APPENDIX V

AGRICULTURE AND AGRO-ECONOMY

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CHAPTER 1 GENERAL

This report entitled Appendix V "Agriculture and Agro-economy" is the supporting report for the feasibility study on "the Improvement Project of the Operation & Maintenance of the Upper Pampanga River Integrated Irrigation System (UPRIIS)".

This report describes present agricultural conditions, identifies constraints encountered in the UPRIIS and proposes agricultural development plan.

The data and information used in this report were collected mainly from the following governmental authorities concerned.

1) UPRIIS Office and Regional III Office of NIA
2) National Irrigation Administration
3) Provincial Office, Bureau of Agricultural Economics
4) Regional III Office, Bureau of Agricultural Extension
5) Provincial Office, National Census and Statistics Office
6) National Food Authority
7) National Economic and Development Authority
8) Philippine National Bank
9) Land Bank of the Philippines
10) Philippine Crop Insurance Corporation
11) Regional III Office, Ministry of Agrarian Reform
12) Philippine Atmospheric, Geophysical and Astronomical Services Administration
13) Maligaya Rice Research and Training Center
14) Securities and Exchange Commission

In addition, the following field surveys were carried out in order to supplement and confirm the data and information collected.

1) Rice yield survey at 90 representative sites by Dr. Matsushima's method

2) Farm economic survey on 282 UPRIIS farmers by the questionnaire method

3) Socio economic survey on 276 UPRIIS farmers by the questionnaire method

4) Socio economic survey on 72 Barangay captains by the questionnaire method

CHAPTER 2 PRESENT CONDITION

2.1 Location and Population

The project area of the improvement project of the O & M of UPRIIS is located in Central Luzon. The project area extends over the area of about 157,000 ha lying in the vast flat alluvial plains in the upper reaches of the Pampanga River 150 km north of Metro Manila. Administratively the project area falls within the three provinces of N. Ecija, Bulacan and Pampanga, consisting of 22 municipalities and two cities.

Basic socio data on the project area is shown in Table 5-1. The population in the project area is estimated at 847,100 consisting of 144,300 households in 1980 and comprises 51% male and 49% female as shown on Fig. 5.1. The age distribution indicates a typical triangular form reflecting the high population growth rate which is estimated at 2.8% per annum from 1975 to 1978. Fifty five (55) percent of the total population is less than 20 years old and only 6% are above 60 years. The population density of the project area is estimated at about 540 persons per km^2. An average family size is 5.9.

With regard to occupation structure of households in the project area, forty three (43) percent of total household are estimated as farm households consisting of landowner operators, amortizing owner operators and lessees as shown in Table 5.2. Most of them are mainly engaged in rice culture. Landless labor households which make their living primarily as farm laborer with emphasis on transplanting and harvesting of paddy occupy about thirty three (33) percent. These landless labor households have played an important role in the supply of farm labor force in the project area. The remaining twenty four (24) percent are engaged in government and private employees, businessmen, vendors, ordinary laborers, etc., which work in major towns in the project area.

Labor force available for farming in the project area is estimated based on the following assumptions:

1) Yearly workable days/person: 365 days x 0.8 = 292 days

2) Total labor force: 127,400 persons

from farm households:	56,700 persons
from landless laborer households:	70,700 persons

Labor force available in the project area is calculated at 37.2 million man-day/year or 3.1 million man-days/month, as shown in Table 5.3.

On the other hand, actual labor requirement for farming in the project area is estimated at 13.5 million man-days per year on the basis of present cropping pattern and land use conditions as shown in Table 5.3. Only about 36% of the total available labor force is engaged in farming of paddy in the project area.

Accordingly the excess of labor force amounts to 23.7 million man-days per year in the project area. Further pupils and students aged between ten (10) and fourteen (14) who occupy thirteen (13) percent of the total population usually carry out part time farming, so that excess of labor force is in fact even greater than estimated.

2.2 Soils

According to the soil map prepared by the Input and Output Monitoring Program in UPRIIS, ten soil series and twenty three soil types are identified in the project area as follows; The area occupied by these soil groups and their aerial extent are summarized in Table 5.4.

Most of the soils are formed by recent alluvium, having relatively deep effective solum depth with medium to fine soil textures. These soils are suitable for irrigation farming especially for rice. Under proper irrigation farming these soils promise to realize full exploitation of their higher productive potentials.

The characteristics of each soil series are described hereunder.

1) ANNAM soil series

- Formation and origin: Residual of andesite, basalt, and Tuffaceous rocks

- Profile:

  A. Surface soil: Brown to grayish brown to light reddish brown, friable and granular clay loam. Depth is 25 to 35 cm.

  B. Subsoil: Chocolate brown to brownish red to almost brown, loose and friable clay loam to clay. Concretions and gravels are present. Depth is 55 to 70 cm from the surface.

  C. Substratum: Brown to chocolate brown gravelly clay loam. Stones, boulders and tuffaceous rock are embodied in this horizon.

- Relief: Rolling to roughly rolling to hilly

- Drainage: Good to excessive

2) BANTOG soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A. Surface soil: Brown to dark brown clay loam. Fine-textured and slightly sticky. Contain brownish red streaks. Depth is 25 to 30 cm.

  B. Subsoil: Dark brown to light brown to yellowish brown, heavy clay loam to clay. Depth is 60 to 100 cm from the surface.

C. Substratum: Light brown to light reddish brown clay. Sticky and plastic. No concretions.

- Relief: Level and the elevation is 30 to 50 feet above sea level.

- Drainage: Poor internal drainage. There is an irrigation system.

3) BIGAA soil series

- Formation and origin: Recent alluvial deposits

- Profile:

A. Surface soil: Brown to dark brown clay loam with brick-red streaks. Fine granular and sometimes plastic and heavy. Concretions present. Depth is 20 to 30 cm.

B. Subsoil: Light gray, dark gray to light and yellowish brown heavy clay to clay. Sticky and plastic. Iron concretions present. Depth is 60 to 120 cm from the surface.

C. Substratum: Light gray, sticky and plastic clay

- Relief: Level. Elevation is approximately from 25 to 40 feet above sea level.

- Drainage: Internal and external drainage poor. Irrigation present.

4) BUENAVISTA soil series

- Formation and origin: Residual soil of water-laid volcanic tuff

- Profile:

A. Surface soil: Brown sandy loam with iron concretions and gravels. Gritty and loose. Depth is 20 to 40 cm.

B. Subsoil: Light gray clay, hard and sticky. Almost depth is 60 to 100 cm from the surface.

C. Substratum: Yellowish gray clay and mottled light gray with brown sandy clay. Adjacent areas to Prensa soils have few concretions.

- Relief: Greater portion is rolling and hilly. The western part is nearly level.

- Drainage: Rolling areas have good external drainage but poor internal drainage. Poor drainage on level areas.

5) CANDABA soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A1. Surface soil: Pale brown, friable moderately compact and hard, fragmental clay loam to silt loam. Depth is 5 cm.

  A2. Surface soil: Glayish brown, pale brown to reddish brown, moderately compact and hard, silt loam to clay loam; sticky when wet, slightly friable when dry. Depth is 20 to 30 cm.

  B. Subsoil: Dark brown, dark gray to almost black soft and sticky, clay, silty clay to clay loam with reddish brown mottlings. Depth is 60 to 80 cm.

  C. Substratum: Reddish brown, soft and sticky, clay loam with pale gray mottlings.

- Relief: Level to nearly level

- Drainage: Poor to fair externally, poor internally.

6) MALIGAYA soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A. Surface soil: Dark brown to brown clay loam with some brick red streaks. Lower surface soil is clay. Depth is 20 to 30 cm.

  B. Subsoil: Light brown to gray brown, cloddy and columnar heavy clay. Plastic and sticky when wet. Depth is 55 to 70 cm from the surface.

  C. Substratum: Light brown to reddish brown silty clay, coarse and gritty. Compact, poor drainage.

- Relief: Nearly level to gently undulating

- Drainage: Surface and subsoil drainage are poor.

7) PENSA soil series

- Formation and origin: Residual soils derived from volcanic tuff

- Profile:

  A. Surface soil: Light brown, brown to light reddish brown, yellowish brown to dark yellowish brown, loose gritty silty clay loam to friable and loose, granular clay loam. Spherical iron concretions are sometimes present. Depth is 15 to 25 cm.

  B. Subsoil: Gray, light yellowish gray to dull grayish brown and black, sticky and hard, clay loam to clay with gravels and concretions. Depth is 50 to 80 cm.

  C. Substratum: Brownish gray, light grayish brown to dark brown, gravelly clay loam to gravelly clay with concretions. Below is volcanic tuff.

- Relief: Level to slightly rolling

- Drainage: Fair to good externally, fair internally.

8) QUINGUA soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A. Surface soil: Brown, reddish brown, or light brown, friable and loose, structureless silt loam to fine sandy loam with reddish brown streaks. Depth is 25 to 40 cm

  B. Subsoil: Dark brown, light brown to reddish brown, loose and friable to slightly compact, silty clay loam to clay loam. Depth is 85 to 114 cm.

  C. Substratum: Reddish brown, yellowish brown or brown, silt loam to silty clay loam.

- Relief: Level to nearly level

- Drainage: Fair to good

9) UMINGAN soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A. Surface soil: Brown to yellowish brown, loose friable and fine granular silt loam to sandy loam to fine sand. Depth is 20 to 45 cm.

  B. Subsoil: Brown to reddish brown, loose and friable sandy loam to fine sand to sand. Lower subsoil has a district layer of river-washed stones and gravels accumulation of 10 to 15 cm thick. Depth is 50 to 100 cm from the surface.

  C. Substratum: Brown to dark brown sand to coarse sand

- Relief: Nearly level to very slightly undulating

- Drainage: Good to very good

10) ZARAGOZA soil series

- Formation and origin: Recent alluvial deposits

- Profile:

  A. Surface soil: Light brown to grayish brown to nearly black, compact, cloddy and hard clay. Sticky and plastic when wet. Depth is 35 to 40 cm.

  B. Subsoil: Dark gray-cloddy, and almost compact clay loam. Mottled dark brown and brownish gray. Depth is 60 to 70 cm from the surface.

  C. Substratum: Reddish brown to yellowish gray clay loam to sandy clay loam.

- Relief: Nearly level and low lying areas that become under water during the rainy season.

- Drainage: Drainage conditions are poor to very poor.

2.3 Climate

There are three meteorological observation stations in the project area: Muñoz, Cabanatuan and San Miguel. In addition fifty five (55) rainfall gauging stations exist in the area.

The summary of the climatic characteristics in the project area is presented in Tables 5.5 and 5.6.

The climate in the project area is characterized by the district wet and dry seasons caused by tropical monsoons. Annual rainfall averages 1,900 mm in Cabanatuan city located at the center of the project area. There is considerable year to year variation in rainfall. The wet season extends from May to October, in which time about 87% of annual rainfall occurs. The seasonal distribution of rainfall in the project area has no significant difference on location.

An annual average temperature is around 27°C in the project area with little variation throughout a year. The difference between maximum and minimum daily temperature is about 10°C throughout a year.

Annual mean relative humidities in three stations vary 71.7% to 82.7%. Maximum monthly mean relative humidity appears in August and minimum in April. Annual mean sunshine hour is 6.9 hours a day in Muñoz and 6.1 hours a day in San Miguel. Maximum monthly mean sunshine hour is observed in April and minimum in August.

Annual mean wind speed in the project area is 10.0 km/hr. Annual evaporations in Muñoz and San Miguel are 1,934 mm and 1,768 mm. Monthly maximum evaporation occurs in April and minimum in August.

Agro-climatically these climate conditions favour higher agricultural production with the project area. However typhoons have sometimes hit and brought out serious damages in the area.

2.4 Land Use

The present land use in the project area is shown in Table 5.7. Farm land consisting of only paddy field is 125,600 ha or 80% of the project area. The area of 8,700 ha is under rainfed paddy. Remaining of 116,900 ha are installed with irrigation facilities. However, the area of 25,100 ha among 116,900 ha is used under rainfed paddy or fallow due to shortage of irrigation water, insufficient water management, inundation and other constraints. So 91,800 ha or about 70% of total paddy field is irrigated during wet season and the area of 84,900 ha is irrigated during dry season. Then the area under double cropping of paddy per annum is 84,900 ha or about 92% of total irrigated paddy field. The multi-cropping index in the project area is calculated at 1.68./1

/1: Total cropping area through a year/total farm land
= (RWP + IDP + ISP)/125,600

where, RWP: rainfed wet season paddy, 33,800 ha (25,100 ha + 8,700 ha)

IDP: irrigated double cropping of paddy, 169,800 (84,900 x 2)

ISP: irrigated single cropping of wet season paddy, 6,900 ha

2.5 Cropping Pattern and Farming Practices

2.5.1 Cropping Pattern

The present cropping pattern prevailing in the project area is illustrated on Fig. 5.2. Main crop grown in the area is paddy. The wet season paddy is planted at the onset of the monsoon, generally July to August, and harvested in October to December. The dry season paddy is mostly planted in the period of December to February in the project area and harvested from April to June. In case of District IV which is located in the southern part of the project area, the dry season paddy is planted half month ahead of the other districts of the project area.

2.5.2 Farming Practices

Based on the results of the rice yield survey, farm economic survey and the reports of IOMP, farming practices and farm input requirements at present are analyzed.

With regard to planting methods in the project area, transplanting and direct seeding methods prevail. The ratios of area for transplanting and direct seeding are 78% and 22% in the wet season and 30% and 70% in the dry season, respectively.

The most predominant rice varieties are IR36, 42, 46, 48 and 50. The average seed amount per ha applied for transplanting and direct seeding is 143 kg and 201 kg in the wet season, 136 kg and 185 kg in the dry season, respectively.

Application of fertilizer and chemicals is practiced over the project area. The estimated dosages of fertilizer per hectare are from 57 kg to 78 kg of N, 15 kg of P_2O_5 and 7 kg K_2O. With regard to agro-chemicals, less than 4 kg of pesticides and insecticides are applied in spite of considerable damages due to stem borer, sheath blight, tungro, grassy stunt, etc. In addition, herbicides are applied.

As for labor, animal power and mechanical power requirements, most of land preparation work and threshing work is done by farm machine. Other farming work is done by manpower. The ratio of dependency on hired labor to total labor requirement is estimated at 70 to 80%. Especially, more than 90% of farming works on transplanting, harvesting and threshing is carried out by hired labor in all farming types. Details of labor, animal power and mechanical power requirements for paddy are shown in Table 5.8.

2.6 Agricultural Production

2.6.1 Rice Yield Survey

(1) General

In order to improve the rice yield in the project area, one must first identify the defects of cultivation on actual paddy field. Without identifying the defects effective improvement can hardly be made.

For the purpose mentioned above, yield survey for wet season paddy was carried out at 90 representative sites in the project area. The survey was carried out during the period from 8th to 16th November in 1982.

Due to shortage of survey period the conventional method/1 was applied. Twenty (20) hills were first selected from each sampling site and an average number of panicles per hill was observed. Next, three (3) representative hills which have the panicles to be the nearest number to average value were selected for yield estimation. After that the number of hills to be grown within two (2) meters in line was both longitudinally and horizontally counted at three (3) locations to observe planting density. By using representative hills, the yield components such as the number of grains per panicle, the percentage of ripened grains and the weight of 1,000 grains were analyzed. The yield estimation was made on the basis of the said yield components, planting density and average number of panicles per hill. The method of analyses was applied to the method described in "Crop Science in Rice"/1.

(2) Defects to be Solved in Improvement of Wet Season Paddy Yield

The results of analyses for yield estimation and yield components are presented in Table 5.9 and summarized below:

	Wet Season Paddy
1) Yield (paddy: ton/ha)	
- Range	3.2 - 5.6
- Average	4.0
2) Yield Components	
- Number of panicles per m^2	356
- Number of grains per panicle	72
- Percentage for ripened grain (%)	73
- The weight of 1,000 grains (gr.)	22.0
3) Number of Hills per m^2	26

/1: S. Matsushima, Crop Science in Rice-Theory of Yield Determination and its application, Fuji Publishing Co., Ltd., 1975.

The yields range from 3.2 ton/ha to 5.6 ton/ha of paddy for wet season paddy, and the average yield is estimated at 4.0 ton/ha. It is worth noting that the yield of 5.6 ton/ha suggested the higher production potentials in the project area.

Correlation analysis was made in order to identify the relation between yield and yield components, as shown below:

Yield Component	Correlation of Yield (r)
1) Number of panicles per m^2	0.76
2) Number of grains per panicle	0.23
3) Percentage of ripened grain	0.40
4) The weight of 1,000 grains	-0.14

It may be concluded from the above analyses that the yield in the project area is clearly governed by the number of panicles per m^2. Rice cultivation, therefore, would be paid on increase of the number of panicles. Through the field reconnaissance, it would be considered that this few number of panicles is due to low root activity during the period of initial tillering stage by poor drainage and insufficient volume and untimely supply of nitrogenous fertilizers. The counter-measures for increase of the number of panicles are considered as follows:

i) To provide drainage facilities

ii) To increase the application amount of nitrogenous fertilizers

iii) To timely supply nitrogen to initial tillering stage

As a result, increase of the numbers of panicles is essential for increasing yield of rice in the project area.

2.6.2 Crop Yield and Production

Main crop grown in the project area is paddy. Unit yield and production of paddy in the project area at present condition are estimated on the basis of "Harvest Report" obtained from each district office of the UPRIIS and questionnaire survey. The present yield and production of paddy under irrigated conditions and rainfed conditions are estimated as shown in Table 5.10.

The unit yield of wet season paddy under irrigated condition shows 3.6 ton of paddy per ha, ranging from 2.9 to 4.2 ton per ha. As for dry season paddy, the average unit yield is 4.1 ton per ha, ranging from 3.4 to 4.6 ton per ha. Unit yield of rainfed paddy is estimated at 2.4 ton per ha. Unit yield of paddy is significantly different on location in the project area as illustrated in Fig. 5.3. It is also noticeable that there exists a significant difference in unit yield between wet season and dry season paddy.

These unit yields are considerably higher than those of national level, 2.1 ton/ha/1. However the unit yield of paddy still keeps low level in comparison with the target yield of the UPRIIS and does not realize the full exploitation of its potential.

Limiting factors which hinder the increase of rice yield are supposed to be accrued from the following major constraints encountered in the area:

i) Flood damages due to typhoons
ii) Poor drainage conditions
iii) Improper irrigation water supply in volume and in time
iv) Limited extent of proper farming

The total production of paddy in the project area is estimated at about 760,000 ton/2.

/1: Source; 1982 Philippine Statistical Yearbook, NEDA

/2: Project area consist of the irrigated area (91,800 ha) and the rainfed area (33,800 ha).

- Production in the irrigated area: 678,500 ton
- Production in the rainfed area: 81,000 ton
  (2.4 ton/ha x 33,800 ha)

2.7 Land Tenure and Holding

Land tenurial and holding situation in the project area was studied based on the farmer's list in the Input and Output Monitoring Programme.

The distribution pattern by land tenure and farm size of the farmers in the project ares is illustrated in Fig. 5.4 and summarized as follows:

(Unit: %)

Land Tenure	Farm Size				Total
	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha	
Owner Operator	2	3	3	2	10
Amortizing Owner Operator	1	11	11	3	26
Lessee	3	24	24	13	64
Whole Area	6	38	38	18	100

It is noticeable that lessee occupied about 64% of the total farmers. The average farm size is estimated at about 2 ha. 82% of the total UPRIIS farmers has farm less than 3 ha.

2.8 Agricultural Support System

2.8.1 General Outline of Organization for Agricultural Development

Governmental organizations are centered in Quezon City and/or Manila, running from there to the regional, provincial, municipal and barangay levels.

The project area stretches over three provinces in Region III, Nueva Ecija, Bulacan and Pampanga. The cities/municipalities related to the area amount to twenty four (24), consisting of 20 in Nueva Ecija, 2 in Bulacan and 2 in Pampanga.

A number of government and non-government organizations have played a very important role in increasing agricultural production through construction and/or improvement of infrastructures, intensive agriculture programs, extension and research works, seed multiplication works, credit services, land reform, etc. Fig. 5.5 indicates the nationwide overall development organization for agricultural and food production which shows relations among the organizations from the standpoints of credit, administration (or management) and research and extension.

(1) Credit (Loans)

On the top of banking institutions, the Central Bank of the Philippines (CBP) makes available increased loan subsidy to its subordinate banks: government banks (Philippine National Bank, Land Bank of the Philippines, Development Bank of the Philippines, Agricultural Credit Administration), rural banks and private banks. Credit technicians from the banks instruct farmers on the judicious use of the lands, assist them on the loaning procedures and act as credit collectors.

(2) Administration (Management)

The National Economic and Development Authority (NEDA) is the central agency for national development planning and coordination of program implementation. As the central planning body of the government, the NEDA is responsible for the formulation and updating of long- and short-term national development plans as well as for the identification and coordination of policies and measures.

As the coordinating and implementing arm of the Ministry of Agriculture, the National Food Agriculture Council (NFAC) launched, in concert with the authorities and agencies concerned, a series of food production programs that filled the quest of the country for self-sufficiency in food. NFAC is empowered to comprise the highest policy-making body to oversee, unify and integrate the administration of the overall food production programs. The National Food Authority (NFA), a government corporation attached to the Office of the President implements the government's price support and massive procurement program which is equally as important as government's grains production and financing programs.

(3) Research & Extension

The Bureau of Plant Industry in the Ministry of Agriculture conducts researches on agricultural crops in collaboration with the research institutes such as the International Rice Research Institute (IRRI), the University of the Philippines College of Agriculture, etc. Concerning the transfer of technology to the farmers, the Bureau of Agricultural Extension plays the leading role for the improvement of rural life through the strenghening of agricultural extension services in conjunction with many organizations and in various ways and means: through a network of farm management technicians or mass media and so on.

Closed up at project level, the organizations for agricultural and food production in the project area comprise three principal parts: i) NIA-UPRIIS (See Appendix VII), ii) Agricultural support agencies and iii) Farmers' organizations (See Appendix IX).

2.8.2 Agricultural and Food Program

In the Philippines, exporting of rice began in 1977 and the self-sufficiency in rice was maintained. Since the consumption of rice is increasing, its export volume began to decrease from 1981.

Recognizing the need for the development of agriculture and food production, the national government continued to sprearhead the numerous Agricultural and Food Programs.

The significant changes in Philippine rice production have been primarily due to a concerted government drive for intensive land cultivation through supervised credit, expanded irrigation facilities, improved farm practices, use of high yielding varieties and an effectively accompanying price support program. Not the least among the elements responsible for production breakthrough was the Agrarian Reform proclaimed on October 21, 1972. Government and private institutions were and are directed to enjoin and extend their fullest support to the Programs; Masagana 99 (National rice program), Maisan 77 (Corn and feedgrains program), Gulayan Sa Kalusugan (Vegetable production), Multiple Cropping-Rice-Fish Culture, Crop Protection, Barangay Irrigators' Service Association (BISA), etc.

The Masagana 99/1 is a nationwide rice production program launched in May 1973 as a top national priority program to achieve self-sufficiency in rice and now in phase XII.

/1: The word "Masagana" means bountiful and 99 quantities the goal of the program to increase yields up to 99 cavans per hectare. This is 4.4 ton of unmilled rice as paddy per hectare.

In twenty four (24) cities/municipalities covering the project area, about 3,752 farmers take part in Masagana (with credit only) in phase XVIII (Nov. 1981 - Apr. 1982), 6,068 farmers in phase XIX (may - Oct. 1982) and 3,394 farmers in phase XX (Nov. 1982 - Apr. 1983). The Masagana area with credit devotes to about 11% in phase XVIII and phase XVIII and phase XIX and 12% in phase X for total Managana area (See Tables 5.11 to 5.13). The repayment of loan is relatively low, being around 62% on the average of last five (5) phases in Nueva Ecija Province (See Table 5.14).

At any given season, the standing crop is often damaged by various causes: typhoon, floods, prolonged drought, plant diseases, pest infestations, etc.

The Philippine Crop Insurance Corporation (PCIC), one of the governmental institutions, was created in June 1978 for the purpose of providing insurance protection to farmers against crop losses arising from natural disasters as well as plant diseases and pest infestations.

The program was launched in May 1981 with the Masagana-99, phase XVII. The objective crops of the insurance are standing palay and corn. The maximum amount of coverage for crop insurance is ₱1,700/ha for Nueva Ecija, ₱1,350/ha for Pampanga and ₱1,600/ha for Bulacan. The total premium for palay is set at 11% of the insured amount, of which 2% is borne by farmers themselves and remaining 9% is granted by the government and/or lending institutions. The assessment of crop loss is done by the team composed of: i) PCIC representatives as head, ii) district agricultural officer of MA and iii) team leader of MAR.

In twenty four (24) cities/municipalities related to the project area, 10,256 farmers covering 24,600 ha in 1982 wet season and 3,621 farmers covering 9,250 ha in 1983 dry season, are insured respectively (See Tables 5.15 and 5.16).

Presently, the Crop Insurance is limited to only standing palay and corn crops, to the extent of the cost of production, or production inputs which include all costs of labor, fertilizers, pesticides, farmers' share of the insurance premium, and other cost items qualified for financing under the government's supervised credit program. The Crop Insurance in Philippines is really one of the effective instruments to stabilize farmers' incomes, but it does not yet come to insure "crop" itself. It is to be desired that eventually, Crop Insurance will cover all types of agricultural produce and also indemnify the loss of crop itself so that farmers can make both ends meet and pay, whatever may happen, all expenses including irrigation service fee.

2.8.3 Agricultural Credit

The government policy requires all financial institutions, whether government or private, to give special priority to agricultural financing and set aside at least 25% of their loanable funds for agricultural credit. Food production financing is directed primarily toward increasing the productive capability of the small farmer through a convenient rural credit system.

As the organizational components of the Masagana program, the seldas (composed of 5-7 farmers with close ties, contiguous or proximate farm areas) act as joint liability groups in the securing of production loans.

The outstanding innovation introduced by Masagana 99 program into the rural credit system was the acceptance of the principle of non-collateral short-term credit which enabled the small farmers to purchase the indispensable inputs to enhance their production capabilities. At the same time, the program innovated rediscounting system of the involved financing institutions, making them more aware of and responsive to the demands of a farmer-oriented and more socialized rural credit system.

Food production financing loans in the Philippines can be classified into crop and commodity loans (or operating capital loans). Under the Masagana program, the PNB can release crop loans from ₱500 to ₱1,700 per hectare of crop land to farmers who are first willing to participate in the program and adopt the rice or corn technology package. Interest rates range from the authorized 12% per annum. The Agricultural Credit Administration (ACA) also assist in the financing for the production and commodity loans to farmers as well as the marketing, facility and operating capital loans to cooperatives.

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

The credit assistance extended usually by banking institutions in the Philippines could be summarized as follows:

1. Loans to farmers
    a. Production loans
    b. Commodity loans
2. Loans to cooperatives
    a. Marketing loans
    b. Facility loans
    c. Operating capital loans

2.8.4 Research and Extension

The country's formula in attaining rice self-sufficiency can be attributed to the new technology, development of high yielding varieties, supervised credit, irrigation development, massive extension and information services and intensified marketing services extended jointly by the government and private sector.

The ramification of this technical know-how with the proper usage of farm inputs is the product of unceasing researches of different agencies whose function and pledge are to increase production and higher farm income. Mentioning some agencies directly or indirectly responsible for research work are the following: International Rice Research Institute (IRRI) at Los Baños, University of the Philippines College of Agriculture (UPCA) at Los Baños, Maligaya Rice Research and Training Center (MRRTC) at Muñoz, Central Luzon State University (CLSU) at Muñoz, National Irrigation Administration (NIA), Ministry of Agriculture (MA) and other private agency.

The IRRI alone carries hybridization of rice that is high yielding and resistent to diseases and plant pests. It also identifies unusual performance stability grown in varying environment of hot and cold.

UPCA and CLSU are responsible for researches of all crops in different angles to boost production and help in molding stronger agriculture.

MRRTC which is operated by the Bureau of Plant Industry, conducts researches on rice varieties and improvement, crop production and processing, intensification of cultural and management practices, seed certification, etc. It also trains technicians and farmers who will directly apply the know-how to the farm.

NIA whose main function is to supply irrigation water now under research. It undertakes water management and study of land classification, irrigation extension and agro-economic research.

The Bureau of Plant Industry (BPI) carries the research and field trials on rice, and other field legumes, vegetables, fiber, beverage, spices, ornamental plants and others. The BPI carries out the work with regard to climatic condition, cultural practices and control of plants, pests and diseases. The Bureau of Animal Industry helps to disseminate animals and increase animal production. The Bureau of Agricultural Extension (BAEx) maintains extension work.

Private agencies whose motive is either personal or help government in food production campaign found themselves involved and can not just ignore research like the chemical dealers and corporate farm.

Ultimately, the research effort would be meaningful and effective through better technology transfer and bridge the wide productivity gap between experiment station and farmers fields. Technology dissemination is carried out by efficient BAEx and BPI personnels and other private sectors like the bankers whose function are alike.

BAEx is responsible for the improvement of rural life through strengthening of agricultural extension and dissemination of useful and practical information on agriculture, soil conservation, livestock, home economics and rural life through field demonstrations, lectures, and other means of imparting information. This extension work is completed by BPI on giving knowledge on plant care, insects and disease control and others.

In the project area, UPRIIS Office undertakes organizational set-up of farmers and training and research works. Agriculture Division (AD) which is one of the supporting divisions in the UPRIIS Office conducts: (1) Live-in training for irrigators group leaders (IGLs), (2) One day echo-seminar for FIG farmer-members and (3) FIA officers training. From 1978 to 1982, 988 IGLs, 34,443 FIG farmer-members and 63 FIA officers attended already the said UPRIIS training programs. The detailed results of training program are given in Table 5.17, as to research works, AD also makes various activities such as application and demonstration to increase agricultural productivity, etc. Details on organization set-up of farmers are explained in Section 2.2, Appendix IX.

2.8.5 Farmers' Organization

In the national development scheme, the government makes every effort to integrate farmers into cooperatives or associations. As a result, some kinds of farmers' organizations are established at every administrative level: province, municipality and barangay in the country.

In the project area, there exist eleven (11) farmers' organizations. Details on farmers' organizations in the project area are given in Chapter 2, Appendix IX.

2.9 Processing and Storage Facilities

Number and capacity of rice mills and warehouses in the project area are shown in Table 5.18. The total number of rice mills amounts to 432. The milling capacity is estimated at about 3,608 ton per day (12 hours) and this is considered to be sufficient for present output. The total number of warehouses is 401 with its total capacity of around 170,000 ton.

2.10 Marketing and Prices

2.10.1 Marketing of Agricultural Output and Input

There exist three kinds of marketing channels for rice distribution from farmers to consumers. (see Fig. 5.6) One is the channel from the National Food Authority (NFA), the government agency charged primarily with price and supply stabilization, and the overall market6ng phase of cereal industry. The NFA procures paddy or rice from farmer-producers in quantities at government support price (see Table 5.19) through the following several systems.

1) Direct Procurement - Procurement transaction between the NFA procurement teams and the farmer-sellers without intermediaries or middlemen.

2) Procurement through Quedan Financing Program - The farmer simply deposits his harvest to a bounded warehouse and in turn is issued with a negotiable receipt called "quedan" as proof of absolute ownership of the goods which can be pledged by cereal trading for commodity loans with the authorized lending banks. The deposited goods can be sold to another party by mere transfer of possession of the quedan with the need of withdrawing the items.

3) Procurement through Payment-in-kind - The NFA has entered into agreement with the various financial institutions and other government agencies that lend out financial and material help to farmers whereby the farmers deliver their produce to NFA as their payment-in-kind for the loans with respective agencies. This scheme is designed to ensure loan repayments under the Masagana programs, and at the same time develop an efficient marketing system that enables the farmer-borrowers to dispose of their farm produce at favorable prices.

Rice procured by NFA is delivered to consumers through its own selling agencies (kadiwa Centers).

The NFA is the sole authorized exporting agent. The main determinant of export volume is the available in-country surplus after reserving a quantity equivalent to a 90-day buffer stock level. The volume comes from existing NFA inventory as well as those purchased from the private sector.

The second one is the channel through farmer's cooperative: Area Marketing cooperative (AMC) and Farm Cooperative Marketing Association (FACOMA), etc. These organizations are composed of small farmers. The farmers deliver to the AMC or FACOMA which in turn sells to its supermarkets or Kadiwa Centers (stores selling essential food items at much lower prices than the ordinary outlets) or direct to consumers.

The third one is the commercial channel through middlemen: Local assemblers, millers, warehousemen, wholesalers, viajeors (merchang-truckers), retailers. In the irrigation development area, there exist 1,564 rice wholesalers and 1,585 retailers (see Table 5.18). To sum up,

rice distribution in Philippines leads through the general levels of markets: (1) local assembly market, (2) regional assembly or transit market, (3) terminal market (Manila) and (4) export market.

About 5 to 30% of total market rice in Nueva Ecija province is through the channel of NFA and the remainder through commercial and other organizations. Table 5.20 shows the amount of rice inflows into Metro Manila through the channel of NFA. The total amount in 1982 is about 37,240 ton of which about 65% or 24,270 ton is derived from Region III and about 40% or 13,771 ton is derived from Nueva Ecija province. Other channels for supply of rice into Metro Manila are also commercial and other organizations. Thus Nueva Ecija province and other provinces related to the project area play a very important role in supply of rice into Metro Manila.

2.10.2 Price of Agricultural Output and Input

Data and information of prices on agricultural output and input are collected from BAEcon and Fertilizer and Pesticide Authority. These data are confirmed by the interview survey for farmers, dealer, etc.

The prices of agricultural output and input in the project area in 1983 are shown below:

Item		Peso/kg or ℓ
i)	Wet season paddy at farm gate	1.3
ii)	Dry season paddy at farm gate	1.6
iii)	Fertilizer (45-0-0)	2.47
iv)	" (21-0-0)	1.814
v)	" (16-20-0)	2.436
vi)	" (14-14-14)	2.446
vii)	" (0-20-0)	1.552
viii)	Machete 5G	6.3
ix)	Furadan 3G	10.78
x)	Azodrin 202K	87
xi)	Mipcin WP	75
xii)	Certified seed	2.61

On the other hand, economic prices for rice and fertilizer for the economic evaluation is estimated on the basis of the information obtained from the government agencies and the same publication/1. The economic farm gate prices are as follows:

Economic Farm Gate Price

Year	Paddy	Fertilizer		
		N	P	K
	(₱/t)	(₱/kg)	(₱/kg)	(₱/kg)
1983	1,497	7.2	7.7	3.3
1995	2,045	9.4	8.6	3.6

The price structure of rice and fertilizers are shown in Tables 5.21 and 5.22.

/1: Price Prospects for Major Primary Commodities prepared by the World Bank and Philippines Estimates of Shadow Prices and Country Parameters prepared by the World.

2.11 Farmer's Economy

2.11.1 Farm Economic Survey

In order to grasp economic activities of farmers in the project area, the farm economic survey was conducted for two hundreds eighty two (282) farmers. These farmers were selected by randum sampling method among the farmers who had already been identified under the input and output monitoring program (IOMP). The data obtained from the survey were compiled and analyzed according to farm size and tenurial status of the sampled farmers. Survey items are shown in Table 5.23.

Further analyses of farm economy is referred to the results of the farm economic survey conducted IOMP in 1981.

Based on the above results the farm economy of the farmers in the project area is analyzed by farm budget method mainly to clarify farmer's capacity-to-pay for irrigation service fee.

2.11.2 Farmer's Economy

As mentioned in section 2.4, total paddy field is used as follows: i) Double cropping of paddy per annum under irrigated land, ii) Single cropping of paddy per annum under irrigated land and iii) Single cropping of paddy per annum under rainfed. Subsequently farmers in the project area can be categorized into above three types from the standpoint of farming.

In this section farm budget analyses are carried out for the farmers having double cropping of paddy per annum as representative farmers because they are most popular in the project area.

Farm budgets for the farmers with double cropping of paddy are prepared on the basis of two kinds of parameters: farm size and tenurial status. Farm size is categorized by four classes: i) below one ha, ii) 1 - 2 ha, iii) 2 - 3 ha and iv) above 3 ha. Tenurial status is categorized by three classes: i) owner operator, ii) amortizing owner operator and iii) lessee.

The farm budget is summarized below.

(Unit: ₱103)

Tenurial Status / Item	Farm Size: Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Owner Operator				
(Average farm size (ha))	(0.63)	(1.14)	(2.77)	(3.42)
- Gross income	14.1	21.1	43.8	56.0
- Gross outgo	11.6	16.4	29.8	37.1
- Net reserve	2.5	4.7	14.0	18.9
(Irrigation fee)/1	(0.3)	(0.6)	(1.4)	(1.7)
Amortizing Owner Operator				
(Average farm size (ha))	(0.58)	(1.40)	(2.45)	(3.10)
- Gross income	13.2	22.4	35.2	41.8
- Gross outgo	12.7	19.4	28.4	31.1
- Net reserve	0.5	3.0	6.8	10.7
(Irrigation fee)/1	(0.3)	(0.7)	(1.2)	(1.6)
Lessee				
(Average farm size (ha))	(0.59)	(1.34)	(2.29)	(3.32)
- Gross income	15.0	22.4	35.9	49.6
- Gross outgo	14.7	21.2	30.8	40.1
- Net reserve	0.3	1.2	5.1	9.5
(Irrigation fee)/1	(0.3)	(0.7)	(1.2)	(1.7)

The details of farm budget are shown in Table 5.24.

Through the analysis of farm budget, the characteristics of the farmer in the project area are summarized as below:

1) Farm budget of all farmers categorized under owner operator indicates good balance in general. On the contrary, that of amortizing owner operator and lessee has poor balance.

2) About 50 to 80% of gross income is derived from farm income and remaining 20 to 50% consists of off/non-farm income and loans from Masagana 99, relatives and friends.

/1: Irrigation fee (1982) = Area planted (ha) x 6 cavans/year x ₱85.0*/cavan

* NFA support price in 1982

3) Most of farm income is derived from paddy production. Source of livestock raising is very limited.

4) Production cost of paddy occupies about 39% of total farm paddy income. Half of production cost is comprised of hired labor and machine costs.

5) A considerable amount of net reserve has been produced from the farmer's off/non-farm incomes.

It can be concluded from the survey that economy for amortizing owner operator with less than 1.0 ha and lessee with less than 2.0 ha still remains on the subsistence level. This fact indicates that those farmers, or 28% of total farmers have insufficient capacity-to-pay for irrigation fee as shown in Table 5.24 although this charge occupies only a few percentage of their gross outgo.

CHAPTER 3 AGRICULTURAL DEVELOPMENT PLAN

3.1 General

3.1.1 Basic Concept for Development

The basic concept for agricultural development for the project area is to increase rice production through proper irrigation farming.

(1) Rice Supply Center to Metro Manila

The region III including the project area has played an important role as a food supply base for Metro Manila. As mentioned in the Feasibility Report on the Pampanga Delta Development Project,/1 the region III was one of the rice supply bases to Metro Manila, supplying about 25% of the total consumption of rice in Metro Manila in 1979 as shown in Table 5.25. In 1982 it is estimated that region III covered with about 65% of the consumption of rice in Metro Manila. Especially Nueva Ecija province has an important position for supply of rice to Metro Manila, indicating about 40% of total movement amount of rice to Metro Manila. Under such situations the project area will be expected to become more important rice supply base to Metro Manila in the future since demand of rice in Metro Manila will rapidly increase due to higher population growth.

(2) Price of Rice

The ceiling price and floor price of rice are set by the Government and the price of rice is stabilized by National Food Authority. As shown in Table 5.19, support price of paddy has increased annually at the rate of 10% during recent five years from 1978 to 1983 under the governmental policy. It is expected that this policy on stabilization of rice price will be continued in the future. Further rice is one of the most profitable crops.

(3) Improvement of Farmer's Economy

In view of farmer's economy, the farmers in the project area get their incomes from farming activities, mainly from rice. However farm income is low due to the low unit yield of rice. In order to rise the living standard of the farmers, it is essential to increase the unit yield of paddy under improved irrigation farming.

/1: This report was prepared by Japan International Cooperation Agency in 1982.

(4) Farmer's Ability and Intention

The farmers in the project area have long experience of irrigation farming on rice. Based on the questionnaire survey, the farming experience of the farmers is shown below:

Period of Farming Experience (year)	Percentage (%)
1 - 5	4.3
6 - 10	10.1
11 - 25	30.2
26 - 35	22.9
36 - 45	20.4
Over 45	12.1
Total	100.0

The above table indicates that over 80% of the farmers have more than 10 years' experience in rice farming.

It is concluded in this fact that the farmers in the project area have superior ability for improved irrigation farming. Further the results of the questionnaire survey indicate that the farmers have every intention of continuing to produce paddy whenever provision of irrigation water allows.

(5) Increase of Employment Opportunity

As mentioned in Section 2.1, about 60% of the total labor force from farmers and landless workers is estimated to be in unemployment in the project area. Especially landless workers, the poorest in the project area, earn their living mainly from farming activities on transplanting and harvesting under such conditions of insufficient employment opportunities. Introduction of intensive irrigation rice farming will be expected to reduce unemployment of the said people and to improve their livelihood.

3.1.2 Strategy for Development

For the purpose of increase of rice production, strategies for agricultural development for the project area are formulated as follows:

- To increase unit yield of paddy through improved irrigation farming.
- To expand irrigated land through implementation of irrigation, drainage and flood control facilities.

3.2 Proposed Land Use

For increasing rice production in the project area, the development projects such as irrigation and drainage, flood control and operation & management of the system will provide fundamental basis for introduction of improved irrigation farming. After the implementation of these projects, present land use in the project area will be drastically changed. The land use of the project area with future project condition is shown in Table 5.26.

As mentioned in Appendix II "Irrigation", delineation of the irrigation service area is determined based on the study of availability of water sources and inundation. As a result, 111,200 ha is selected as the irrigation service area from the project area of 157,000 ha as shown in Table 5.26. Out of 111,200 ha, 108,000 ha is to be irrigated in dry season and remaining 3,200 ha is obliged to be fallow due to lack of irrigation water. On the other hand 106,800 ha will be irrigated in wet season. Remaining area of 4,400 ha will be still under rainfed condition.

The multi-cropping index in the irrigation service area will increase from 1.76 at present condition to 1.97 at future with project condition.

3.3 Proposed Cropping Pattern and Farming Practices

3.3.1 General

As mentioned in Section 2.6.1, the countermeasures to the present constraints for increase of paddy yield in the project area are considered as follows:

- To provide drainage facilities.
- To increase the application amount of nitrogenous fertilizers.
- To timely supply nitrogen to initial tillering stage.

Taking the above countermeasures into consideration, the proposed cropping pattern and farming practices are studied in the project area.

3.3.2 Proposed Cropping Pattern

The basic concept for agricultural development in the project is to increase rice production. It is proposed that double cropping of paddy per annum will be practiced under proper irrigation and drainage facilities. The cropping calendar is framed as illustrated on Fig. 5.7, taking into consideration the following conditions: i) Since critical growth periods in terms of sunlight requirement are about 15 days just before heading and about 25 days just after heading, the cropping calendar is designed so that these critical growth periods are not in the period of August, the lowest in sunshine hour duration as much as possible,

ii) Internal period between seeding and last harvesting should be designated to be more than 30 days at least from the standpoint of farming practices and maintenance & repair of irrigation facilities, iii) The calendar is designed so as to extend irrigable area as much as possible taking into consideration the balance of consumptive use of rice plant and effective rainfall and river discharge available for irrigation water, iv) The capacity of main canal of PBRIS in District III is restricted and seeding in District IV will be started 15 days before commencement of seeding in other area because of reducing peak water requirement.

3.3.3 Proposed Farming Practices

Proper farming practices are the most essential factor for realizing full exploitation of the agricultural potential in the area. For the purpose high yielding and/or improved varieties will be introduced. Proper amount of fertilizers and chemicals will be applied through proper farming practices with project condition. The proposed farm inputs and design criteria for irrigation farming are shown in Table 5.27.

Labor, animal power and mechanical power requirements with and without project conditions are estimated as shown in Tables 5.28 and 5.29. The ratio of dependency on hired labor to total labor requirement with project is estimated at around 70%.

Monthly labor requirement at present condition and with project condition is estimated in the irrigation service area (111,200 ha) as shown in Tables 5.30 and 5.31 respectively. Farming with project condition additionally absorbes 4.9 million man-days out of non-farming labor force available at present condition. The peak of labor requirement with project condition is estimated at 3.24 million man-days in March and 3.25 million man-days in October. On the other hand, labor force available is estimated 2.75 million man-days per month. As a result, shortage of labor force occurs about 500 thousand man-days. This shortage of labor force would be supplemented by landless workers around the irrigation service area.

3.4 Anticipated Yield and Production

Unit yields of paddy are estimated for the future both without and with project conditions.

Unit yield of irrigated paddy without condition is estimated taking into consideration the present situation of farming and yield. It is expected that yield of paddy under irrigated will increase more 0.2 ton per ha in future without project than present unit yield. Unit yield of paddy under rainfed will be expected to remain present yield without project condition.

Unit yield of paddy in future with project condition is estimated on the basis of the results of yield survey in the project area, Harvest report, IOMP report, the experimental data of the Maligaya Rice Research and Training Center, results of Masagana 99, and International Rice Research Institute.

The expected unit yield of paddy in without and with project conditions is estimated as follows:

Item	Without Project	With Project
Irrigated Paddy		
- Wet season (t/ha)	3.8	4.5
- Dry season (t/ha)	4.3	5.2
Rainfed Paddy (t/ha)	2.4	2.4

For the achievement of the anticipated yield, optimum application of farm inputs will be required with effective water management.

The yield will increase gradually from the present level and reach the target yield in the 3rd year after the completion of each irrigation, drainage and flood control facilities.

Total production of paddy in the irrigation service area will be expected to be one million ton with project conditions as follows:

Item	Without Project Condition			With Project Condition		
	Area	Unit Yield	Total Production	Area	Unit Yield	Total Production
	(ha)	(t/ha)	(10^3t)	(ha)	(t/ha)	(10^3t)
Irrigated dry season paddy	84,900	4.3	365	108,000	5.2	562
Irrigated wet season paddy	91,800	3.8	349	106,800	4.5	481
Rainfed wet season paddy	19,400	2.4	47	4,400	2.4	11
Total			761			1,054

3.5 Irrigation Benefit

Irrigation benefit to be expected is defined as the difference between with project and without project conditions. On the basis of the estimated production cost and gross income, net return per hectare for crop is calculated both on future without and with project conditions as follows. Details are shown in Tables 5.32 to 5.40.

(Unit: ₱/ha)

Item	With Project			Without Project		
	Gross Income	Production Cost	Net Return	Gross Income	Production Cost	Net Return
Irrigated Land						
Wet Season Paddy:						
transplanting-paddy	9,203	3,830	5,373	7,771	3,429	4,342
direct seeding-paddy	9,203	3,580	5,623	7,771	3,187	4,584
Dry Season Paddy:						
transplanting-paddy	10,634	4,258	6,376	8,794	3,676	5,118
direct seeding-paddy	10,634	4,023	6,611	8,794	3,449	5,345
Rainfed Land						
Wet Season Paddy:						
transplanting-paddy	4,908	2,629	2,279	4,908	2,629	2,279

Applying net return per hectare estimated above to crop area, total net returns for irrigation project are estimated both on future without and with project conditions. Based on this result, irrigation benefit is calculated. The benefit will be expected to increase linearly year by year and reach the full benefit in and after three years after the implementation of the project. The irrigation benefit at the full stage is estimated at about ₱400 million as shown in Table 5.41.

3.6 Farm Economy

In order to assess the O&M project from farmers' view point, farm budget analyses are examined under both future without and with project conditions. In this analysis, the farmers having a double cropping of paddy per annum were selected as representative farmers because they are mostly popular in the project area.

After the implementation of this project, drastic increase of farm income in the future with project condition can be expected in the representative farmers. On the other hand, substantial increase on farm income will be expected in the future without condition. The farm budget categorized by land tenure and farm size in both futhre without and with conditions are prepared as shown in Tables 5.42 and 5.43 and outlined below:

a) Without Project Condition

(Unit: ₱10³)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Owner Operator				
(Average farm size (ha))	(0.63)	(1.14)	(2.77)	(3.42)
- Gross income	14.4	21.7	45.4	58.0
- Gross outgo	11.8	16.7	30.7	38.3
- Net reserve	2.6	5.0	14.7	19.7
(Irrigation fee)	(0.3)	(0.6)	(1.4)	(1.7)
Amortizing Owner Operator				
(Average farm size (ha))	(0.58)	(1.40)	(2.45)	(3.10)
- Gross income	13.5	23.3	36.6	43.5
- Gross outgo	12.9	19.9	29.2	32.1
- Net reserve	0.6	3.4	7.4	11.4
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.6)
Lessee				
(Average farm size (ha))	(0.59)	(1.34)	(2.29)	(3.32)
- Gross income	15.4	23.1	37.2	51.5
- Gross outgo	14.9	21.6	31.6	41.2
- Net reserve	0.5	1.5	5.6	10.3
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.7)

b) With Project Condition

(Unit: ₱10³)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Owner Operator				
(Average farm size (ha))	(0.63)	(1.14)	(2.77)	(3.42)
- Gross income	15.9	24.4	51.9	66.0
- Gross outgo	12.2	17.5	32.5	40.5
- Net reserve	3.7	6.9	19.4	25.5
(Irrigation fee)	(0.3)	(0.6)	(1.4)	(1.7)
Amortizing Owner Operator				
(Average farm size (ha))	(0.58)	(1.4)	(2.45)	(3.10)
- Gross income	14.9	26.5	42.3	50.8
- Gross outgo	13.3	20.8	30.8	34.1
- Net reserve	1.6	5.7	11.5	16.7
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.6)
Lessee				
(Average farm size (ha))	(0.59)	(1.34)	(2.29)	(3.32)
- Gross income	16.7	26.3	42.6	59.4
- Gross outgo	15.2	22.5	33.1	43.4
- Net reserve	1.5	3.8	9.5	16.0
(Irrigation fee)	(0.3)	(0.7)	(1.2)	(1.7)

Net reserve or capacity to pay with project condition will be expected to increase in each representative farmer considerably. The increase ratio of net reserve with project condition to without project condition in the representative farmers are summarized as follows:

(Ratio)

Item	Below 1.0 ha	1.0 - 2.0 ha	2.0 - 3.0 ha	Above 3.0 ha
Without Project	100	100	100	100
With Project				
- Owner Operator	142	138	132	129
- Amortizing Owner Operator	267	168	155	146
- Lessee	300	253	170	155

Net reserve with project condition will be expected to increase 1.29 to 3 times of that of without condition. The amortizing owner operator with farm size of less than 1.0 ha and lessee with farm size of less than 2.0 ha, however, still remain on the subsistence level in farm economy without project conditions. While net reserve of the farmers mentioned above will be expected to increase with project condition as follows:

(Unit: ₱)

Item	With Project	Without Project	Difference
Amortizing Owner Operator			
below 1 ha	1,600	600	1,000
Lessee			
below 1 ha	1,500	500	1,000
1 - 2 ha	3,800	1,500	2,300

This table indicates that the implementation of the project will upgrade the livelihood of these farmers. Further these farmers, having no or insufficient capacity to pay irrigation service fee at present and without project conditions, will be able to sufficiently pay irrigation fee with project condition.

With respect to land and labor productivity, it is expected that the productivity of labor will be improved from 52 to 55 ₱/man-day and the productivity of land will increase from ₱7,100/ha to ₱8,800/ha as summarized below:

(Unit: ₱)

Item	Without Project	With Project
Productivity of Labor/1 (₱/man-day)	52	55
Productivity of Land/2	7,100	8,800

Note: Indicates average value of each farmer.

/1: Net income of paddy/labor requirement
/2: Net income of paddy/planted area of paddy