6,370	5,130
- Yield (ton/ha)	2.07	1.75	2.19	2.50	2.07	2.15	2.50	2.18
<u>M. Sta. Rita:</u>								
- Acreages (ha)	2,160	1,850	2,140	2,050	2,050	2,020	2,070	2,050
- Production (ton)	5,300	5,040	4,710	5,720	5,720	4,550	5,600	5,230
- Yield (ton/ha)	2.45	2.72	2.20	2.79	2.79	2.25	2.70	2.55
<u>M. Porac:</u>								
- Acreages (ha)	1,220	1,340	1,490	2,520	2,420	2,200	2,250	1,920
- Production (ton)	1,690	2,620	3,200	6,430	6,050	4,620	5,060	4,240
- Yield (ton/ha)	1.38	1.95	2.15	2.55	2.50	1.92	2.25	2.21
<u>Average</u>								
Yield (ton/ha)	1.96	2.21	2.26	2.63	2.53	2.19	2.53	2.35

Note: Figures were obtained from the whole area in each Municipality.
Data source; Annual Report of the Agricultural Extension
office, Pampanga.

TABLE II-17 SUGAR CANE CULTIVATION

Year Cropped	ISCCO/ ¹		PASDECO/ ²		Total	
	Area (ha)	Product (ton)	Area (ha)	Product (ton)	Area (ha)	Product (ton)
1970 - '71	13,380	504,270	21,350	716,230	34,730	1,220,500
'71 - '72	17,080	527,090	22,310	725,350	39,390	1,252,440
'72 - '73	12,760	382,760	19,100	478,570	31,860	861,330
'73 - '74	10,920	411,310	17,620	664,230	28,540	1,075,540
'74 - '75	12,990	361,300	17,840	628,480	30,830	989,780
'75 - '76	14,230	449,210	17,600	953,990	31,830	1,403,200
'76 - '77	13,240	242,830	18,580	666,980	31,820	909,810
'77 - '78	-	205,860	⁴ 17,500	-	-	-

(33.7)

¹: Integrated Sugar Central Company Inc. (Semi-Governmental organization) managed by National Sugar Development Corporation (NSDC) and financed by Philippines National Bank.

²: Pampanga Sugar Development Inc. (Private company)

³: Production estimated only at the harvesting duration between Nov. 7, '77 and Feb. 19, 1978.

⁴: Out of 17,500 ha shared by PASDECO, some 17,200 ha of cane field is cultivated under rain-fed condition, while only 300 ha is operated with irrigation practice in which irrigation water is provided by use of pump (groundwater).

TABLE II-18 RESULTS ON PADDY RICE CULTIVATION
(with and without irrigation)

Description	Municipality			Total	
	Bacolor	Guagua	Sta. Rita		
Area harvested (ha)					
- irrigated	1,420	760	1,070	730	3,980
- rain-fed	35	10	20	320	385
Production (ton)					
- irrigated	5,130	3,180	4,080	2,650	15,040
- rain-fed	60	20	40	830	950
Average yield (ton/ha)					
- irrigated	3.61	4.18	3.81	3.63	3.78
- rain-fed	1.71	2.00	2.03	2.59	2.46

Data Source; Annual Report of the Agricultural Extension Office,
Pampanga

Note; Figures show a productive condition of paddy in wet season.

TABLE II-19 PRODUCTION OF FISH AND ITS GROSS VALUE

Description	Bacolor	Guagua	Total
1. Acreage of fish-pond (ha)	400	790	1,190
2. Unit yield (ton/ha/crop)	0.7	0.7	
3. Gross production per annum (tons)	560	1,110	1,670
4. Unit price at farm gate (P\$/ton)	4,900	4,900	
5. Gross values per annum (P\$ x 10 ³)	2,744	5,439	8,183

Source: Bureau of Fishery, Pampanga, 1977.
Summary Data on Estimate of Damage to Fishpond Fisheries,
Regional office No. III, San Fernando, Pampanga.

TABLE II-20 GROSS VALUE AND NET VALUE OF AGRICULTURAL PRODUCT
(Present Condition)

Major Crops	Gross Production (tons)	Unit Price (P\$/ton)	Gross Values (P\$X10 ³)	Total Production Cost (P\$X10 ³)	Net Values (P\$X10 ³)
Paddy:					
Irrigated paddy	18,260	1,150	21,000	9,230	11,770
Rain-fed paddy	1,790	1,150	2,060	980	1,080
Sub-total	20,050		23,060	10,210	12,850
Sugar cane:	189,800	270	51,250	19,640	31,610
Secondary crops:	330	1,300	430	150	280
Upland crops:	170	740	130	60	70
Total			74,870	30,060	44,810

Note: (1) Secondary crops and upland crops are represented by mongo-bean and white-maize, respectively.

(2) All the figures are rounded.

TABLE II-21 FARM ECONOMICS
(Present condition)

Balance of Payment on Typical Farm

Description	Agricultural Block III	Agricultural Block V
Average land holding (ha)	2.4	5.5
- cultivated area	2.4	0.63
- fallow land	-	4.87
Major crop production (ton)		
- paddy	12.1	2.9
- secondary crops	0.3	0.1
Balance of Payment (Pₒ)		
(1) Gross income	<u>17,240</u>	<u>3,470</u>
- Crops	14,310	3,470
- Agri-credits	2,930	-
(2) Production cost	<u>6,390</u>	<u>1,540</u>
(3) Net income (1)-(2)=(3)	<u>10,850</u>	<u>1,930</u>
(4) Financial outgo	<u>4,610</u>	<u>2,400</u>
- Land rent	2,650	570
- debt repayment	130	-
- living allowance	1,830	1,830
(5) Net reserve		
(3) - (4) = (5)	6,240	-470

TABLE II-22 TYPICAL FARM IN AGRICULTURAL BLOCK III

(Average holding size: 2.40 ha)

Crop Production, Gross Income, Net Income
(Present condition)

Land Category	Crops	Planting Area (ha)	Unit Yield (ton/ha)	Gross Production (tons)	Unit Price (P\$/ton)	Gross Income (P\$)	Farming Cost (P\$)	Net Income (P\$)
Irrigated paddy	1st paddy	1.22	3.8	4.6	1,150	5,290	2,330	2,960
Field	2nd paddy	1.22	3.8	4.6	1,150	5,290	2,330	2,960
Rain-fed paddy	1st paddy	1.18	2.5	2.9	1,150	3,340	1,580	1,760
Field	2ndary crop	0.56	0.6	0.3	1,300	390	150	240
Total		4.18				14,316	6,390	7,920

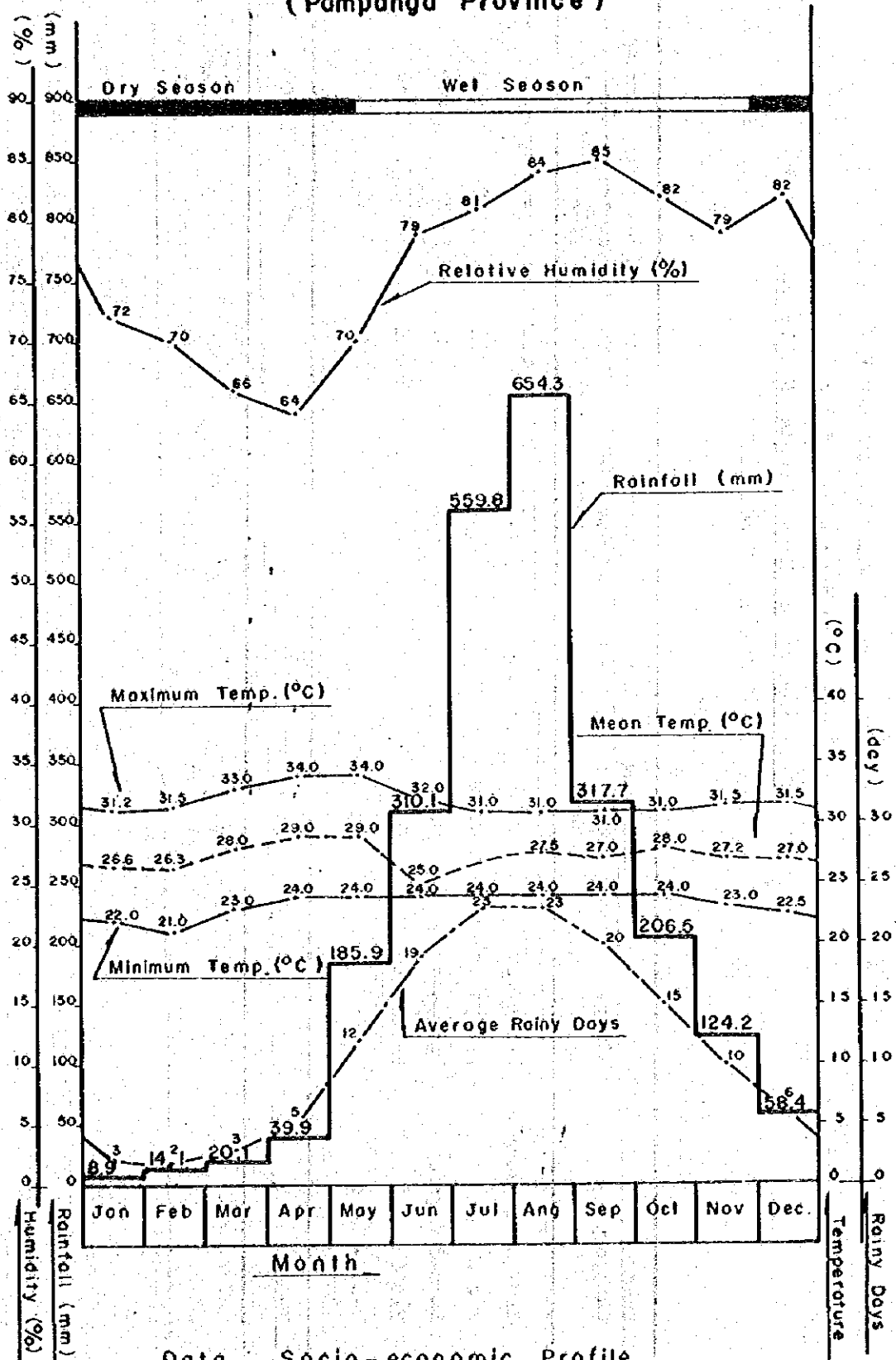
TABLE II-23 TYPICAL FARM IN AGRICULTURAL BLOCK V

(Average holding size: 5.5 ha)

Crop Production, Gross Income, Net Income
(Present Condition)

Land Category	Crops	Planting Area (ha)	Unit Yield (ton/ha)	Gross Production (tons)	Unit Price (P\$/ton)	Gross Income (P\$)	Farming Cost (P\$)	Net Income (P\$)
Irrigated paddy	1st paddy	0.26	3.8	1.0	1,150	1,150	500	650
Field	2nd paddy	0.26	3.8	1.0	1,150	1,150	500	650
Rain-fed paddy	1st paddy	0.37	2.5	0.9	1,150	1,040	490	550
Field	2ndary crop	0.18	0.6	0.1	1,300	130	50	80
Fallow land	-	-	-	-	-	-	-	-
Total		1.07				3,470	1,540	1,930

FIGURE II-1 CLIMATIC CONDITIONS (as of 1976)
(Pampanga Province)



Data Socio-economic Profile
Pampanga Province
1976

FIGURE II-2 DISTRIBUTION FLOW OF RICE

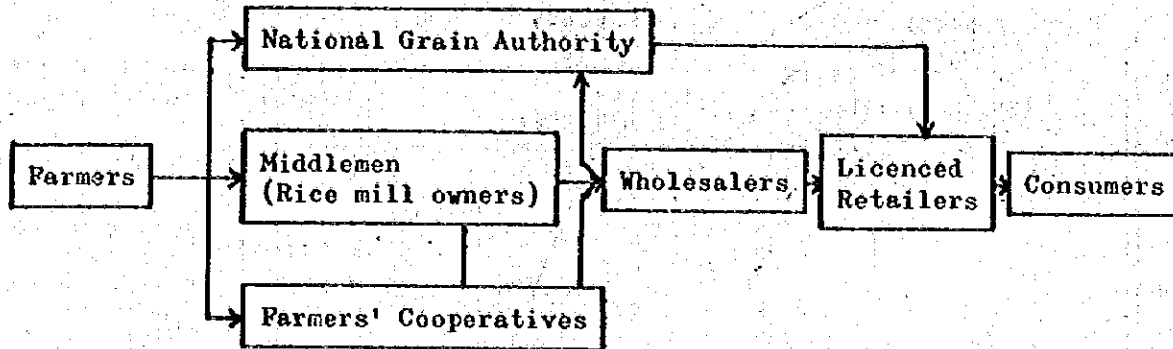
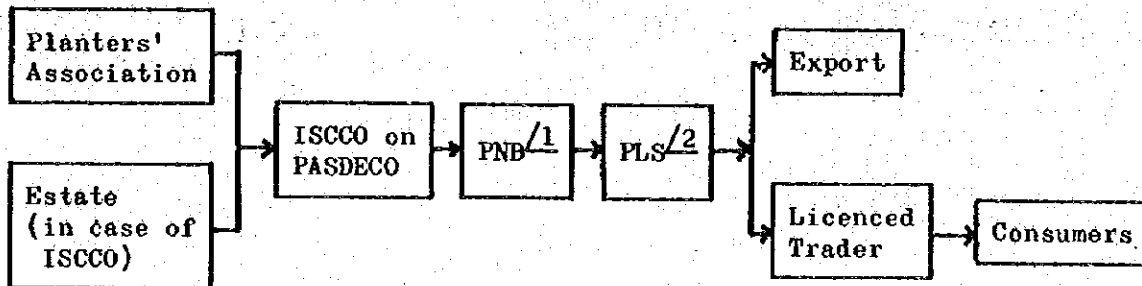


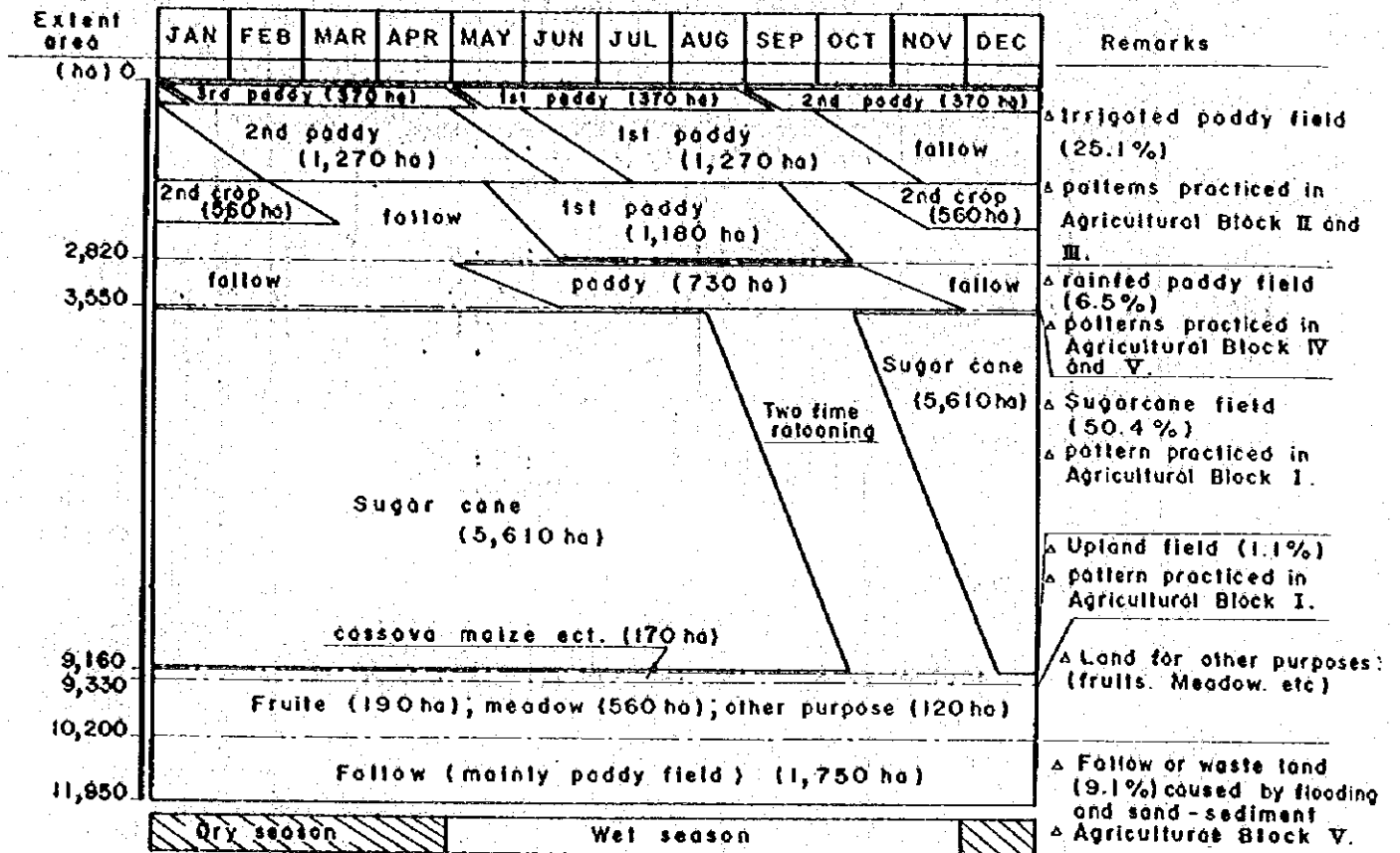
FIGURE II-3 DISTRIBUTION FLOW OF SUGAR



/1: Philippine National Bank

/2: Philippine Sugar Commission

FIGURE II - 4 LAND USE AND PRESENT CROPPING PATTERN



PROSPECTIVE AGRICULTURAL DEVELOPMENT

III PROSPECTIVE AGRICULTURAL DEVELOPMENT

3.1 General

As stated in the previous Chapter 2.1, all the soils in the project area are defined into suitable for cultivation of both paddy and upland crops, although such constraints as sandy textures, low water holding capacity, lack of organic matters, etc. are, more or less, limit to their production. An eco-climatic conditions for crop growing are also favourable except uneven occurrence of fail-fall. Besides, the agricultural supporting services are extensively propagated with the farmers through institutional programme being promoted by the Government. Under such conditions, the prevailing agricultural setting has been exploited at efficient level. The biggest constraint in the project area is only the seasonal occurrence of river flood and sand sediments. Thus, where the land is protected from the said problems, it can be expected to realize more socio-economic development.

In due consideration for the above background, the prospective agricultural land use and cropping pattern to be applicable to the project are estimated as follows:

With protection against seasonal flooding and sand-sedimentation to the field, the present unstable landscape will be stabilized effectively. Thus, the land will be cultivated more intensively with providing irrigation facilities (groundwater irrigation system) being gradually exploited in the area of Agricultural Block II by the farmers themselves. The present uncertainties of crop yield due to existing flood and sand damages and rainfed cultivation practices will be vanish by means of timely cropping and proper irrigation operation.

3.2 Prospective Agricultural Land Use

As estimated in the foregoing Chapter 2.3.1, about 6,150 ha in gross or 40% of the total project area suffered from the serious problem caused by the seasonal flooding and sand-sedimentation. As far as the future conditions without the Project, such flood and sand problems will still affect to the area similar to the present situation. Hence, an extensive agricultural development cannot be expected in the project area.

Within the project, two stages of development are considered. The first stage is the flood control and the other stage is a management of distractive sand-sediments by means of the implementation of Sabo-dams.

Under the first stage of flood control, it can be foreseeable that almost all of the prevailing flood and sand damages on the agricultural product and properties will be prevented through diking along the Pasig-Potrero river.

The areas classified into Agricultural Block III and V will be

improved to the field condition similar to the Agricultural Block II where the land is, at present, free from the flood and sand damages. Then, the field conditions as well as crop production pattern will be drastically changed as estimated in the following III-1. While, the area of Agricultural Block IV will still lie under the prevailing situation due to the flooding by the Guagua river. The area of Agricultural Block VI will be used as the reservoir of sand sediment and a part of the area will also use for forest growth for protection of embankment against flood.

Along with the perfection of sediment control by means of the Sabodams, the proposed river structures and dikes will be completely secured from the problems against sand-sedimentation in river bed. As the results, even uncertainties of flood and sand damage will be disappeared fully and hence, about 6,150 ha of affected area will be envisaged to turn entirely free from the constraints. It will become possible to introduce the most adaptable rotational cropping patterns to meet the objectives.

Taking into consideration the above situation to be prospected in the future, the overall landuse pattern is estimated as shown in TABLE III-2. In this estimation, forestation along the river is proposed aiming to protect the embankment against distractive floodings. In the area of Agricultural Block V, some 680 ha and 250 ha of the farm land is estimated for rainfed and upland field, respectively. There are mainly due to the topographic condition and very sandy soil. An exploitation of agricultural land use and incremental extent to be attributable to the project are estimated as shown in TABLE III-3.

3.3 Prospective Crop Production

3.3.1 Cropping Pattern and Major Crops

As mentioned in the foregoing Chapter 2.3.2, there exist several cropping patterns in use in the area which have been built-up on the farmers' experiences obtained during their long history of farming. These patterns have been brought-up adequately to meet given natural conditions such as rainfall and its distribution pattern, occurrence of typhoon, flooding and also an availability of irrigation water.

Taking into account the prevailing cropping patterns particularly crop rotation of paddy being operated in the Agricultural Block II, five type of the cropping patterns are foreseen in the future conditions with the Project, as shown in TABLE III-4. The overall cropping pattern is illustrated in FIGURE III-1 attached to this report.

The first pattern consists of high yielding varieties (HYV) of paddy and practiced three times a year under well contribution of irrigation. The second pattern consist of paddy (HYV) twice a year interposed by the secondary crops between first paddy and second paddy. The third pattern is a predominant pattern of paddy cultivation constituting to be 40% of the total paddy field. The fourth and fifth pattern a single cropping of paddy a year under rainfed condition.

Due to lack of irrigation water sources in the most of upland field, sugar cane and other upland crops traditionally grown in the area will be continued even in the future with the project.

As for the paddy cultivation, broadly two type of the paddy varieties are adopted in the area. In the area where irrigation facilities are provided, so-called high yielding varieties (HYV) such as IR-36, IR-42, C-4 series, etc. will be grown with adequate application of farm inputs. While in the area where the land is still rainfed condition and sometimes affected by flooding, local varieties of Elonelon, Wagwag, etc. will be grown.

The secondary crops interposed in the paddy cultivation are mainly of such legumneous crops as soybean, peanut, and other beans and vegetables. Some casava, sweetpotato, maize will be also grown in paddy field after harvesting of paddy but most them will be traditionally cultivated in small part of the upland field.

Sugar cane is the most important crop in upland field. For this cultivation, such tolerant varieties against drought and disease as Hawaii 1933 and POJ series will be continued from the present condition.

3.3.2 Prospective Crop Yield and Production

The prospective crop yield is estimated on the basis of the recent achievement obtained from both rain-fed field and well irrigated field in the project area.

As seen in the foregoing TABLE III-5, where the land is blessed with sufficient irrigation water throughout the crop season, about 3.8 tons per ha on an average is obtained by farmers, while in the rain-fed field, an average yield is about 2.5 tons per ha in terms of the unhusked paddy. Based upon these data, prospective paddy yield is forecasted conservatively at 3.8 tons/ha and 2.5 tons/ha respectively for irrigated paddy and rain-fed paddy. As far as the paddy yield in each crop season is concerned, no big difference is obtained under prevailing climate.

With regard to the prospective crop yield of the other crops, it is estimated that the present yielding condition will be maintained even under the condition with the project. The following Table shows a prospective crop yield of major crops forecasted in the future condition with the project.

Prospective Crop Yield

<u>Major Crops</u>	<u>Yield (t/ha)</u>
1. <u>Paddy</u>	
- irrigated high yielding varieties	3.8
- rainfed local varieties	2.5
2. <u>Sugar cane</u>	34.0
3. <u>Secondary crops</u> (mongo bean)	0.6
4. <u>Upland crops</u> (maize)	1.0

Note; Paddy yield is shown by unhusked paddy rice.

From the agricultural land use mentioned in the former Chapter 3.2, and the prospective crop yield estimated hereinabove, the gross crop production under full development of the project is gained as shown in TABLE III-5. The incremental paddy production to be attributable to the project is about 11,700 tons per annum or 38% of the present production (see TABLE III-6 and III-7).

3.3.3 Farm Economy

As mentioned in the previous Section 3.2, prospective land use and production pattern in future condition with the project will be gradually change to intensive and productive farming from the existing conditions by dint of the prevailing agricultural supporting services and the project implementation.

The farm benefits attributable to the Project, that is the protection against flood and sand damages, will arise from cultivation of high yielding varieties of paddy rather than the traditional farming depending on the local conditions. Besides, such provision of irrigation facilities as component, the farm benefit will much arise from intensive and irrigated farming. These many result in incremental production per unit area and hence, to realize the stabilization of farmers' livelihood.

The typical farm budget is studied taking into account the following assumption:

- (1) In the condition after completion of the flood control, all the farm land will be released from the flood and sand sedimentation problems.
- (2) All the existing irrigation facilities will be free from the flood damage and serious sand sedimentation, and the ground water irrigation system will also rapidly extended whole over the area.
- (3) Under irrigated condition, double cropping of high yielding varieties of paddy will be extensively practiced and some triple cropping of paddy will also introduced in certain extent,
- (4) Blessing with the location very near to the Metro-Manila, such secondary crops as vegetable, legumeous crops, etc. will be grown extensively.
- (5) The area, which has been covered by coarse sand deeply, will be changed to upland farm and/or partly to rainfed paddy field.

Based upon the above assumptions on the future agricultural conditions, typical farms in the Agricultural Block III and Block V are estimated as follows. As far as the farms in other Agricultural Blocks are concerned, no considerable change can be expected and then, budget analysis on those farms are disregarded from this study.

Typical Cropping Pattern

Land Category	Crops	(ha)	
		Agricultural Block III	Agricultural Block V
Irrigated paddy field	- 1st paddy	2.4	1.2
	- 2nd paddy	0.6	0.3
	- 3rd paddy		
	- secondary crops	0.3	0.15
Rain-fed paddy field	- 1st paddy	-	2.55
	- secondary crops	-	1.20
Upland field	- upland crops	-	0.90
Total		5.7	7.5

The crop production, gross farm income and net farm income in each typical farm at the full development condition are estimated on the basis of the cropping pattern and prospective land use. These are shown in the TABLES III-8, III-9 and TABLE III-10. The balance of payment in each farm is summarized as follows:

Typical Farm Budget

(P/household)

Description	Agricultural Block III	Agricultural Block V
Average land holding (h)	2.4	5.5
- Cultivated area	2.4	4.65
- Forest growth	-	0.85
Balance of payment:		
(1) Gross farm income	30,310	24,980
(2) Production cost	10,390	9,150
(3) Net farm income		
(1) - (2) = (3)	19,920	15,830
(4) Financial outg6	7,720	4,960
(5) Net r6serve		
(3) - (4) = (5)	12,200	10,870

As stated in the previous Section 2.3.8. The net reserve in each farm under present condition is at P6,240 in The Agricultural Block III and at P-470 in the Agricultural Block V. The net reserve per household to be anticipated in the future condition with the project will increase to P12,200 and P10,870 respectively. These are respectively represented about two times and 24 times of the present level (see TABLE III-11). These amount can still retain about P3,700 and P2,370 per annum, even though some P8,500 or so of land tax and public duties is deducted from the net reserves. This fact prove the financial viability of the project from the viewpoint of the individual farms.

TABLE III-1 PROSPECTIVE AGRICULTURAL LAND USE
(Condition with the Project)

Land Classification	Present Condition	Future Condition	Gross Area (ha)	Net Arable Land				Forest Growth (ha)	Fallow & Waste Land (ha)
				Paddy Field	Upland Field	Other Crop	Sugarcane		
			(ha)	Irrigated (ha)	Rainfed (ha)	Sugarcane (ha)	Other Crop (ha)	(ha)	(ha)
1.	Agri-Block I	Agri-Block I	8,570	0	0	5,610	170	0	0
2.	Agri-Block II	Agri-Block II	930	930	0	0	0	0	0
3.	Agri-Block III	Agri-Block II	2,430	2,400	0	0	0	0	0
4.	Agri-Block IV	Agri-Block IV	1,250	0	50	0	0	0	0
5.	Agri-Block V	Agri-Block II	1,570	320	680	0	250	120	100
6.	Agri-Block VI	Agri-Block VI	900	0	0	0	0	450	0
Total			15,740	3,650	730	5,610	420	570	100

TABLE III-2 PROSPECTIVE LAND USE AND CROPPING PATTERN

Land Category	Cropping Pattern		Extent Area	
	Wet season	Dry season	(ha)	(%)
<u>Paddy field</u>				
a. Irrigated	1. Paddy - paddy	- Paddy	730	(6.5)
	2. Paddy - 2nd crop	- Paddy	730	(6.5)
		(1/2)		
	3. Paddy	- Paddy	1,800	(16.1)
b. Rain-fed		(1/2)		
	1. Paddy	- 2nd crop	390	(3.5)
	Paddy	- follow	730	(6.5)
<u>Upland field</u>				
a. Sugar cane	1. Sugar cane with twice ratooning		5,610	(50.3)
b. Other crop	1. Cassava, maize etc.		420	(3.8)
<u>Forest growth</u>				
	Perennial crops (trees, bamboo etc.)		570	(5.1)
<u>Fallow/waste</u>				
	Waste from agricultural use		100	(0.7)
Total			11,080	(100.0)

TABLE III-3 EXPLOITATION ON AGRICULTURAL LAND USE

Land Category	Present Land Use (ha)	Prospective Land Use (ha)	Incremental Extent	
			(ha)	(%)
Paddy field	<u>3,550</u>	<u>4,380</u>	<u>830</u>	<u>(18.9)</u>
a. irrigated	2,220	3,260	1,040	(46.8)
b. rainfed	1,330	1,120	-210	-15.8
Upland field	<u>5,780</u>	<u>6,030</u>	<u>250</u>	<u>(4.1)</u>
a. sugar cane	5,610	5,610	0	(0)
b. other crop	170	420	250	(4.1)
Forest growth	0	570	570	(100.0)
Fallow/waste	1,750	100	-1,650	(-94.3)
Total	11,080	11,080	-	-

TABLE III-4 ANNUAL PLANTING ACREAGES

Major crops	Acreages (ha)
<u>Paddy</u>	
- first cropping	4,380
- second cropping	730
- third cropping	3,260
<u>Sub-total</u>	<u>8,370</u>
<u>Sugar cane</u>	
- new planting	1,870
- first ratooning	1,870
- second ratooning	1,870
<u>Sub-total</u>	<u>5,610</u>
<u>Secondary crops</u>	<u>560</u>
<u>Other crops</u>	<u>420</u>
Total	14,960

Note: gross cropping intensity is at 1.44:
(14,960 ha in total planting area + 10,410 ha
in total farm land)

TABLE III-5 PROSPECTIVE ANNUAL GROSS PRODUCTION

Major Crops	Planting Area (ha)	Unit Yield (t/ha)	Gross Production (t)
<u>Paddy</u>			
a. first cropping irrigated	3,260	3.8	12,390
b. second cropping irrigated	730	3.8	2,770
c. third cropping irrigated	3,260	3.8	12,390
<u>Sub-total</u>	<u>7,250</u>		<u>27,550</u>
d. rain-fed cropping	1,120	2.5	2,800
<u>Total</u>	<u>8,370</u>		<u>30,350</u>
<u>Sugar cane</u>			
a. new planting	1,870	42.0	78,540
b. first ratooning	1,870	34.0	63,580
c. second ratooning	1,870	25.5	47,680
<u>Total</u>	<u>5,610</u>		<u>189,800</u>
<u>Secondary crops</u>	<u>560</u>	0.6	<u>330</u>
<u>Other crops</u>	<u>420</u>	1.0	<u>420</u>
<u>Grand total</u>	<u>14,960</u>		

TABLE III-6 GROSS VALUES AND NET VALUES OF AGRICULTURAL PRODUCT
(Prospective Conditions with Project)

Major Crops	Gross Production (t)	Unit Price (P/t)	Gross Values (P10 ³)	Total Production Cost (P10 ³)	Net Values (P10 ³)
Paddy					
- Irrigated paddy	27,550	1,150	31,680	13,850	17,830
- Rain-fed paddy	2,800	1,150	3,220	1,500	1,720
Sub-total	30,350		34,900	15,350	19,550
Sugar cane	189,800	270	51,250	19,640	31,610
Secondary crops	330	1,300	430	150	280
Upland crops	420	740	310	110	200
Total			86,890	35,250	51,640

Note: Secondary crops and upland crops are tentatively represented by mung-bean and white maize, respectively.

TABLE III-7 INCREMENTAL GROSS VALUES AND NET VALUES OF AGRICULTURAL PRODUCT

(F103)

Major Crops	<u>Present Condition</u>		<u>Prospective Condition</u>		<u>Increment</u>	
	Gross Values	Net Values	Gross Values	Net Values	Gross Values	Net Values
Paddy	21,450	11,950	34,900	19,550	13,450	7,600
Sugar cane	51,250	31,610	51,250	31,610	0	0
Secondary crops	430	280	430	280	0	0
Upland crops	130	70	310	200	180	130
Total	73,260	43,910	86,890	51,640	13,630	7,730

Note: Secondary crops and upland crops are represented by mongo-bean and white-maize, respectively.

TABLE III-8 TYPICAL FARM IN AGRICULTURAL BLOCK III
(Average holding size: 2.4 ha)

Crop production Gross income, Net income
(Future Condition with Project)

Land Category	Crops	Planting Area (ha)	Unit Yield (t/ha)	Gross Production (t)	Unit Price (P/t)	Gross Income (P)	Farming Cost (P)	Net Income (P)
Irrigated paddy field	1st paddy	2.4	3.8	9.1	1,150	10,460	4,580	5,880
	2nd paddy	0.6	3.8	2.3	1,150	2,650	1,150	1,500
	3rd paddy	2.4	3.8	9.1	1,150	10,460	4,580	5,880
	Secondary crops	0.3	0.6	0.2	1,300	260	80	180
Total		5.7				23,830	10,390	13,440

TABLE III-9 TYPICAL FARM IN AGRICULTURAL BLOCK V
(Average holding size: 5.5 ha)

Crop production, Gross income, Net income
(Future condition with Project)

Land Category	Crops	Planting Area (ha)	Unit Yield (t/ha)	Gross Production (t)	Unit Price (P/t)	Gross Income (P)	Farming Cost (P)	Net Income (P)
Irrigated paddy field	-1st paddy	1.2	3.8	4.5	1,150	5,170	2,290	2,880
	-2nd paddy	0.3	3.8	1.1	1,150	1,260	570	690
	-3rd paddy	1.2	3.8	4.5	1,150	5,170	2,290	2,880
	-secondary crops	0.15	0.6	0.1	1,300	130	40	90
Rain-fed paddy field	-1st paddy	2.55	2.5	6.3	1,150	7,240	3,410	3,830
	-secondary crops	1.20	0.6	0.7	1,300	910	320	590
Upland field	-upland crops	0.90	1.0	0.9	740	670	230	440
Total		7.50				20,550	9,150	11,400

TABLE III-10 FARM ECONOMICS

(Future condition with project)

Balance of Payment on Typical Farm

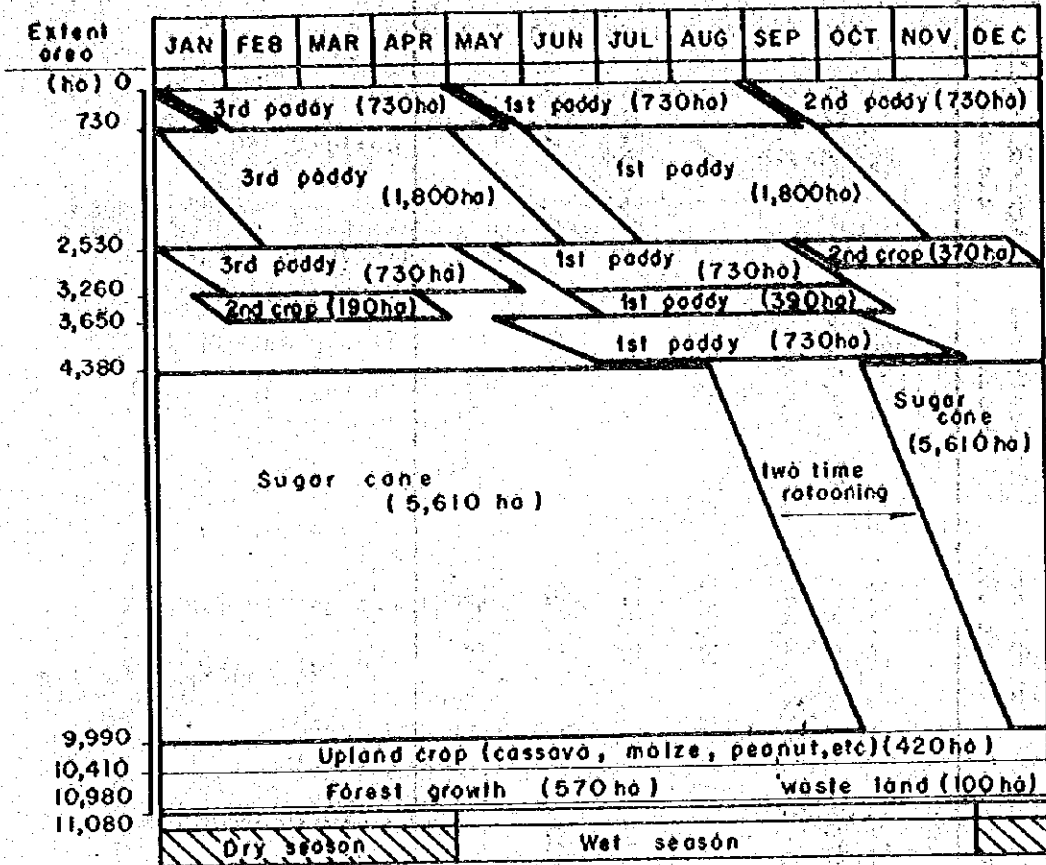
Description	Agricultural Block III	Agricultural Block V
Average land holding (ha)	2.4	5.5
- cultivated area	2.4	4.65
- Forest growth	-	0.85
Major crop production (t)		
- Paddy	20.5	16.4
- Secondary crops	0.2	0.8
- Upland crops	-	0.9
Balance of payment (P)		
(1) Gross income	<u>30,310</u>	<u>24,980</u>
- crops	23,830	20,550
- Agri-credits	6,480	4,430
(2) Production cost	<u>10,390</u>	<u>9,150</u>
(3) Net income (1)-(2)=(3)	<u>19,920</u>	<u>15,830</u>
(4) Financial outgo	<u>7,720</u>	<u>4,960</u>
- land rent	5,230	2,590
- debt re-payment	390	270
- living allowance	2,100	2,100
(5) Net reserve (3)-(4)=(5)	<u>12,200</u>	<u>10,870</u>

TABLE III-11 FARM ECONOMICS (Incremental Benefit)

(P/household)

Description	Present Condition		Future Condition with Project		Incremental Condition	
	Agricultural Block III	Agricultural Block V	Agricultural Block III	Agricultural Block V	Agricultural Block III	Agricultural Block V
Gross income	17,240	3,470	30,310	24,980	13,070	21,510
- Crops	14,310	3,470	23,830	20,550	9,520	17,080
- Agri-credits	2,930	-	6,480	4,430	3,550	4,430
Production cost	6,390	1,540	10,390	9,150	4,000	7,610
Net income	10,850	1,930	19,920	15,830	9,070	13,900
Financial outgo	4,610	2,400	7,720	4,960	3,110	2,560
Net reserve	6,240	- 470	12,200	10,870	5,960	12,670

FIGURE III - I PROSPECTIVE LAND USE AND CROPPING PATTERN



FLOOD DAMAGE AND SEDIMENTATION DAMAGE

IV. FLOOD DAMAGE AND SEDIMENTATION DAMAGE

4.1 General

Flood and Sedimentation damage consists of direct damage, indirect damage and intangible damage which is not quantifiable. Direct damage includes such damages as damage on agricultural product, damage on buildings and properties and damage on public goods such as roads, bridges, schools, etc. Indirect damage is "the net economic losses of goods and services to the nation due to the interruption of business, industry, commerce, traffic, communications and other activities, both within and outside the area subject to flooding, and the cost of activities made necessary by the flood such as emergency flood fighting measures and relief, care and rehabilitation of flood victims." ^{/1}

The most important items of indirect damage are: (1) loss of goods and services in the area because of production stop; (2) loss of wages and other incomes; (3) loss of stock due to spoilage; (4) increased cost of business operations, including higher transportation cost; (5) costs of evacuation, reoccupation, temporary quarters, emergency flood-protection works, and relief and care of flood victims.

Beside above, loss of life, impairment of public health due to outbreak of contagious disease, insects and unfavourable effect on social and political stability are another important damages. These damages are difficult to be quantified and called intangible damage.

In this study, mainly the direct damage is taken into account for the flood damage estimation of the past main floods due to the difficulty in assessment of the indirect and intangible ones. The damages included are damage on agricultural products and irrigation facilities, damage on houses, damage on transportation.

Since there are no systematic assessment records of the past flood damages and even if they exist, the estimated damage includes the damage caused not only by flood but also by rain and wind, the damages of the past three floods, namely, 1966 flood, 1972 flood and 1974 flood are assessed in this report on the basis of the collected data concerning the flooded areas, depths and durations.

4.2 Flooded Area

During the past 12 years from 1966 to 1977, the following destructive flooding are reported by the local inhabitants. Namely, they occur in the mid-May, 1966; July-August, 1972; mid-August, 1974; mid-May, 1976 and November, 1977. Among them, floods in the mid-May, 1966 and in the mid-May, 1976 are attributed to a heavy rain being frequently born by the strong pre-monsoon. The other floods are caused by the destructive typhoons.

^{/1}: Annual Report of Chief of Engineers (1951)

FIGURE IV-1 to FIGURE IV-5 attached to this report show flooded area in each floodings delineated on the basis of the informations obtained by the field interview with the farmers. In the maps, inundated area is classified by the degree of inundation depth and duration which are defined in the Philippines Recommends for Rice, 1977 (see TABLE IV-1). As for the area affected by sand sedimentation, it is also classified into four-categories by the depth of sand-deposition which is preliminarily defined herein taking into account the prevailing farming practices being operated in the project area. The results of these classification are summarized as follows:

Area Inundated and Sand Deposited

Description	(ha)				
	1966	1972	1974	1976	1977
1. Gross flooded area:	5,090	5,500	4,940	3,020	3,980
2. Area by inundated period:					
- short duration;	1,490	70	1,970	-	1,410
- medium duration;	2,350	470	1,720	1,760	1,400
- long duration	1,250	4,960	1,250	1,260	1,170
3. Area by inundation depth:					
- shallow	-	450	1,500	220	-
- moderate	3,840	90	2,190	2,550	2,810
- deep	1,250	4,960	1,250	250	1,170
4. Area affected by sand sediments:					
- thin sand;	1,540	450	930	530	220
- rather thick sand;	1,030	150	-	160	190
- thick sand;	-	2,310	-	-	-

Note: Detailed break-down is shown in the following TABLE IV-2.

As seen in the above Table, some 5,000 ha or so of the area is, more or less, influenced by every flooding under the condition without dikes. The flooded area categorized by land use is summarized as follows:

Flooded Area in Each Land Category

Land Categories	(ha)				
	1966	1972	1974	1976	1977
Paddy field;	4,160	3,690	2,830	2,100	2,830
Upland field;	70	70	70	70	70
Fish-pond;	390	540	1,190	540	540
Village yard;	470	1,200	850	310	540

4.3 Damages on Agricultural Production

The agricultural damages caused by flood and sand sediment are defined into (1) crop damage, (2) damage on agricultural facilities such as farm land, irrigation facilities, farm roads and their related structures, etc. and (3) additional expenditure (or minus profit) as are in terms of direct damage; and (4) such missing or decreasing as land arability and productivity as are in terms of indirect damage.

At present, no systematic investigation and evaluation of damages on agricultural production and agricultural facilities are conducted in the project area. Therefore, the agricultural damages caused by the flood and sand-sedimentation are estimated based upon the data and informations obtained by the field interview with the farmers and the reference available in the annual report published by the Governmental offices concerned.

4.3.1 Damages on Crop

As mentioned in the Section 4.2, the farm land affected by flood and sand sediment is mainly lowlying paddy field. Almost all of the sugar cane field and other upland field are free from the flooding every season.

The actual planting acreages of paddy by different stages of crop growth are presumed according to the official information and the maps on the flooded area attached to this report.

Cropping Area by Growing Stages of Paddy

Flood Year	Total Cropped Area	Stage of Crop Growth (ha)		
		Nursery to Tillering	Young Panicle Formation	Heading to Reopening
1966	4,155	2,890	-	1,260
1972	3,690	10	3,680	-
1974	3,990	3,470	370	-
1976	2,100	1,470	-	630
1977	2,830	1,950	370	510

Note: Detailed breakdown is shown in TABLE IV-3.

In the normal condition without flood, it is expected to obtain the gross paddy production at about 9,190 tons/3,950 ha on an average for three years of 1966, 1972 and 1974 when no embankment was provided along the Pasig-Potrero river. However, almost all the cropped area is, more or less, affected by flood and sand sedimentation and the paddy production largely decrease as follows:

Crop Production Estimated

(t)

Crop Production	1966	1972	1974	1976	1977
Paddy in normal condition	8,310	8,490	10,770	4,620	6,420
Paddy damaged by flood (damage rate: %)	3,170 (38.1)	7,550 (88.9)	3,120 (29.0)	2,420 (52.4)	2,140 (33.3)

Note: Detailed breakdown is shown in TABLE IV-4.

In this estimation, an average yield obtained from the area where the land free from the flood problems (see TABLE IV-5) is applied and a ratio of crop damage at each different crop stage is estimated with the reference available to the preliminary estimation on crop damage: "the Philippines recommends for rice, 1977" (see TABLE IV-6). The degree of yield reduction of paddy in each flood and sand sedimentation condition is shown in the following TABLE IV-7.

On the basis of the above production estimate, a value of crop damage is estimated with the current farm gate price of paddy at P1.15/kg in 1977. The damage value in each flood is summarized as follows and detailed breakdown is shown in the following TABLE IV-8.

Damage Value on Crop

(P 10³ by 1977 current price)

Description	1966	1972	1974	1976	1977
Damage value on paddy	3,650	8,680	3,590	2,780	2,460

4.3.2 Damage on Agricultural Facilities

Due to the soils having relatively loose in consistence, the agricultural facilities such as farm land, irrigation facilities, farm roads and their related structures are easily eroded or broken when the land is influenced by flood. According to the informations obtained from the Agricultural Extension offices in Municipality of Bacolor, Guagua and Sta. Rita and chieives of Barrangaias (village), large extent of farm land particularly of field ridges on paddy field and the embankment of irrigation canals and creaks were eroded out seriously by the past distructive flooding of Pasig-Potrero river. As the results, those eroded materials (sands) were widely spreaded over the paddy field and sometimes, crops were completely buried under those sands. Thus, in case of this constraint, the agricultural damages in the Project area extend not only missing the facilities but also putting hindrance to the further increment of crop productivity.

The damage on the agricultural facilities obtained by the field investigation conducted in March, 1978 and the informations collected from the rural offices concerneds is listed in the following TABLES from IV-9 to IV-13 and these are summarized as follows:

Damages on Agricultural Facilities

Description	1966	1972	1974	1976	1977
1. Farm land damaged:					
a. Seriously eroded (ha)	230	370	250	230	190
b. Partially eroded (ha)	390	500	550	440	340
2. Irrigation canal damaged:					
a. Seriously eroded (km)	6.4	19.1	3.4	4.0	4.1
b. Partially eroded (km)	14.1	33.0	10.9	7.9	10.5
3. Farm roads damaged:					
a. Seriously eroded (km)	1.3	7.1	0.5	0.8	0.5
b. Partially eroded (km)	3.1	11.9	2.3	1.8	1.5
4. Major structure damaged:					
a. Bridges (Nos.)	5	13	2	0	0
b. Curverts (Nos.)	14	31	5	5	3

Usually, these damages are maintained and rehabilitated by farmers themselves with the capital supporting made by the Government. An evaluation of the damages on the agricultural facilities is made based on the past results on the maintenance and rehabilitation works obtained from the villagers. The unit cost estimated is as shown in the following TABLE IV-14. The estimated damage value in each flood is shown in detail in the following TABLES from IV-15 to IV-19 and those are summarized as follows:

Damage Value of Agricultural Facilities

(P 10³ in 1978 current price)

Description	1966	1972	1974	1976	1977
1. Farm land	348.3	511.9	426.5	367.3	294.5
2. Irrigation facilities	78.7	304.5	45.8	48.8	52.2
3. Farm roads	6.7	30.7	3.9	4.1	3.0
4. Major structures	30.5	68.5	11.0	10.0	6.0
Total ^{/1}	464.2 (460)	915.6 (920)	487.2 (490)	430.2 (430)	355.7 (360)

4.3.3 Unexpected Farming Expenditures

Unexpected farming expenditures are the damage in terms of minus profit caused by the flood and sand sedimentation. In the objective area, expenditures for re-transplanting and for harvesting and processing of paddy are the most extent among the unexpected farming expenditures.

According to the data provided by the Agricultural Extension office re-transplanting of paddy and harvesting area affected by each flood is shown in the following TABLE IV-21. The expenditures for both

^{/1} Figures in the parentheses are rounded figures which are used for the total damage estimation.

retransplanting and harvesting works are estimated on the basis of the unit cost per ha, defined in TABLE IV-20. The total expenditures estimated are as follows:

Expenditures (or Minus Profit)
due to the flood

(P 10³ in 1978 current price)

Description	1966	1972	1974	1976	1977
a. Re-transplanting:	1,240	-	-	340	20
b. Harvesting & processing:	200	-	-	100	80
Total	1,440	-	-	440	100

Note: No additional works were practiced in 1972 and 1974 because of the crops which were being staged on the young panicle formation to maximum tillering at the flood times.

4.3.4 Damage on Land Arability and Productivity

Missing or decreasing the land arability and land productivity caused by deep sand sedimentation is one of the serious damage in the project area. According to the field investigations made by the Bureau of Soils Conservation, about 2900 ha of low-lying land along the Pasig-potrero river was deeply covered by sand sediments transported by the destructive flood in July-August, 1972. As the results, about 2,900 ha of paddy field was seriously damaged, and of which about 1,140 ha was lie waste and the remaining land also missed its productivity due to changes of the field condition from irrigated field to rainfed or paddy field to upland field.

Based upon the informations obtained by the field interview with the villagers and data provided by the Agricultural Extension offices in Municipality, the area damaged by sand sediments and the land changed to the other land categories are presumed as in TABLE IV-22 and are summarized as follows:

Area Affected by Sand Sediments and Area
Changed to Other Land Categories

(ha)

Description	1966	1972	1974	1976	1977
1. Area affected					
a. Thinly sedimented	1,540	0	930	400	230
b. Rather deeply sedimented	1,030	600	0	120	130
c. Deeply sedimented	0	540	0	0	0
d. Ultra deeply sedimented	0	1,770	0	0	0
2. Damages on land arability					
a. Completely missed (waste)	0	1,080	0	0	0
b. Transformed to upland crop	280	220	0	40	10
3. Damages on land productivity					
a. Missing irrigability (rain-fed)	1,060	1,140	0	0	0
b. Partly missing irrigability	960	470	830	520	155

To evaluate the damages mentioned above, the following assumptions are preliminary framed up in due consideration of the present condition of farming practices, unit yield and production in the project area.

Degree of Damaged Land Value

Description	Damage rate
Damages on land arability:	
(a) Land lie waste;	- 100% of the normal production of paddy
(b) Land transformed to upland field;	- 75% of the normal production of paddy
Damages on land irrigability:	
(a) Land changed to rain-fed paddy field;	- 65% of the normal production of paddy under irrigated condition
(b) Land irrigable only in the wet season;	- 50% of the normal production of paddy under irrigated condition

Based on the damage rate assumed in the above, the damaged land values in each flood are estimated in the following TABLES IV-23 and those are summarized as follows:

Damaged Land Value

(P 10³ in 1977 current price)

Description	1966	1972	1974	1976	1977
4. Damage values					
a. Missing or decreasing land arability (P 10 ³)	161.0	3,002.1	0	25.3	7.4
b. Missing or decreasing land productivity (P 10 ³)	1,957.3	2,079.2	1,288.5	657.8	231.7
Total ^{/1}	2,118.3 (2,120)	5,081.3 (5,080)	1,288.5 (1,290)	683.1 (680)	239.1 (240)

4.4 Flood Damage to Fish Culture

In the lowlying riparian land in the project area, flooding not only from Pasig-Potrero river but also Guagua river is a frequently recurring and cause considerable damages to the facilities of fish-pond and fish production. The usual affects of consecutive inundation are escape of fish stocks, erosion of embankment of the pond, sedimentation and intrusion of wild fish (fish-predators). In some sever case as seen in the 1972 flood, such parmanent structures as water-gates, drops, main embankments, etc was seriously destroyed and completely missing the fish stock in certain extent.

According to the data provided by the Bureau of Fishery regional office No. III, San Fernand, Pampanga, a few percent of the total production is affected to the damage caused by regular flooding and such distructive flood as in 1972 counters more than 10% of damages to the production. The following table shows summary of damage by the typical flooding during the past years from 1966 to 1977. Detailed breakdown is shown in TABLE IV-24 and summarized below:

Damages on Fish-pond and Fish Production

(P 10³)

Description	1966	1972	1974	1976	1977
Value of damages:					
- Fish-pond	16	474	39	-	13
- Fish production	63	517	28	80	17
Total	79	991	67	80	30

^{/1} Figures in the parentheses are these which are used in the total damage estimation.

4.5 Damage on Houses

In this study, only the damage on private houses is included excluding the damage on public buildings such as schools, churches, etc, and factories. Damage on household effects is also excluded in the estimate.

4.5.1 Value of House

Houses in the project area are divided into three classes, namely, A, B and C. "A class" houses are those which are made by cement, wood with FI roofs. "B class" houses are those which are made of wood. "C class" houses are made of wood and bamboo. On the basis of the assessed value by the Tax Authority and taking into account the price increase in the past few years, A-class houses are valued at P72,000, B-class houses at P28,000 and C-class at P8,500.

Distribution of the different class houses is assessed both for urban area and rural area. The estimated proportion is as presented in the following table.

Type of houses	Proportion	
	Urban Area	Rural Area
A	5 %	-
B	25 %	-
C	70 %	100 %

From the above table, average value of a house in the urban area is estimated at P16,550/1, while that in the rural area is P8,500.

4.5.2 Flood Damage Rate

Since there is no flood damage rate to be applicable especially to the country, the damage rate estimated on the basis of Japanese floods is applied taking into account the difference in the height of house foundation. The damage rate in relation to flood depth is presented in the following table.

Depth above floor level	Damage rate
0-0.5	0.05
0.5-1.0	0.07
1.0-1.5	0.10
1.5-2.0	0.12
2.0-2.5	0.14
2.5-3.0	0.18
over 3.0	0.22

$$\underline{1} (0.05 \times 72,000 + 0.25 \times 28,000 + 0.7 \times 8,500) = 16,550$$