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REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

THE PANAY RIVER BASIN WIDE FLOOD CONTROL STUDY

SUPPORTING REPORT

APPENDIX VI : AGRICULTURAL DEVELOPMENT PLAN
APPENDIX VII : IRRIGATION DEVELOPMENT PLAN

NOVEMBER [illegible]

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF THE PHILIPPINES
MINISTRY OF PUBLIC WORKS AND HIGHWAYS

THE PANAY RIVER BASIN-WIDE FLOOD CONTROL STUDY

SUPPORTING REPORT III

APPENDIX VI AGRICULTURAL DEVELOPMENT PLAN
APPENDIX VII IRRIGATION DEVELOPMENT PLAN

NOVEMBER 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

APPENDIX VI

AGRICULTURAL DEVELOPMENT PLAN

FOR

FINAL REPORT

ON

THE PANAY RIVER BASIN-WIDE

FLOOD CONTROL STUDY

APPENDIX VI

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1. INTRODUCTION

This appendix presents the findings of the preliminary study on agronomy cum agro-economy in connection with the Panay river basin-wide flood control study. The purposes of agronomic and agro-economic study were (1) to assertain the location, extent, and quality of the land adaptable to agricultural development with the avialable water supplies and the anticipatated crop to be grown and (2) to provide necessary data for planning and evaluation such as irrigation suitability, irrigation benefits, their derivation analysis and etc..

The reconnaissance survey on general land use, land classification and farmers economy were made in February 1984 in collaboration with MPWH and NIA officials. Crop yield survey, cost-benefit analysis of irrigation development, study on fisheulture and mapping were carried out during the period from July to November 1984. Considerable time was devoted to the "on-job-trainning" of the Philippines staff which did the paddy yield survey under the assistance of the JICA team.

The primary findings in the agricultural field in the basin are (1) any future development in the basin is constrained by limited cultivable land and decreasing farm sizes, therefore, (2) development efforts should be focused on improving land use and raising production efficiences in presently cultivated areas and (3) present agriculture having the largest potential source of employment should change their course to the direction of intensification through development and improvement of present farming practices.

The secondly are that the development efforts in the agriculture of the province of Capiz are placed on improved area productivity, post-harvest technology and marketing of agricultural products.

The thirdly are that an agricultural development plan should be focused on irrigation development through expantion and rehabilitation of existing irrigation facilities to meet the need of the people in the Panay river basin.

2. BACKGROUND OF AGRICULTURE

2.1 National Agricultural Condition

Philippines has a population of 48 million according to the 1980 census corresponding to the density of 160.3 persons per km^2. The growth in population was about 21 million compared with the 1960 census. The high growth rates recorded during the 1960's where average annual growth rate reached at 3.08%. In the 1970's population growth, however, slow down registering an average annual growth rate of 2.7% in 1979-1980. The population is forecasted to double after 25 years with this growth rate. In 1980, the "Philippines Population Program Medium Plan (1981-1985)" was approved to reduce the population growth rate from an estimated 2.3% in 1980 and to an estimated 2.0% in 1985.

GDP in 1983 was about ₱380 billion (about US$27 million) which means about 11.8% increase from the previous year. Per capita GDP is ₱7,330 which shows about 9.3% increase from the previous year. Real growth rate of GDP and per capita GDP, however, were 1.0% and -1.3% respectively, which record the lowest figures for the decade.

Although agriculture experienced the constnat growth during the second half decade of 70's, the real growth rate gradually went down from 4.5% in 1979 to 3.5% in 1983 reflecting the poor crop owing to the unfavorable weather and mainly the deterioration of export of agricultural products. Hampered by a long dry weather during rainy season and the adverse effect of typhoons, annual growth in paddy production declined from 6.5% in 1979 to 3.6% in 1982. Likewise, banana and forestry declined during the same period caused by depressed market condition abroad. In contrast, fishery, sugar cane, livestock and poultry brought about the modest gains for the same period.

2.2 Regional Agriculture Condition

Region VI, The Western Visayas Region, is composed of the four provinces of Panay Island, the sub-province of Guimaras, and the Western Province of Negros Island. The provinces of Panay Island are Aklan, Antique, Capiz and Iloilo, (Iloilo includes the sub-province of Guimaras). Negros Island is subdivided into Negross Occidental belonging to Region VI, and Negross Oriental belonging to Region VII. Region VI has a total of 4,032 barangays, 8 cities and 122 municipalities with Iloilo City as its regional center.

The aggregate economic output of Western Visayas Region in terms of the gross regional domestic product (GRDP) amounted to P8,335 billion, at constant 1972 prices, as of 1982. This represented 8.4% of the country's gross domestic product. With this level of output, Western Visages ranked fourth among the Philippines' thirteen regions, trailing only the National Capital Region, Southern Tagalog and Central Luzon. The region's per capital GRDP in 1982 amounted to 1,760 peso.

About P3.31 million (39.7%) of the GRDP of Western Visayas was contributed by the agriculture, fishery and forestry sector. The industry sector contributed 2.36 million (28.3%), while the service sector's share amounted to 2.66 million (32.0%).

The annual growth rate of the GRDP average 5.5% between 1978 and 1982. During this period, the agriculture, fishery and forestry sector's average annual growth rate matched that of the industrial sector at 6.4%, while the service sector's average annual growth rate was only 3.9%. With these sectoral growth trends, not much structural change in the regions GRDP composition has really occured between 1978 and 1982.

Gross Value added in agriculture, fisheries and forestry has increased from P2,600,000 in 1978 to P3,300,000 in 1982, an increase of P710,000 in a period of five years. Paddy constituted 17% of the sector's GVA in 1978, 20% in 1980 and 18.3% in 1982. On the other hand, sugarcane accounted for 28% of the GVA in the agriculture and natural resources sectors. This share increased to 32% in 1979 but subsequently decreased to 29% and 28%

in 1980 and 1982, respectively. Gross Value added in fisheries went down from 24% in 1978 to 19% in 1982.

As a whole, paddy, sugarcane and fishery products constituted the major/primary sector commodities of the region, accounting for 69% of the GVA in agriculture, fishery and forestry in 1978, and 65.3% of the same in 1982.

Agricultural Employment:

As of 1982, the estimated employment in the region reached 1,717,000 persons, of which the agricultural sector accounted for 1,032,000. Comparing these with the 1978 figures, it will be noted that the 1982 agricultural employment of 1,032,000 persons was even slightly lower than 1978 employment figures. Consequently, the percentage share of agricultural employment to total regional employment had decreased from 63.4% in 1978 to 60.1% in 1982. The decline had, of course, not been a consistent with the year to year fluctuations in both the absolute and relative size of agricultural employment in the region.

2.3 Agricultural Development Plan in Fiver Years at National Level

Plans for agriculture in the 1983-87 period reflect a number of new initiatives in programs for rice, corn, other feed crop, coconuts, sugar, and livestock products as presented below.

Expected Gross Agricultural Output, 1982-87

Item	1982	1987	Average Annual Growth Rate 1982-87
All crops			5.3
Food crops (thousand metric tons)			
Paddy	8,198.5	9,762.0	4.0
Corn	3,392.0	5,900.0	11.7
Coconut (Copra terms)	2,311.1	2,422.2	0.9
Sugar	2,530.0	3,320.0	5.6

Item	1982	1987	Average Annual Growth Rate 1982-87
Banana	2,271.0	2,710.0	3.6
Nonfood crops			16.6
Total agricultural output in 1972 prices			6.0

Source: Ministry of Agriculture

More favorable return prospects are being considered in order to turn up rice production. A major new program thrust for corn-Maisagana is designed to greatly expand plantings to hybrid corn and other types of high yield varieties. An effective program may almost double output in five or six years. Most of this increase would go into feed for livestock and for export. Such a gain in feed output could provide either for large exports of corn or for exports of hog and poultry products by the end of the plan period.

In addition to new program thrusts for rice and corn, effective programs are being undertaken for the domestic production of soybeans, increased milk production, increased use of coconut oil for fuel, larger investments to expand fish production, incentive programs to expand the output of commercial crops and improved breeding and nutrition programs for livestock.

Agricultural Development Plan at Regional Level:

In agriculture, any further development in the region is constrained by limited cultivable land and decreasing farm sizes. Hence, development efforts would mainly focus on improving land use and raising production efficiences in presently cultivated areas, along with a judiciously modest amount of area expansion in undeveloped upland and pasture areas.

Since surplus production of major crops like rice and sugarcane has been attained, emphasis will now be placed on improving the area produc-

tivity, quality, postharvest technology, and marketing of these products, moreover, development of secondary crops and other non-traditional agricultural products that could be suitable in the region and which have good market prospects, will be promoted. Among these are corn and other feedgrains, mango, cocoonut, banana, coffee, cacao, ginger,and various types of vegetables, legumes and root crops. Poultry and livestock raising will likewise be given greater impetus in the region. Appropriate farm enterprise systems under various estate crop development schemes will be set up and adequately provided with technical, financial, marketing and other institutional support services to bring about the accelerated development of the identified priority agricultural crops. Supportive of this thrust will be the expansion of vital infrastructures such as irrigation projects, farm-to-market roads, warehouses, processing centers, and other agricultural services facilities.

The thrust in fisheries development will now focus on further boosting production output and increasing productivity levels of inland fisheries through the promotion and wide diffusion of improved aquaculture methods. Production of prawn and other exportable aquatic species will be emphasized because of their foreign exchange earning potentials.

In marine fisheries, support programs will be instituted to assist small municipal fishing operations in line with the regional concern for livelihood generation and improvement. For commercial fishing operations, adoption of more efficient deep sea fishing technologies will be encouraged to offset the high cost of fuel. The completion of the Iloilo Fishing Port Complex and construction of ancillary facilities required for an efficient fish marketing infrastructure will be undertaken. This will boost the marketing mechanism not only of the region but also of the nearby areas.

3. PRESENT AGRICULTURAL CONDITION IN THE PANAY RIVER BASIN

3.1 Physical Status

3.1.1 Location and Area

The Panay river basin is situated in the northern part of the Panay island, occupying the area of 2,182 km^2 or 218,200 ha. The river basin is mostly enclosed with the boundary of Capiz province except for a part of the province of Iloilo locating at the southeastern corner of the river basin.

The river basin is bounded by the province of Iloilo in south and southeast, by the province of Aklan in west and by the municipalities of Sapian, Ivisan, Pontevedra and President Roxas of Capiz province in north. The northeastern parts of the basin face on the Sibuyan Sea.

The river basin is administratively composed of 14 municipalities (Cuartero, Dao, Dumalag, Dumarao, Ivisan, Jamindan, Maayon, Mambusao, Panay, Panitan, Pontevedra, Sapian, Sigma, and Tapaz) and one City (Roxas City) of Capiz province and 2 municipalities (Lemery and Bingawan), of Iloilo. Roxas City, the capital of Capiz province, is also the administrative center of the river basin which is located 150 km north of Iloilo City by land and 375 km south of Manila by air.

3.1.2 Topography

The Panay river basin is drained in the northward direction by the Panay river and its main tributaries such rivers as Mambusao, Maayon and Badbaran. These rivers have their sources in the southern and western mountains in the basin. The land of the Panay river basin is geomorphologically categorized into the following fiver topographies:

(1) Sand dune: The land has nearly flat to very slightly undulating topography and extends narrowly along the coast of the northern part in the basin. The land consists of coarse to fine particles of sand developing under the siltation balanced

between the ocean current and river flow.

(2) Alluvial plains: Almost all of this land have been developed as the paddy field and are found extensively along and near the mouth of the Panay river. The land has very flat topography, including such microtopography as natural levees, constricted swamps, slight depressions and tidal marshes. Seasonal flooding is a severe constrain for profitable farming in some parts of the land.

(3) Residual or highly dissected hills: This might be the tertiary land formation and have undulating to rolling topography. The residual hills are isolated and distributed in the alluvial plain. Highly dissected hills extend all over the basin and are mainly used for cultivation of sugar cane and upland rice.

(4) Undulating or rolling hills: The land might be the tertiary land formation, lying on the foot of the mountains. The land consists of loamy to clayey soils developed in place from stratified sedimentary rocks such as shale and sandstone. It is dissected by small creeks and rivers. The sloping land with no vegetative cover suffers from heavy soil erosion.

(5) Steeply sloping mountains: This mainly distributes in the western part of the basin and have an elevation ranging from 200 to 1,000 m above mean sea level. The land is covered with primary soils developed in place from hard igneous rocks.

3.1.3 Climate

The Panay river basin has the third type of climate based on the classification of the Philippine climate due to the rainfall pattern. It has no pronounced difference between rainy season and dry season.

It is relatively dry from November to April and wet during the rest of the year. Roxas City, which represents the third type of rainfall, has the greatest precipitation on October and the least on February. An average annual precipitation of 2,109 mm falls in Roxas City, ranging

from annual maximum of 3,102 mm to annual minimum of 1,354 mm. The precipitation increase as elevation goes higher to the mountainous area along the western part of the basin, indicating an annual average of more than 3,000 mm.

The temperature slightly varies throughout the year. The lowest monthly mean temperature occurs in January with 25.9°C and the highest is in May with 28.5°C. The annual mean temperature is 27.2°C.

The relative humidity is high at all times, ranging the values from 77% to 83% with an annual average of 81%.

The north and northeast winds occurs from October to May with an average speed of 12.2 km/hr and the southwest wind from June to September with an average speed of 9.0 km/hr. Typhoons are relatively frequent on October in the northern half of the basin.

Table VI. 3.1 gives the monthly mean value of each climatic element in Roxas City.

In agro-climatic points of view, it is considered that the Panay river basin is under the favorable climatic condition for profitable farming, particularly for cultivation of paddy.

3.1.4 Soils

The primary soil investigations and studies were conducted in 1948 by the Bureau of Soil Conservation (now the Bureau of Soils) covering about 441,000 ha in the Province of Capiz (before it was divided into two provinces, Capiz and Aklan), and the report was updated and edited in 1962. In this Study, soil investigations are concentrated mainly to confirm the existing soil condition and the modification of the existing soil maps by use of aerial photographs taken in 1983 and through check survey on soil profiles. These profile descriptions are shown in Table VI. 3-2.

Soils in the Panay river basin are classified into four general groups; (1) soils of deltas, swamps and marshes, (2) soils of sand dune,

(3) soils of plains and valleys and (4) soils of hills and mountains. In these general groups, the following fourteen soil types identified by the Bureau of Soils are enumerated:

- Hydrosols
- Beach sand
- San Manuel clay loam
- San Manuel sandy clay loam
- Sara clay loam
- Sara sandy loam
- Bantog clay
- Sta. Rita clay
- Alimodian clay loam
- Alimodian-Barotac complex
- Luisiana clay loam
- San Rafael loam
- Sapian clay
- Faraon clay

These soil types are rearranged into nine groups in order to indicate on a small-scale map as shown in Fig. VI. 3-1. Area, percentage and landform/parent materials of each soil type are shown in Table VI. 3-3.

(1) Soils of deltas, swamps and marshes
(Mapping symbol; Ww)

The soils of this group, generally characterized by a brackish aqueous horizons or surface water ranging in depth from 5 to 100 cm, occupy an area of 14,680 ha or 6.7% of the basin total area of 218,200 ha.

Falling under this soil type are the mangroves, nipa swamps, and fishponds distributed mainly at the northern part of the basin.

Some parts of this soil type are used for rice cultivation. In order to expect the profitable farming in the area of this soils, it requires proper drainage system, modification of soil acidity and fertilization.

(2) Soils of sand dune (As)

The soils of this group, developed on a narrow strips of land along the seashore, are used mainly for residential yard and growing of coconuts.

The soils are characterized by structureless, coarse to fine sand, low organic matter content and high percolation rate. In the light of these properties, they are scarcely suitable for the agricultural utilization. The area of the beach sand is 280 ha or 0.1% of the total land area of the basin.

(3) Soils of plains and valleys (B, Bw, Bn and C)

There are two soil complexes and one soil type in this group, namely, the San Manuel complex on the alluvial plain, Sara-Bantog complex on the older alluvial fans, plains and terraces and San Manual clay loam on the alluvial depression and natural levee.

The soils of San Manuel complex (B),occupying an area of 29,230 ha or 13.4% of the basin, developed on the low lying and flat area, is intensively planted with rice. They consist of brown to pale brownish gray clay loam to sandy loam derived from recent alluvial deposits. Although they are subject to occasional flood, they are suitable for paddy cultivation with proper irrigation and drainage improvements.

The soils of San Manuel clay loam are mapped at two phases; (Bw) on the alluvial depression and (Bn) on the natural levee. The soils of (Bw) occupy an area of 650 ha or 0.3% of the basin land area. They stay idle or abandoned for agricultural production because of the seasonal water stagnation. The soils of (Bn) are found along the banks of the Panay river, primarily planted with sugar cane. It has an aggregate area of 3,690 ha or 1.7% of the basin.

The soils of Sara-Bantog complex (C) are found gently undulating areas and plains, developed from recent alluvial deposits. The total area is about 72,560 ha or 33.3% of the total basin area. The whole area is cultivated with the two principal crops of sugar cane and rice.

(4) Soils of hills and mountains (D, E and G)

The soils of hills and mountains,occupying about 45% of the basin, are residual soils developed from parent materials originating from hard

igneous rocks and consolidated sedimentary rocks such as sandstone, limestone and shale. There are two soil complexes and one soil type in this group; Alimodian-Barotac complex, Luisiana-Sapian complex and Faraon clay.

The soils of Alimodian-Barotac complex (D) are found on the western part of the basin, occupying an area of 8,840 ha or 4.1% of the basin area. They are developed from parent materials derived from the weathering of soft stratified sedimentary rocks. The predominating soil texture is clay loam. In some places the surface soil is already thin because of erosion. Drainage is good to excessive. A greater portion of these soils is devoted to pasture/grassland and upland rice, resulting from former slash and burn cultivation.

The soils of Luisiana-Sapian complex (E) are developed from highly weathered igneous rock materials. They distribute on the rolling, hilly and mountainous areas, covering a total of about 84,230 ha or about 38.5% of the basin area. Drainage is good to excessive. The higher hills and mountains are covered with secondary forests wherein scattered clearings are used for upland rice cultivation or grazing.

The soils of Faraon clay (G) occupy the limestone hilly areas with an area of 4,040 ha. They are developed through the weathering of soft and porous coralline limestone. Drainage is excessive and erosion is serious in some places. A greater portion of the soils is covered with secondary forests.

3.1.5 Land Suitability

The land suitability classification for agriculture is made in accordance with the classification system defined by the Bureau of Soils, Department of Agriculture and Natural Resources. The results are presented in Table VI. 3-4 and Fig. VI. 3-2 and summarized below:

Suitability Classes	Subclass /1	Area Ha	Area %
A: Very good land	-	29,400	13
B: Good land		6,900	3
	Be	2,900	
	Bw	300	
	Bs	3,700	
C: Moderately good land		15,100	7
	Ce	14,400	
	Cw	400	
	Cs	300	
D: Fairly good land	De	81,200	37
M: Steep, very severely eroded land	-	56,700	26
X: Marshy, swampy land	-	23,100	11
Y: Very hilly or mountainous	-	5,800	3
Total		218,200	100

Remarks: /1: Subdivided by limiting factors as follows:

e: erosion hazard because of steep topography
w: wetness because of depressed topography
s: soil with high percolation

The lands classified into A, B and C, covering an aggregate area of 51,400 ha or 23% of the basin total, are practically suitably for the agricultural use in general. They have been used mainly for cultivation of rice and sugar cane intensively.

The land of class A is a good land, having no limitation for the agricultural use. The soils are deep, usually fertile or can be made fertile under good management. The land occupies an area of about 29,400 ha or 13% of the basin total, mainly distributed on the alluvial plain.

Class Be land, occupying an area of 2,900 ha, is good land but the gently sloping relief makes it susceptible to moderate erosion when unprotected. All crops common to the area can be grown.

Class Bw land is good land but because of poor drainage condition some effort to drain the excess water is required. They usually occur on the alluvial depression.

Class Bs land is good land but because of moderately high permeability, upland crops as sugar cane, maize and mung beans are recommended.

Class Ce land is moderately good land suitable for the cultivation under the soil conservation practices. The land is moderately to severely eroded or subject to erosion when unprotected because of slopes ranging from 8 to 15%.

Class Cw land is moderately good land, however, because of seasonal water stagnation, drainage improvement is required for the sustained agricultural use.

Class Cs land is moderately good land. Because of rapid permeability, the land may be profitably grown with coconut and fruit trees.

Class De land, having a slope from 15 to 25%, is fairly good land that can be clutivated occasionally with proper soil conservation practices.

Class M land, occupying the undulating mountainous area with slopes ranging from 25 to 40%, is highly dissected, eroded, or shallow for cultivation but is suited for grazing or forestry if well managed.

Class X land is usually level or slightly depressed, wherein water, either sea or fresh, stays most of the time making it unsuitable for crop cultivation. The land can be used for salt bed or fishpond sites. Conversion of land covered with mangroves or nipa palms should be minimized into fishpond or human settlement because the area can be usually effectively used for nursery ground of the tiger prawn and milkfish.

Class Y land is too steep, eroded, barren and rugged, and should be reserved only for wildlife.

3.2 Present Land Use

The present conditions of land use in the Panay river basin are clarified by using aerial photographs on a scale of 1/20,000 taken in 1983. The area and proportional extent are summarized below. Table VI. 3-5 gives the details of land use categories by province, city and municipality concerned in the Panay river basin. The schematic land use map is presented in Fig. VI. 3-3.

Land Use Category	Area	
	ha	%
Paddy	40,960	19
Sugar cane/Upland crops	48,530	21
Orchard (Coconut)	7,740	4
Pasture/Grassland	8,410	4
Shrub	86,730	40
Forest	11,880	5
Marshes/Swamps	1,850	1
Fishpond	10,560	5
Buildup area/Village yard	1,540	1
Total	218,200	100

The plains and valleys are principally devoted to the cultivation of paddy. The uplands and rolling areas are adapted to the diversified farming, particularly to cultivation of sugar cane and upland rice and grazing land. The mountainous areas are covered with secondary forests of shrub resulting from slash and burn. Almost all of the fishpond constructed on the lowlying land along the seashores are derived from marshes or swamps wherein some parts are remaining in a limited scale.

Rice is the main crop in the basin. Paddy fields occupy an aggregated area of 40,960 ha or 19% of the baisn total, which are mainly distributed on the flood plains and valleys. In the Municipalities of Dao, Dumarao, Mambusao and Panay, paddy cultivation is mainstay.

Planting is done two or three times a year.

The area developed to the cultivation of sugar cane is estimated at about 48,530 ha or 21% of the baisn total including cultivation area of upland corps. The planting of sugar cane is concentrated to the Municipalities of Dumarao, Maayon and Tapaz. Small scattered plantings that cannot be indicated separately on a small-scale map are also found in many parts of the basin.

The area covered with coconut is 7,740 ha or 4% of the basin total. They are found along the shores and mostly in home yards, but not indicated on the schematic land use map because of small scattered plantings.

Out of fishpond area, 10,560 ha or 5% of the basin total, 40% is for prawn and 60% for milkfish. Both farmings are manage more intensively compared with other regions in the Philippines.

Shrub extends widely over the elevated slope land, in biggest constituent in terms of areal extent. The land is rather densely covered with secondary forest. The most of shrub land demarcated here is not suitable for future agricultural development mainly because of erodability of soil. However, shrub plays an important role in soil and water conservation.

3.3 Agricultural Population

The 1980 Census on population registered a total of 492,231 for the whole Province of Capiz. Person under 15 years old consists of 215,901 or 43.9% of the total population. The population between 15 and 64 years old, considered as the actual economic active age group, makes up 256,866 or 52.2%. Adult of 65 years old and above are counted to 19,464 or 3.9% of the total population.

The population in the Panay river basin, consisting of 15 Municipalities of the Province, and Lemery and Bingawan of the Iloilo Province, is 465,258 and numbers of household are 82,031. Average family size in the river basin is calculated at 5.7. The breakdown is shown in Table VI. 3-6.

The Capiz Province has 141,679 gainful workers of more than 15 years old as shown in Table VI. 3-7. The dominant industry group are agriculture, fishery and forestry, providing work to some 67.2% of the total gainful workers of more than 15 years old. Agricultural crop production is the leading source of employment in this group (57.7%), followed by fishery workers (9.3%).

As stated in age composition of the population in the Capiz Province, there are 256,866 of the economic active population more than 15 years old. Out of this population, some 141,679 persons are engaged in various gainful occupations. The remaining 115,187 persons, making up approximately 45% of the total economic active population, are seemed not to have gainful jobs.

In order to raise employment opportunity in the river basin, present agricultural crop productions having the largest potential source of employment will have to change their course to the direction of intensification through irrigation development and improvement of present farming practices.

3.4 Land Tenure and Farm Size

The investigation and study on present land tenure system and farm size in the basin are made based on the census of agriculture 1960, 1971, census of agriculture, special report Number-1, 1981 and other informations provided by municipality development staff of the province.

According to the census of agriculture 1960, there were 28,905 farm operators in total in the province of Capiz. Out of this, 67% of farm operators was tenant, 21% was fullowner, 13% was other forms of tenure. In 1971, number of farm operator was no changed, almost the same that in CY 1971, as 28,914 in total. However, proportion in type of tenure drastically changed in this decade. Percentage of tenant farm operator against to the total counted for 42%; full owner, 32%; part owner, 13%; and other type of forms of tenure, 13%.

In relation to the corresponding figures of 1960, part-owner increased by 53.6% and full-owner by 51.3% while tenant decreased by 38.1%. Other forms of tenure shows extremely increased by 427.1%. This figure will probably be included the number of amortizing owners. The breakdown on land tenure situation in the province of Capiz comparatively shows in Table VI. 3-8.

The size of farm in and around the basin, as measured by area of farm per farm operator, is generally small because of the limited availability of arable land and large number of farm population. The size of farm averages about 2.0 hectare per farm operator at present in the Panay river basin as shown in Table VI. 3-9.

It can be clear from the following tabulation that generally, the average farm size are becoming smaller at national level and also provincial level presented as follows.

(Unit: ha)

	1960	1980
Philippines	3.6	2.6
Capiz	2.9	2.1

Breakdown of farm size in 1971 and 1980 in the province of Capiz are shown in Table VI. 3-10.

In the census of agriculture 1971, Capiz was paddy producing province. A major portion of the farms in the province or 85% were rice farms. These rice farms constituted 62% of the area of the farms in the province. Next to paddy farms were the other farms, sugar cane farms, coconut farms, corn farms which consisted of 5, 3, 3 and 2% respectively. Remaining farms were the tuber, root and bull crops, banana, pineapple, hog and cattle farms in totalled about 1% of the total farms.

3.5 Crop Cultivation

3.5.1 Areal Extent

The total areal extent in terms of agricultural land use is counted for 116,200 ha in the Panay river basin of 2,182 km^2 using aerial photographs with 1/20,000 scale of contact print taken in 1983. The farm lands classified by crops are summarized as follows:

	Area (ha)	Proportion (%)
Paddy	40,960	35
Corn/1	6,700	6
Sugar cane	40,800	35
Coconut	5,740	5
Vegetable/1	1,000	1
Fruit trees/1	2,000	2
Pasture/Grassland	8,410	7
Fishpond	10,560	9
Total	116,200	100

Note: /1: Estimated by Ministry of Agriculture, 1981-1982.

Approximately 116,200 ha or 53% of the total basin area of 218,200 ha is devoted to the agricultural activities including grazing and fish culture.

Out of the agricultural land, some 40,960 ha or 35% is occupied by lowland paddy field, of which 3,820 ha or about 9% belongs to the Iloilo Province.

Corn is a food crop second to rice for the people, extending approximately over 6,700 ha which are scattered along the banks of the rivers or in the home yards.

The area devoted to sugar cane cultivation is estimated at approximately 40,800 ha in the basin including about 6,620 ha located in the Iloilo Province. However, the annual planted area is only about 10,000 to 14,000 ha,

because of the alternative use to the grassland or diversified crop land.

Approximately 5,740 ha is used for coconut trees, grown mainly in the home yards.

Approximately 10,560 ha or 9% of the total area is devoted to the fish culture, mainly located in the Municipalities of Pontevedra, Panitan and Panay.

3.5.2 Present Cropping Calendar

The major crops grown in the Panay river basin are paddy, followed by sugar cane. Upland crops presently cultivated are corn, cassava, sweet potato, etc. Other crops grown as adjuncts to paddy farming are banana, mango, leafy vegetables and beans. They are generally grown in the orchard and backyard gardens. The prevailing cropping calendar in the river basin is shown in Fig. VI. 3-4. (1).

Paddy

Approximately 80% of lowland paddy cultivation are generally made under rainfed conditions. Irrigation facilities are quite limited in the Panay river basin. The lowland first paddy or rainy season paddy is grown during the period from May to October and its harvested area accounts for 43% of the total harvested paddy area. The area planted with second lowland paddy during November to March, mainly dry season, is also 43% of the total harvested paddy area, while upland paddy area without standing water is about 14% of the area.

Sugar cane

The sugar cane is harvested every month throughout the year in the Panay river basin. Prevailing sugar cane varieties in the basin are PHIL-5333, PHIL-56226 and PHIL-58260. Ages required for maturity of these varieties are ten to twelve months. This means that the planting of these sugar cane varieties are also practiced every month all the year round. However, harvesting and planting of sugar cane are concentrated

during the period from January to May. The monthly harvesting percentage of sugar cane in the Panay river basin is as follows; and illustration is given in Fig. VI. 3-4. (2).

Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
0.7	4	6	6	13	15	15	15	14	8	3	0.3

Corn

There are three crop seasons of corn cultivation prevailing in the Panay river basin, i.e., rainy season corn, dry season corn and third season corn. The rainy season corn is planted at the onset of monsoon, generally from April to May and harvested from June to July. The sowing of dry season corn starts in October and harvest is in December. The third corn cultivation is practiced from December to February as a supplemental crop for beans and vegetables.

Leafy vegetable

Cabbage, celery, lettuce, mustard, pechay, spinach, etc. are prevailing as leafy vegetables in the rainy season. Duration for maturity of cabbage and mustard are three months and that of lettuce and spinach are two months. These vegetables are generally sown in April or May and harvested in May or June. Duration for maturity of celery is five months. This vegetable is usually planted in March and harvested in July. In the dry season, all leafy vegetables including celery and cauliflower are generally planted in October and harvested in December.

Fruit vegetable

Ampalaya, chayote, cucumber, eggplant, melon, squash and sweet pepper are generally planted in May and harvested in June. Okra is sown in February and harvested in May. Except chayote and sweet pepper, most of fruit vegetables mentioned here are also planted in the dry season. Their sowings are usually made in November and harvestings in December or January.

Root crops

Age for maturity of sweet potato is three months both in the rainy and dry seasons. This crop is sown in April and November. Harvesting is made in June and January. Age for maturity of cassava generally takes about six months. Planting of this crop is made in January and June, and harvesting is made in July and December.

Mung beans

Age for maturity of mung beans is two months. Prevailing crop seasons are from September to October and December to January, i.e., twice cropping through the year.

3.5.3 Crop Yield and Production

The crop yield and production under present condition are estimated on the basis of production data at Municipality level obtained from the BAECON in Roxas and Iloilo and the Ministry of Agriculture and Food in Roxas. These data shows that the crop yield and production largely fluctuated year by year due to wide variation of annual rainfall and unexpected damages caused by inundation by flood water, drought, insects and diseases. The total paddy production including first and second season paddy and upland paddy in the province of Capiz showed a skewed trend during past 8 years period as follows:

Year	ha	Production (cv)	cv/ha	t/ha
1976/77	83,560	5,619,780	67.2	3.36
1977/78	85,630	5,435,550	63.5	3.18
1978/79	87,730	5,471,750	62.4	3.12
1979/80	86,570	6,273,420	72.5	3.63
1980/81	87,370	6,184,440	76.9	3.85
1981/82	87,860	6,248,700	71.1	3.56
1982/83	80,760	4,335,460	53.7	2.69
1983/1	51,580	2,568,700	49.8	2.48
Average				3.23

Source: MA Capiz

Note: cv: in bags of 50 kg.
/1: first crop only
Figures include upland paddy.

The skewed trend in the provincial total was brought by the shift of preference to corn by some farmers in the province and the decreasing trend of unit yield of paddy.

The areal extent of lowland paddy field is counted for approximately 40,960 ha in the basin by using aerial photograph with 1/20,000 scale of contact print. The area planted for the first and second paddy and irrigated and rainfed paddy areas are estimated by the proportional extents occupied by each categorized paddy fields presented in the Socio-Economic Profile, Province of Capiz 1983. The unit yield of paddy and production are calculated based on the report of Ministry of Agriculture, Province of Capiz. In the 1980's, lowland paddy production in the entire basin is summarized as follows:

	Area (ha)	Production (t)	Unit Yield (t/ha)
Lowland Paddy Area:	40,960 ha		
1st Season Paddy			
Irrigated	7,320	22,253	3.0
Rainfed	33,550	86,474	2.6
Sub-total	40,870	108,730	2.7
2nd Season Paddy			
Irrigated	5,930	18,283	3.1
Rainfed	34,290	88,339	2.5
Sub-total	40,220	106,622	2.7
Total	81,090	215,354	2.7

The estimated unit yield and production of paddy by Municipality in the basin are as shown in Table VI. 3-11.

The paddy field distribution and yield for cultivated lands lying within the boundaries of the flood lines of 2m depth of flooding in the lawland paddy areas are surveyed during the harvesting season of the first paddy 1984. The paddy fields under the boundaries of 2m depth of flooding is counted for approximately 7,900 ha. Unit yield of paddy in this area are resulted at 3.2 tons per ha for the irrigated paddy and 2.8 tons per ha for the rainfed paddy. A description on paddy yield survey is prescribed in Chapter 4.

Historical data on area cropped, production and unit yield for corn reported by Ministry of Agriculture, Capiz are as follow:

	1977	1978	1979	1980	1981	1982
Area (ha)	1,840	1,240	1,870	2,530	6,690	6,870
Production (t)	2,800	1,110	1,950	1,710	9,730	10,300
t/ha	1.52	0.90	1.04	0.68	1.45	1.50

Table shows severe fluctuation in yield per hectare and uptrend in cultivated area of corn in the Province of Capiz. In the Panay river basin, the total cultivated area of corn is counted for about 6,700 ha by using serial photographs with 1/20,000 scale of contact print. Therefore, almost all of the cultivated area of corn is included in the basin and an average yield per ha of corn is estimated about 1.2 tons per ha.

The unit yield and production of sugar cane fluctuates year by year and from place to place, depending on rainfall and inputs supply conditions. The annual average harvested area of sugar cane and production of sugar (picul) in the Panay river basin is shown as follows:

		Area (ha)	Production (Ps)	Ps/ha
Pilar	1978-79	5,695	485,505	85
	1979-80	5,669	429,789	76
	1980-81	6,035	504,745	83
	1981-82	7,875	691,735	88
	1982-83	5,514	429,381	78
Asturias	1978-79	5,872	400,103	68
	1979-80	5,246	377,606	72
	1980-81	5,831	377,128	65
	1981-82	5,864	440,591	75
	1982-83	7,907	490,563	87
Annual Average		12,302	965,429	78

Picul per Tone-cane ratio is resulted at 1.5. Therefore, unit yield per ha of sugar cane is estimated approximately at 52 tons per ha in the Panay river basin on an average of plant-cane plus ratoon. Average harvested area is estimated at approximately 12,300 ha and yield of sugar is counted for about 965,400 piculs annually.

The unit yields and productions of major vegetables grown in the Panay river basin are estimated based on the production data through the last six crop seasons, i.e., 1981, 1982 and 1983. Summary is shown as follows:

Vegetable	Area (ha)	Average Production (ton)	Average Yield (ton/ha)
Ampalaya	20	22	1.1
Squash	30	495	16.5
Eggplant	40	476	11.9
Mung beans	50	50	1.0
Camote	300	2,580	8.6
Cassava	310	2,852	9.2
Garlic	20	64	3.2
Ginger	20	214	10.7
Peanuts	20	32	1.6
Total	810	-	-

On the above table, more than 75% of the area is occupied by root crops such as camote and cassava, followed by beans as mung and peanuts. It is clear that the areas used for leafy vegetables are negligibly small in the basin.

3.6 Livestock

The comparative study on livestock and poultry raising in the basin are caried out based on the census of agriculture 1960, 1971 and statistic data provided by BAECON, Capiz. As a whole, except cattle, the animal populations in the basin showed an increase in considerable number of heads during the CY 1960 to CY 1981. Among them, the census showed the trememdous increase of chicken population, from 614 thousands level to over a million level. Both carabao and hogs also showed remarkable increase from 60 thousand level to more than 90 thousand level.

In a span of the CY 1960 to CY 1971, the Cattle population decreased from 5,864 heads to 1,780 heads due to the outbreak of hemmorhagic septicemia. However, it took a favorable turn up to 5,100 heads level at the CY 1981. The animal population during past 20 years in and around the Panay river basin was as follow.

	1960	1971	1981
Carabao	61,244	24,933	95,624
Cattle	5,864	1,780	5,121
Hogs	60,916	19,832	94,332
Goats	19,512	19,400	20,121
Horse	383	332	1,531
Chicken	614,131	27,038	1,111,382
Ducks	99,060	4,651	163,818

Major factors that contributed to the increase in the livestock and poultry population were the implementation of several development schemes like the Supervised Credit for Livestock Program such as Bakahang Barangay and the Kambingang Barangay. The KKK program is

attributed to be one of the factors that has caused the increase in these livestock and the poultry raising.

The livestock and poultry products are used for home consumption and also are sold from time to time to meet special expenses. Annual income from livestock is, however, of little significance to the study area as well as farm economy.

3.7 Fish Culture

3.7.1 Areal Extent

The fishpond culture with brackish water widely exists in lowland areas in Capiz Province, blessing with good prawning ground of the mangrove swamps and the Sibuyan area. According to the data obtained from the Bureau of Fishery and Aquatic Resources, the recent status of fish culture in brackish water ponds in Capiz Province is summarized below.

Municipality/ City	1978		1982	
	Area (ha)	Production (ton)	Area (ha)	Production (ton)
Roxas City	1,880	1,690	2,110	1,320
Ivisan	400	520	680	630
Panay	5,940	4,500	5,930	4,910
Pilar	860	510	1,900	1,530
Pontevedra	3,190	2,700	3,000	2,380
Pres. Roxas	860	520	1,980	1,320
Sapian	2,040	1,500	4,490	2,810
Total	15,170	11,940	20,090	14,900

The fishponds are concentrated to the seashore in the Province, occupying the total area of 20,090 ha in 1982. At present, the total fishpond area cultivated in the Panay river basin is estimated at about 10,560 ha as shown in the present land use survey. Out of the total fishpond areas of the basin, about 2,300 ha is distributed in the Roxas City, and 6,620 ha and 1,640 ha in the Municipalities of Panay and Pontevedra respectively.

Milkfish and prawn (tiger prawn or "sugpo" locally) are the main culture species in the area. According to the data from the Capiz Fishpond Operation Association (CAFOA), it is considered that about 60% of the pond area is devoted to the milkfish cultivation and 40% for the prawn on an average. However, the distribution rate varies from place to place in accordance with the environmental conditions such as temperatures and salinity. In the Panay river basin, the proportional extents of pond used for the milkfish cultivation in the City/Municipality of Roxas, Panay and Pontevedra are estimated at about 100%, 70% and 50% of the total ponds in the respective areas, based mainly on the interview to the CAFOA members.

The prawn culture is managed as a single pond during the period from stocking to harvest. On the other hand, the milkfish farm intensively managed in the area has three major types of ponds such as nursery pond, transition pond and rearing pond. Nursery ponds occupy 2% of the farm on an average, 10% is used for the transition ponds and 85% is rearing ponds. These rates correspond to the average of the Philippines.

3.7.2 Culture System

(1) Milkfish

Modular systems having three types of ponds predominate in the basin. However, monoculture systems which require little management and can be modified to the prawn culture also exist in most of the area. Rearing period from stocking to harvest is 5.5 months on an average. The main season starts from May, lasting until January. Usually farmers harvest milkfish three times a year in case of modular systems. The average stocking rate is 2,640 fingerlings per ha in nursery pond and 1,320 pcs. of market size in rearing pond.

(2) Prawn

Most cultured shrimp including tiger prawn was a secondary crop from brackish water milkfish ponds. Recently, in terms of selling value, especially of tiger prawn, many fishpond owners are eager to convert their milkfish ponds to prawn ponds, since the latter offers

higher profitability as compared with milkfish. There are three culture periods per year, each lasting for 4 months, the 1st from June to September, the 2nd from October to January and the 3rd from February to May. Stocking rates are estimated at about 3,000 pcs. of fry per ha to 2,400 pcs. of market size per ha.

3.7.3 Yield and Production

The fishpond production estimated in Subsection 3.7.1 mainly includes two species; milkfish and prawn. Unit yield and production in kilogram or metric ton are highly dependent not only on culture species but also on culture systems, pond composition, etc. According to the results from the interview to pond caretakers and CAFOA members, the basic data necessary for the estimation of unit yield and production are summarized below.

	Milkfish	Prawn
Stocking rate in market size (pcs/ha)	1,320	2,400
Market size (pcs/t)	250	40/1
Yield per crop (kg/ha)	330	96
Harvesting (times/year)	3	3
Yield per year (kg/ha)	990	288

Remarks: /1: 2nd class in grade for export

Using these data, the fishpond production in the Panay river basin can be estimated as summarized below.

Municipality/ City	Fishpond Area (ha)	Culture Species	Production of Pond Area (%)	Production (ton/year)
Roxas City	2,300	milkfish	100	2,280
		prawn	-	-
Panay	6,620	milkfish	70	4,590
		prawn	30	570
Pontevedra	1,640	milkfish	50	810
		prawn	50	240
Total	10,560			8,490

Approximately 90% of the production is milkfish, though the ponds for milkfish occupy 73% of the total pond area. The production value of milkfish is estimated to be ₱92,160,000 based on the fish market price of ₱12/kg in 1984. About 10% of the production is prawn, valued at ₱81,000,000 by using the market price of ₱100/kg in 1984.

3.8 Agricultural Support Services

3.8.1 Research

There are three (3) research stations in the province of Capiz, namely, the Milibili Research Station, the Agricultural Service Center and the Provincial Technology Verification Team (PTVT) as shown in Fig. VI. 3-5.

The Milibili Research Station is located in Barangay Milibili, Roxas City conducting soil conservation research activities. The Agricultural Service Center was established in the Dumarao Resettlement area to conduct researches on cropping systems and as a proposed site for the practical training of core-staff of Regional Integrated Agricultural Research Services. The Provincial Technology Verification Team is stationed at Jamindan.

The Regional Integrated Agricultural Research Services is a program for integrated agricultural research in crops, livestocks, soils and even socio-economics at the regional level through the establishment and operation of a technology verification network headed by manager in close cooperation with the Provincial Agricultural Officer, Regional Directors and Regional Research Coordination.

The Provincial Technology Verification Team is under the direct supervision of the Provincial Agricultural Officer and receives technical support and funding from the RIARS' manager and staff. The function of the PTVT in the Province is to make research activities on technology of which adaptabilities will be verified in other areas of the province based on the result of researchs.

3.8.2 Extension Services

The Ministry of Agriculture and Food (MAF) is the primary agency responsible for the extension services to the farmers with supporting and complementing activities from other government agencies and private institutions involved in agriculture.

The Ministry of Agrarian Reform implementing the agrarian reform program, the National Irrigation Administration responsible for irrigation extension services, Philippines Sugar Commission responsible for sugar industry, Rural Bank technicians on financing aspect and private technicians, are some of their supporting and complementing agencies on extension activities.

To cope with the requirement of a coordinating body that shall have the sole authority and responsibility to coordinate, supervise and integrate all programs of all agencies of the national government on all food and agricultural production programs of the country, the government created the National Food and Agricultural Council (NFAC) by the virtue of Executive.

EO 803 provided the effective administrative framework that will secure the integration and coordination of agricultural services and inputs and also allow the government to respond more effectively to the requirements of development in the area. Figure VI. 3-6 presents the organizational chart under EO 803.

In this system, for instance, at the start of the crop year, financing institutions are ready to provide the loans on areas where the NIA can deliver irrigation water at the right amount and at time it is needed. The Fertilizer and Pesticides Authority (FPA) must be able to supply required fertilizers and pesticides. The extension workers of the MAF have to assist the farmers in the scientific care of the growth of the rice plants. NFA will handle the procurement, price support and marketing during the harvest season, while the Ministry of Public Works and Highways will provide for the farm-to-market roads and bridges to facilitate the transport of farm inputs and farm products of the farmers.

However, plans and programs under the EO 803 in the province was only based on the available resources as an initial step in the implementation of the overall program.

The Masagana 99 program is a nation-wide priority program on agriculture to attain the self-sufficiency in rice by increasing the present low average rice production up to an average of 99 cavans or 4.95 tons per ha. While, the Maisagana program aims to increase corn and feed grains supply to satisfy the demand of expansion in poultry and livestock sectors, to export yellow corn and to increase farmers' income. The Gulayan sa kalusugan program is also promoted to increase the production of vegetables. However, participating provinces were selected based on their suitability to crop cultivation, available resources and willingness to adopt the recommended technology. In the province of Capiz, Masagana 99 and Maisagana programs are given emphasis at present.

There are one hundred fifty-four (154) field technicians stationed at the seventeen (17) municipalities and city in the province. One hundred twenty-five (125) farmers are served by one (1) field technician under the Masagana 99 program on an average, while seventy-five (75) farmers are covered by one (1) field technician under the Maisagana program. Table VI. 3-12 shows the number of field technicians provided in every municipality/city of the province. One (1) provincial technician for every three (3) to five (5) barangays is the standard policy of the MAF for the development of technicians.

Technicians usually prefer to be assigned in their home town due to economic reasons. The MAF is presently on the process of reorganization. These are some of the reasons why the deployment standard policy was not followed accordingly causing some municipalities with excess technicians and some with insufficient number of technicians.

3.8.3 Seed Farm

Before the start of the cropping season, the seed requirement of the province is prepared by the Masagana 99 program officer in close

coordination with the Seed Inspector based on targets by Masagana 99 loan phases.

This seed requirement is submitted to the National Food and Agriculture Council forty-five (45) days before the start of the cropping season. The consolidated seed requirement is provided to the Bureau of Plant Industry (BPI) of the MAF for distribution and allocation to seed growers.

Certified seeds for commercial planting are produced by the registered seed growers association through its bonafide members. In provinces where there are no organized seed growers association, the BPI provides the seed requirement of the province.

The marketing or distribution of the certified seeds produced by seed growers is the responsibility of the seed growers association. It is either sold on a seed grower-farmer to farmer-buyer or through the financing institution by means of chit system.

Production and multiplication of seeds in the province is supervised, coordinated and regulated by the Provincial Seed Coordinator of the MAF.

There are sixteen (16) registered seed growers in the province of Capiz. It has a total area of fifty-six (56) ha with average production of 4.2 tons per ha. Figure VI. 3-5 presents the location and the number of seed farm in the province of Capiz. High yielding varieties (HUV's) of rice such as IR-36, IR-56 and IR-60 are the most common varieties produced by the seed growers in the locality.

The supply of certified seeds for farms programmed under the Masagana 99 program is sufficient to meet the demands of the farmers. In case that supply of seeds exceeds the demand, surplus is usually exported to other countries.

3.8.4 Agricultural Credit

To cope with the domestic needs on food, promotion of exports, reducing imports and agro-energy requirements, the national policy of

increasing farm productivity and expanding production is supported by providing liberal credit system to the farmers.

Through the Masagana 99 and Maisagana program, the government is presently undertaking a supervised credit scheme of granting non-collateral loan to needy and qualified farmers. The financial institutions participating in the loaning operations of these programs are the Rural Banks and the Philippine National Bank.

The amount of loan granted is based on the actual needs of the farmer but must not exceed the approved loaning rate per ha. In the Masagana 99 program the authorized amount of loan granted per ha is ₱1,700 with 25% of interest rate per annum. The Maisagana program authorized ₱2,300 per ha for a 5-ton Package of Technology (POT) on hybrid yellow corn, ₱1,450 and ₱1,000 for 3-ton POT on IPB Bar I yellow corn and DMR white corn, respectively, with the same interest. Tables VI. 3-13 and VI. 3-14 show the Masagana 99 and Maisagana situation report and status report with financing, respectively. Tables VI. 3-15 and VI. 3-16 show the Maisagana and Masagana 99 status report on area with technical assistance only. The Maisagana loans were suspended in PNB, Roxas City starting the Phase 1983-A and all financing institutions as of 1984. However, financing of this program will start again from this corn planting season in 1984.

Other type of agricultural credit assistance is extended by the Land Bank of the Philippines (LBP) and the Development Bank of the Philippines (DBP) in the province to support their farm mechanization, post harvest needs and production of other crops including agro-energy requirement of the province. Table VI. 3-17 shows the LBP loan releases and Tables VI. 3-18 to VI. 3-20 present the DBP credit assistance for the year 1980, 1981 and 1982 respectively. The DBP, Roxas City has suspended temporarily extending all types of loans for the year 1984.

The Philippine Crop Insurance Corporation (PCIC) was created by Presidential Decree No.1467 for the purpose of providing insurance for the production cost of paddy and corn based on the authorized loan ceilings of the government's supervised credit program. Natural calamities

such as typhoons, floods, drought, earthquakes and volcanic eruptions and plant diseases and pest infestations are the compensable losses of this type of insurance. Tables VI. 3-21 and VI. 3-22 show crop insurance production and insurance claims approved in the province of Capiz.

3.8.5 Farm Inputs Supply

The Fertilizer and Pesticide Authority (FPA) supervises and regulates the proper allocation and distribution of fertilizers and pesticides to farmers in close coordination with the NFAC, through its accredited fertilizers and agrochemical distributors and dealers under the Masagana 99 program.

Fertilizer requirement of the province for every phase of the Masagana 99 program is prepared by the Masagana 99 program officer in coordination with the provincial soil technologist based on soil fertility maps or soil analysis using the portable soil kit. The provincial fertilizer requirement is submitted to the NFAC and then it is submitted to the FPA for timely allocation and distribution.

The Masagana 99 pesticide technical group reviews and recommends pesticides to be used in the program. Agricultural field technicians are provided with the approved list of recommended pesticides and other chemicals with corresponding codes for recommendation to farmer-borrowers. Accredited dealers and financing institutions are also furnished with list facilitating locations of farmer-borrowers.

All distributors, dealers or sellers engaged in the sale of fertilizers and pesticides are requested to acquire a license to operate from the FPA. The price increases of fertilizers and pesticides are determined and controlled to be kept at a minimum level by the FPA.

Private companies are given an option to implement their own distribution systems, to appoint their distributors, dealers and sub-dealers and to operate in all areas except in places wherein the market is considered as saturated subject to the guidelines and policies of FPA.

In the province of Capiz, there are three (3) listed fertilizer and chemical distributors all located in Roxas City and 58-dealers of fertilizer and chemicals. Table VI. 3-23 shows the number of dealers

and their location. The delay of distribution of fertilizers and high cost of both the fertilizer and chemicals are the problems encountered on the phase XXIII of the Masagana 99 program.

3.8.6 Farmers Organization

Farmers are trained to improve their capabilities to enable them to realize the full potentials of the land. The kind of skills needed in the agricultural areas is not technical alone but farm families are oriented and trained in various institutional aspects such as family life, economic, political, educational and health. They are made to develop a strong capability to manage their own community affairs. In order to increase production, a cooperative involvement of the different members in the community is required. The increase in production creates an impact on the economic, political, health and educational institutions.

Skills development is a costly program and requires a certain degree of permanence to people. It is for this reason that community participation through community organization is a must in agricultural development. Both technology transfer and skills development must be channeled through community organization.

In the province of Capiz, there are various types of farmers' organization formed by the different government agencies. These farmers' organizations do not compete each other, although they have similar objectives in the same area and are formed to answer the needs of farmer in various aspects.

The followings are the different types of farmers' organization in the locality:

(a) Samahang Nayon (SN) is an organization of farmers on a barangay level to educate the farmers on savings and serves as the foundation of the country's cooperative system. Out of 252 SN organized in the province with 8,339 members, only 138 SN are active with 4,103 members as shown in Table VI. 3-24.

(b) Area Marketing Cooperative (AMC) is a special type of cooperative wherein the members are not composed of individual farmers but

a group of functional SN on a municipal and/or provincial level. Its function is to provide the procurement and marketing needs of SN. There is only one (1) AMC operating in the area.

(c) Agrarian Reform Beneficiaries Association (ARBA) is an association organized by the Ministry of Agrarian Reform for farmers who are benefited by the Agrarian Reform Program. The function is to educate and promote social justice to insure the dignity, welfare and security of agrarian reform beneficiaries. Target to be organized in the province is 282 ARBA with 13,321 members. As of September 21, 1984, the Ministry has organized 261 ARBA with 7,110 members. Table VI. 3-25 presents the ARBA organized by municipality/city in the province of Capiz.

(d) Farmers Irrigators Group/Association (FIG/FIA) is an organization of irrigation water users under the national irrigation system for the purpose of effective implementation of water management program at the farm level and proper operation and maintenance of the system. There is only one (1) existing National Irrigation System in the province of Capiz and located at Mambusao. About 28 FIG were organized consisting of 720 members and merged into one Irrigators Association; the Mambusao-Sigma Farmers Irrigators Association.

(e) Communal Irrigation Association (CIA) is an association organized in a run-of-the-river type of communal irrigation system below 1,000 ha of irrigation area. This is owned, operated and maintained by the farmers themselves under the technical support of the National Irrigation Administration. There are about 50 CIA organized in the province of Capiz with 2,600 members.

(f) Irrigators Service Association (ISA) is an organization of farmers in pump irrigation system under the responsibility of the Farm System Development Corporation (FSDC). There are 114 ISA organized in the province of Capiz with 5,340 members.

3.9 Marketing

3.9.1 Paddy

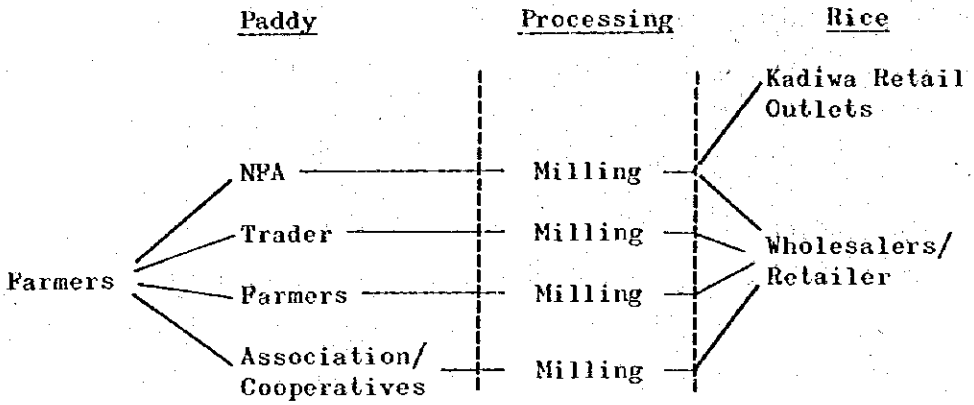
Western Visayas Region is the second most important rice producing area in the Philippines. The region's paddy production showed a skewed trend during the five year period as shown in Table VI. 3-26. The annual paddy production of region is estimated at approximately 1,167,310 tons. Province of Iloilo manages to remain as top paddy producer contributing 41% of region's production, followed by Capiz, 23%; Negros Occidental 13%; Antique, 21% and Aklan 11%, annually. In the basin, approximately 215,000 tons of paddy is produced at present.

According to the 1977 - 1980 survey of Regional Consumption patterns for major foods, jointly conducted by the Ministry of Agriculture and the National Food Authority, the region's per capita consumption was 118.9 kg, 11% higher than the Philippines average of 105.8 kg. Average human consumption for five years was 86%, household feeds was 5%, seed was 1.6% and wastage was 7.4% of the average consumption requirements. The paddy production vs paddy consumption requirement is shown in Table VI.3-27.

In line with government's role to stabilize the price of paddy on farmers level, the National Food Authority continued to buy paddy from the farmers. Throughout the period from 1978 to 1981, the total NFA paddy procurement in the Western Visayas Region summed up to 280,860 tons which was equivalent to an average annual procurement of 70,215 tons, sharing of 6.0% of paddy production as follows.

Year	Production (t)	Procurements	
		Volume (t)	%
1978	1,215,530	52,280	4.3
1979	1,186,230	86,720	7.3
1980	1,171,240	76,410	6.5
1981	1,136,150	65,450	5.8
Total	4,709,150	280,860	6.0
Annual average	1,177,288	70,215	6.0

Marketing channel of paddy from farmers to consumer is illustrated below.



Accumulation of stocks have been successfully sustained through the establishment of 36 permanent and 14 temporary buying stations. Four mobile procurement teams were formed to penetrate the interior towns. 35 team leaders, 43 special disbursing officers and 40 grains classifiers were assigned to the region.

The number of procurement teams fielded depended on the volume of production in every province. But usually, NFA encourages bulk procurement from farmers' association for facilitating transport of their stocks and saving their fuel cost and handling fees, which promotes these associations to purchase post barresting facilities. NFA Buying Stations and Procurement teams are presented as in Table VI. 3-28.

3.9.2 Corn

Corn production in a span of five years totalled approximately 177,510 tons averaging 35,500 tons a year. Corn consumption requirement totalled about 304,900 tons with an average consumption requirement of 60,980 tons per year. The region's per capita consumption was 6.8 kg. Of this, food consumption was 78.1%; household feeds, 18.1%; seeds, 0.9%; wastages, 1.8%; and other industries users was 1.1% of the region's average consumption requirements. Inflow and market distribution of corn grains are also handling through the same channels that of paddy. Production, consumption of corn are shown in Tables VI. 3-29 and VI. 3-30.

3.9.3 Sugar Cane

Harvesting of sugar cane is contingent upon the milling schedules set by individual sugar mills. Cane cutting in both mill district of the Pilar Sugar Central, Pilar, and the Asturias Sugar Central, Dumalag in the basin are done by manually which are linked with employment opportunities in the rural area.

For transportation of sugar cane from field to the sugar factories, provided with subsidy to individual farmers by sugar centrals. For example, Austrias Sugar Central is free charge on 70 trucks owned by the factory, and in case of Pilar Sugar Central, collecting only 7% on the composite price of sugar per picul as a transportation fee. The transportation subsidy per mill district is shown in Table VI. 3-31.

Under a cooperative partnership of procuring sugar that characterizes the sugar industry, the planters are exclusively dedicated to sugar cane growing while the millers are responsible for processing the cane, i.e., the recovery of sugar from cane. The planters and miller enter into a milling contract which stipulates the following:

a) The supply of cane is exclusively in the hands of the planters.
b) The recovery of the sugar falls obsolutely in the hands of the millers.
c) Whoever owns the sugar canes owns everything derived from it.
d) For services rendered in the manufacture of sugar, the millers are paid not in cash but in kind, i.e., a certain percentage of the sugar and molasses produced.
e) A system of sugar distribution which emphasizes the sucrose extraction, boiler house, recovery and other performance standards are also included.

The milling share by mill districts is shown in Table VI. 3-32.

The present production of sugar in the country is geared towards harmonizing Philippines capability to meet local consumption and the country's quota commitment of 1.4 million not under the International Sugar Agreement. The marketing of domestic sugar in the Philippines

has been influenced by the free enterprises system and recently by government controls. The domestic trader is a primary distributor of sugar for the local market who obtains his stock from the mill warehouses and/or refineries upon presentation of delivery order issued by the National Sugar Trading Cooperation (NASUTRA). Industrial users are also given sugar allocation by PHILSUCOM/NASUTRA for the manufacture of sugar-containing products. Marketing flow of sugar is as illustrated in Fig. VI. 3-7.

3.9.4 Livestock and Poultry Products

Livestock and poultry raising is still not major agricultural activity in the basin. Although there are some peoples who raise animal for business, mostly cattle, swine, and poultry, those people only engage in small scale businesses. To this effect, commercial piggeries and poultry exist and are adequate enough to supply the local market. The availability of Roxas City has enable a few of those people to export their products to Manila. Dairy production, however, is negligible. Number of animals slaughtered in the Roxas City is given in Table VI. 3-33.

Prior to send to the slaughterhouse, both large animals and small animals are registered and those meats are inspected by City treasurer under supervision of Ministry of Agriculture, Capiz. Organizational structure of the City Treasurer's office gives in Fig. VI. 3-8.

4. PRESENT AGRICULTURAL CONDITIONS IN THE IRRIGATION DEVELOPMENT AREA

4.1 Physical Status

4.1.1 Location and Area

(1) Panitan-Panay Area

The Panitan-Panay area, amounting to the total study area of about 6,000 ha, is situated along the lower reaches of the Panay river. The area extends over three (3) minicipalities (Panitan, Panay and Pontevedra) and one City (Roxas City). It forms like that of an isosceles triangle with the apex point in north. The town of Panay is located near the apex and the line which connects the town of Panitan with the town of Pontevedra corresponds to the base of triangle. A railway line connecting Roxas City with Iloilo City passes along the western boundary. The area is bounded by the Panay river, its tributaries, swamps and fishponds in north and east. Southern boundary is formed by many residual hills.

(2) Mambusao Area

The Mambusao area extends over the both banks of the Mambusao river which is the tributary of the Panay river. The area has the total study area of about 4,000 ha. It administratively consists of two (2) minicipalities of Mambusao and Sigma of which the administrative centers are Mambusao and Sigma. The both towns are located about 8 km apart by the provincial road at the western and eastern ends of the area respectively.

4.1.2 Topography

(1) Panitan-Panay Area

The area is geomorphologically categorized into alluvial plain including such microtopography as slight depressions, former river trails, oxbows, natural levees, constricted swamps and tidal marshes. Residual and highly dissected hills are also found on the both banks of the Panay river in the southern part of the area.

Alluvial plain having very flat topography extends all over the area. The plain is divided into the several portions by meandering of the river, so that the drainageways of creeks and small rivers develop on each small inland basin.

The microtopographies except for the natural levees are characterized by waterlogging or seasonal water stagnation. At the time of flooding, these lands play a role of flood way or reservoir. Natural levees develop along the Panay river and its former trails in a small scale. The land is free from the seasonal flooding due to slightly higher elevation than the surrounding area. Residual hills are isolated or highly dissected by the small valleys.

(2) Mambusao Area

The Mambusao area topographically consists of alluvial plain, natural levees, depressions, constricted swamps and residual hills.

Alluvial plain develops extensively in the area. The plain is gently sloping to the eastward and drained by creeks and small rivers which are tributaries of the Mambusao river.

There are typical alluvial depressions in the eastern part of the area. The lands still lie in waste because of severe waterlogging or seasonal water stagnation.

The swamps constricted by the natural levee are found at the mouth of valleys which dissect the residual hills. Some water stands throughout the year.

Residual hills are mainly located in the central part of the area. The topography is undulating to rolling at an elevation of more than 10 m surrounding alluvial plain.

4.1.3 Soils

(1) Panitan-Panay Area

Soils in the Panitan-Panay area are classified into the three general groups: (1) soils of deltas, (2) soils of plains and valleys

and (3) soils of hills and mountains. In accordance with the microtopography of soils, soils of plains and valleys are divided into 4 sub-groups; (2-1) soils of alluvial plain, (2-2) soils of alluvial depression, (2-3) soils of natural levee and (2-4) soils of older alluvial terraces. Area and proportional extents of these soils are summarized below.

Soils		Area	
		ha	%
1.	Soils of deltas	110	2
2-1	Soils of alluvial plain	4,651	78
2-2	Soils of alluvial depression	226	4
2-3	Soils of natural levee	562	9
2-4	Soils of older alluvial terraces	430	7
3.	Soils of mountainous area	21	-
	TOTAL	6,000	100

Soils of alluvial plain develop most extensively all over the area, occupying about 4,651 ha or 78% of the total study area of 6,000 ha. In general, the soils have clay loam to sandy loam in texture, deep to very deep in effective soil depth, moderate permeability, moderate inherent fertility and well tillability. At present the lands covered with these soils are fully used for cultivation of rice, two or three times a year under the irrigated condition.

Soils of deltas distribute around the area adjoining swamps in a limited scale of 110 ha or 2% of the study area. Proper drainage, modification of soil acidity and fertilization are required for the agricultural use of the soils.

Soils of natural levee, extending narrowly along the Panay river, have an area of 562 ha or 9% of the study area. The soils are loam to sandy loam in texture, deep to very deep in effective soil depth, well drained and moderately permeable. Since the soils lie on the elevated lands slightly higher than the lands of alluvial plain, this lands can not be irrigated by gravity system. By this reason, the lands are entirely devoted to cultivation of upland crops, particularly for

sugar cane.

Soils of alluvial depression are found in the plain behind the natural levee, occupying an area of 226 ha or 4% of the study area. The soils are characterized by the gley and mottlings caused by waterlogging and seasonal fluctuation of groundwater to a certain extent. Although the soils of this group have been used for cultivation of rice, the proper improvement of drainage is required so as to expect the further production increase.

Residual hills scattered in the southern part of the area are covered with the soils developed in place from the parent materials derived from the stratified sedimentary rocks. The lands are vulnerable to soil erosion due to undulating to rolling topography. Mountains soils distribute in a very limited scale at the foot of the mountains in the west of the area.

(2) Mambusao Area

Soils of the Mambusao area belong to the general group of the soils of plains and valleys consisting of 3 sub-groups; (1) Soils of alluvial plain, (2) Soils of alluvial depression and (3) Soils of older alluvial terraces. Area and proportional extents of these soils are summarized below.

Soils	Area	
	ha	%
1. Soils of alluvial plain	3,207	80
2. Soils of alluvial depression	340	9
3. Soils of older alluvial terraces	453	11
Total	4,000	100

Soils of alluvial plain which are fully used for rice cultivation occupy almost all of the area, amounting to about 3,207 ha or 80% of the total study area of 4,000 ha. In general, the soils are deep in effective soil depth, clay to heavy clay in texture, very sticky when wet and extremely firm when dry, poorly drained and slowly permeable. The soils, particularly in the southern half of the area, are less tillable.

Soils of alluvial depression, occupying 340 ha or 9% of the study area, are found at the foot of the residual hills and in the eastern part of the area. The soils are characterized by underlaid peat. Waterlogging and seasonal water stagnation are severe constraints for agricultural use of the soils.

Residual hills situated at the central and southern parts of the area are covered with the soils derived from the parent materials of sedimentary rocks of shale and sandstone. The lands occupying about 453 ha or 11% of the study area, are scarcely suitable for the agricultural utilization because of shallow effective soil depth and undulating to rolling topography isolated in a small area.

4.1.4 Land Suitability

(1) Panitan-Panay

Land suitability in the Panitan-Panay area for agricultural development is shown in Fig. VI. 4-1 and summarized below.

	Sub-class	Limitation	Area ha	Area %
A: Very good land	-	-	4,651	78
B: Good land			931	15
	Be	Erosion	143	2
	Bw	Wetness	226	4
	Bs	Moderate permeability	562	9
C: Moderately good land	Ce	Erosion	243	4
D: Fairly good land	De	Erosion	65	1
X: Marshy, swampy land	-	Waterlogging	110	2
Total			6,000	100

Most of the study area, about 4,651 ha or 78% of the study area of 6,000 ha are classified into Class A of land suitability class except for the lands developed on swamps, depressions, natural levees, residual hills and mountains. The Class A lands have no constraints for cultivation in particular. In the light of soil condition and topography,

the lands are most suitable for irrigation farming of rice. While, irrigation system is forced to be divided into several units due to the geomorphological conditions particularly specified by meandering of the rivers.

From the topographical point of view, the lands of Class Bw are also suitable for irrigation farming with gravity system by providing proper drainage facilities. These lands mainly occupying the alluvial depressions amount about 226 ha or 4% of the study area.

(2) Mambusao Area

Land suitability in the Mambusao area where the existing irrigation facilities are planned to be rehabilitated is shown in Fig. VI. 4-2 and summarized below.

Suitability Classes	Sub-class	Limitation	Area ha	Area %
A: Very good land	-	-	3,207	80
B: Good land	Be	Erosion	22	1
C: Moderately good land			771	19
	Ce	Erosion	431	10
	Cw	Wetness	340	9
Total			4,000	100

The lands of Class A which have no limitation for agricultural use extend over about 3,207 ha, corresponding to about 80% of the study area of 4,000 ha. The area also includes some depressions of Class Cw (moderately good land) where waterlogging or seasonal water stagnation are moderate constraints for agricultural use.

Taking into consideration the soils and topographic condition, all lands can be used for the cultivation of rice under the proper management of irrigation water with providing proper drainage facilities.

4.2 Present Land Use

(1) Panitan-Panay Area

Present land uses in Panitan-Panay area are clarified by the use of aerial photographs taken in 1983. The results are summarized below.

Land Use Category	Area	
	ha	%
Paddy	5,097	85
Sugar cane/Upland crops	496	8
Orchard (Coconut)	213	4
Pasture/Glassland	10	-
Shrub	52	1
Marshes/Swamps	25	-
Buildup area/Village yard	107	2

The lowlands of the Panitan-Panay area have been developed for rice cultivation close to its potential maximum with the irrigation water in some fields. The area is estimated at 5,097 ha, corresponding to 85% of the study area of 6,000 ha. The lands have many pump irrigation systems which are isolated in a small scale and disperse in the area due to the topographic conditions specified by meandering of the river.

Natural levees developed along the Panay river are principally used for the planting sugar cane and diversified crops. The areal extent is about 496 ha or 8% of the study area.

Other land uses such as orchard, grassland, shrub, marshes and village yards are found in a very limited scale, totalling to about 407 ha or 7% of the study area.

(2) Mambusao Area

Present land uses in the Mambusao area are shown below.

Land Use Category	Area	
	ha	%
Paddy	3,400	85
Sugar cane/Upland crops	138	3
Orchard (Coconut)	248	6
Pasture/Glassland	36	1
Shrub	8	-
Marshes/Swamps	63	2
Buildup area/Village yard	107	3
Total	4,000	100

At present, the plains and valleys in the Mambusao area are principally devoted to rice cultivation two times a year under the both irrigated and rainfed conditions. The areal extent is estimated at about 3,400 ha corresponding to 85% of the study area of 4,000 ha. Other land uses such as sugar cane, orchard, grassland, shrub, and village yard except of marshes are mainly found on the elevated land, totalling to 537 ha or 13% of the study area.

4.3 Agricultural Population

4.3.1 The Panitan-Panay Area

The population of the Panitan-Panay area, in terms of the selected area for the irrigation development study, is estimated at approximately 43,960, accounting for 8.9% of the provincial total population of 492,000.

Population of this study area consists of 45 barangays' populations i.e., 21 barangays in Municipality of Panay, 10 barangays in Municipality Roxas City, 8 barangays in Municipality Panitan and 5 barangays in Municipality Pontevedra Approximately 40,100 persons or 91% of the total population in the study area are inhabitants in rural area with about 7,020 households and 5.7 family member on an average. Remaining about 3,800 persons make up of 640 households exist in urban area.

The agricultural population in terms of economic active population in agricultural sector can be estimated based on age group structure of the rural population. According to the population census 1980, the population between 15 years and 64 years old in the minicipalities of Panay, Panitan and Roxas City are accounted for 76% of the total rural population on an average. Therefore, the agricultural population in the Panitan-Panay Area will be estimated at approximately 30,500 persons. A breakdown of population status of the Panitan-Panay Area shows in Table VI. 4-1.

4.3.2 The Mambusao Area

The total population of the Mambusao irrigation development study area is estimated at approximately 27,320 persons, accounting for about 5.6% of the total provincial population. This total population makes up of 16 barangays in the Municipality of Mambusao and 8 barangays in the Municipality of Sigma. There exist about 6,110 persons in the urban area with 1,060 households averaging 5.8 family members per household and 21,210 persons consists of 3,800 households with average 5.6 number of family members per household in the rural area.

The agricultural population i.e., the economic active population within rural area of the Municipality of Mambusao and the Municipality of Sigma are 74% and 75% of the total rural populations, respectively. The agricultural population will, therefore, be computed at approximately 15,750 persons in total.

The population by barangay/municipality in the Mambusao irrigation development study area is summarized in Table VI. 4-2.

4.4 Land Tenure and Land Holding

In the Panitan-Panay irrigation study area 4% of the farm operators were tenants. 17% full-owners, 11% part-owners, 25% other form of tenure and 1% farm manager in 1971. In relation to the corresponding figures of 1960, full-owner operators increased by 27.8%, part-owners by 24.4%, while tenants decreased by 46.2%.

In the Nambusao irrigation study area 38% of the total farm operators were tenants, 19% full-owner, 23% part-owners and 20% other form of tenure. In comparison with the figures of 1960, full-owners and part-owners increased by 38.2% and 111.7%, while tenant operators decreased by 37.3%. It appear that a number of farm operators who had been previously operating their holding either as part-owners or tenants had acquired full-ownership of their farms. Detail is given in Table VI. 4-3.

In order to alleviate the economic and social status of tenant farmers, the Department of Agrarian Reform is still continuously putting great emphasis on the enhancement of tenurial arrangement for the paddy and corn farm lands. To grasp this real condition, the field survey was carried out in the Barangay Cabugao Oeste, Municipality of Panay and the Barangay Mangoso, Municipality of Sigma on August 1984.

The Barangay Cabugao Oeste, consisting of 95 households which exist at the center of the Panitan-Panay irrigation development study area have 47 tenant farmers who are participants of the Operation Land Transfer under the Land Reform Program of the Government.

Out of 47 tenant farmers, 25 are lease contract desired (L), 3 lease contract already written (LC), 9 request ownership under P.D. 27 (O) and 10 land under investigation by MAR (I). By the information from Department of Agrarian Reform they are still amortizing owners as of September 1984.

The Barangay Mangoso located at the middle of Municipality of Sigma have 367 households in total, consisting of 237 farmers, 120 landless laborers, 4 teachers and others 6, covering land of about 460 ha of lands.

Of the 237 farmers counted, 185 are participants of the Operation Land Transfer under the land reform program. They are classified into 61 lease contract desired (L), 1 lease contractor already written (LC), 113 requested ownership under P.D. 27(Q), 9 land under investigation by MAR (I) and 1 other. These participants are also still amortizing owners as of September 1984. Real condition of 2 barangays shown in Table VI. 4-4, Figs. VI. 4-3 and VI. 4-4.

The following tabulation shows the farm fragmentation in the above barangays.

	Cabugao Oeste		Mangoso	
1. Parcel	148	80%	35	74%
2. Parcels	29	16%	7	15%
3. Parcels	6	3%	4	9%
4. Parcels	3	1%	1	2%
Total	186	100%	47	100%

As a whole, over 90% of the total farms are consisted of 1 or 2 parcels. The fragmentary farms are observed only 1 - 3% of the study area.

4.5 Agricultural Production

4.5.1 Present Cropping Pattern

Cropping patterns prevailing irrigation development study area are different between Panitan-Panay area and Mambusao area. In the Panitan-Panay area the triple cropping of paddy in a year is made on some part of the irrigated paddy lands. In the Manbusao area it is never seen such farmers who adopt the triple cropping of paddy as like Panitan-Panay area. Present cropping pattern prevailing in those two areas are illustrated in Fig. VI. 4-5.

The Panitan-Panay area has approximately 6,000 ha in gross. The area planted of paddy are 4,540 ha, of which 1,850 ha area irrigated paddy land and the 2,690 ha are rainfed. These figures correspond to about 31% and 45% of total study area. Out of the irrigated paddy land some 550 ha is used for triple cropping of paddy in a year at present. The area planted of sugarcane occupies about 230 ha and that of corn covers 40 ha. Other crop grown as supplemental crop for paddy farms are coconuts, banana and vegetables. They are generally planted in and around the farmers home-stead.

In the Panitan-Panay area, the wet season irrigated paddy is usually made from the beginning of June to October. Dry season irrigated paddy is operated during from the beginning of October to the middle of February. The third paddy season is taken between February to June and area covered are usually about 50% of the total irrigated paddy lands. Remaining 50% of irrigated paddy land is laid as follow due to lack of irrigation water in this season.

Wet season rainfed paddy is grown in the period from the middle of May to the end of September. Dry season rainfed paddy is usually made between October to beginning of February.

Crop season of corn is two in a year. First crop season is taken from April to July and second season is from October to January.

The extent of the Mambusao study area is approximately 4,000 ha in gross. The area planted of paddy is about 3,380 ha in total, of the total, the 1,920 ha are irrigated paddy lands and the 1,460 ha are rainfed paddy lands. The area planted of corn is calculated at about 110 ha, and that of sugarcane covers 20 ha. Other crops grown in this area are coconuts, banana, and vegetables.

Cropping calendar in this area, as a whole, the irrigated paddy season is taken about half month later than that prevailing in the Panitan-Panay area. But dry season paddy is usually started about half month earlier than that being carried out in the Panitan-Panay area. This difference of cropping calendars between Panitan-Panay area and Mambusao area is mainly depending on the beginning of rainy season.

4.5.2 Farming Practices and Farm Inputs

The paddy cultivation by direct seeding method is prevailing both wet and dry seasons in the study area. All the members of family contribute their laborer to rice farming. Animal power, mainly buffaloes and oxen, is extensively used for land preparation. The use of farm machineries and equipments are not so common. Existing farm machineries in the study area are as follows.

Municipality	Turtle	Hand Tractor	4-Wheel Tractor	Sprayers
Nambusao	105	72	4	608
Sigma	62	15	10	578
Panitan-Panay	61	47	10	365
Pontevedra	60	15	13	206
Roxas City	18	45	-	405
Total	306	194	37	2,162

The high yielding varieties are introduced in the area through the International Rice Research Institute and the Maligaya Rice Research Training Center, etc. The major varieties introduced are IR 36, IR 50, IR 52, which are short matured varieties with growth period of 105 days to 115 days and IR 38, IR 54 BPI-3-2 which are medium matured varieties with growth period of 120 days to 125 days.

Paddy seeds are selected from last harvest or are supplied from the Capiz Seed Producers Association organized by some 16 seed producers under the supervision of Ministry of Agriculture and Food. Paddy seeds are generally sown at the rate of 35 kg. to 45 kg per hectare on the nursery which is prepared in the size of about 1/20 to 1/25 of the paddy field to be transplanted. In the case of adoption of direct seeding, paddy seeds are broadcasted by hand at the rate of about 135 kg (3 cavans) per hectare.

The land preparation, ploughing and harrowing are carried out before transplanting by using animal power. Puddling is also carried out immediately after sufficient water becomes available. The transplanting is made by hand with at random. Planting space is generally taken narrow, being 30 to 40 hills per m^2. After transplanting or direct seeding, weeding is practiced one or two times by hand, sometimes by using herbicides.

The use of fertilizers and pest-insecticides are generally low in the study area. Fertilizers are commonly applied in two split doses at the rate of 100 kg of urea, 150 kg of phosphorous (N-16-P20-K0) per

hectare, respectively. One half of the amount of urea and all of the required amount of phosphorous fertilizer are incorporated into the soil at the final harrowing and leveling and the remaining amount of urea is topdressed at the period of panicle initiated stage. Spraying is carried out as necessary based on their own economic threshold.

Harvesting is generally practiced using by sickles. Paddy plant harvested is dried on the ground surface of paddy field for about half a day, then, threshed by the throw-in type of power thresher which is local made. The Paddy grains threshed are dried up again on the roadside or near the houseyards. When moisture content of paddy grains goes down at around 15% of the moisture contents, the paddy grains i.e., product are sold to the millers.

4.5.3 Yield and Crop Production

The paddy yield survey was carried out during the period of August 27 to September 15, 1984 to identify the defects hampering the increase of paddy yields under present condition. The paddy sampling was made for the first paddy season at 118 sites in the irrigation development study area in total, of which 80 samples were taken from irrigated paddy fields and 38 samples from the rainfed paddy fields. The varieties of paddy samples were IR-36 and IR-54, the dominant varieties in the study area.

Method of yield survey was taken as follows:

1) Determine the three places at random to be taken the paddy samples within the same Paddy plots.
2) Measure strictly one square meter (m^2) with a rule, on the selected places.
3) Cut the paddy plants within strictly four handred square centimeter (400 cm^2) from one square meter and count the number of panicles.
4) After taken the four hundred square centimeters (400 cm^2), cut the remaining paddy plants in a rule of one square meter and count the number of their panicles.

5) Cut-off the panicles of four hundred square centimeter (400 cm^2) paddy plants which were taken from each three places in the same paddy plot separatory and only panicles of each samples are sent for laboratory analysis.

In the laboratory, the paddy samples were analyzed in accordance with the method described in "Rice Cultivation for the Million[1/]" and the following yield components were determined:

1) Number of panicles per m^2
2) Number of grains per panicles
3) Percentage (%) of ripened grains
4) Weight of 1,000 grains.

In the laboratory, the representative panicles taken from the sampling site were threshed by hand and all the rachis-branches were removed. The total grains thus obtained were dried by an infrared ray lamp for 5-10 minutes. The dried grain were then put into a salt solution with 1.06 specific gravity and stirred about one minute. By this operation the grains are well divided into two groups i.e., a floating one and a sunken one, the former can be taken as non-ripened grains and the latter as fully ripened grains.

The floating grains were scooped out with net spoon, dried and then counted. The sunken grains were also counted after taking them out of the salt solution by transferring the solution to another vessel by using a sieve and washing them well with water. Then, the number of grain per panicles was calculated by dividing the total number of grains, which was the sum of the number of floating grains and that of sunken grains, by the total number of panicles of the paddy samples.

The percentage of ripened grains was easily calculated by dividing the number of sunken grains by total number of grains. It is considered that all the sunken grains represent the actual yield. The sunken grain was dried up to the moisture content of 14% under the infrared ray lamp.

Note: 1/ S. MATSUSHIMA, Rice Cultivation for the Million, Japan Scientific Societies Press 1980.

The dried grains were then accurately weighted. The 1,000 grains weight was calculated by dividing the weight of dried grains by the total number of sunken grains. The grain yield of paddy is the product of these average yield components. The unit yield is expressed by the following equation:

Unit yield (ton/ha)

= Number of ripened grains per 400 cm^2
÷ Number of panicles per 400 cm^2
x Number of panicles per m^2
x Weight of 1,000 grains (g)
÷ 1,000 (conversion to one grain weight)
x 10,000 (conversion to yield per ha)
÷ 1,000,000 (conversion to metric ton in weight)
x 1.0-0.2 (estimation of 20% as harvest-losses)

Result of the paddy yield survey and analysis of yield components carried out by the Team in August/September, 1984 are given in Table VI. 4-5. The figures on average yield per ha in the same table are already deducted the harvest-losses consisting of 2% for reaping, 3% for threshing, 4% for handling and 2% for drying totalled 11% and 9% of area covered by yield survey as the levee/paddy land ratio.

According to the information from the Food Nutrition Research Institute, Philippines, the harvest-losses of paddy grains are generally estimated as left vertical line in the following table. The right vertical line in the same table show the preliminary figures which were applied at this survey period.

(Unit: %)

Losses	FNRI	Preliminary
Reaping loss	1 - 3	2
Threshing loss	2 - 6	3
Handling loss	2 - 7	4
Drying loss	1 - 5	2
Milling loss	2 - 10	-
Storage loss	2 - 6	-
Total	10 - 37	11

Yield survey showed the results of 3.22 tons per ha in the irrigated area and 3.18 tons per ha in the rainfed area. It is, however, considered that these preliminary estimation of harvest-losses applied in the yield survey should be revised as to be 14 - 15% for the irrigated paddy, 18 - 19% for the rainfed paddy. Besides, in the case of rainfed paddy the levee/paddy land ratio must be pull-up from 9% to about 11% level due to the field conditions.

Therefore, taking into account of above harvest-losses and levee/paddy land ratio and other factors such as farm ditches, foot paths at the farmers field levels present paddy yield per ha are estimated at 3.2 tons for irrigated paddy land and 2.8 tons for rainfed paddy land in the irrigation development study areas. These unit yield of paddy will be applied for the cost-benefit estimation of rice farming in the study areas.

Unit yield and production of corn, sugar cane, vegetables and tree-crops are depended on the statistical data at the Municipal levels. Present crop yields and productions in the study areas are summarized as follows:

	Panitan-Panay			Mambusao Area		
	Area (ha)	Prod. (t)	Yeild/ha (t/ha)	Area (ha)	Prod. (t)	Yield/ha (t/ha)
Irrigated paddy	1,850	5,920	3.2	1,920	6,144	3.2
Rainfed paddy	2,690	7,532	2.8	1,460	4,088	2.8
Corn	40	60	1.5	110	253	2.3
Sugar cane	230	11,960	52.0	20	1,040	52.0
Beans	10	63	6.3	30	189	6.3
Eggplants	10	119	11.9	10	119	11.9
Sweet potato	10	75	7.5	30	225	7.5
Coconut	160	7,200	45.0	280	12,600	45.0
Banana	90	36,900	410.0	190	73,900	410.0

4.5.4 Livestock Raising

Buffalo and oxen play an important role in farm operation and transportation as motive power, and also in meat food supplies. The livestock and poultry products are used for home consumption and also are sold to meet special expenses. Livestock and poultry raising, however, is not mainline of irrigation farming in the study areas. The number of livestock and poultry in the study areas both Panitan-Panay area and Mambusao area show as follows:

(Unit: head)

	Panitan - Panay	Mambusao
Cattle	149	82
Buffalo	2,340	401
Goats	257	127
Ducks	5,286	3,849
Chicken	19,406	7,840
Hogs	4,105	1,936

4.6 Marketing and Prices

The surplus of paddy is generally sold to National Food Authority through NFA's Buying Stations and NFA's Procurement Teams or middle men through brokers. The paddy collected by NFA is transported to other provinces after milling or re-drying by NFA own facilities or through private mill accredited by NFA. The post harvest facilities and buying personels by property in the study area show in Table VI. 4-6.

The surplus of corn grains is also collected by NFA and distributed to generally outside of the study area through the same market channel that of paddy.

The sugarcane harvested in the study area, nearly 100% of them are sent to the Asturias Sugar Central and Pilar Sugar central located within Panay river basin. Transportation of sugar cane is usually made by trucks. Some part of transportation cost are subsidized by both sugar millers.

Other usual marketing system in the rural area is to have processor or wholesaler pick-up the products at the farm and then follow normal market channels in cash.

The prices of paddy are generally controlled by Government through NFA. As of September 1984, the buying price of paddy is set at ₱2.65 per kg. The prices of the milled rice are set at ₱4.65 per kg for the selling price and ₱4.85 per kg for the ceiling price. When the market price of rice is over the ceiling price, NFA sells its' stocks with ₱4.65 per kg to the market through retailers.

Buying price of NFA has been increasing annually. During the period from CY 1974-75 to 1978-79, buying price was ₱1.0-1.1 per kg however, during the period of recent 5 years it is rapidly increasing as like ₱1.3 per kg up to ₱2.65 per kg as shown on Table VI. 4-7.

Prices of sugar: during past 7 years, the liquidation price of sugar in terms of sugar picul, has been increasing annually. From CY 1976-77 the price registered an increasing trend up to ₱237.12 per picul in CY 1983-84, or an increase of ₱ 156.12 per picul in a period of 7 years, it means over two times that of CY 1977-78, as seen in the same Table.

4.7 Farm Budget

In order to grasp the present farm economic conditions, the typical size of paddy farmers are selected among the beneficiaries in the areas designed for the irrigation development at both the Panitan-Panay area and the Mambusao area. The typical size of paddy farm in the Panitan-Panay area is 1.5 ha with 7 family members and that in the Mambusao area is 2.2 ha with 8 family members.

Their farmer's income and expenditures are summarized as follows.

		Panitan-Panay (1.5 ha)	Mambusao (2.2 ha)
A.	Farmer's Income		
	1. Crop	8,830	11,440
	2. Livestock	2,500	2,600
	3. Others Wages	4,500	4,500
	Extra	200	1,000
	Total Income	16,030	19,540
B.	Farmer's Expenditures		
	1. Tax & Duty	600	840
	2. Living Expenses	14,740	17,840
	Total Expenditure	15,340	18,680
C.	Capacity to Pay (A-B)	(+)690	(+)860

The farmers income and expenditure of paddy farmer of 1.5 ha size in the Panitan-Panay area are ₱16,030 and ₱15,340. Therefore, capacity to pay is plus ₱690. In the case of 2.2 ha size of paddy farmer in the Mambusao area, the total income is ₱19,540. The total expenditure is 18,680, capacity to pay comes plus ₱860. It is considered that the typical paddy farmer of 1.5 ha size have no enough capacity to pay at present, despite low living standard. The typical paddy farmer of 2.2 ha size in theMambusao area is also obtained a few surplus in terms of capacity to pay with a little high living standard than that of the typical paddy farmer of 1.5 ha size in the Panitan-Panay area.

Breakdown of farm budgets of the typical paddy farmers in both Panitan-Panay area and the Mambusao area are in Tables VI. 4-9 (1) and VI. 4-9 (2).

Marketing on fertilizers and chemicals are handled by distributors, dealers or outlets who are accredited to operate from the Fertilizer and Pesticide Authority.

The price of fertilizers are set by the Fertilizer and Pesticide Authority by Minicipality in whole province of Capiz. The price list of fertilizers per municipality of the province of Capiz is given in Table VI. 4-8.

5. PROSPECTIVE AGRICULTURAL DEVELOPMENT PLAN

5.1 Development Concept

(1) Basic Concept for Development

The basic concept for agricultural and irrigation development in the Panay river basin is set forth to increase rice production by increase in unit yield of paddy, productive and efficient use of land and expansion of irrigated land based on the following consideration:

(a) Government development plan: Following the Five-Year Philippine Development Plan (the Five-Year Plan) for 1978 - 1982, the Five-Year Plan for 1983 - 1987 was issued by the National Economic and Development Authority (NEDA). In order to achieve the national goals of sustainable economic growth, equitable distribute of the fruits of development and total human development, the following overall targets were established in respect to agricultural sector:

- To attain the target of about 5% increase in the GDP from 1983 to 1987, increase in agricultural sector will form about 3.5 billion pesos or 70% of increase in the GDP. Annual increase in agricultural sector is expected to be 3.4%.

- In region VI, in order to increase the GRDP by about 10% from 1983 to 1987, increase in agricultural sector is expected to account for 77% of total increase of the GRDP and aboug 660 million pesos. Annual increase rate is to be about 5%.

- To promote self-sufficiency in rice and other food production.

(b) Rice marketing to outer islands: Region VI, especially the Panay island, is one of the rive supply base to other outer islands such as the Negros, Mindoro and Cebu, in which industrial crops of sugar cane, etc. are mainly produced. The Panay island is endowed with natural and physical conditions suitable for rice cultivation. While, the Negros and Mindoro islands will be further developed for industrial crop production in the future. In addition, the population of Metro Manila will also

Increase with high growth rate year by year. These facts will result in increase of demand of rice in outer islands and the Panay island will be further expected to keep the role of rice supply center.

(c) Increase in farmer's income: The farmers in the Panay river basin get their incomes from farming activities, mainly from rice cultivation. Farmer's income is, however, low due to low productivity. Net reserves of the farmers are negligibly small. The results of farmer's interview survey indicate that they are eager to produce paddy whenever provision of available irrigation water will be permitted.

(d) Profitability of rice: The ceiling price and floor price of rice are set by the Government and the price of rice is stabilized by the National Food Authority (NFA). It is expected that stabilization of price will be continued in the future. On the contrary, prices of common crops other than rice are not stable. Farmers also intend to cultivate rice if irrigation water is available, since rice is one of the highest crops in profitability.

(e) Increase in employment opportunity: About 45% of the total gainful workers more than 15 years old in the river basin seems not to have gainful jobs. Introduction of intensive irrigation farming will be expected to reduce unemployment of the said people.

(2) Strategy for Development

Taking into consideration the basic concept for development, strategy for agricultural and irrigation development are formulated for the purpose of increase in rice production as follows:

(a) To introduce improved irrigation farming practices.

(b) To provide appropriate agricultural extension and supporting services.

(c) To develop the existing irrigator's group in the national irrigation system into functional and viable organization.

(d) To provide irrigation facilities to supply stable perennial irrigation water to the potential irrigable areas selected.

(e) To improve and rehabilitate the existing irrigation systems to raise productivity and cropping intensity.

(f) To integrate the existing PIS dispersing along the Panay river and other tributaries to avoid complicated water supply system and to save high operation and maintenance cost.

(g) To provide adequate drainage facilities to mitigate a considerable damage due to maldrainage and flood in lowland area.

(h) To introduce proper operation and maintenance system as well as water management system after completion of irrigation schemes.

5.2 Anticipated Yield and Production

5.2.1 Proposed Cropping Pattern

In due consideration of the basic development concept as described in the previous Section 5.1, paddy is selected as main crop. For some portion, beans such as Mung are recommended as supplemental crop for the diversification of rice farming.

In formulating the proposed cropping pattern, at least one month period is considered as an absolute condition to maintain the irrigation canal network. To meet this condition, a medium term varieties such as IR-38 and IR-54 will be selected for Mambusao area. In Panitan-Panay area, especially in Panay area where the triple cropping of paddy is prevailing among some farmers at present, the short term varieties as like IR-35 and IR-50 are recommended to apply in this area.

In the Mambusao area, growing seasons of paddy are set as follows i.e.,

Wet season paddy: Middle of May to end of October
Dry season paddy: Beginning of November to middle of April

During a period from the middle of April to the middle of May is proposed to be fallow as a period to maintain irrigation canals and related structures.

The proposed cropping pattern for the Panitan-Panay area are as follows:

Wet season paddy : Beginning of May to end of September
Dry season paddy : Middle of September to middle of February
Supplemental crop : Beginning of February to end of May

The triple cropping of paddy is made on some parts of paddy lands in Municipality of Panay. This is the reason for the paddy is most profitable crop among other possibly grown crops under the present economic situations. The farmers in the area have long experiences for paddy cultivation and are likely to realize the maximum irrigation benefits by means of introducing triple cropping of paddy.

However, the regular maintenance of irrigation canal and related structures is indispensable. It is, therefore, proposed to introduce mung beans instead of the third paddy. Mung beans could be grown in between two crops of paddy because its growth period is relatively short. For the cultivation the mung beans do not require much water compared with paddy therefore it can be taken enough time to maintain the irrigation canals and facilities. Proposed cropping pattern is illustrated as in Fig. VI.5-1 .

5.2.2 Anticipated Yield and Production

The yield of paddy can be increased through improvement of defects involved in each yield component. In order to find the defects of the present paddy yield, the relation between unit yield and each of yield component was examined, as illustrated on Figs. VI. 5-2 (1) to (2). There is a clear correlation between unit yield and number of ripened grains per m^2 not only for irrigated paddy and rainfed paddy but also

total samples by locations. There is no correlation between unit yield and other yield components. Only percentage of ripened grains is a faint. The most important factors for increase in paddy yield in the study area are twofold i.e., the number of grains per m^2 and percentage of ripened grains. In general, the number of ripened grains per m^2 under the normal condition should be more than thirty thousands. For improvement of rice cultivation, attention should be fistly given to the increase in this number of ripened grains per m^2.

The most decisive factor is the number of ripened grains per m^2, which is generally determined during the period of 25 days before flowering. Any conditions during other growth periods do not affect spikelet number per panicle. The unfavorable conditions, like shortage of available water, lack of fertilization, too high temperature and low solar radiation during the period of 25 days before flowering make the number of spikelets low. The proper water management, fertilization and cropping schedule, considering the stage of plant growth, should be the key to increase the number of spikelets, and thereby to increase the unit yield.

The percentage of ripened grains is generally determined during the period from the neck-nods differentiation stage to the time 30 days after heading. Therefore, the causes for low percentage of ripened grains must have resulted from the some defects occurred during this period. The shortage of irrigation water during this period is the main reason for low percentage of ripened grains. The methods for increasing the percentage of ripened grain are:

(1) To create favorable conditions during the period from the initiation of young panicles to heading,

(2) To prevent the production of an excessive number of spikelets,

(3) To make the rice plant strong and healthy by the heading time,

(4) To carry top-dressing with nitrogenous fertilizers at the full heading time,

(5) To make the rice plant head at the optimum time when good weather last for 15 days before heading and 20 days after heading for 35 days in total,

(6) To prevent the plant from lodging,

(7) To make the plant ripen before a fall in temperature in cool season,

(8) To select the varieties which yield a high percentage of ripened grains,

(9) To create the nice plant type, and

(10) To stimulate the root activities.

The number of ripened grains per m^2 are counted at about 17,470 in the irrigated paddy and 16,330 for rainfed paddy on averages from Table VI. 4-5 (Code No. 11). The weight of 1,000 grains is an average 24 grams. By use of these yield components and revised harvest-losses and levee/paddy land ratios, Present unit yield of paddy can be calculated at 3.2 tons for irrigated paddy and 2.8 tons for rainfed paddy per ha, as follow.

	Irrigated	Rainfed
Number of ripened grains per m^2	17,470	16,330
Weight of 1,000 grains (g)	24	24
Harvest-losses (%)	14	18
Levee/paddy land ratio (%)	9	10
Paddy yield per ha (t)	3.2	2.8

The percentages of ripened grain are accounted for 74% of the total grains in irrigated paddy and 69% for rainfed paddy on the same Table VI. 4-5 (Code No. 12). The percentage of ripened grains is generally determined during the period from the neck-node differentiation stage to the time 30 days after heading. Therefore, the cause of a low percentage of ripened grains must have resluted from the some defect during this period. The shortage of available water during this period is the main reason for low percentage of ripened grains.

Under the future condition with project, the productivity of paddy is expected to increase considerably through solution to the problems of small number of ripened grains per square meter and low percentage of ripened grains by effective countermeasures as described in previous paragraph. It is expected that the number of ripened grains per square meters can be easily increased to 28,000 grains and more than 75% level of ripened grains to the total grains, through improved farming practices on the basis of the diagnosis result of yield survey.

The anticipated paddy yield are, therefore, estimated at 5.0 tons per ha for both first and second season paddy in the irrigation development areas.

5.2.3 Proposed Farming Practices and Inputs Requirement

Proper irrigation farming is the most important factor for realizing full exploitation of agricultural potentiality in the study area. For this purpose, high yielding paddy varieties such as IR series and improved varieties bred in the Department of Agriculture, UP, etc., will be introduced. Proper amount of fertilizer and agricultural chemicals will be applied.

Fertilizer requirement in the study area is prepared by the Masagana 99 program officers in coordination with provincial soil technologist. Agricultural chemical requirement is recommended by the pesticide technical group under the same program at present.

It is expected to apply strictly their recommended dosage i.e., N-90, P-30, K-30 kg for the dry season and N-60, P-30, K-30 kg for the wet season and 2 liters insecticides and herbicides for the dry and wet season paddy per ha to achieve the anticipated yield of 5.0 tons per ha stated in previous subsection 5.2.2.

5.3 Proposed Agricultural Support Services

5.3.1 Research

(1) Panitan-Panay Area

Research activities must concentrate on specific technologies adaptable to these localities following the PCARRID research priority areas to support the agricultural development program designed in this area. Studies on improvement of water management practices must be undertaken by the NIA.

(2) Mambusao Area

Existing research activities must be continued with emphasis on increasing farm productivity and farmers' income. Results on researches conducted by the NIA and the agricultural school in the area must be properly coordinated by the MAF to facilitate the transfer of approved technology adaptable for the locality to the farmers.

5.3.2 Extension Services

(1) Panitan-Panay Area

This area must be considered in the preparation of the Integrated Agricultural Development Program for its Integrated Area Management System as established by EO 803 to insure the effective utilization of the proposed national irrigation system in the locality to increase farm productivity.

The construction of the irrigation system will be favorable to one of the national productivity program to be implemented in this area; the Unified Azolla program which inevitably needs irrigation water.

In this area, it is necessary to find out the detailed extension requirements of the area to define the capability and limitations of extension manpower deployment. This will be the basis to adjust the programs implemented in area to extension capability and to re-train extension personnel. In areas being an oversupply of manpower, excess personnel should be redeployed to other areas where needed.

(2) Mambusao Area

This area must be also included in the Integrated Agricultural Development Program for its Integrated Area Management System to effectively enhance the farm productivity of the area considering of the proposed rehabilitation works and expansion of irrigable farms of the existing national irrigation system in the area.

It is also needed to find out the detailed extension requirements of the area to define the capability and limitations of extension manpower deployment. This will also be the basis to evaluate whether there is a oversupply of manpower in the area.

5.3.3 Seed Multiplication and Distribution

(1) Panitan - Panay Area

There is a need to increase the number of seed farms in the area to supply the seed requirement for the projected increase in demand due to the proposed construction of the irrigation system. Price of seeds must be increased a little higher than the present price to encourage seed growers.

(2) Mambusao Area

The rehabilitation and expansion of the existing national irrigation system in the area will generate more areas for paddy cultivation. It will require additional seed farms to supply the increasing need of seeds in the locality. Seed distribution system prevailed presently must be continued. To encourage seed growers in the locality, the reasonable price of seeds should be established.

5.3.4 Agricultural Credit

(1) Panitan - Panay Area

PNB and Rural Bank of Panay must continue to provide extensively the agricultural credit required for Masagana 99 program in the area. However, there is a need to study further the implementation of the Central Bank's Integrated Rural financing which support the entire annual farm plan of the farmer including all his production requirements for several crops, infrastructure needs and marketing exigencies for the area.

(2) Mambusao Area

Some measures must be instituted to ensure the continuous flow of credit to this area which are inadequately served by existing rural bank particularly on Masagana 99 program. Effect of implementating the Integrated Rural financing program in the area must be further evaluated.

5.3.5 Farm Inputs Supply

(1) Panitan - Panay Area

There is a need to put up additional dealers of agricultural inputs to support the needs for the increase in demand of fertilizers and chemicals due to the construction of an irrigation system. The Area Marketing Cooperative (AMC)must be encouraged to establish marketing outlets in strategic barangays to reduce the hauling cost of the farm inputs which has been endured by the farmers. This will give good accessibility to farmers in the procurement of farm inputs.

(2) Mambusao Area

Existing agricultural input dealers must be increased to supplement the increasing demand due to the proposed rehabilitation and expansion of the irrigable area of the existing national irrigation system in the locality.

The AMC must establish marketing outlets in strategic locations to facilitate the procurement of farm inputs to the farmers. However, the FPA must properly supervise and control the approval of license to avoid saturation of input dealers in the locality.

5.3.6 Farmers Cooperatives

(1) Panitan - Panay Area

It is necessary to unify all types of farmers organization under a single organizational group at the village level. This Organization will effectively function as a channel for delivering inputs and services to the farm in consonance with the newly adopted area-specific farm systems approach of the Integrated Area Management System.

The Samahang Nayon is the most ideal farmers' organization that can be strengthened to serve the basic farmers' needs at the village level. Its functions must be widened to include irrigation, agrarian reform and other specialized activities. Ministry of Agriculture and Food's technicians must re-trained to provide them with capability to handle the reorganization of Samahang Nayons.

(2) Mambusao Area

The requirement of the area in terms of farmers organization is similar to that of the Panitan - Panay area. Various types of farmers organization formed in the locality requires unification to eliminate confusion and fragmentation with farmers frequently holding membership and having to pay dues in several organizations at the same time.

5.4 Benefit

5.4.1 Marketing and Price Prospect

In line with the irrigation development concept, the paddy and mung beans are selected to the area designed for irrigation development. Marketable surplus of these crops would be sold and distributed through existing marketing flow channel of NFA. The increased production of paddy after the completion of the project would be marketed in domestic markets in Philippines, as the substitute for imported rice. In this meaning, import substitution price of paddy and fertilizers are forecasted for the economic evaluation.

The economic farm gate prices of farm products and farm inputs are calculated based on the projected international market prices forecasted by IBRD in the long term ranges for the period of 1983 to 1995. The economic farm gate price of paddy is estimated at ₱3,339 per ton in 1984, ₱4,473 per ton in 1889 and ₱4,390 in 1994 as shown in Table VI. 5-1 Economic farm gate prices of sugarcane and corn are presented in Tables VI. 5-2 and VI. 5-3. The economic farm gate prices of fertilizers per 50 kg bag in peso are as follows:

	Urea	Kcl	DAP	NP
1984	194.10	153.95	287.75	203.45
1989	290.80	179.20	499.40	306.45
1994	409.50	184.80	538.70	341.15

Breakdown of estimated economic prices of fertilizers is given in Table VI. 5-4.

Labour has been valued at a shadow price per man-day which is considered by the Ministry of Agriculture to be the wage prevailing in the rural area. It is significantly below the legislated wage rate for agricultural labour of ₱25.73 per man-day Economic production cost of each crops are shown in Table VI. 5-5.

5.4.2 Incremental Benefits

The irrigation benefit of the irrigation development project primarily is acquired from the increased crop production attributable to stable irrigation water supplies. After 6 to 7 years of build-up period from the completion of construction works, the full development stage will be attained. The project benefits is defined as the incremental economic value between the both net production values under the without and with project conditions. The net production values of typical farmers under the with and without projects are estimated at the full development stage. For this study, the 1994 price forcasted are used in the estimation of the incremental benefits.

The net production value of paddy under the without project at the 1994 are estimated at ₱23,953 per 1.5 ha size of typical paddy farmers in the Panitan-Panay area and ₱34,610 per 2.2 ha size of typical paddy farmer in the Mambusao area. After completion of the project, the net production value of paddy and mung beans will amount to ₱42,495 per typical size of farmers in the Panitan-Panay area and ₱58,766 for that of Mambusao area as summarized below.

	Without	With	Increment
Per typical farm (₱)			
Panitan - Panay	23,953	42,495	18,542
Mambusao	34,610	58,766	24,156

The Panitan-Panay area and Mambusao area are selected as NIS development with the irrigation area of 3,250 ha and 2,145 ha respectively. The primary increased in the total crop production value, except other crop in detailed table, at the CY 1994 would be approximately ₱13.0 million (US$2,391 x 10^3) in the Panitan-Panay area and ₱24.7 million (US$1,372 x 10^3) in the Mambusao area. Detailed net production value without and with project condition and the breakdown of the economic costs of production per ha for crops under the with project condition are given in Tables VI. 5-6 to VI. 5-8.

5.5 Farm Budget

5.5.1 Typical Farm

Prior to analyze present farmers economy, the typical paddy farms are selected from the Panitan-Panay and the Mambusao areas demarcated for the irrigation development. The structure and ratio of those farms in terms of cropping area are strictly surveyed by the study team. Therefore, it is considered these typical paddy farms selected will be applicable for the study on farm budget analysis for future without and with the project conditions. Present cropping pattern of typical farms are given in Fig. VI. 5-3.

5.5.2 Farm Budget Analysis

Despite under the without project condition, the crop yield will be increased at about 10% from 1984 up to 1994. Presently, unit yield of rainfed paddy is 2.8 tons per ha, but by 1994, it will be attained approximately 3.0 tons per ha and present irrigated paddy yield of 3.2 tons per ha will be reached at about 3.6 tons per ha by the CY 1994.

As compared with the farm budgets of typical paddy farmer under without and with project conditions, their farm income, expenditures and benefits are estimated on the basis of rural market price as of 1984. The result is summarized as follows.

(Unit: ₱)

	Panitan-Panay Area		Mambusao Area	
	Without	With	Without	With
A. Farm Income	17,100	30,880	21,520	37,180
B. Farm Expenditure	15,410	16,890	18,700	20,750
C. Capacity to Pay	1,690	13,990	2,820	16,430

The typical farmer in the Panitan-Panay area will be obtained about ₱12,300 per farmhousehold and that of in the Mambusao area will be gained at about ₱13,610 per farmhousehold in terms of capacity to pay. The detailed net production value, net production value and farm budget under the without and with project condition are shown in Table VI. 5-9, 5-10, 5-11.

In case of the Panitan-Panay area, the estimated annual O & M cost is ₱1,852/ha. As the farmer's income will sufficiently increase as above-mentioned, this O & M cost shall be paid by the farmers. The farmer's net reserve is shown as follows:

Panitan-Panay Area (1.4 ha) (Unit: P)

	Without	With
1. Capacity to Pay	1,690	13,990
2. Irrigation Fee	928	2,592
3. Net Reserve	762	11,398

6. FISH CULTURE DEVELOPMENT PLAN

6.1 Development Concept

In Capiz province, it can be qualitatively pointed out that the fish culture in the brackish water ponds depends subtly on ecological balance, although aqua eco-system of existing fishponds and mangrove swamps has not been quantitatively explicated due to poor accumulation and arrangement of statistical data on fishery activities as well as lack of data on ecological assessment of fish fauna under natural and artificial aqua environment. At present, the aqua eco-system of the Panay river basin suffers from such hydrological changes as flood, inundation, saline water intrusion and drought to large extent. In order to increase fish production value in Capiz province through stabilization of present production and maximization of future production potential, it is needed that the aqua eco-system in the existing fishponds is always well balanced.

The development concept is made as follows in due consideration of the future aqua eco-system of the Panay river basin after construction of flood control measures, stabilization of river course and security of river maintenance flow:

(1) Intensification of brackish water fishpond culture through the transfer from milk fish to prawn expecting more harvest under less salty brackish water condition,

(2) Strengthening of research efforts to evaluate marine fish resources aiming at coastal fishery development, and

(3) Preservation of mangrove forest to maintain the existing eco-system.

6.2 Potentials and Prospects

In the Panay river basin, there exist fishponds of 10,560 ha, while the remaining marshes/swamps occupy only 1,850 ha. As discussed in Section 6.1, these marshes/swamps should be preserved in the present circumstances for maintaining ecological balance. From this viewpoint, there is physically no room in expanding fish culture ground in the Panay river basin.

The possibility to develop fish culture potential places, therefore, main reliance on intensification of the prevailing fish culture method in the existing fishponds. Such intensification can be expected when establishment of hatcheries for fry supply, proper fertilization and improvement of harvesting methods are implemented in a package and in harmony with the future aqua eco-system. As a result of hydrological study, the present aqua eco-system of brackish water fishponds will change in terms of water quality by undertaking of river basin-wide flood control measures and become more suitable for prawn culture.

The Batan Bay is well known as a developed fishing area for the tiger prawn as well as other nine species of prawn. At the offshore of the Panay river mouth, the larvae of tiger prawn had also observed as a habitat by experimental trawlings conducted by the Aquaculture Department, Southeast Asian Fisheries Development Center from March 1975 to 1980. Prawan cultivation in brackishwater ponds is traditionally carring out as a secondary crop in milkfish culture in the basin might be attributed to the following reasons:

1) Prawn from fry to adult in general has great tolerance to environmental fluctuations, thus it is relatively easy for pond caretakers to let them grow in the ponds.

2) The species has rapid growth and attains a large size.

3) The flavor is good and they are in demand both nationally and internationally, which results in high prices.

4) In general, the fry are easily identified and collected by rural people, and are found locally and seasonally, furthermore, fry are available the whole year round.

5) There are plenty of low cost, unpolluted brackishwater ponds which provide areas for extensive prawn culture.

6) Prawn cultivation is possible all year round due to relatively stable water temperatures associated with their latitudes, although seasonal patterns of rainfall in some areas may be a constraint.

Recently the technology for the artificial production of postlarval of tiger prawn has been established and the gross income of fishpond producing prawn obtained nearly 1.3 times compared with that of fishponds for milkfish. In case that all of the existing milkfish production ponds of 7,750 ha will be transferred to prawn culture ponds, the annual increase in the gross production value is estimated to be about ₱ 13 million under the present conditions. Prawn production will play an important role both in dollar caring and supply of animal protein to the people among developing countres in the near future.

6.3 Recommendation

In view of the above discussion it is recommended that:

(i) There are presently five methods of commercial production of the prawns i.e. the fry collection at shore waters or mangrove areas: artificial fry production in the hatcheries; inshore fisheries by fish corrals, baby trawlers and other fishing gear; offshore fisheries by commercial trawlers; and prawn cultivation in brackishwater ponds. The last is the most promising industry, supported mainly by the artificial fry production, and in the near future may be the most widely used method of the production. In the next stage, however, more detail study should be carried out on these five methods mentioned above due to questionable whether the present aqua eco-system will change or not after implementation of river basin-wide flood control measures.

(ii) Parallel with (i) detail study on intensified cultural methods of milkfish should be conducted in harmony with stable aqua eco-system which is expected through implementation of river basion wide flood control plans.