PART-III
FEASITILITY STUDY ON THE PRIORITY PROJECTS

4. THE PROJECT AREA

4.1 Location and Population

4.1.1 Location

The Project area covers the Jalaur proper and Suague RIS (JSRIS) areas. Its borders are defined by Jalaur dam site on the north, the municipality of Mina on the west, the municipalities of Dumangas and Zarraga on the south, and the municipality of Barotac Nuevo on the east. Its most central area is the municipality of Pototan which is situated 36 km north of Iloilo city. It covers seven municipalities and 78 barangays.

4.1.2 Population

The total population of the Project area encompassing 78 barangays is 89,075 in 1995, with a population density estimated at 7.5 persons per ha, or more than 210% higher than the provincial average. This situation can be explained by three socio-economic factors: the large number of farm workers (both resident and migrant) in the area, the small average size of farm (about 1.5 ha), and the existence of extended family members (e.g., parents and the family of one of their children) residing in one household. The average family size of 5.3 persons in the Project area, however, is comparatively smaller than the provincial average of 5.5 persons.

4.2 Soils and Land Suitability

4.2.1 Soil Classification

The soils of the project area are divided into two physiographic land forms: the lowland soils and the residual upland soils. The lowland soils consist of two soil series: Sta. Rita and Umingan series; and the residual soils are covered by Faraon series. Among these soils, the Sta. Rita soil series occupy 95% of the project area. Other soils that occur along the rivers and surrounding hills are also associated with Sta. Rita series.

4.2.2 Land Suitability

The land suitability for paddy and diversified crops is assessed using the NIA's classification system patterned from the FAO Framework for Land Evaluation (1976).

Lands in the project area are generally assessed as highly suitable (S1) for paddy cultivation without limitation of soil characteristics and risk or damage of land resources. However, about 60 ha in the Suague RIS with gently sloping with limitation of slope of 3 to 5% are assessed as moderately suitable class (S2) for paddy cultivation.

As regards diversified crops cultivation, the entire project area is assessed as marginally suitable class (S3) due to the poor drainability of soils. The texture of major soils is classified into clay and silty clay with low permeability. It is recognized that diversified crop cultivation is not only acceptable during the wet season, but also the dry season, and the countermeasures to improve poorly drained damage is required even for the diversified crop cultivation during the dry season.

4.3 Agriculture

4.3.1 Irrigation Service Area

NIA has reported that the service areas of Jalaur proper and Suague RISs are 8,826 ha and 2,958 ha, respectively. The current irrigation service area is reviewed by the study team. The service area of the Jalaur proper and Suague RIS is respectively estimated at 8,820 ha and 2,900 ha. The irrigation area decreases 6 ha in the Jalaur proper RIS and 58 ha in the Suague RIS due mainly to land conversion.

4.3.2 Land Tenure and Farm Size

The actual beneficiaries are known using the documents such as the TSA profiles and the Annual Report of Irrigated and Benefited Areas of the JSRIS. However, the documents do not completely cover all farmers in the project area, especially farmers who are presently not getting irrigation water from each system. Total number of potential beneficiaries in the project area is estimated at about 7,850 farmers. About 5,900 farmers are in the Jalaur proper RIS while 1,950 farmers are in the Suague RIS. The non-benefited area has an estimated number of about 1,140 farmers.

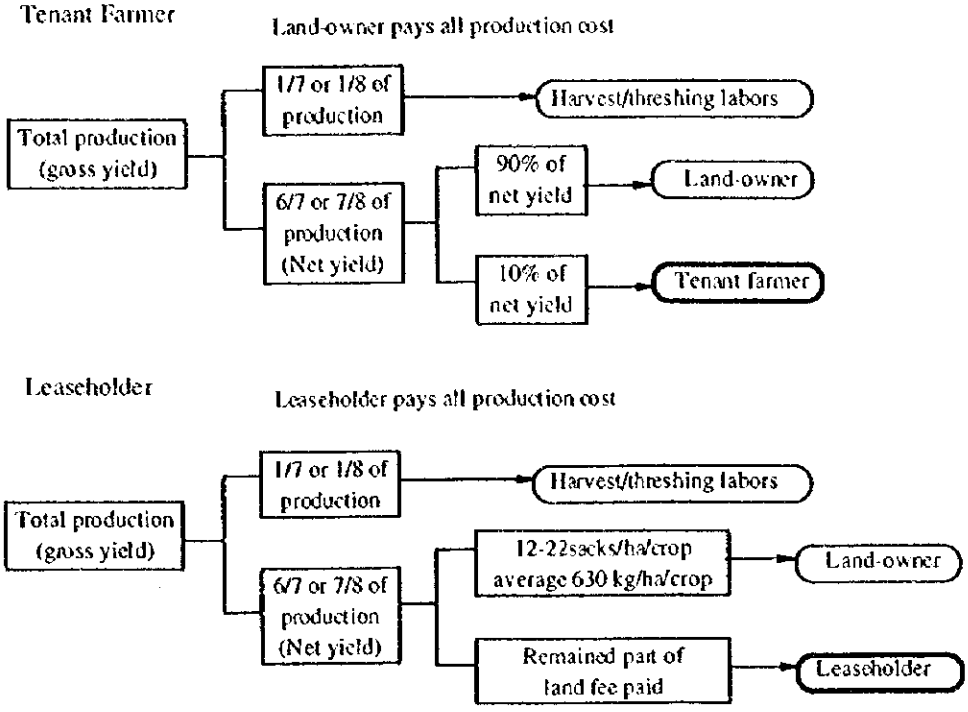
The average farm size is estimated at 1.5 ha for both the Jalaur proper and Suague RIS. In terms of occupancy by tenure based on the TSA profiles, the owner-cultivators, leaseholders and tenant occupy 40.0%, 28.4% and 31.6%, respectively of the project area.

The total households in the 78 barangays of the project area is estimated at about 16,880 in 1995. Out of them the households engaged in agriculture is estimated 12,830 taking into consideration the population ratio engaged in agricultural sector which is estimated at 76% of the rural labor force in Iloilo Province. Mentioned above, as the beneficiaries is 7,850, the remaining 4,980 households are estimated to be farm workers without operation farm.

The households represented as the farm workers is estimated at about 4,980, taking into consideration the household ratio engaged in agricultural sector which is estimated at 76% of the rural population in Iloilo Province.

The traditional system of land rental is common among tenant farmers in the project area. Tenants receive only 10% of the paddy production. On the other hand, the

leaseholders pay to landowner 630 kg/ha. Under the Comprehensive Agrarian Reform Program (CARP), the tenancy is illegal. This kind of sharing arrangement should be avoided to protect the welfare of the tenants.



4.3.3 Cropping Pattern

(1) Cropping pattern

The cropping pattern is significantly dependent on the availability of irrigation water. However, farmers still exert effort to cultivate paddy twice or more per year even under extreme condition of limited supply of irrigation water. This is evidenced by the proliferation of small-sized irrigation pumps numbering more than 1,200 units in both the RISs, and being used by farmers to supplement the limited irrigation water. About 15% of the beneficiaries have irrigation pumps for supplemental irrigation during critical period of water, e.g. early stage of wet season paddy (May and June) and dry season paddy (December to March).

The farmers in the project area are applying the following cropping patterns:

Pattern (a) Paddy (irrigated) - Paddy (irrigated),
Pattern (b) Paddy (irrigated) - Fallow,
Pattern (c) Paddy (dry seeding/irrigated) - Paddy (irrigated)
Pattern (d) Paddy (rainfed) - Paddy (rainfed) or Fallow,

Additionally, third cropping such as cultivation of third paddy, watermelon and mungbean is being practiced in some irrigation areas by the farmers. The extent of the practice is virtually negligible, however. The third paddy is irrigated by shallow tube-

wells as well as canal water of irrigation system before the termination of the regular water distribution. Watermelon is cultivated by manual irrigation using dug-well water in the paddy field. Mungbean is cultivated without plowing using residual soil moisture after harvest of the second paddy.

Pattern (a) is a standard practice prepared by NIA for irrigation water distribution. Pattern (b) is dominant in downstream areas where there is insufficient water. Pattern (c) is mainly applied in the downstream areas in order to plant paddy twice under condition of water shortage. However, this practice has met little success. Finally, pattern (d) is the practice among the rainfed farmers. Pattern (d) occupies the areas where the irrigation system is virtually non-functional.

(2) Cropped area

In accordance with NIA JSRIS Office's classification of the cropped area with irrigation, the areas are defined as irrigated and benefited areas. The irrigated area means the actually irrigated area, and the benefited area means the crop area which paddy yields are more than 2 ton/ha/crop. The computation and collection of the ISF are based on the benefited area. The irrigated areas which are defined as the benefited area attained about 15,450 ha through the 2 crop seasons for both RISs during the last five years (1992 to 1996). Each irrigated area is about 11,030 ha for Jalaur proper RIS and about 4,420 ha for the Suague RIS.

It should be noted that the cropping intensity of irrigated paddy in Jalaur proper RIS is about 125%, while in the Suague RIS, the cropping intensity is slightly higher at 152%. During the wet season, the proportion of the service area provided with irrigation in Jalaur proper RIS stands at only 69%. This cropping intensity is relatively lower compared with the 88% posted in the Suague RIS. It is observed that such a low cropping intensity of irrigated paddy in the Jalaur proper RIS is affected by the improper water management on water discharge and time schedule of irrigation water supply which are directly caused by the severely deteriorated irrigation facilities and insufficient water management skills.

The current cropping patterns are illustrated in Figure 4.3.1. The cropped areas of irrigated, rainfed, and third crop paddy, including the respective cropping intensity are shown below.

Name of RIS	Jalaur Proper	Suague	Total/Average
Service Area (ha)	8,820	2,900	11,720
Cropped Area (ha)			
Irrigated paddy			
Wet season	6,120	2,540	8,660
Dry Sean	4,910	1,870	6,780
Total	11,030	4,410	15,440
Rainfed paddy			0
Wet season	2,600	360	2,960
Dry season	1,940	610	2,550
Total	4,540	970	5,510
Third crops			
Paddy	1,200	50	1,250
Watermelon	100	20	120
Mungbean	600	150	750
	1,900	220	2,120
Total	17,470	5,600	23,070
Cropping Intensity (%)			
Irrigated paddy			
Wet season	69	88	74
Dry season	56	64	58
Total	125	152	132
Rainfed paddy	51	33	47
Third crops	22	8	18
Total	198	193	197

Source: JSRIS Office

4.3.4 Farming Practices

The common farming practices for paddy, mungbean and watermelon are summarized as follows:

(1) Paddy

Cultivation period: The cropping period of first paddy is from May/Jun. to Aug./Sept., second paddy from Sept./Oct. to Dec./Jan., third paddy from Dec./Jan. to May/Apr. The growth period ranges from 95 to 110 days. Farmers in the upstream areas normally advance the planting in order to plant third paddy. Some farmers apply dry seeding before the wet season.

Land preparation: Plowing is generally done by hand-tractor, while leveling is done by carabao or hand tractor.

Major variety: The varieties being planted include IR 64, RC 14, RC 18, RC 20, RC 10, and IR 72. Almost 100% of the area are planted with high yielding varieties.

Seeding: Direct seeding is practiced by about 85 to 90% of the farmers. The use of certified seeds is not common. Seeding rate of direct seeding and transplanting is 120 to 200 kg/ha and 80 to 120 kg/ha, respectively. The seeding rates are relatively higher compared with the standards of 50 kg for

transplanting and 100 kg/ha for direct seeding. The use of certified seeds is not common. Only 10 to 20% of farmers use certified seeds due to shortage of certified seeds coupled with its prohibitive cost.

Fertilizer: The average fertilization rate is as follows: N: 93 kg/ha, P: 28 kg/ha, K: 13 kg/ha. The amount of fertilizer application, particularly on nitrogen is rather high vis-a-vis present yields. About 70% of farmers do not apply basal fertilizer. Usually the farmers apply twice, i.e. 15 to 20 days and 45 to 50 days after seeding, side-dressing for vegetative stage and top-dressing for reproductive stage respectively. Organic manure is seldom used.

Weed control: Herbicide is commonly applied. Manual weeding is not common.

Insect/pest control: Tungro, Grassy stunt, Bacterial leaf blight, Stem borer, Brown plant-hopper and Green rice leaf-hopper are major insects and pests. Spraying is done using knapsack sprayer. The amount of agro-chemicals and timing of application are believed to be improper due to low knowledge on application method.

Snail and rat control: The damage caused by golden snail and rat appears serious during the past years. Molluscicide for snail is commonly used.

Harvesting: Harvesting is done by hand, while threshing is done by portable engine thresher. Rice straws are generally burned in the paddy field. The farmers sell wet paddy except those left for family consumption

(2) Mungbean

Seeding: The seeds are broadcasted without plowing immediately after harvest of paddy using residual soil moisture.

Crop management: Mungbean is cultivated under rainfed condition. The application of fertilizer and agro-chemicals is seldom practiced.

(3) Watermelon

Land preparation: Watermelon is usually planted in seed plots plowed in a one (1) meter-diameter circle by hand from December to early February. This is right after the second paddy cultivation. The timing is to avoid water logging.

Crop management: The land is irrigated every day by hand and bucket using water from dug-wells. The application of fertilizer and agro-chemicals is a common practice

4.3.5 Farm Machinery

The use of hand-tractors has become widely used for plowing, harrowing, leveling during land preparation. Plowing and harrowing are mostly done by hand-tractor, while 70% of the leveling works are done by carabao. Threshing is also machine-operated. Seed, fertilizing, spraying, weeding and harvesting are generally done manually. For chemical spraying of pest and disease control, farmers use the knapsack sprayers. Irrigation pumps that are engine driven with 2 hp are common among farmers for supplemental irrigation. According to the consultation meetings with the IAs, the available number of farm machinery, except irrigation pumps, are presently sufficient.

The socio-economic survey and the farm household survey reveal that about 50% of farm labor requirement is dependent on hired labor. There are plenty of farm workers in the barangays. The farm workers get their income mainly as hired laborers. The available labor force for various farm activities is estimated at 2.0 persons per household on the basis of the socio-economic survey. Such condition of labor availability is enough for an average farm size of 1.5 ha.

4.3.6 Input Supply

The supply of inputs such as fertilizer and agro-chemicals is mainly available from private traders and partly from farmers' cooperatives. The supply is believed sufficient relative to the total requirement of the farmers. However, the capability of the farmers to acquire such farm inputs is contingent on their savings. In general, they get the inputs in the form of credit from the private traders and input suppliers.

Certified seeds are produced by seed growers who have been accredited by the Bureau of Plant Industry (BPI). There are 51 seed grower-farmers in the project area. Seed inspectors from DA and MAO provide technical assistance to seed growers. The seed growers have 430 ha of paddy fields, but the actual seed production area is less than 10% of the total area. It is observed that the available supply of certified seeds are insufficient for the requirement in the project area. Compounding this problem is the prohibitive cost of certified seed at 14 to 16 Pesos per kg. As such, only 10 to 20% of the farmers use certified seeds. Usually farmers replace or renew their seed stocks once in several cropping seasons. The low utilization of certified seed is one of the factors for obtaining low yield of paddy.

4.3.7 Agricultural Production

Average yields of irrigated paddy in each RIS are estimated at about 3.5 ton /ha in the wet season and 3.3 ton/ha in the dry season as shown below, based on the NIA JSRIS office' s data during the past five years. (refer to Table 4.3.1)

(Unit: ton/ha)

RIS	Average Yield (5 years)		Range	
	Wet	Dry	Wet	Dry
Jalaur proper	3.40	3.30	2.67 ~ 4.09	2.33 ~ 3.74
Suague	3.64	3.41	2.68 ~ 4.43	2.79 ~ 3.81

Source: JSRIS Office, NIA Region VI

Based on the estimated yields mentioned above, the present paddy production in the project area is calculated at 49,870 tons for Jalaur proper RIS, and 17, 910 tons for Suague RIS.

	Irrigated Paddy			Rainfed Paddy/3rd Paddy				Paddy
	Wet	Dry	Subtotal	Wet	Dry	3rd	Subtotal	Total
Jalaur Proper								
Cropped area (ha)	6,120	4,910	11,030	2,600	1,940	1,200	5,740	16,770
Yield (ton/ha)	3.40	3.30	3.36	2.24	2.24	2.24	2.24	2.97
Production (ton)	20,808	16,203	37,011	5,824	4,346	2,688	12,858	49,869
Suague								
Cropped area (ha)	2,540	1,870	4,410	360	610	50	1,020	5,430
Yield (ton/ha)	3.64	3.41	3.54	2.24	2.24	2.24	2.24	3.30
Production (ton)	9,246	6,377	15,622	806	1,366	112	2,285	17,907
Total								
Cropped area (ha)	8,660	6,780	15,440	2,960	2,550	1,250	6,760	22,200
Yield (ton/ha)	3.47	3.33	3.40	2.24	2.24	2.24	2.24	3.05
Production (ton)	30,054	22,580	52,633	6,630	5,712	2,800	15,142	67,776

The production of watermelon and mungbean is respectively estimated at about 480 tons and 300 tons in the RIS areas as shown below.

RIS	Cropped Area (ha)	Average Yield (ton/ha)	Total Production (ton)
Jalaur proper			
Watermelon	100	4.0	400
Mungbean	600	0.4	240
Suague			
Watermelon	20	4.0	80
Mungbean	150	0.4	60
Total			
Watermelon	120	4.0	480
Mungbean	750	0.4	300

4.3.8 Farm Economy

The net profits of the 1st and 2nd irrigated paddy are over 11,000 pesos/ha in both the RIS areas, and the highest net profit of the paddy is about 13,250 pesos/ha of the 1st paddy in the Suague RIS. The net profit of rainfed paddy is estimated at about 6,600 pesos/ha which is nearly 60% of the irrigated paddy. The net profits of other crops are roughly estimated at about 16,700 pesos/ha for water melon and 6,000 pesos/ha for mungbean.

Net income of owner cultivators is roughly estimated at about 28,000 pesos for the Jalaur proper RIS and 32,600 pesos for the Suague RIS, based on the results of farm budget analysis of typical farm size of 1.5 ha.

The net incomes of the tenurial type farmers such as leaseholder and tenant farmer are also roughly estimated on the basis of current sharing system in the project area. The net incomes of the tenurial type farmers range from 11,800 to 16,400 pesos for the leaseholders and from 6,500 to 7,000 pesos for the tenant farmer. The lowest income is received by the tenants. These farm income levels are typical of paddy farming.

	Jalaur proper	Suague
Owner-cultivator	P28,000	P32,600
Leaseholder:	P11,800	P16,400
Tenant farmer	P6,500	P7,000

4.3.9 Livestock

The growing of livestock is a minor economic activity in the project area. However, about 64% of the respondents of the socio-economic survey are raising livestock or poultry as supplementary source of income and nutrition for the family.

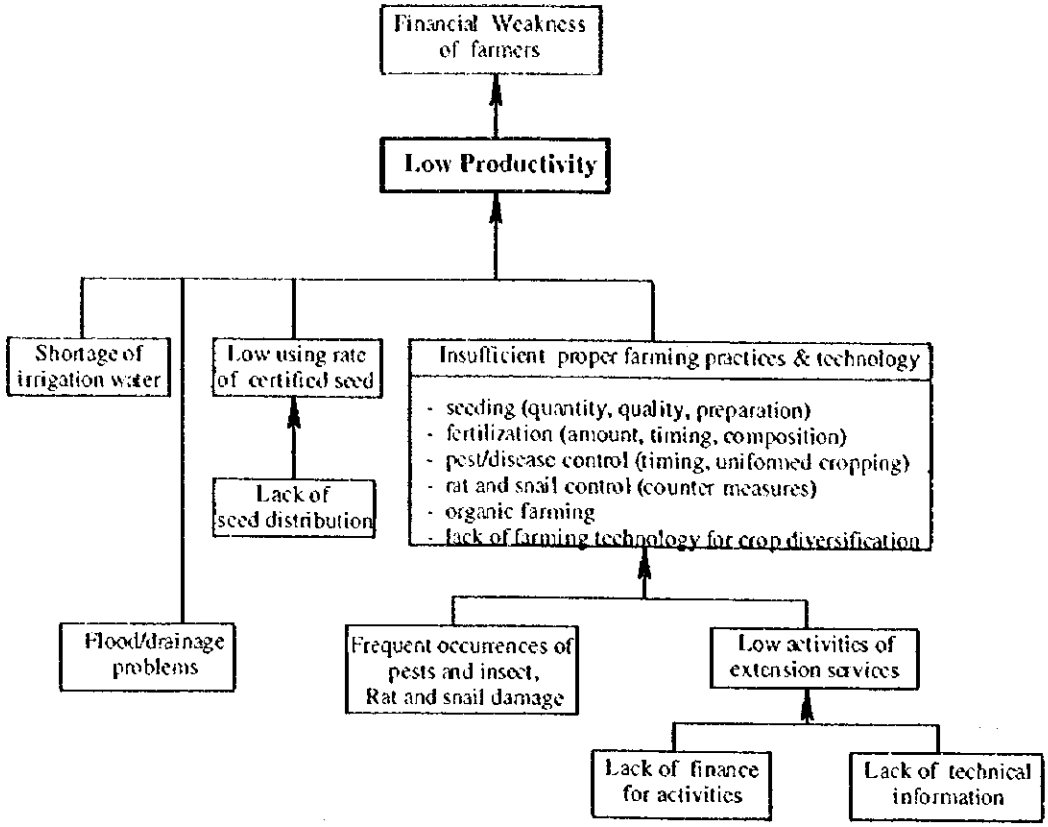
	Ratio of farmer raising livestock (%)	Average No. of livestock in raising farmers
Carabao	26	1.3
Cattle	13	2.0
Hog	44	2.5
Goat	10	2.7
Poultry	69	18.7

Source: Socio-economic Survey

Carabaos are traditionally used as draft animal for paddy cultivation. About 26% of the farmers are raising carabao, and 13% of the farmers are raising cattle. The cattle feeds on grass and rice straw after harvesting of paddy. On the average, a farmer owns roughly 2.0 heads of cattle. Hogs and poultry are popular livestock in the project area. The ratio of farmers raising hogs and chicken is 44% and 69%, respectively.

4.3.10 Constraints and Problems

The low productivity of irrigated paddy is one of the major problems for the development in the project area. This is mainly caused by a number of factors, such as the shortage of irrigation water; inadequate extension of new and improved farming practices; and low utilization rate of certified seed.



(1) Shortage of irrigation water

The shortage of irrigation water is the most limiting factor to increase the yield of paddy. Consequently, the cropping intensity for paddy production is greatly reduced. Even during the wet season, the irrigated service areas of the two systems are greatly affected with only 69% to 88% of the service areas in both RISs being provided with irrigation water. During the dry season, only 56% to 64% of the service areas are irrigated. The remaining paddy field is cultivated under rainfed condition or fallow.

(2) Inadequate extension of proper farming practices and technology

Proper farming technology is not commonly practiced in the project area as regards the application rate and method of seeding, application and timing of N : P : K fertilization, amount and timing of chemical application for weed and pest control, etc. Damage by snails and rats is also a serious problem. Direct seeding is very common among the farmers. The direct seeding method is believed to be a determinant of low yield. It compounds difficulty in manual weeding, improper germination of seeds, and snail and rat damage. The other factor is the weak capacity of the present agricultural extension efforts of the MAO. This is mainly affected by mobility of extension personnel and lack of skills in disseminating new technologies.

(3) Low use of certified seed

Only 10 to 20% of the farmers use certify seeds. It has been proven that yields can be increased with the use of good seeds. The problem, however, is that seed producers are few in the project area. Compounding this difficulty is the prohibitive cost of certify seeds. Without the usual financial support to farmers, i.e. access to the government lending program, there is no way the poor paddy farmers can acquire and apply good seeds.

(4) Problem on sustainable agriculture

Rice straw is generally burned in the paddy field after threshing. Organic manure and compost such as rice straw and livestock manure are seldom applied in the farms. Although soils in the project area are relatively fertile for paddy cultivation, the continuos cultivation without application of organic manure would decrease soil fertility.

4.4 Irrigation and Drainage

4.4.1 Current Irrigation Service Area

The present irrigated services areas of both the Jalaur and Suague RISs are respectively estimated at 8,826 ha and 2,958 ha based on the NIA's data. The irrigation water is conveyed to the areas through main canal networks consisting of 2 main canals and 37 lateral canals. The irrigated service area is basically divided in division areas of about 500 ha. This is in accordance with the current water management practices. The Suague RIS has 4 division areas, while the Jalaur proper RIS has 11 division areas.

However, the irrigated service areas of the Jalaur proper RIS have 3 lateral canals as damaged, namely: E4, E5 and G. The service area of these 3 canals has not been supplied with irrigation water for more than 10 years because the middle sections of the lateral canals have been flushed out by typhoons. To date, the NIAs' rehabilitation and maintenance work has not been done at all. The service area is estimated at about 440 ha.

The pump irrigation areas are extended along the head sections of the main canals in both the RISs. This is also extended along the middle sections of the lateral canal E of the Jalaur proper RIS. The main purpose of pump irrigation is to supplement irrigation water. The irrigation water is being absorbed from the NIAs' canals by using portable pumps. Moreover, the illegal water is brought in the downstream through a syphon that crosses the Jalaur river. This is facilitated using illegal turnout. The areas are estimated at 144 ha in the Jalaur proper RIS and 39 ha in the Suague RIS.

The Jalaur - Suague RIS office has already tolerated the use of such illegal irrigation water in the said areas. However, it considers only the water supply as supplemental irrigation.

4.4.2 Diversion Dam

The Jalaur and Suague diversion dams are currently being maintained by the Jalaur - Suague RIS office. Funds for the maintenance of these dams come from the IOSP II and local budget of NIA. The salient features of the dams are described below.

Description	unit	Jalaur	Suague
Diversion Weir		Ogee type with main gates	Ogee type
Main gate	nos./size	13/H 3.5 X W 5 ~ 6	
Scouring sluice			
Right bank		Open channel type	Open channel type
Left bank		Under sluice	-
Gate	nos./size	2/H 1.82 x W 4.26	1/H 2.6 x W 5.2
Length of weir	m	174	150
High water channel section	m	78	134
Low water channel section	m	96	16
Height of weir			
High water channel section	m	5.15	1.8
Low water channel section	m	3.42	1.6
Intake method/structure		Orifice type	
Intake gate	nos./size	2/left bank 10/right bank	2/H 1.8 x W 1.45 right bank
Intake discharge			
Right bank	m3/sec	13.5	4.5
Left bank	m3/sec	4.0	-
Measuring devices		Staff gauge	Staff gauge
Settling basin		No installation	No installation

The main gates of the Jalaur diversion dam consisting of 13 nos. and scouring sluice gates of 2 nos. have already been repaired using the IOSP II fund. New lifting machine driven is provided at the 5 main gates and 2 sluice gates. Some sections of the dam such as the downstream apron from dam, the retaining wall, etc. have been repaired and/or improved using likewise the fund of the IOSP II.

The majority of gates of both the dams are manually operated. The intake gates installed at the left bank have technical problem on the cable suspension for lifting during gate operation. The manual operation system and technical problem on the gate lifting affect the proper operation of the gate.

The course of the Suague river meanders in the upstream of the dam. The right bank is heavily eroded on sections of about 280 m of the dam due to main current. The left bank of the dam is heavily silted and the area is converted to agricultural land. The erosion of the right bank is measured approximately 120 m from the scouring sluice way of the dam. The Jalaur - Suague RIS office has remedied the erosion problem by constructing the gabion protection. The facilities, however, have been destroyed by the recent flood.

Furthermore, the trashracks for intake gates and the communication facilities for the gate keepers house are not provided at both the diversion dams. The lack of the facilities somehow creates difficulty in sustaining proper gate operation and the effective water management.

4.4.3 Irrigation Canals and Related Structures

The main canal networks of both the RISs consist of one (1) main canal and 28 lateral canals in the Jalaur proper RIS and one (1) main canal and 9 lateral canals in the Suague RIS. All irrigation canals are earth canals. The total length of canals is respectively estimated at 121.3 km in the Jalaur proper RIS and 40.9 km in the Suague RIS as shown in Figure 4.4.1.

The Suague RIS is located in the western area of the Jalaur proper RIS and connects along the main canal of the Jalaur proper RIS. The main and 2 lateral canals of the Suague RIS, namely lateral canal B-3 and lateral canal B are directly connected with the main canal of the Jalaur proper RIS to spill out excess water.

All canals of both RISs have technical problems which are: (a) over-flowing of irrigation water at some canal sections due to the low embankment and the back water caused by improper operation of water level at head gates and/or turnout; and (b) siltation in canals and open-cut of embankment due to provision of illegal turnout. These problems affect proper water operation primarily due to the lack of proper maintenance and illegal turnouts. The slow water run in the main and lateral canals and the insufficient water discharge to the irrigation service areas occur.

The existing related structures consist of head gates, turnouts, check structures, syphons, aqueducts, culverts, drop structures, etc. There are 9 head gates constructed in the Suague RIS and 24 in the Jalaur proper RIS. Parshall flume is constructed in the downstream from the a few head gates as the measuring device. However, all Parshall flumes are not functional and are abandoned due to complicated operation. In lieu of the Parshall flume, the staff gauge is used at several head gates. The staff gauge is curved in the retaining wall in the downstream.

The number of turnout is 70 in the Suague RIS and 246 in the Jalaur proper RIS. Majority of the turnouts are double-gate type. The gates have already been severely deteriorated and some gates and its parts were lost. The control and monitoring of irrigation water discharge is not conducted at all at the turnouts.

The other related structures are functional. However, the settling basin in the downstream from the intake structure, spillway and tartaric of syphon are not constructed in both the RISs.

(1) Jalaur proper RIS

The low embankment occurs at about 39 km along the main and 12 lateral canals. The problems on siltation and open-cut embankment are extended in all of the canals.

Furthermore, the canal sections of 3 lateral canals, notably lateral canals E4a, E5 and G are flushed out by the flushing water from the river during a typhoon around 10 years ago. The supply of irrigation water has been abandoned in the downstream areas of the canals. Total length of the damaged and abandoned canals is estimated at about 3.7 km, and the areas of about 440 ha become rainfed paddy fields.

Majority of the head gates and turnouts have deteriorated and lack measuring devices. Erosion problem also occurs at the outlet section of the head gate. The head gate for lateral canal C is severely deteriorated and considered non-functional. In addition, the head section of lateral canal C is stretched along the main canal in reverse direction from the downstream to the upstream of the main canal. Concerned farmers complain of the slow delivery of water and insufficient water discharge at the head gate.

The existing syphons constructed at the main canal and lateral canal E do not experience choking problem at the barrel portion. In addition, the trashrack at the inlet section and manhole are not maintained.

(2) Suague RIS

The main problem of the network is similar as those of the Jalaur proper RIS. The over-flowing occurs about 150 m. of the lateral canal B during full supply of water. The siltation problem also occurs on sections of all the canals. The open-cut of the embankment occurs along the lateral canal B. This is caused by the illegal turnout and drain inlet.

The gates of the head and turnout are severely deteriorated. The body structure of the head gate is generally fine. Erosion, however, occurs at the outlet section of the structure. The measuring device is practically missing in all the head gates, except for the head gate of lateral canal A. The turnout is mainly a double-gate type. The measuring device near the turnout is also missing.

The two culverts of the lateral canals B and B-3 which cross the old railway are destroyed due to overloading of the old railway. The supply of irrigation water in the downstream area from the damaged culverts is restricted. A drop structure constructed in the lateral canal B-4 has been damaged, and the erosion occurs around the structure.

4.4.4 Existing Pump Irrigation and Portable Pump Use

The existing pump irrigation projects (PIP) are operated at 2 sites with a total service area estimated at about 180 ha. The purpose of the pump irrigation project is to provide supplemental irrigation at the tail portion of the Jalaur proper RIS. The water source of these projects is the Jalaur river and the drainage water coming from the Jelicuon creek.

On the other hand, a number of shallow tube wells are existing in both the RIS areas. Total number is about 80 tube wells in the Suague RIS area and about 600 tube wells in the Jalaur proper RIS area. Shallow ground water is the supplemental water

source of irrigation. The irrigation area of shallow tube well is estimated at about 140 ha in the Suague RIS area and approximately 1,200 ha in the Jalaur proper RIS area.

4.4.5 Drainage Canal and Related Structures

The main drainage canal network is the 11 natural rivers and creeks excluding the 3 rivers, namely the Janipan-an river in the Suague RIS area, and Jalaur and Dumangas rivers in the Jalaur proper RIS area. The total length of the main drainage canals in both the RIS areas is estimated at approximately 90 km.

The current problems on the drainage canal networks are primarily inland inundation and back water. The inundation is mainly caused by: the choking of the flow sections at the related structures; temporary diversion dams for irrigation use; and clogging of the drainage canals. The inundation occurs along the highways near Pototan, Pototan - Barotac Nuevo and Zarraga - Barotac Nuevo. The main reasons for the flooding near the Pototan are depressed topographic condition and limited flow capacity of the existing cross drain and drainage canal. The inundation occurring along the other highways is caused by the choking of the existing cross drains constructed at the high ways.

Back water sometimes limits the irrigation service areas of lateral canals C and C-1 during heavy rainfall in the rainy season. The back water is caused by the insufficient flow capacity of the river section at the bridge of the highway, Pototan - Passi. The inundation has been reported to stay for 2 - 3 days.

Similarly the lowland irrigation service areas within Zarraga - Dumagas is also affected by back water. This occurs in the simultaneous period of spring tide and heavy rainfall during the rainy season. The other back water which occurs due to temporary diversion dams constructed along the small creeks, restricts the service areas near Dumangas in the rainy season. The service area is submerged for 1 to 2 days. The flooding, however, has not caused damage to paddy production.

The flood of the Jalaur river flows into the urban areas of Barotac Nuevo and Dongsol. The inundation stays for a few days. The flood affects partial sections of the rural road and induces sedimentation in low land area such as urban area, sugarcane and paddy field. However, no severe damage to the irrigation facilities and service areas of the Jalaur proper RIS has been noted.

4.4.6 Farm Ditch and Farm Drain

Majority of the main farm ditches have double functions of water conveyance: (i) supply of irrigation water in the upstream sections; and (ii) conveyance of drainage water from the paddy field in the downstream sections. Due to these double functions, water management problems such as improper and inadequate water operation and poor drainage condition prevail during the harvest season.

On the other hand, the illegal tapping of water is perpetuated by the construction of illegal turnouts. The irrigation water in the canal is also diverted by the use of portable pumps. These problems are happening due to insufficient water distribution in each farm. The dysfunction in water distribution is prevalent during the dry season. The main reasons are the lack of turnout and main farm ditches.

4.4.7 Service Road and Rural Road

The service road of an irrigation canal has essentially two (2) functions: (a) inspection road for the irrigation facilities; and (b) farm to market road for both the RIS areas. The service roads apparently are not constructed along all the main and lateral canals. There are 25 road sections consisting of 6 in the Suague RIS area and 19 in the Jalaur RIS area. Total length of the road is approximately 36 km in the Suague RIS and 112 km in the Jalaur proper RIS. A road, originally classified according to the two (2) types has different width (e.g. 4 m - width or 3 m - width). At present, majority of the road sections, including the pavements have deteriorated. Total length of damaged road sections that render them impassable during the rainy season is estimated at about 31 km in the Suague RIS and approximately 73 km in the Jalaur proper RIS. Furthermore, main canals have deep cut sections in both the RIS, and the service road is situated at original ground in these sections. This situation of the service road is so weak to sustain proper maintenance activities by O&M equipment.

The isolated barangays are not located in the rural road network of both the RISs. The linkage status of the service road with the rural road such as barangay, municipal and provincial roads is also in poor condition. Some barangay and municipal roads are not linked with the service road due to severe deterioration. The most deteriorated rural roads adjacent to the service road and can potentially serve the function of a farm to market road are: (a) one (1) barangay road near laterals B and B5 of the Suague RIS; and (b) one (1) barangay road near lateral E3 of the Jalaur proper RIS. The road length is about 1.2 km in the Suague RIS and about 2.1 km in the Jalaur proper RIS.

4.4.8 Land Conversion

Land conversion is apparent at the tail portion of lateral canal B3 of the Suague RIS and at the tail portion of the main and lateral canals I of the Jalaur proper RIS. Both portions are adjacent to the municipalities of Pototan and Zarraga. Incidentally, there is growing urbanization in these areas. Total area of lands converted is estimated at 175 ha consisting of 81 ha in the Suague RIS area and 94 ha in the Jalaur proper RIS area.

4.4.9 Constraints to Improvement

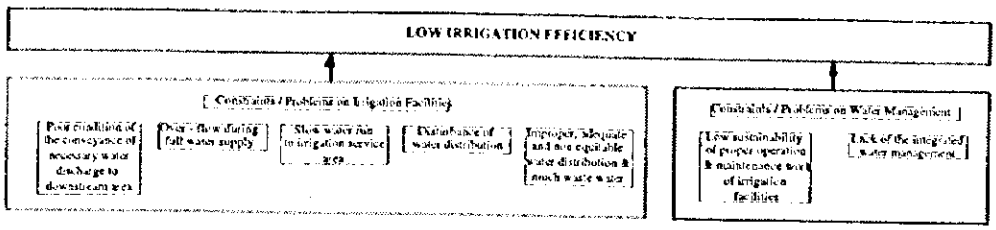
(1) Eroded right bank in upstream from the Suague diversion dam

At present, the erosion of the right bank in the upstream of the Suague diversion dam is generally not considered a direct constraint to irrigation and water management. However, the erosion is being developed from flooding. The possibility of severe erosion of the small hill caused by further floods and the occurrence of damage on the diversion

dam and main irrigation canal are pointed out, if the current river course is sustained. Therefore, the erosion development at the right bank should be prevented to sustain the irrigation function of the diversion dam and main canal.

(2) Low irrigation efficiency

The main reasons of the low irrigation efficiency are the deterioration of irrigation facilities and poor water management practices. Specifically, the main concerns on the irrigation facilities are: (i) poor conveyance condition of the water discharge to the downstream area; (ii) over - flow at the canal sections during the full delivery of water; (iii) slow velocity of water to the irrigation service area; (iv) disturbance of the water distribution; and (v) improper, inadequate and non equitable distribution of water. The main constraints on water management, meanwhile are: (i) low sustainability of proper operation and maintenance works of irrigation facilities; and (ii) lack of integrated water management as shown below.



The constraints on the irrigation facilities are aggravated by the siltation in the canal due to absence of settling basin, low embankment, the long length of main and lateral canals, improper layout of farm ditch, illegal turnout, deteriorated gates at head gates and turnout, lack of the measuring devices, the limited period of rotational water distribution in the dry season, the portable water use in canals, etc..

The constraints on water management are further compounded by lack of monitoring system, shortage of O&M equipment, shortage of O&M budget, insufficient information and lack of communication on water distribution.

(3) Heavy siltation in canals and low embankment

The heavy siltation practically covers all the canals due to the lack of settling basin and/or silt excluder along the main canal and improper maintenance works. The siltation inhibits the flow capacity of canals. This also puts pressure on the work load of the NIAs periodic maintenance work.

The low embankment causes over-flowing of irrigation water during delivery of full water. As a result, significant losses in irrigation water occur. Finally, the irrigation water can not sufficiently reach the service areas in the downstream of the canals.

(4) Deterioration of gates and lack of measuring devices

The deterioration of gates and the lack of measuring devices are caused by the improper, inadequate and non equitable water distribution and become, at present, one of the direct and technical reasons of the low irrigation efficiency in both the RISs.

(5) Deterioration of service road and shortage of linkage

The deterioration of service roads and the shortage of the linkage of service roads with rural road directly affect the transportation of agriculture input and output in the rural areas. Specially, the poor condition of the transportation in the rainy season suffers considerably the rice quality, and affects to the farmers' income is also severe. The improvement of the service road and the linkage of the service road with rural road, therefore, are needed to sustain the rural economic development in both the RIS areas.

4.5 Water Management and O&M Practices

4.5.1 Organization and Function

The Jalaur-Suague (JS) RIS office has technical, administrative and financial sections to function exclusively for the RIS and consists of five (5) main sections headed by an irrigation superintendent. The operation and maintenance section has responsibility on the O&M works for the Jalaur and Suague RISs. Two other sections, namely the equipment & project implementation section and ISF collection unit are also concerned with the water management and O&M activities.

The operation and maintenance section has 44 field O&M staff headed by three (3) engineers and carries out the water management and O&M works in both the RISs as shown in Table 4.5.1. Some staff have also responsibility for the same activities in the Jalaur extension RIS.

Engineers are assigned to supervise the activities of the field O&M staff. The O&M staff consist of Water Resources Facilities (WRF) Technicians, WRF Operators and WRF Tenders.

At the field level of the RIS, the irrigation service areas are normally divided into divisions of approximately 700-900 ha which are managed by the WRF Technicians with two or three WRF Tenders depending on the size of the irrigation division and length of canals. The diversion dam area is managed by the WRF Operator. These staff are under the supervision of the Engineer in each RIS. Presently, the WRF Technicians are responsible for system operation activities, maintenance of canals, and also act as collectors of Irrigation Service Fee (ISF) in their respective areas or division. The WRF Tenders are also deputized as assistant ISF bill collectors. In addition, the ISF collection is carried out by the irrigators' association through the Type II Contract between NIA and IA.

In some divisions, there are no WRF Technicians but only WRF Tenders who are designated to discharge the former's functions in some divisions. This improper work assignment of the O&M staff results in low O&M performance.

In keeping tract with the current trend of operation and maintenance activities, a monthly meeting between NIA and IA Officers is held regularly. This is supplemented by seasonal NIA-IA Operation and Maintenance Conference.

The JSRIS office has its own O&M equipment. Its equipment maintenance is done by the Regional Equipment Division personnel since only few mechanics are available in the JSRIS office.

4.5.2 Water Management Practices

(1) Water delivery schedule

The cropping calendar is prepared by the Irrigation Superintendent and staff of the JSRIS office on the basis of the probable water supply and rainfall. This is discussed and presented to the IAs for their guidance. In this manner, the farmers in the area are made aware of the timing of planting as scheduled by the JSRIS office. However, the cropping calendar is presently not being followed by the farmers because of the following reasons: (i) water delivery is not sufficient and stable due to water management problem and shortage of water supply from the river, (ii) water delivery is started regardless of farmers' preparedness to start their farming activities on time due to financial constraints, and (iii) farmers are doing advance planting in anticipation of high benefits as well as water shortage at the end of the dry cropping season (Jan.-Feb.) particularly in the downstream area.

Presently, the JSRIS office cuts off the water delivery after the second crop for O&M works. The cut-off date is disseminated to the farmers for them to stop planting after the dry crop to avoid the possibility of crop failure. However, water delivery is sometimes extended in the project area due to the demands of some farmers and IAs. The present water delivery and distribution schedule are as follows.

(a) Jalaur proper RIS

Continuous irrigation is adopted when water supply is available for all the divisions. However, rotational irrigation by laterals is implemented whenever intake discharge is very low and rainfall is inadequate. This schedule, except for the whole water delivery period, is not officially informed to the farmers and beneficiaries.

- Starting: May 16, 1997
- Stopping: March 15, 1998

(b) Suague RIS

Rotational irrigation is adopted in four RIS divisions with a duration of 3-day water delivery schedule for each area, and a 9-day interval before water returns to the first area. However, continuous irrigation is applied when water supply is available for all the divisions. This schedule, except for the whole water delivery period, is not officially informed to the farmers and beneficiaries.

- Starting: May 15, 1997
- Stopping: March 1, 1998

(2) Water management practices

Intake discharge from the river is being recorded through the staff gauges. However, due to the shortage of competent technical staff and calibration equipment, intake discharge is not calibrated regularly. Furthermore, erroneous readings which do not take consideration of the rapid siltation in the main canal are being done.

The IAs play a very important role in water management. Water delivery and distribution schedule, and cropping calendar and pattern are jointly determined by the O&M personnel, Institutional Development group and the IA officers through their Board of Directors (BOD) during the NIA-IA O&M conferences. Three conferences on O&M planning, mid season assessment and post-harvest season evaluation are held for every cropping season.

The JSRIS adopts a sequential start for land soaking during the initial release of irrigation water (usually during the months of April and May) until the entire area of the system is totally soaked with water.

4.5.3 Operation and Maintenance Practices

(1) Current O&M method for existing facilities

(a) Diversion dam

Dam-site areas and gates at diversion dam are being operated and maintained by the WRF Operators assigned in the area. Their specific responsibilities include the maintenance of records on intake discharge, rainfall, water level elevation, and maximum and minimum flood elevations. However, the recording of intake discharge is not being done properly due to the absence of proper measuring device.

(b) Gates and structures

Control structures and gates along the main canal and laterals are being operated and maintained by the WRF Technicians and WRF Tenders within their areas of jurisdiction. No such records as discharge and water elevations are being maintained at present.

Gates and structures are regularly checked by the maintenance crews by taking off floating debris and applying lubricants to the mechanical parts of the gates. Major repairs are scheduled whenever the physical condition of these facilities has become worst, but repairs are simultaneously conducted with water delivery by proper scheduling.

(c) Main and lateral canals

Maintenance of main and lateral canals are being done by the existing WRF Tenders and the IAs with Type I contracts. The Irrigation Superintendent (IS) is grouping the WRF Tenders from several RIS Divisions to act as a maintenance crew, where each group is assigned to sections that need immediate cleaning.

The desilting works and the rehabilitation and improvement works of existing facilities in the main and lateral canals are being done under project funds and government budget such as the Irrigation Operations Support Project (IOSP) and through the General Appropriations Act (GAA). The frequency of canal desilting work is also quite low as shown in Table 4.5.2.

(d) On-farm facilities

Operation and maintenance of on-farm facilities such as main farm ditch is being done by Turnout Service Area (TSA). This is directly undertaken by the Turnout Service Area Groups (TSAGs) of the IAs and individual farmers of the concerned facilities in the area as shown in Table 4.5.1. However, the TSAGs (including the other farmers) in some areas do not perform this responsibility because of unclear definition of responsibilities among the IA members and farmers.

(e) O&M manuals

The NIA has prepared "General Operation and Maintenance Manual" for all RISs and "Specific Operation and Maintenance Manual" for the Jalaur-Suague RIS as guidelines for the operation and maintenance in 1991 as a part of Irrigation Management Information System (IMIS) under IOSP I. However, these manuals are not being utilized by the O&M staff in the project area because they are not practical and easily comprehensible, and also are not widely disseminated in the systems.

The IMIS is one of the components of IOSP I which has selected Jalaur-Suague RIS and Pangiplan RIS as the priority areas in Region VI. However, it was not implemented to the fullest due to fund constraints but has been recognized as an indispensable tool for the RIS.

(2) O&M equipment

The Jalaur-Suague RIS office has 17 units of construction and O&M equipment and 29 vehicles as shown in Table 4.5.3. Of the total 46 equipment and vehicles, 40 are operative but the average use-age of these operative units exceeds 10 years.

In general, the existing operative equipment and vehicles seem to be inadequate to enable the JSRIS office to meet the effective and proper O&M requirements of the two RIS under consideration.

(3) Budget planning and irrigation service fee (ISF) collection

(a) Budget planning

The JSRIS prepares the annual budget plan, but does not provide the budget for desilting works and rehabilitation works of existing facilities in main and lateral canals. The JSRIS's budget plan is reviewed by the Regional Irrigation Manager for eventual submission to the Central Office for approval and funding.

(b) Actual income

The income of the JSRIS office includes the equipment rental from NIA projects but it cannot be used for operation and maintenance in the RIS. Such income from equipment rental is mainly utilized for the operation of the NIA Region VI office. The JSRIS office can only utilize the income from equipment rental paid by private lessees and other government agencies. However, this income is not regularly expected because the priority use of equipment is for system O&M. Hence, the ISF income is the main budget source of the JSRIS office, making the ISF collection the most important activity for sustaining its O&M works. The actual income and expenses of the JSRIS office are shown in Table 4.5.4.

(c) ISF collection

The average collection efficiencies of both the RISs are respectively 28 of the Jalaur RIS and 34% of the Suague RIS during the 5 years from 1992 to 1996 and lower than the national average of 48% in 1995 due to inefficient legal procedure for non-payment of ISF, and other causes mentioned in section 4.5.4.

Non-payment of ISF by water users contributes to the low income of the JSRIS office. There were 176 delinquent water users reported in the Jalaur proper RIS and Suague RIS from 1993 to 1995. A subpoena has been sent to these water users by the Provincial Prosecutor, but 71 of them have still not settled their back accounts to date.

	Subpoena	Non-Payment of ISF after subpoena
Jalaur proper RIS	147	60
Suague RIS	29	11
Total	176	71

From 1995 to the present time, another 561 water users have been listed as delinquents. Of these, 547 have not paid their ISF after a letter of reminder was sent to them by the JSRIS office due mainly to inefficient legal procedure among others.

4.5.4 Main Causes of Poor Water Management and O&M Practices

The poor water management and O&M practices in the system are mainly caused by the following factors, as shown in Figure 4.5.1.

(a) Water management

The poor water management can be mainly attributed to improper water delivery and distribution schedule. Under the present situation, the cropping calendar is not being followed by the farmers, thereby resulting in inefficient use of water. The water delivery and distribution schedule is also not properly being prepared based on the actual water availability and actual farming condition due to the absence of proper monitoring system, particularly the appropriate measuring devices for intake and river discharge.

(b) O&M practices

The poor O&M practices can be mainly attributed to insufficient O&M cost due to low ISF collection and inadequate O&M competence on the part of O&M staff and the IAs.

Insufficient O&M cost (Low collection of ISF)

Present ISF collection is lower than the actually required O&M costs, causing difficulty for the JSRIS office to allocate adequate funds for O&M work of the system facilities. Presently, the salary of the O&M personnel has not been paid regularly for two months due to lack of the JSRIS office budget. The insufficient O&M cost (low collection of ISF) is mainly caused by the following:

(i) Inefficient use of irrigation service area,
(ii) Low farm incomes of water users,
(iii) Low level of awareness and willingness of water users for ISF payment,
(iv) Improper evaluation of benefited area and production, and
(v) Poor database management on ISF billing and collection records.

Inadequate O&M Competence (NIA & IA)

The inadequate O&M competence of NIA staff and the IAs is mainly caused by the following:

(i) Improper irrigation facilities due to deterioration/lack of measuring devices for canal discharge,
(ii) Insufficient training program for O&M staff,
(iii) Improper work load of NIA O&M staff,
(iv) Absence of practical O&M manuals, and
(v) Illegal water diversion.

4.6 Farmers' Organizations and NIA

4.6.1 Farmers' Organizations

The irrigators' associations and barangay-based farmers' cooperatives are the two dominant farmers' organizations in theproject area, which are the target beneficiaries of the Project.

(1) Irrigators' Associations (IAs)

There are 20 existing IAs distributed in the Jalaur proper and Suague RIS, covering a total farm area of 10,685 ha. This area represents about 91% of the total irrigation service area (ISA) of 11,720 ha. About 9% of the ISA are still not covered by the IAs. The present ISA of the two RIS includes the upstream areas which use irrigation water illegally, with about 44 and 39 ha in the Jalaur proper and Suague RIS, respectively. A summary of the organizational characteristics and main O&M activities of the IAs is shown below.

Description	unit	Jalaur proper	Suague	Total
Number of IAs	nos.	15	5	20
Farm area	ha	8,032	2,654	10,685
Irrigation service area	ha	8,820	2,900	11,720
Total number of farmers	nos.	5,900	1,950	7,850
Total number of registered IA members	nos	2,407	1,378	3,785
Present number of active IA members	nos.	1,449	866	2,315
Number of turnout service area groups (TSAG)	nos	200	71	271
Number of board of directors' (BOD) members	nos.	204	71	275
Number of women members				
BOD	nos.	14	7	21
IA	nos.	207	81	288
Number of IAs with O&M contracts				
Type I	nos.	12	4	16
Types I & II	nos.	2	1	3
Type II	nos.	1	0	1
Length of contracted canal	km	83.3	32.9	116.2

Source: NIA -JSRIS office and results of consultation meeting with IA / JICA Study Team.

Presently, only about 48% of the 7,850 total farmers are registered IA members. Efforts to expand the IA members are constrained by the difficulty of encouraging farmers to become members due to inadequate and irregular supply of irrigation water for reasons cited in sections 4.4 and 4.5. In the consultation meeting of the study team with the 20 IAs, the data gathered indicate that the active IA members are only 61%.

In terms of the IAs participation in the O&M of the two RIS, there are two main types of institutional arrangements for the O&M which presently exist between the IAs and NIA. These are contained in the following O&M contracts granted by the JSRIS office to the IAs:

(i) Type I (maintenance) contract - which refers mainly to grass cutting and clearing for the entire length of the supply canal contracted every 45 days when the height of vegetation is more than 15 cm. at a cost of 1,400 pesos per 3.5 km.

(ii) Type II (system operation and ISF collection)- which refers mainly to the implementation of authorized cropping calendar and water delivery/ distribution schedule, management of water delivery/distribution from the main/lateral canals to the turnouts, and ISF collection.

As reflected in the table above, nineteen of the 20 IAs implement Type I contract. The length of canals maintained by the IAs is about 116.2 km, representing 69% of the existing total length of main and lateral canals of 168.1 km.

Actual implementation of Type I contract, however, is presently carried out through three different schemes: by involving the IA members only, by hiring labor who

are non-IA members, and by a combination of IA members and hired labor. The number of contracted IAs employing these schemes is shown below.

RIS	Implementation scheme for Type I contract (no.)			Ave. monthly remuneration of Type I contract (pesos)
	IA only	Hired labor only	Both IA and hired labor	
Jalaur proper	6	2	7	2,370.50
Suague	0	1	4	2,629.20
Total	6	3	11	2,438.60

Source: Results of consultation meeting with IA

In the consultation meeting with the IAs by the study team, it was found that the most common reason for hiring labor is the lack of time of IA members for canal clearing and grass cutting due to their land preparation, planting and harvesting works on their respective farms. The financial remuneration for Type I contract is also considered low by the IAs and thus gives little incentive for their members to get involve on this work. Even the six IAs which implement the contract only by themselves have been relying mainly on the board of director (BOD) members. No functional service committee, which is responsible for Type I contract execution by virtue of the IA constitution and by-laws, exists at present.

Four of the 20 IAs in the Jalaur proper-Suague RIS are presently involved in Type II contract implementation. The aggregate service area of the four contracted IA is 1,670 ha, which represents about 14% of the total ISA of the two RIS. Under the contract, the four IAs have the following main functions in relation to system operation:

(i) to formulate and implement operations plan containing the authorized cropping schedule and water delivery and distribution schedule one month before the start of the next cropping season in coordination with the NIA-JSRIS office,

(ii) to disseminate information on cropping schedule and water delivery schedule to the members, and

(iii) to manage water distribution from main/lateral canals to different turnout service area (TSA) effectively and equitably.

In the consultation meeting with IA, it was found that only the dissemination of information on cropping schedule and water delivery schedule, and the operation of turnouts have been generally done by the IAs, mainly the IA president or TSA chairman. But, many IA members and farmers in the study area are not aware of the schedules and the persons responsible for the operation of turnouts.

The insufficient water supply for the preparation of paddy field and planting of paddy rice, and the lack of financial resource for the same activity have been identified by the IAs as the two most dominant reasons for the non-acceptance or adoption of

cropping calendar by the IA members. Only six of the 20 IAs confirmed that their members have followed the cropping calendar, as shown in the table below.

RIS	IA judgment on acceptance of cropping calendar		Two most important reasons for non-acceptance of cropping calendar (no.)			
	Yes	No	Financial problem for preparation of paddy	Insufficient water for preparation of paddy	Expected high benefit of advance planting	Others
Jalaur proper	4	11	1	10		
Suague	0	5	3	2		
Total	4	16	4	12		

Source: Results of consultation meeting with IA

Type II contract also requires the four IAs to act as ISF collectors and undertake the following main functions:

(i) to distribute ISF bills to each farmer-member of the IA with benefited area (i.e., with harvest of more than 40 cavans per ha),

(ii) to collect ISF and remit the same to the NIA every Fridays within the contracted period, and

(iii) to assist the NIA in the verification assessment of farm lots requested for exemption from payment of ISF.

While ISF collection is placed under the responsibility of the finance committee based on the IA by-laws, the four contracted IAs rely on only the BOD members to execute the Type II contract due to non functionality of such committee. The NIA collectors (WRF Technicians and Tenders) also continue to collect ISF in the areas of the contracted IAs, indicating the institutional weakness of the IAs.

On the other hand, incentives are given to the IAs for ISF collection that exceeds 50% of the current accounts of benefited area in the IA coverage area based on five levels of collection. The present incentive scheme is found by the IAs to be inappropriate and difficult to achieve with low irrigation efficiency due to damaged and poorly functioning facilities and with poor water management and O&M practice. These factors have caused low paddy yields, and weaken the financial position of the IA members to pay the ISF. The two most important reasons for non-payment of ISF by the IA members are shown below.

RIS	Financial need for education of children	Financial need to pay for credit to traders	ISF not collected by NIA strictly	Crop failure due to flood & pests/ diseases	Insufficient budget for next crop	Low production due to insufficient water received	Low production due to delayed delivery of water
Jalaur proper						1	2
Suague				2		1	
Total				2		1	2

Source: Results of consultation meeting with IA

In both Type I and Type II contracts, the IAs are faced with low participation rate by their members due to unclear definition of IA activities and benefits caused by inadequate organizing strategy and nonfunctional committees as gathered from the results of participatory rural appraisal (PRA) and consultation meeting with the IA officers.

One IA, the SMEWBAT IA, is faced with boundary and administrative problems since it is covered by three divisions of the Suague RIS. Geographically, this IA is located partly in the RIS division 1 (348 ha) and partly in the RIS division 2 (67 ha). In terms of ISF collection, the IA is covered both by RIS division 1 and RIS division 4, since the WRF Technician of division 4 is made responsible for ISF collection on 133 ha of SMEWBAT IA. This arrangement hinders the opportunity for the IA to assume greater responsibility for proper O&M and ISF collection activities due to the difficulty in coordinating with different NIA field personnel. This is also difficult for the current O&M staff in the RIS division 1 to carry out more effective water management and O&M activities.

Compounding the IAs' institutional and technical weaknesses are their present weak financial position, as summarized below with the main sources.

RIS	Total amount (pesos)	No. of IA	Source of finances (no. of IA)				
			Type I contract	Type II contract	Membership fee	Annual dues	Contribution
Jalaur proper	28,179	5	5		2		
Suague	30,000	4	4		2		
Total	58,179	9	9		4		

Source: Results of consultation meeting with IA

The Type I contract serves as the only primary source of finances for the 9 IAs which reported to have savings at present. The lack of alternative sources of capital for the IAs has made them financially weak to sustain the O&M work.

(2) Constraints and problems to institutional development

The present institutional and technical weakness of the IAs is attributed to their weak financial position and unclear definition of activities and benefits, as shown in Fig. 4.6.1, and the contributing factors to these are as follows:

(i) causes of weak financial position
- limited source of capital due to IA charter restriction,
- low price of paddy and other crops due to absence of organized system of marketing crops and absence of IA committee on post-harvest processing and marketing;

(ii) causes of unclear IA activities and benefits
- absence of IA/TSAG working committees due to no formal training for IA members caused by limited budget of the NIA for IA training, and absence of IA office to hold regular meeting and training and keep records,
- poor database on the IA such as the exact irrigated farm area, etc., and
- inadequate strategy for IA organizing arising from limited roles give to the IAs and non-participation of farm workers.

(3) Farmers' Cooperatives

Fifteen farmers' cooperatives currently exist in five IA areas in the Jalaur proper RIS and two IA areas in the Suague RIS. By virtue of their by-laws, they are essentially barangay-based cooperatives whose members are mainly those farmers residing in their respective barangays. Thus, the services of these cooperatives such as provision of crop production loan, and pre- and post-harvest facilities have been limited to their members within the covered barangays. Of their total members, the percentage of IA members ranges from 30% to 90%.

Most of these cooperatives, however, are both financially and technically weak. While all have been able to avail of agricultural loans from the Land Bank of the Philippines (LBP), they are mostly faced with overdue and unpaid debts due to the very low repayment rates from their members. Consequently, only six cooperatives are considered active and functional, but they could not also apply for additional credit from LBP until their outstanding loan accounts are fully settled. Technically, many of their officers have inadequate training and skills in cooperative and financial management, while practically all the cooperatives have not gone through the proper organizing process. Thus, many members have become inactive after receiving crop loan from the cooperatives, and also neglected to meet their debt obligations.

In the other IA areas with no existing farmers' cooperatives, between 70% and 90% of the IA members go to the private traders/millers and input suppliers for financial support for their agricultural activities and other family needs (particularly for children's educational expenses).

4.6.2 National Irrigation Administration (NIA)

(1) The Jalaur-Suague RIS (JSRIS) Office

The overall responsibility for O&M of the Jalaur proper and Suague RIS is presently carried out by the JSRIS office, which is headed by an Irrigation

Superintendent and situated in the municipality of Pototan.. The office consists of six (6) main sections: Institutional Development, Administrative, Equipment and Project Implementation, Collection , Jalaur proper O&M Personnel, and Suague RIS O&M Personnel, as shown in Fig. 4.6.2 with the corresponding number of positions. The first three sections provide institutional, administrative and technical support to the O&M personnel in discharging the functions of the office in the two RIS.

As mandated, the JSRIS office is performing the following functions in the two RIS:

i) Formulate and implement guidelines on proper O&M practice and improved water management;
ii) Maintain primary and secondary canals, drainage, diversion and other facilities such as service road;
iii) Prepare and implement the cropping calendar of the RIS in coordination with the IAs and farmers, and appropriate agencies;
iv) Coordinate with other agencies concerned with food production for agricultural development in the RIS;
v) Prepare and administer the institutional development program for organization and training of turnout service area group (TSAG) and subsequently the IA;
vi) Perform billing and collection of irrigation service fees (ISF) for water users; and
vii) Maintain pertinent records and submit required reports.

Hence, there are four main functions which the JSRIS office is responsible for: water management and O&M practices, ISF collection, organization and training of the IAs, and coordination with concerned organizations for provision of agricultural support services.

(2) Staffing

A total of 33 and 13 O&M personnel from Jalaur-Suague RIS Office are presently assigned to Jalaur proper and Suague RIS, respectively, as summarized below.

(Unit: Number)

System	Engineer	WRF Technician	WRF Operator	WRF Tender	Total
Jalaur proper	2	7	1	23	33
Suague	1	1	1	10	13

Source: Water Resources Facilities (WRF) NIA - JSRIS office -

The inadequate number of WRF Technicians for the 11 and 4 divisions of Jalaur proper and Suague RIS, respectively, has resulted in the designation of acting WRF Technicians of three (3) WRF Tenders in each RIS who have generally lower educational qualifications (college undergraduate or high school graduate).

Four institutional development officers (IDOs) take the direct responsibility of developing and strengthening the institutional capabilities of the IAs. Each IDO is assigned to three to seven IAs. But, one of the IDOs is a utility worker. Presently, the IDOs are involved in the reorganization of the IAs and their respective TSAGs for the effective implementation of Type I and Type II contracts.

The IDOs are all contractual employees, and their contracts are renewed annually depending on the available budget of the JSRIS office. The IDOs have no proper data on the IAs due to the lack of computers for data processing, planning and monitoring activities, and inadequate logistical support (transport and communication equipment) for improved undertaking and monitoring of O&M works. The IDOs have also very limited coordinative activities for agricultural support services to the IAs due to lack of training on planning and management of integrated delivery of such services.

(3) Training facilities

The existing NIA Regional Training Center in Pototan includes a conference and training room, audio room, mess hall and bed rooms for trainees with a floor area of about 728 sq. m. It was constructed by the Jalaur River Multi-Purpose Project (JRMP) principally for the training of NIA personnel, but has also served as an important venue for IA training. Presently, only the conference and training room can be utilized for NIA-IA meetings and training activities due to nonfunctional comfort rooms, poor drainage system, roof leakages and low flooring that gets easily flooded during heavy rains. No budget is also allocated for its current operation.

(4) Office equipment and apparatus

The office equipment and apparatus of the Jalaur-Suague RIS office are 2 units of survey instruments, 31 units of office equipment and a unit of communication equipment. Of the total 34 office equipment and apparatus, 28 are operative but the average use-age of these operative units is about 10 years.

In general, the existing operative office equipment and apparatus seem to be inadequate to enable the JSRIS office to meet the effective and proper office management for the two RIS under consideration.

(5) Constraints and problems to institutional development

The capacity of the JSRIS office is also presently constrained by institutional and technical weakness due to the following contributing factors:

(i) lack of training and experience of the institutional development officers (IDO) on community organizing, cooperative development and inter-agency coordination;
(ii) unclear delineation of functions of the IDO and water resources facility (WRF) technician and tender (WRFT/WRF tender), and

(iii) weak planning and monitoring system due to insufficient management information system and lack of skills for data collection and analysis.

Compounding this weakness is the lack of technical competence of the O&M personnel in the two RIS, as clarified in Section 4.5. The concentration of the IDO activities on the facilitation of regular BOD meeting, the renewal of IA's O&M contract, and the reactivation of the TSAGs and the updating of TSA members leaves little time for IDOs to carry out the regular on-site education and training of the IA members. Their inadequate skills in inter-agency coordination also deprive the IAs of the benefits from integrated agricultural support services and technical assistance.

4.7 Agricultural Support Services

4.7.1 Agricultural Research and Extension

(1) Primary Agencies

The Department Agriculture (DA) is primarily responsible for supervising applied research and regulatory services such as quarantine, phyto-sanitary, etc. Agricultural extension is essentially the task of the local government units (LGUs). The Provincial Agricultural Office (PAO) coordinates provincial level agricultural extension activities, while the Municipal Agricultural Office (MAO) is responsible for carrying out municipal level extension activities. The PAO and MAO are part of the LGUs and funding for extension activities come from the internal revenue allotment (IRA) of the concerned LGUs. In the Project, the relevant LGUs are the Provincial Government of Iloilo and the seven (7) municipal government units comprising the Project area.

The Western Visayas Integrated Agricultural Research Center (WESVIARC), a regional research center under the DA has technically competent researchers. However, the research activities could not be expanded due to limited budget support. The center has a rice seed processing facility funded under the Japanese Grant Aid Program. The center is expected to be relied upon as a potential source of technical assistance for the project.

(2) Assessment

The transfer of agricultural extension activities from the DA to the LGUs in 1992 has created problems pertaining essentially to logistics such as support for demonstrations farms, propagation of seeds, and conduct of training for farmers. The current extension works are carried out by 94 extension workers in the concerned seven municipalities. The extension workers generally work three days at the field and remaining two days in the office

Specialty	No. of Technicians
Municipal Agricultural Officer (MAO)	7
Municipal Community Development Officer (MCDO)	5
Crop Technician	56
Livestock Technician	7
Fishery Technician	10
Soil Technician	2
Home Management Technician	7
Total	94

The average budget of the concerned MAOs in 1996 ranged from 61,000 to 91,000 pesos per extension worker including personal expenses. This amount is sorely lacking if one considers the magnitude of work of the agricultural extension agents. Such perception is evident in the poor outreach of the agricultural extension agents. The integrated pest management program (IPM) funded by the DA has also been reported to have a limited outreach on account of budgetary constraint from the MAOs. The seven MAOs in the relevant municipalities considered the following constraints and problems to their work as shown below:

Constraints/Problems	Frequency of answers/7 MAOs
- lack of finance for activities	7/7
- lack of information on new technologies	4/7
- Shortage of extension workers	3/7
- lack of transportation facilities for field activities	6/7
- lack of farmers' willingness for production increase and difficulty in organizing farmers groups	2/7

Presently, the agricultural extension activities of the MAOs have minimal involvement with the activities of the IAs. About 60% of the respondents of the farm household survey have not felt the activity of the extension worker in the area. The respondents complain of infrequent services, and lack of interest and delay of the services.

- No activity by extension workers:	63%
- Kinds of support services received	
Technical guidance:	25%
Seed/seedling supply:	13%
Fertilizer/chemical supply:	9%
- Complains against support services	
Delay delivery of service/input:	14%
Infrequent services:	35%
Lack of interest of services:	14%

The extension workers has few opportunities to receive new information and to attendant on training. An extension worker has attained annually less than one training course by DA and PAO. As regards extension activities for farmers, which focus to

farmers groups and farmers cooperatives of barangay, training is held about one time during a year, and there are only 17 plots of demonstration farms including diversified crops in seven municipalities concerned.

4.7.2 Agricultural Credit

(1) Supply of Agricultural Credit

In the project area, about 61% of the farms use credit and the remaining 39% do not use credit. The supply of agricultural credit in the project area is met by formal and informal sources. Among the formal sources are the LBP, rural and thrift banks, lending investor and NGOs. The LBP uses the farmers' cooperatives as its conduits for retail lending by virtue of its mandate as wholesaler of agricultural loans. There are about 15 farmers' cooperatives that have received credit lines from the LBP. The rural and thrift banks operate in the urban center of the municipalities covering the project area. These lending institutions provide agriculture and commercial loans at interest rates of 25% to as high as 60% per annum. The loans are further secured by collateral. It is observed that about 14% of the farms use these lending institutions. The NGOs provide credit mostly to women, about 95% of total borrowers, who are engaged on vending.

Among the informal sources, the private traders/millers and input suppliers are the dominant source of crop production loans. About 24% of the farms have secured their crop production loans from these sources. The private traders and input suppliers provide loans at interest rates ranging from 30% to 100% per annum depending on the type of credit obtained. Despite this prohibitive cost of credit, the private traders have become convenient and flexible source of credit. The farmers and IA members get their inputs on credit. In return, the farmers bring their paddy to the traders' warehouses or buying stations as payment for their loans. The input suppliers and traders are expected to provide mostly the credit needs of the IAs and farmers unless their respective organizations can provide the same type of lending operation.

(2) Demands of Agricultural Credit

On the demand side, the farmers' cooperatives are considered end-user of agricultural credit. The farmers' cooperatives, as credit retailers, obtain loan funds from the LBP and lend these funds to their members. There are 15 farmers' cooperatives serving the 20 IAs in the project area. Out of these 15 cooperatives, 9 or 60% have been reported to be inactive. This means that they have completely stop their lending operations for the simple reason that the members have not repaid their loans. The average past due loan(arrears) of a farmer-member has been estimated at about P5,000 as of end 1995. This reflects the poor credit discipline among the farmers and IA members.

Records from the LBP indicate that there are about 22 bank-assisted cooperatives as actively operating in the municipalities comprising the project area. The proportion of these cooperatives relative to the total active cooperatives listed by the CDA is only about 26% of the total active cooperatives. The farmers' cooperatives are simply not

ready to administer loan services to their members. They encounter this difficulty on account of weak financial position, leadership and managerial skills.

(3) Problems

It can be inferred that the supply of agricultural credit in the project area is not at all a concern. There are various credit sources, formal as well as informal, including the availability of loanable funds. There are the three main problems of the demand sides, i.e., the low repayment rates of credits, the low rates of use of formal credits, and divergent use of the formal credits.

(a) Low repayment rates of the credits

This is the main problem of the farmer-borrowers. The existing arrears of a farmer-borrower has been estimated at P5,000. This has unduly deprived good paying members to renew their loans with their cooperatives. As such, the farmer-borrowers have turned to the input traders and suppliers as their immediate source of credit. The main causes of the low repayment rates are the lack of the intention to repay, calamities such as drought and floods, the lack or shortage of collateral or guarantor, the lack of effort to recover loans, the lack of monitoring system of loans, the shortage of information on high risk loanees, and the shortage of supporting services for the production and marketing by loaners.

Masagana 99 is a good project to draw lessons. The reasons why Masaganan 99 credit programme failed were subsidized interests, lack of monitoring system, etc., not group guarantee system itselfe. The group guarantee system works well in a micro-credit programme in Iloilo, and were adopted in the Rural Microenterprise Finance Project by ADB since 1996.

(b) Low rates of use of formal credits

In the project area, no more than 33% of the farms use credits from cooperatives. While, as much as 24% of the farms lend money from traders and millers at high interest rates. Causes of these situations are the lack of active credit cooperatives near farms, the limited capability of loanees to plan and to implement viable projects, complicated long procedures to get loans, the lack of collateral, and limitation of cooperative credits to agricultural purposes, etc. It is estimated that only 20% to 40% of the existing cooperatives are active. However, less than 20% of these cooperatives are able to deliver the credit needs of their members. Most of the farmer loanees are unable to make loan application forms by themselves due to low educational background. Complicated loan application procedures demand group arrangement of loan documents within a certain period. Landless farm workers, who occupy 29.5% of farmers do not have viable assets for collateral. Most of the farmers' cooperatives deal with only agricultural credits. The non-flexibility of the farmers' cooperatives to extend variety of loans make the farmer-borrowers to go to the input suppliers and traders as source of credit. It should be noted that aside from the agricultural

loans that the farmer needs, other credit demands for education and hospital are equally important as mentioned in the PRA sessions.

(c) Divergent use of the formal credits.

According to the informal information of ADB, agricultural loans are sometimes diverted to non-agricultural purposes such as leisures, trading, industry, education and medical treatments due partly to non monitoring of loan usage. The agricultural credits sometimes become a good alternative finance source to commercial banks because the agricultural credits are given without collateral and no persistent claim to arrears.

4.7.3 Marketing and Post-Harvest Facilities

(1) Paddy

(a) Production

The production of paddy in the project area is significant to the total paddy production of Iloilo. It is estimated at about 25% of the total paddy production in Iloilo. The incremental production from the project is expected to stabilize the dwindling paddy production in Iloilo estimated to be growing at an annual rate of only 2% during the periods 1992 and 1996. The projected growth of consumption of rice in Iloilo is about 2.02% per year.

(b) Current marketing practices

The private traders and millers practically control the buying of paddy in the project area. It is estimated that 90% of the marketable surplus(production less consumption) are bought by these traders. In the selling of rice, the local traders locally known as "casa" in Iloilo market controls the distribution of rice to major institutional buyers. The traders and millers control paddy and rice prices and dominate the market because of their financial resources and availability of post-harvest facilities. They have integrated buying of paddy into their post-harvest operation to take advantage of the profit opportunities in milling and selling of rice. The farmers and IAs are selling their paddy to the private traders because they are indebted to them. It should be noted that the farmers get practically their crop production loans from the traders. Their paddy oftentimes serve as payment for their crop loans. This relationship perpetuates individual selling among the farmers.

(c) Farm gate prices

Farm gate prices of paddy in the project area are lower by 10% to 25% of the farm gate prices posted in Iloilo market. This is largely due to the high moisture content(>20%) of paddy harvested in the area. In addition, the farmers' practice of selling the paddy right after threshing does not allow any room for anticipation of higher prices, especially during lean months.

Farm gate prices of quality paddy in Iloilo market have been generally stable over the past 21 months. The farm gate prices of paddy also follow the movement of the wholesale and retail prices of rice. In the Iloilo province, the mean farm gate price ranged from a low of 8.11 pesos/kg to a high of 9.58 pesos/kg during the past 21 months. In the region 6, meanwhile, the mean farm gate price stood at a low of 8.30 pesos/kg to a high of 9.29 pesos/kg. For both the areas, the average farm gate prices have been over and above the current support price of 8.00 pesos/kg. The farm gate prices were higher by about 1% to as high as 20% over the support price of 8.00 pesos/kg. This simply indicates that good quality of paddy can command prices higher than the support price.

(d) Post-Harvest facilities

Mechanical threshing and manual drying are prevalent in the project area. About 74% of the paddy farmers thresh their paddy mechanically. Most of the paddy farmers (i.e. 98%) dry their produce manually using bamboo mats when they keep their produce in their house.

About 70% of the paddy are marketed. Sixty three percent of farmers sell their paddy to traders, 23% to local markets and 4% to NFA. Most of the paddy farmers sell their paddy at lower prices immediately after threshing and cleaning to settle their loans and to get cash for education and other expenses.

Proper storage facilities for paddy are insufficient. Sixty three (63) percent of the paddy farmers have storage facilities, while 37% have no storage facilities. Distribution of the storage facilities is 5% for warehouse, 84% for Kamalig (bamboo shed) and 11% for makeshift storage.

Manual transportation of paddy is prevalent in the field. Transportation means of paddy from the threshing floor to drying place is 75% by hand, 14% by sled, 4% by cart and 6% by vehicle, while from drying place to storage is 60% by sled and 40% by hand. Seventy two percent of the paddy farmers transport their produce from farm to market by vehicle.

Post-harvest losses in the project area do not seem to be a big problem nowadays. Manual threshing has been replaced with mechanical threshing, which significantly reduced threshing losses to minimum level, and mobile rice mills with relatively high recovery rate of about 65%, has been replacing the Kiskisan type rice mills which have high milling losses. Most the rice are stored in the form of paddy which suffers minimum storage losses.

There is seemingly a saturation of rice mill capacity. The municipalities covering the project area have an estimated excess capacity of 26,887 tons of paddy. As a whole, the total excess capacity in Iloilo province is about 250,000 tons. In addition, the proliferation of portable and movable rice mills have made it convenient for farmers to mill their paddy right in front of their respective houses.

(ton)

	Production	Milling Capacity	Balance
Iloilo province	614,873	865,505	253,632
Related municipality	167,508	184,395	26,887
Project area, present	67,776	176,538	108,762
Project area, future	43,224*	108,762	65,538

* Incremental Production
Source: National Food Authority, Iloilo
Interview Survey with IA Officers
Bureau of Agricultural Statistics, Iloilo

The existing capacity of warehouses in the municipalities covering the project area is about 34,000 tons The province of Iloilo has an existing capacity of 154,000 tons. The existing capacities of the warehouses in the project area is about 12,000 tons.

Mechanical dryers are normally owned by the rice millers. Some cooperatives have acquired this facility through the assistance of the Department of Agriculture(DA). The price difference between dried paddy (moisture content of around 14%) and wet paddy (moisture content of around 25%) is 0.89 peso/kg of dried paddy. While, the cost of drying wet paddy is 0.4 peso/kg. So, the advantages and mechanical drying can normally compensate for its cost. The available mechanical dryers in the project area has an estimated capacity of 22,000 tons per year. Over and above these dryers, are solar dryers which are commonly used by farmers who wants to get better prices for their paddy. The annual capacity of solar dryers in the project area is estimated at 55,680 tons. Thus, total drying capacity is calculated at 77,680 ton/year. As the expected paddy production in the Project area is 111,000 tons, the shortage of the drying capacity is calculated at 33,320 tons.

(Metric ton)

	Paddy production	Dryer Capacity	Shortage
1. Mechanical			
Iloilo province		48,600	
Related municipality		21,600	
Project area	111,000	22,000	33,320
2. Solar (project area)		55,680	

Source: National Food Authority, Iloilo
Interview Survey with IA Officers

(e) Problems

(i) Low price of paddy and improper post-harvest handling

The common complaint of low prices received among farmers is normally a function of the relatively low quality of paddy. A number of the improper post-harvest handling are noticeable in the project area. First is the practice of selling wet paddy immediately after threshing. This condition prevails because of the tight cash flow experienced by the farmers. As such farmers normally lost 10% to 20% of the premium price

for paddy. Second is the misconception about mechanical drying. The additional cost of about 5% of the purchase price is traditionally viewed by farmers as excessive. In reality, however, the advantages of mechanical drying far outweigh its costs. These include high milling recovery, less broken and longer storage efficiency.

(ii) Non farmers' participatory to integration of production cum processing stages of paddy

This situation is happening among the farmers because of the following: (a) fragmented selling and handling of paddy; (b) absence of processing thus foregoing additional value-added; and (c) poor linkage with market information. It is actually the private traders and millers that are taking advantage of the profit opportunities created by the integration of paddy production and milling. This is because of their ability to mobilize financial resources coupled with adequate rice mill, warehouse and hauling facilities.

(2) Mungbean and Watermelon

(a) Production

The production of mungbean in the project area is virtually negligible. It is only in the Suage RIS where farmers plant mungbean during the dry season. The production in Iloilo averaging about 800 tons per year that comprises 34% of the regional production is, however, insignificant to meet the total requirement. Available supplies of mungbean in the province come from Manila that are directly imported from China.

The national production of mungbean stood at an annual average of about 24,800 tons between 1990 and 1995. In the same manner, the Philippine imports average to about 17,500 tons per year between 1990 and 1996. This condition clearly shows that the local supply of mungbean is inadequate to meet total requirement.

Average Annual Production(1990-1995)	Metric Ton
Philippines	24,800
Region VI	2,240
Iloilo	768
Average Annual Philippine Imports(1990-1996)	17,500

Source: Philippine Statistical Yearbook
Foreign Trade Statistics
Bureau of Agricultural Statistics, Iloilo

In the case of watermelon, the production in the project area is also negligible. The production in Iloilo, however averaged about 21,000 tons during the periods 1993 and 1997. The production represents roughly 96% of the

regional production. Practically the available supply in the region comes from Iloilo.

(b) Prices

Wholesale prices for mungbean at the Iloilo terminal vary for mungbean yellow and mungbean green. The former commands higher prices than the latter by about 30% to 50%. The wholesale prices of mungbean yellow during the 12-month period in 1996 stood at 37.04 pesos/kg. In the 8-month period of 1997, the wholesale price dropped by about 4%. The wholesale price was registered at 35.65 pesos/kg.

Wholesale price for mungbean green stood at 24.68 pesos/kg during the 12-month period of 1996. The 8-month period of 1997, however, showed a slight increase by about 7%.

The wholesale prices of mungbean in Iloilo market are rather high compared with the average farm gate price at national level as well as import prices. The average farm gate price at national level stood at about P17.00 per kg in 1995. The CIF import price, meanwhile, in 1996 was about US $ 0.48 per kg (12.4 pesos/kg).

Farm gate prices of watermelon, on the other hand, change drastically. The early stage in production commands higher prices as in most fruits and vegetables. In 1996, farm gate prices drastically ranged from 6.4 pesos/kg in January to 1.7 pesos/kg in April on monthly base. However, the wholesale prices are stable to sustain the prices of about 9.0 pesos/kg to 10.0 pesos/kg for the same period.

(c) Marketing practices

Harvested mungbean in the project area are directly brought to the Iloilo market for sale. The traders practically buy all the volume brought to the market. It is observed that most of the mungbean stocks in Iloilo come from Manila. Such stocks are imported from China. This implies that the local mungbean produce is insufficient to meet the local demand.

For the mungbean in the project area to be competitive, the quality and yield must be improved. It should be noted that imported mungbean are relatively cheap. Although this is now the current situation, national policy still supports the nationwide production of mungbean.

4.8 Watershed Area

4.8.1 Location

The Jalaur watershed is estimated at about 106,500 ha at the Jalaur diversion dam in the municipality of Dingle. The area corresponds to about 60% of the whole Jalaur river basin of 1,827 km^2, and administratively belongs to eight municipalities, namely: Lambunao, Duenas, Calinog, San Enrique, Passi, Dingle, Bingawan and San Rafael.

The Suage watershed is located in the municipality of Mina with an estimated area of 18,300 ha.. The watershed is adjacent to the Jalaur watershed in the south, comprising the municipalities of Janiuay and Badiangan.

4.8.2 Hydrology and Sub-watershed Classification

The Jalaur watershed is composed of 8 tributaries, while the Suague watershed is composed of two (2) tributaries as shown below.

Watershed	Main river	Tributaries	Catchment (km^2)
Suague	Suague	Magapa river	65
		Suague river	118
Jalaur	Jalaur	Panay river	118
		Jalaur river	128
		Asisig river	74
		Alibunan river	79
		Tagbacan river	137
		Ulian river	150
		Lumunan river	320
		Tambunac river	59

4.8.3 Status of Land Classification and Slope Condition

(1) Land classification

The Jalaur watershed is classified into 106,500 ha composes of 41,130 ha (39%) of public forest land and 65,370 ha (61%) of alienable and disposable land. The Suague watershed is classified into is 5,220 ha (29%) of public forest land and 13,080 ha (71%) of alienable and disposable land.

(2) Slope classes

The area with a slope of less than 18% is estimated at about 49,000 ha (46% of Jalaur watershed area) in the Jalaur watershed and about 9,200 ha (51% of Suague watershed area) in the Suague watershed. These areas are principally classified as alienable and disposable lands. Moreover, the alienable and disposable land also expand in the other areas with a slope of more than 18%. The areas are respectively estimated at about 16,370 ha (15% of Jalaur watershed area) in the Jalaur watershed and about

3,880 ha (21% of Suague watershed area) in the Suague watershed. The areas have already been utilized.

(unit; ha)

Watershed	Slope Class 0 to 18%		18 to 30%		over 30%		Total	
Suague Watershed	9,200	51%	3,100	17%	5,800	32%	18,100	100%
Jalaur Watershed	49,000	46%	24,500	23%	33,000	31%	106,500	100%

Source: Department of Environmental and Natural Resources (DENR), Region VI.

4.8.4 Land Use of the Watershed

According to the land cover maps prepared by NAMRIA in 1988, the present land use of both the watersheds is extensive land which consists of brush and grasslands with small portion of the cultivated land. The forest is covered by dipterocarp and other broad-leaved species with an open canopy of less than 50% is respectively estimated at only 7% of the Jaluar watershed and 6% of the Suague watershed.

(unit; km^2)

	Forest mature trees<50%		Extensive land use *1		Intensive land use *2		Build-up area town		Total	
Suague	10	6%	127	70%	44	24%	0	0	181	100%
Jalaur	76	7%	680	64%	308	29%	100	0%	1,065	100%

Note: *1;Extensive land use include cultivated land less than 70% mixed with brush land and grassland.
*2;Intensive land use include cultivated land more than 70%.
Source: Digital data of Land Cover Maps (1/250,000), 1987, NAMRIA.

Real forest area is relatively smaller than forest lands classified by DENR. The watershed is mainly covered by the extensive land which expands in the upland areas with a slope of more than 18%. The low forest vegetation cover and the high proportion of brush and grasslands cause the degradation of the watershed.

4.8.5 Population of the Watershed Areas

The socio-economic conditions in each watershed are represented by using the data on the municipalities concerned mainly, i.e. 4 municipalities of Lambunao, Calinog, San Enrique and Passi in the Jalaur watershed and municipality of Janiuay in the Suague watershed.

The population of the whole province has been increasing with an average annual rate of 2.0% during 1960 to 1995. The average annual rate is respectively 2.4% in the Jalaur watershed and 0.2% in the Suague watershed during the same period. Population density in 1995 was 240 persons/km^2 in Jalaur area and 280 persons/km^2 in Suague area. The reported population density of the municipalities concerned are bigger than the national average of 228 persons/km^2. The data on population and number of households in 1995 in the watershed areas are shown below.

Watershed	Municipality	Population (1995)		Annual	Household (1995)	
		Number (1000person)	Density (P./km^2)	increase rate at '60 -'95	Number (1000H.H.)	Density (H.H./km^2)
Suague	Janiuay	50	280	0.2	9.4	52.3
Jalaur	Lambuano	59	238	1.8	10.4	42.0
	Calinog	45	194	1.2	8.6	36.7
	San Enrique	26	292	2.4	4.8	54.6
	Passi	60	237	2.3	11.3	44.9
	Sub-total	189	240	1.9	35.0	42.8

4.8.6 Current Government Activities

As for the proper management and rehabilitation of forest areas, the DENR has pursued forest management programs and declared reserve areas in the public forest land. The present forest management program covers an area of about 5,730 ha in both the watersheds, involving regular reforestation, contract reforestation, integrated social forestry and industrial tree plantation. On the other hand, the reserve area of the Jalaur watershed covers about 12,600 ha which include national park, watershed area, civil reserve area, military forest reserved , communal forest and grazing land as shown below.

(Unit: ha)

	Municipality	Forest Management Program *1		Reserve Area *2		Non-classified Area		Total Timber Land	
Suague	Janiuay	646	12%	0	0%	4,803	88%	5,449	100%
Jalaur	Lanbunao	769	9%	2,640	31%	5,136	60%	8,546	100%
	Calinog	2,398	16%	9,977	67%	2,579	17%	14,954	100%
	San Enrique	1,201	52%	676	29%	4374	19%	2,314	100%
	Total	5,084	20%	12,578	49%	8,152	32%	25,814	100%

Remarks : *1 Forest management program includes 1) Regular reforestation, 2) Contract reforestation, 3) Integrated Social Forestation Program, 4) Industry Tree Plantation.
*2 Reserve area includes 1) National park, 2) Watershed area, 3) Civil reserve, 4) Military reserved forest, 5) Communal forest, 6) Grazing land.

Source : Provincial Environment & Natural Resource Office (PENRO), Iloilo

4.8.7 Watershed Reserve Area (Watershed Rehabilitation Sub-project)

The Jalaur watershed rehabilitation sub-project is proposed to be designated in the Jalaur watershed under the OECF funding, and declared as a watershed reservation areas. The area is about 2,200 ha, and the components of the project are community organization, nursery operation, reforestation of 958 ha, agro-forestry of 750 ha, bamboo plantation of 143 ha and erosion control.

4.8.8 Cause and Effect of Forest Destruction and Watershed Degradation

Forest and watershed degradation in the Jalaur and Suague watersheds has been caused by various reasons. Timber logging activities and collection of fuelwood to supply sugarcane mills were the main causes in the past. These two activities are not serious at present, since timber logging is generally prohibited and sugarcane mills use bagasse as the main fuel source. The population pressure in the watershed area is

considered as the most serious threat at present. Salsh and burn cultivation in the sloping areas without proper soil conservation measures is conducted intensively to produce food and products necessary to sustain the people's needs. There are some other causes such as charcoal production, forest fire and illegal timber logging. However, these activities are seemed minor compared with slash and burn cultivation. Policies and programs on the rehabilitation of forest and watershed are generally established by the government agencies concerned. Several programs have already been launched within the Jalaur and Suague watershed areas. However, these programs need to be reinforced, improved and expanded to secure stable sources of water for the project as well as enhance the welfare of the people in the Jalaur river basin.

4.9 Environment

4.9.1 Flora and Fauna

Forest with certain ecological and commercial values does not exist in the project area. No endangered wildlife are also reported within the project area.

Natural vegetation and wildlife are noticeable outside, but near the project area. In the steep mountains extending over the highest part of the Jalaur river watershed, old and virgin forest is existing in a limited area. This is now protected under the classified public forest land. In this forest area, considerable species of wildlife are assumed to be available, such as wild pig (*Suscelebenesis*), palm civet (*Paradoxurushermaphroditus*), deer (*Cervus sp.*), birds (eagles, hawks, falcons, fly catchers). Along the seashore located outside of the project area, the mangrove colonies have existed until 1970s or early 1980s. Most of the mangrove colonies have already been converted to fish ponds, and only a small area remains along the rivers and creeks at present. Wildlife species associated with the nearby mangrove vegetation include shellfishes, lizards, fishes and birds such as waders, migratory birds, kingfishers.

4.9.2 Historical and Cultural Assets, National Parks and Reserved Area

There are no historical and cultural assets, national parks and reserved area in the project area. However, four reserved areas and two national parks are located near the project area, as listed below;

Reserved area	Area and Location
Bulabog-Puti-An National Park (natural cave)	845 ha located at north-eastern part outside the project area, in the municipalities of Dingle, Pototan, Duenas, San Enrique.
Panay Mountain National Park (to be proclaimed in December 1997)	approximate 6,000 ha of the Jalaur river watershed, in the municipalities of Calinog and Lambuano.
Jalaur Watershed Area (watershed reserved area)	9,228 ha located in western edge of the Jalaur river watershed, in the municipality of Calinog.
Military Reserved Forest	20 ha in the municipality of Calinog.
Primary Forest	758 ha in the municipality of Lambuano
Western Visaya State University Reservation	3,464 ha in the municipalities of Lambuano and Calinog

Source: Region VI, Department of Environment and Natural Resources.

4.9.3 Water Quality

Water quality is assessed based on water samples collected in the Jalaur and Suague RIS areas in the dry season from mid- to late-February 1997 when the river flow was low. The results of water analysis are presented in the table below.

Sampling Sites (Site No.)	pH	TDS mg/l	DO mg/l	BOD mg/l	EC S/cm	TSS mg/l	Nitrogen mg/l
Jalaur Proper RIS							
Calinog, Jalaur river upstream (1)	7.7	60	3.77	2.7	1.56	745	0.63
Passi, Jalaur river upstream (2)	7.6	100	6.26	30.0	0.21	672	0.08
Calinog, Tributary of Jalaur river (3)	7.7	100	5.43	34.0	0.21	1,524	0.24
Dingle, Jalaur intake dam site (4)	7.0	190	1.46	128.0	0.33	39	0.05
Zarraga, Jalaur river downstream (24)	7.7	200	4.25	6.2	0.29	138	0.05
Irrigation canal, upstream (22)	7.2	160	1.04	5.2	0.35	69	0.03
Irrigation canal, middle reach (23)	7.3	280	2.25	5.4	0.34	117	0.05
Irrigation canal, downstream (8)	7.6	200	4.25	6.2	0.29	138	0.09
Creek, down reach (9)	7.7	100	1.58	1.6	0.38	595	0.12
Suague RIS							
Janiuay, Suague river upstream (6)	7.8	180	3.01	32.0	0.35	375	0.18
Janiuay, Tributary of Suague river (5)	7.6	160	3.01	2.9	0.34	5,792	0.43
Janiuay, Suague intake dam site (7)	7.8	180	2.81	22.0	0.37	581	0.10
Irrigation canal, upstream (19)	7.8	150	2.64	0.5	0.30	5,880	0.24
Irrigation canal, downstream (20)	7.3	65	5.07	5.4	0.6	1,160	0.04
Creek, down reach (21)	7.3	280	5.07	4.0	0.57	65	0.55

Source : JICA Study Team (1997)

The BOD values are generally high, which could be attributed to the sampling period when the river flow was relatively low in the dry season. There are two main sources for the high BOD values. One source is the domestic waste water from the populated area, and another is the waste water from the sugarcane mill factories in the upstream.

The water at the Jalaur diversion dam is considered to be affected by the waste water of two sugar mill factories in the upstream. Two sugar mill factories, namely Passi Sugar Central and New Frontier are located in Passi. The Passi Sugar Central has facilities of waste water treatment, and the treated water is utilized for its operation. This factory is not considered as the main source of high BOD. Crop damages caused by the low water quality of irrigation water have not occurred at all.

4.9.4 Fish Ponds Located in down Reaches of the Project Area

Fish ponds of about 7,000 ha are widely operated along the coastal area of the municipalities of Barotac Nuevo, Dumangas and Zarraga. The total area and number of operators in the municipalities are listed below.

	Fish Pond Area	Operators	Products
Barotac Nuevo	4,360 ha	273	Milk fish, tilapia, shrimp, seabass, mud crab
Dumangas	2,010 ha	135	Milk fish, tilapia, shrimp, prawns
Zarraga	660 ha	17	Milk fish
Total	7,030 ha	425	

Source: Municipal Agricultural Officer in each municipality.

The ponds are brackish type which use water from the creek, shallow well and sea. At present, drainage water from the Jalaur proper and extension RISs is used for the fish pond. While the drainage water might contain the residual fertilizers and agro-chemicals, damage on fish production has not been observed.

4.9.5 Application of Agro-Chemicals

According to the farm household survey conducted in this study, agro-chemicals applied in the project area are listed in Table 4.9.1. The average dosage of agro-chemicals is 3.3 lit./per ha in the dry season and 2.8 lit./ha in the rainy season. Insecticides and herbicides are utilized by 81% and 53% of the farm households, respectively. Molluscicide chemicals to prevent snail damage on rice plant are also applied by 24% of farmers. Some agro-chemicals, which were banned due to its toxicity, are still being used in the project area. These include Meptox and Thiodan for insecticide, Pond snail for molluscicide, Ratoxin for rodenticide and Clencher for herbicide.

4.9.6 Ground Water

Ground water is widely utilized for drinking water by households in the rural area as well as supplementary irrigation to surface irrigation from the RISs. During this season, the decrease of ground water table was reported in some area due to excessive pumping of ground water, resulting in the abandonment of some shallow tube wells. Despite the declining supply of ground water, the number of shallow tube wells and pumps are still increasing at this time. This is expected to reduce further the ground water table and begin the process of salt water intrusion.

4.9.7 Quarry Activity in the Downstream of Suague Intake Dam Site

Presently, quarry activities are conducted by several individuals and private companies on the downstream of Suague intake site. Although the size in most of them is small less than 1 ha, the number of operators is large. Thus, these, in total, may induce the environmental impact such as sinking of riverbed. It may affect the sustainability of Suague intake dam in future. Although it may be needed to carry out a certain conservation measures in the long term aspect, it is required to identify a relevance between the quarry activities and the sinking of riverbed through monitoring works from short term aspect.