The Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan
Pampanga Delta Development Project (Irrigation Component)

External Evaluator: Haruko Awano, IC Net Limited

0. Summary

This project was conducted to increase agricultural production in the Pampanga Delta Area in Central Luzon, Philippines, by constructing irrigation facilities, thereby contributing to the improvement of living standards and income of local residents.

This project is fully consistent with the development policies and development needs of the Philippines for the improvement of productivity and self-sufficiency rate of rice as well as Japan's aid policy to support agricultural development; therefore its relevance is high. Households of the beneficiary farmers reported effects and impacts of the project, such as an improved agricultural income due to the increase in rice production and improved living standards. However, the extent of these effects and impacts is very limited as the actual irrigated and planted areas were about 30% of the planned ones; hence the overall effects and impacts of this project are low. Efficiency of the project is fair because its cost and period exceeded the plan. Some problems have been observed in staff shortages of the local offices responsible for maintenance and financial sustainability; therefore sustainability of the project is fair. In light of the above, this project is evaluated to be unsatisfactory.

1. Project Description

Project Location

Pampanga Diversion Dam

Pumping Station

1.1 Background

In the Philippines, only half of the potential irrigable areas of 3.1 million ha were irrigated as of 1989 and establishment of irrigation facilities was an important investment for stable food production. The Central Luzon region, where this project was implemented, is adjacent to Metro

Manila and has played an important role in supplying rice. The project site of the Pampanga Delta, which had been affected by floods every year, had great potential in agricultural development. However, due to inadequate irrigation and drainage facilities in the region, irrigation water was insufficient in the dry season while water management was difficult in the rainy season. As a result, the growth of annual rice production had been sluggish, which affected the improvement of farm income and stable supply of rice. Therefore, the development of irrigation facilities in the region to increase rice production was an urgent task for the government of the Philippines.

1.2 Project Outline

The objective of this project is to increase agricultural production in the Pampanga Delta Area by providing irrigation facilities, thereby contributing to the increase of income and the enhancement of the living standards of residents in the project area.

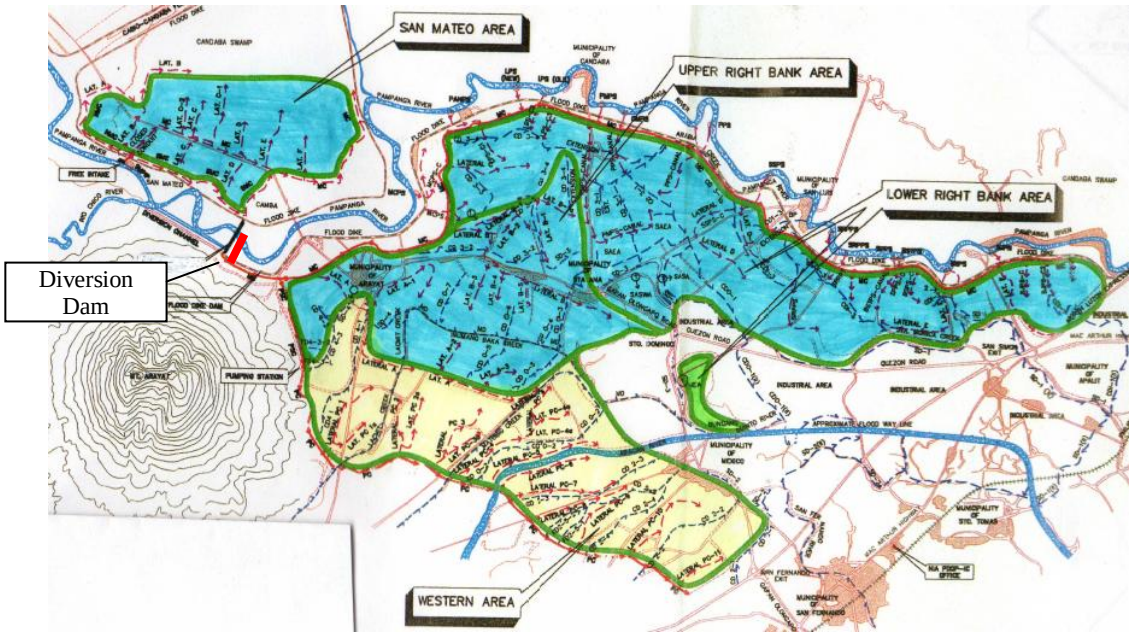


Figure 1: Layout of Pampanga Delta Development Project (Irrigation Component)

(The project area is surrounded by the green line. The blue area shows the gravity irrigation area; the light yellow one, the West Bank pump irrigation area; and the green one, the small-scale pump area[1].)

[1] Gravity irrigation is a method that applies irrigation water to fields by letting it flow from a higher-level supply canal through ditches or furrows to fields at a lower level. Pump irrigation is to pump up irrigation water from the water source by pump equipment to be supplied to the ground. In this project, a large-scale pump irrigation system was introduced in the West Bank to pump up the water in the diversion dam by large pumps; in the Mexico area in the downstream of the Right Bank, small equipment was introduced to pump up the water in the river.

Loan Approved Amount / Disbursed Amount	9,427 million yen / 9,303 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March, 1991 / July, 1991
Terms and Conditions	Interest Rate: 2.7% Repayment Period: 30 years (Grace Period: 10 years), Conditions for Procurement: General Untied
Borrower / Executing Agency	The Government of the Republic of the Philippines / National Irrigation Administration (NIA)
Final Disbursement Date	October, 2002
Main Contractor	Taisei Corporation (Japan) / Kurimoto Ltd. (Japan) (JV), Kubota Corporation (Japan) / C. M. Pancho Construction Inc. (Philippines) / L.P. Engineering Services (Philippines)(JV)
Main Consultant	Nippon Koei Co., Ltd. (Japan)
Feasibility Studies (F/S), etc.	F/S (1980), E/S (1986), SAPI (1995) by Yen Loans
Related Projects (if any)	UNDP (Pampanga Delta and Candaba Swamp Integrated Development Plan, 1975); JICA (Project on the Development and Promotion of Location - Specific Integrated High - Yielding Rice Technologies, Nov. 2004 – Nov. 2009); JICA (Irrigators Association Strengthening Support Technical Cooperation Project, Oct. 2007 – Sep. 2011); JICA (Pinatubo Hazard Urgent Mitigation Project III, Dec. 2007 – present)

2. Outline of the Evaluation Study

2.1 External Evaluator[2]

Haruko Awano, IC Net Limited

2.2 Duration of Evaluation Study

Duration of the Study: November 2011 - October 2012
Duration of the Field Study: February 3 - 12, 2012, March 3 - 24, 2012,
May 20 - 31, 2012, July 17 - 20, 2012

2.3 Constraints during the Evaluation Study

In this project, the unexpected eruption of Mount Pinatubo occurred in the target area which necessitated the suspension of the project and significant changes in the project's scope. Therefore, the evaluation was done based on the plan that was adopted from the results of the Special Assistance for Project Implementation (SAPI), which was conducted after the eruption, not the plan at the time of the appraisal. Due to the reassignment of the staff responsible for the implementing agency, it was difficult to obtain information such as review processes of the project plan for the criteria of relevance, reasons for the decrease in the irrigated and planted areas for effectiveness, and the monitoring situation of the Environment Compliance Certificate (ECC) and land acquisition for impact.

[2] This project was jointly evaluated with the National Economic Development Authority of the Philippine government.

3. Results of the Evaluation (Overall Rating: D[3])

3.1 Relevance (Rating: 3[4])

3.1.1 Relevance with the Development Plan of the Philippines

During the project appraisal period, the Mid-Term Philippine Development Plan (1987 - 1992) emphasized the food self-sufficiency through increasing agriculture production. Low productivity was raised as one of the reasons for insufficient supply of rice, and the plan gave irrigation related projects a high priority, which accounted for about 8% of the plan's total investment. The provincial government of Pampanga put importance on the production of agricultural products with high added value and aimed to improve the quality of agriculture. The Development Plan (1990 - 2000) of the National Irrigation Administration (NIA) stated that irrigated area would be expanded from 1,469,000 ha in 1989 out of the potential irrigation area of 3,126,000 ha to 2,000,000 ha by 2000.

At the time of the ex-post evaluation, the Philippines' Mid-Term Development Plan (2011 - 2016) aims for inclusive economic growth and considers infrastructure development including irrigation improvement as one of the country's development strategies. In agriculture development, the top priority is the improvement of agriculture productivity and income through such measures as improved irrigation facilities. The Food Staples Sufficiency Program (2011 - 2016) by the Department of Agriculture points out that self-sufficiency in rice has not been achieved with the increase of rice consumption[5]. In order to reduce the import of rice, the Mid-Term Development Plan aims to expand the planted areas of rice and increase yield and production. It also puts emphasis on the rehabilitation of existing irrigation facilities and the construction of new facilities to expand irrigated areas. The Development Plan of Pampanga Province (2011 - 2016) stipulates that agriculture development is one of the major economic clusters as source of growth. The plan specifies support to agriculture by such means as small-scale irrigation facilities, and the province is rehabilitating existing irrigation facilities and providing shallow tube wells for upland areas. Moreover, the NIA aims to construct new irrigation facilities of 166,671 ha and rehabilitate or restore the facilities of 284,399 ha in the first three years in its six-year irrigation plan from 2012.

3.1.2 Relevance with the Development Needs of the Republic of the Philippines

At the time of the appraisal, the agriculture sector employed about half of the total labor force in the Philippines. However, the country was not self-sufficient in rice, its staple food, from 1988 and 1990, and imported it to make up for the shortage. Due to the increased population, the demand for rice was expected to grow by 31% in 1998 compared to 1988. Although the rice production was estimated to increase by 23% during the period, there would still be supply shortage of 170,000 tons and the shortage was expected to continue.

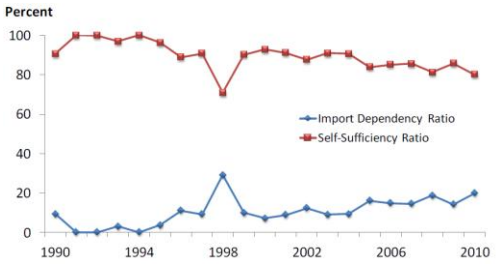
At the time of the ex-post evaluation, rice production has been increasing but does not meet the increasing demand. The average self-sufficiency rate of rice from 2004 to 2010 remained at 84.7%. In 2009, the Philippines' rice yield was 3.6 ton/ha, behind Indonesia and Vietnam. Thus

[3] A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

[4] 3: High; 2: Fair; 1: Low

[5] Annual consumption of rice per capita increased from 105.77 kg in 1999/2000 to 119.08 kg in 2008/2009. However, the amount of rice that can be domestically supplied per capita was estimated at 114.64 kg in 2009. Therefore, there is a gap of 4.4 kg per capita between supply and demand in the year. The rate of population growth during the 2000s is 1.9% per year, which is less than 3% of the annual growth rate of rice production during the same period. However, the amount of rice consumption per capita has increased together with income increase, which is considered to be a cause of the demand-supply gap of rice.

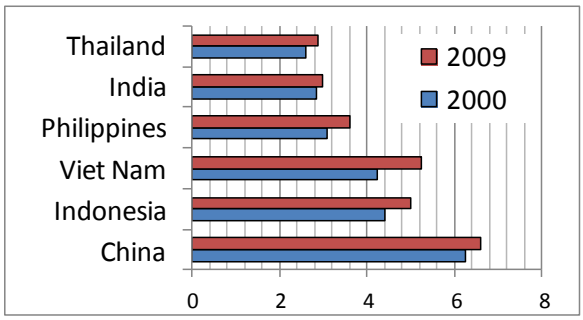
the improvement of rice productivity is still urgent.



Source: Department of Agriculture

Fig. 2: Self-Sufficiency and Import Dependency Rate of Rice

(Unit: Tons/ha)

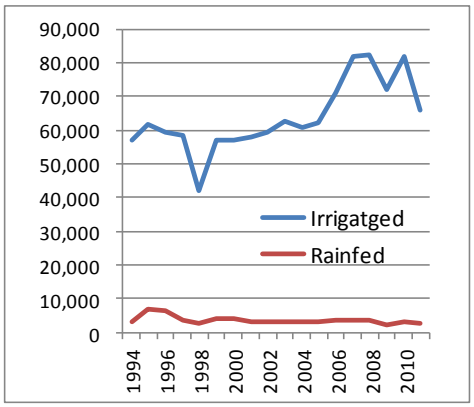


Source: Department of Agriculture

Fig. 3: Comparison of Rice Yield

Central Luzon, where Pampanga Province is situated, has been the largest producer of rice in the country and a major supplier of rice to Metro Manila. Pampanga Province is one of the major grain production areas in the Region. However, the province's production did not meet its own demand in 1990, and the province's rice self-sufficiency rate was 82%. Therefore the increase in rice production in the province was imminent. In 2010, the rice planted area increased to 84,746 ha, and rice production increased, but the self-sufficiency rate remained at 89%[6]。

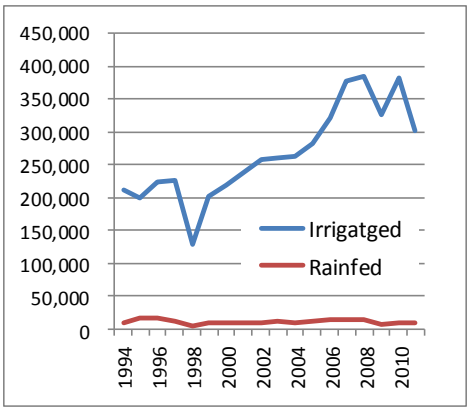
(Unit: ha)



Source: BAS

Fig. 4: Rice Planted Area in Pampanga Province

(Unit: ton)



Source: BAS

Fig. 5: Rice Production in Pampanga Province

3.1.3 Review Process of the Project

The concept of this project originated from the "Survey of Comprehensive Development Plan and Candaba Pampanga Delta Swamp" (1975 - 1978) by the United Nations Development Programme (UNDP). Based on the survey results, the Feasibility Study (F/S) for flood control and irrigation, both of which were considered urgent, was conducted by JICA in 1980 and the Engineering Study (E/S) was carried out in 1986 - 1989 by JICA's yen loan projects. Then, the Flood Control project started in 1990 and the Irrigation Project in 1991 by JICA's yen loans.

[6] Data from the Department of Agriculture

After the appraisal of this project was conducted in 1990, Mount Pinatubo erupted in June 1991. Since the impact by the eruption could not be anticipated at that time and the Philippine side's preparation of the project, such as establishment of the project office, was proceeding, the loan agreement was signed in July 1991 as scheduled. However, a large amount of lahar flow occurred a few months after the volcanic eruption, the target area sustained a major negative impact, and the project was suspended in March 1993. After the situation stabilized, a study on the SAPI was conducted in 1994. The SAPI proposed ten alternative plans, and the plan 7 to add a pump irrigation scheme in the West Bank area was adopted[7]. The plan cited the disadvantage of high irrigation fees in the West Bank area. However, the cost analysis of water fees including pump operation was presented as average cost per hectare of the whole project, which was less than 2% of the estimated net agriculture income. It was analyzed that beneficiary farmers would be able to bear the cost. Since the operation cost of pumps would be paid by the farmers in West Bank, water fees including the pump operation cost should have been analyzed targeting West Bank and explained in the SAPI report; but no such analysis was done[8]. Cash crops in the West Bank area were also planned in consideration of higher economic effects and sustainability of this project through facilitating the payment of water fees by farmers[9]. The needs for agriculture extension services and loans were pointed out, but only the collaboration with relevant agencies such as the Department of Agriculture was suggested.

3.1.4 Relevance with Japan's ODA Policy

The White Paper on Japan's ODA in 1990 cited the agriculture sector as an important assistance area. It also made promotion of agricultural development as one of its priorities to increase food production and stabilize food production. Moreover, it suggested comprehensive support to agricultural development by (1) equipment and facilities as well as (2) human resources and institutions. The former included the expansion of irrigation facilities.

From the above, this project is highly relevant with the development policies and development needs of the Philippines which aimed to improve the productivity and self-sufficiency rate of rice, as well as Japan's ODA policy to support agriculture development. Therefore its relevance is high. However, in the process to add pump irrigation in the West Bank area after the eruption of Mount Pinatubo, the examination was insufficient on the cost of operating pump irrigation to be borne by farmers, the introduction of cash crops, and their possible impacts and effects on the project.

3.2 Effectiveness[10] (Rating: 1)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Irrigated and planted area

The table below shows Firmed Up Service Area (FUSA, the area that can be provided with irrigation water) and irrigated and planted area (the area which is actually irrigated and planted) at the time of the appraisal, at the time of the SAPI, and actual values from 2009 to 2011. At the

[7] In addition to the 8,100 ha which will be irrigated by the gravity system, 2,400 ha which will be irrigated by pumps was added. The plan was adopted because it included the introduction of highly profitable cash crops in the dry season and the estimated net income of farmers was the highest.

[8] The disadvantages of the plan 7 are taken from the comparison table of proposed plans in Table 4-9-12 on page T-68 of the SAPI. The study on the farmers' willingness to pay the irrigation water fees was not conducted.

[9] Based on the interviews with the former manager and staff of the PMO (Project Management Office) of the NIA.

[10] The impact is to be taken into consideration in sub-rating for effectiveness.

time of the appraisal, a FUSA of 11,540 ha was planned but the SAPI excluded several areas and the FUSA was reduced to 10,500 ha. As a result, it was planned to irrigate and plant rice for a total of 17,290 ha for both the dry and rainy seasons. However, at the time of the ex-post evaluation, FUSA decreased to 7,836 ha and the irrigated and planted area of rice registered at the NIA in a year was only 5,166 ha, or about 30% of the plan at the SAPI. However, the actual area may be more than the area registered at the NIA because many farmers reportedly tend to declare their planted area in a way that is less than the actual value.

It was assumed that cash crops would be planted in 3,710 ha in the dry season but the NIA reported only the planted area of corn as 28 ha and the actual area of cash crops is considered small[11]. Even in a sum of the irrigated and planted area of rice and the area used for cash crops and fish ponds in the dry season when the utilized area in the FUSA is higher than in the rainy season, only 4,505 ha is irrigated in 2011[12] and it is considered that 3,331 ha of FUSA is not used. Table 1 and Figure 6 below show these situations.

Table 1: FUSA, Irrigated and Planted Area of the Project Target Area (Unit: ha)

Items	Apprai -sal	SAPI (Planned)	Actual				Actual / Planned
			2009	2010	2011	Average	
FUSA	11,540	10,500	7,836	7,836	7,836	7,836	74.6 %
Irrigated & planted area of rice (Dry)*1	9,540	6,790	4,103	3,866	4,041	4,003	59.0%
Irrigated & planted area of rice (Rainy)*2	11,540	10,500	1,344	1,048	1,096	1,163	11.1 %
Irrigated & planted area of rice (Annual: Dry + Rainy)	21,080	17,290	5,447	4,914	5,137	5,166	29.9 %
Irrigated & planted area of cash crops (Dry)	2,000	3,710	N/A	540	28	28	0.8%
Fish Pond Area using irrigation (Dry)*3	N/A	N/A	N/A		436	436	N/A

Source: Appraisal documents, SAPI Report, NIA documents

*Note 1: Since the data of cash crops and fishponds of the dry season in 2009 is not available, the planted area of rice may include such data.

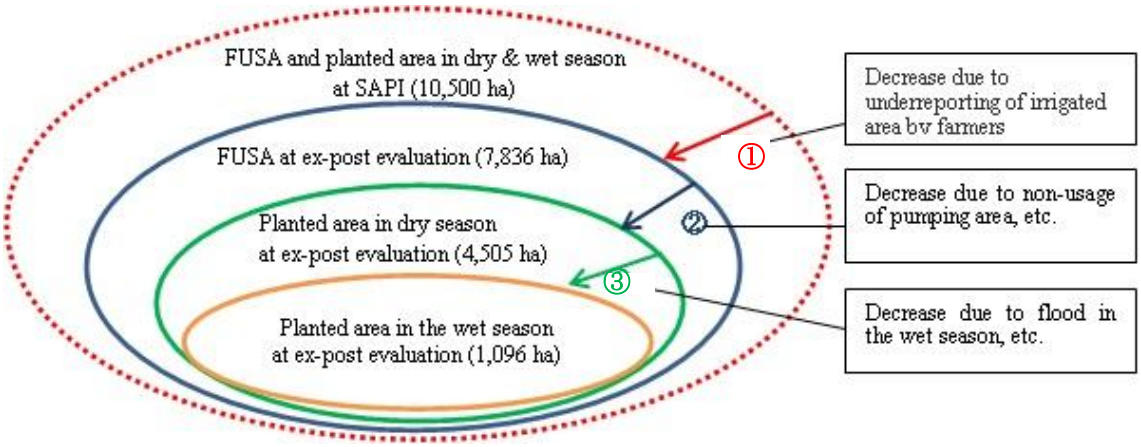
*Note 2: The data of the area of cash crops and aquaculture ponds in the rainy season in 2009 and 2011 could not be obtained. Therefore, there is a possibility that the data of planted area of rice for these two years contains the area of cash crops and fish ponds. The area of cash crops and fish ponds during the rainy season of 2010 was 114.8 ha.

*Note 3: Fish ponds in the target area are not planned in SAPI. However, tilapia fish ponds increased from 2005 to 2008 and improved the income of farmers. Irrigation fees set for a fish pond are higher than those for rice and contributed to the increase in the NIA's income from irrigation fees. However, since around 2011, the pond area has been reduced due to cost increase in such items as feed, crop failure due to rising temperature, and decreased market prices. At the time of the ex-post evaluation, a number of ponds are being converted to rice paddy.

[11] The PDRIS Office of the NIA, which is in charge of O&M (Operation and Maintenance)of the project, collects only the cash crop data of corn. Therefore, the data of "Actual" in the table is limited to corn. The data of corn is available only for 2011 and the data for other years is the total of cash crops and fish ponds. Therefore, the data of corn cannot be compared with other years.

[12] The figure is calculated from Table 1 as follows. Irrigated and planted area of rice 4,041 ha + cash crops 28 ha + fish ponds 436 ha = 4,505 ha.

Figure 6: FUSA and Irrigated and Planted Area (Including Cash Crops and Fish Ponds) in 2011



Source: SAPI Documents, NIA

The table below summarizes the reasons for decrease of irrigated and planted area. Repair of laterals and other facilities with problems indicated in Item 2. in the table are included in the Action Plan by the NIA and it is expected to restore about 1,000 ha in 2012.

Table 2: Reasons for Reduction of FUSA and Irrigated and Planted Area[*1] (Unit: ha)

Items	SAPI	Actual	Gap	Reasons
1. FUSA	10,500	7,836	2,664 (① in Figure 6	1,420 ha was added by the project after SAPI, then decreased by 4,084 ha. Reasons are **underreporting of irrigated area by farmers** (-2,000, estimated by NIA), lack of canals in pump area (-952, estimated by NIA)[*2], and conversion of land (-905, estimated by NIA)[*3]
2. Irrigated & planted area (Dry season)	10,500	4,505	5,995 (Gap from actual FUSA: 3,331, ② in Figure 6)	In addition to the reduction of FUSA above, **non-utilization of pump irrigation (-1,956),** withdrawal of small pumps in the Right Bank area (-260), malfunction of Lateral A (-320), necessary repair for several facilities (-785)
3. Irrigated & planted area (Rainy season)	10,500	1,096	9,404 (Gap from planted area in dry season: 3,409, ③ in Figure 6)	In addition to the above reduction of FUSA and planted area in dry season, it is estimated that **farmers do not plant due to flood in the downstream area and/or use rain water for planting.**

4. Planted area of cash crops (Dry season)	3,710	28	3,682	Lack of canals in pumping area (-952); non-use of irrigation in pumping area (-1,956); farmers do not introduce cash crops; lack of data of NIA

Source: SAPI Report, NIA

Note: Irrigated and planted area includes cash crops and fish ponds.

*Note 1: Data in the table is based on the O&M data, the Action Plan including repairs, and information from the PDRIS Office of the NIA. However, much of the data is estimates by the PDRIS Office since precise data was unavailable.

*Note 2: The Project Completion Report (PCR) reported 2,920 ha of FUSA was constructed in the West Bank where pumping irrigation was introduced. According to the NIA, however, after the completion of the project, it was found that FUSA decreased by 952 ha because a few parts of the canals were not constructed. The reduction of FUSA by the incomplete construction of the canals should have been reflected in FUSA, but the reduced area was included in the PCR by mistake.

*Note 3: Parts of FUSA were converted to other purposes such as residence and industrial use.

The major reasons for the decrease in the irrigated and planted area are as follows.

1) Reductions of FUSA due to underreporting of areas by farmers

The NIA estimates that the area declared by farmers for irrigation services is less than the plan by more than 2,000 ha and believes that the farmers may be utilizing irrigation services in more areas than their report[13]. The NIA cannot determine the correct FUSA. Therefore, it is expected that FUSA and the planted area will increase when the NIA conducts parcillary mapping[14].

2) Reductions of irrigated and planted area due to non-utilization of pumping facilities

Most farmers in the pump irrigation area in the West Bank do not use the irrigation services due to the high price of diesel fuel and availability of shallow tube wells. The SAPI in 1994 estimated the price of diesel fuel per liter at 7.1 pesos, but it increased to 21.6 pesos in 2003 when this project was completed and 43.3 pesos in 2011[15]. Thus the pumping facilities were not used for about four years after the completion of the project. In 2008 and 2009, when a subsidy was provided, three Irrigation Associations (IAs) in the upstream used the pumping facilities. However, only one IA has been using the facilities for about 30 ha[16] since then. At the time of the ex-post evaluation, farmers in the upstream area planted rice

[13] Based on the interviews with the NIA and the vice president of the Federation of Irrigation Associations. An IA conducted parcillary mapping that almost doubled FUSA. Therefore, the NIA believes that it is highly likely that farmers are underreporting the irrigated area.

[14] If the planted area is increased, the NIA can increase the income from water fees. Out of the planted area of 4,505 ha including cash crops and fish ponds in the dry season in 2011, 4,384 ha was irrigated by gravity.

[15] Based on the data from the Department of Energy of the United States and the Department of Energy of the Philippines. Even when adjusted by the average CPI rate of 6% from 1994 to 2011, the diesel fuel price in 2011 is 2.4 times the price in 1994.

[16] After the completion of the project, the NIA held several discussions with the farmers in the area on the use of pump irrigation facilities, but the farmers declined to use them due to the high diesel fuel cost. The NIA estimated that the water fee including diesel fuel and other operation costs of the pumping facilities would be 700 kg of rice per ha. (Water fees applied to other areas by the project at the ex-post evaluation are 150 kg of rice for the dry season and 100 kg for the rainy season.) The three IAs tried pumping irrigation for 165 ha in 2008 and 80 ha in 2009 but the two IAs decided not to use the pumping facilities because of the high cost and difficulties in arrangements among IA members. At the ex-post evaluation, only one IA near the pumping station was using the pumping facilities for 30 ha out of 123 ha of its FUSA. However, it did not use the pumps in the dry season in 2012. (Based on FGD with farmers in the area and interview with the NIA.)

and corn using the existing shallow tube wells. It is assumed that most farmers in the downstream area do not plant using irrigation during the dry season[17].

3) Significant decrease in irrigated and planted area in the rainy season due to inundation and use of rain water

The target area is a region that has suffered frequently from flooding and the SAPI excluded the flood prone areas from the project. Therefore, the SAPI assumed that, even without the project, 96% of the target area will be planted by irrigation or rain fed in the rainy season. The SAPI pointed out the possibility of an increase in floods caused by lahar but planned that the same level of areas will be irrigated and planted in the dry and rainy seasons. However, the actual irrigated and planted areas in the rainy season after the completion of the project in 2004 were very small in the range of 893 to 1,343 ha. The main reason is that the crop cannot be planted as many areas are flooded in the rainy season[18]. In the project area, floods increased after the eruption of Mount Pinatubo due to an accumulated lahar in the river. In addition, the improvement of the river Bungang Guinto, which was the cause of flood and drainage facilities, was carried out during the civil works, and the other flood prone areas were added as target areas. However, these works were insufficient to solve the problems of flooding in the area. Furthermore, drainage of some fishponds is inadequate and causing the expansion of the inundation area.

For the reasons above, crops cannot be planted during the rainy season in many areas. While lahar affected the area, the target area should have been determined after a thorough study and review of the other project plans on flood control measures to improve drainage, when a project is implemented in flood prone areas. Currently, JICA is requesting the DPWH to carry out the dredging of the Bungang Guinto river in the ongoing project of Emergency Disaster Relief of Mount Pinatubo. When completed, the dredging is expected to reduce the impact of flooding.

In addition, it is estimated that many farmers use rain water for planting and do not use irrigation services in the rainy season[19]. The SAPI assumes that, even if this project is not implemented, 2,868 ha will be planted using rain water in the rainy season, and farmers in the area will use irrigation services after the completion of the project. However, it is considered that farmers in the area is still using rain water and not using irrigation services. According to the NIA, even if farmers are in rain-fed farming, the NIA should include them

[17] Based on the field study for the upstream area and information from the NIA for the downstream area. The SAPI reported that a few areas were using small-scale facilities to use groundwater but estimated that they were short of groundwater in the dry season after the eruption of Mt. Pinatubo.

[18] The program areas of the NIA PDRIS Office exclude the flooded area in the rainy season and the area of the rainy season in 2011 was only 1,826 ha and out of which only 1,096 ha was actually planted. The program areas in the previous rainy seasons were 1,410 ha in 2010, 1,647 ha in 2009, 1,356 ha in 2008, 1,485 ha in 2007, 1,586 ha in 2006 and 1,788 ha in 2005. Data on the program area of the rainy season in 2004 was not available but the irrigated and planted area was 1,071 ha. Therefore, it is fair to say that, immediately after the completion of the project in May 2003, the NIA judged many of the target areas could not be planted in the rainy season. On the other hand, the SAPI in 1994 does not show the data of the planting situation in the rainy season of the target area but estimated the planted area without the project as 10,120 ha consisting of 5,920 ha of irrigated area and 4,200 ha of rain fed area. It assumed that, when the project is implemented, all the rain fed area will be irrigated and planted with rice and the total irrigated and planted area will be 10,500 ha. The SAPI pointed out the risk of flooding due to lahar accumulated in the rivers, but the risk was not reflected in the plan of irrigated and planted area in the rainy season and the SAPI assumes that 100% of FUSA can be planted in the rainy season. Later, there was an increase in the area which cannot be planted due to the influence of accumulated lahar.

[19] Reason: Only about 30% of the respondents in the beneficiary study reported excessive water in the rainy season due to flood and an insufficient drainage system.

in the irrigated and planted area and require water fees from them. However, due to a lack of information, the NIA finds it difficult to collect the water fees.

4) Reduction of planted area of cash crops during the dry season

The SAPI planned that cash crops such as eggplant and tomato were to be planted for 3,710 ha mostly in the West Bank area. However, most of farmers in the area in the West Bank (planned area of 2,400 ha) is not using the irrigation facilities for planting due to the increased cost of diesel fuel in the dry season[20]. As for the remaining 1,310 ha, the NIA reported that corn is planted for 28 ha at the time of the ex-post evaluation. Although the Pampanga Provincial Agriculturists are conducting the training courses on cash crops in collaboration with the NIA, only 4% of the respondents of the beneficiary study reported the introduction of the cash crops after the project. Reasons for not introducing the cash crops are the preference of farmers to continue rice cropping which farmers are accustomed to, unsuitable soil and weather, and lack of funds.

As stated in the section on relevance, the introduction of cash crops was planned in order to facilitate payment of water fees by farmers in the West Bank and increase the economic benefit by the project. However, the project should have considered the preference of farmers and farming patterns and measures to secure necessary funds. With regard to the introduction of new crops, it is necessary to conduct a pilot project and confirm the achievement in planting, sales, and revenue, or review and confirm the cropping achievement in neighboring areas, before including the new crops in the planned beneficiary areas.

On the other hand, in the upstream portion of the dam outside the project area, rice is planted in an area of 550 ha during the dry season using dam backwater after the project completion. At the time of the ex-post evaluation, the NIA is conducting the necessary operation of dam intakes to benefit the farmers in the upstream area and initiated negotiations with the farmers to collect water fees. The NIA estimates that about 3,000 ha in this area could be planted with rice in the dry season using the dam backwater. If the area is included, many farmers can benefit and contribute to effective utilization of the project facilities. In order to include the area in the FUSA, it is necessary to construct necessary canals and form IAs. In addition, the NIA must provide guidance on and manage the planting periods for the irrigation water to be supplied properly to each of the upstream and downstream portions of the dam[21]. It should also be noted that the upstream area of the dam is in the lowland and inundated in the rainy season and cannot be planted in the rainy season.

(2) Yield and Annual Production of Rice

As shown in the table below, yields of rice did not meet the target of the SAPI. Since the irrigated and planted area is about 30% of the plan and the yield falls below the target, the annual production of rice is estimated at 23% of the plan.

[20] In the West Bank area, corn was planted in some places in the dry season, but egg plant and tomato were not.

[21] Although it is reported that the necessary facilities in the area such as canals are not large ones, the costs and benefits must be reviewed. As for the management of the planting period, the NIA must close the intake gate of the dam for the upstream area to avail the backwater in the dry season and open the gates to supply water to the downstream area only after confirming that the upstream farmers finished planting rice.

Table 3: Yield and Annual Production of Rice in the Project Area

Item	Before Project	SAPI (Planned)	Actual*	Actual / Planned
Rice Yield (ton/ha) (Dry season)	3.8	5.48	4.23	77.2%
Rice Yield (ton/ha) (Rainy season)	3.7	5.35	3.89	72.7%
Estimated annual production of rice (ton)	-	93,384	21,457	23.0%

Source: Appraisal documents, SAPI Report, NIA documents
*Note : Actual value is the average of the data from 2009 to 2011

The lower yield of the rainy season than the dry season is caused by floods and typhoons. It is hard to control natural disasters, but problems they cause may be mitigated to some extent by improving drainage. The NIA plans to dredge drainage and JICA is to conduct river improvement works as explained previously.

In the beneficiary survey, crop diseases, rat infestation, and lack of funds to purchase agriculture inputs were cited as major constraints to improving rice production. The SAPI assumed that the rice yield would be increased by the construction of irrigation facilities and agriculture inputs such as fertilizer. However, in the beneficiary survey, 31% of the respondents cited high cost of agriculture inputs, lack of funds, and unavailability of quality seeds as the major obstacles to improving productivity and achieving higher yield.

3.2.2 Qualitative Effects

To evaluate the effects and impact of irrigation projects, a beneficiary survey was conducted for 200 farmers using the irrigation facilities in the target area[22]. As mentioned in the section on the quantitative effects, the project's effects as a whole are limited due to decreased irrigated and planted area. However, among the beneficiary farmers who utilize the irrigation services, effects such as satisfaction with water supply and increase in yield were reported.

(1) Satisfaction with water supply

As shown in the following figure, the beneficiary farmers' satisfaction with irrigation water improved significantly compared with the one before the project.

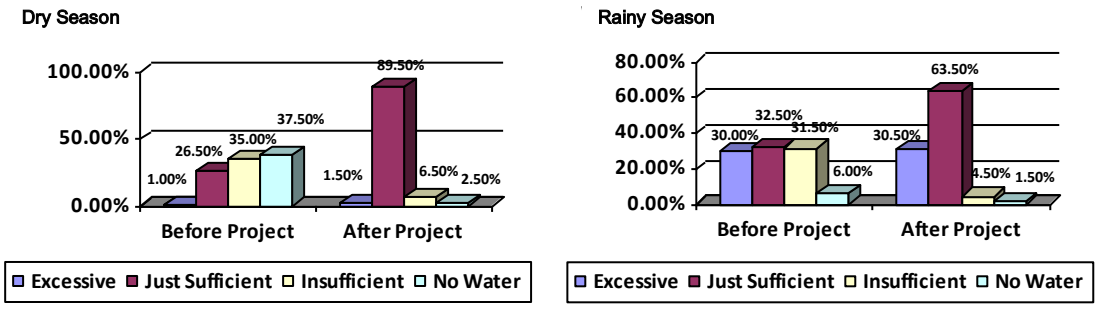


Figure 7: Extent of Satisfaction with Water Supply

[22] The beneficiary survey was conducted for 200 samples consisting of 72 farmers in nine IAs in the upstream area, 64 farmers in eight IAs in each of the middle and downstream areas, which were selected randomly from the list of IAs of the NIA. One of the IAs in the upstream area was the one using pumping irrigation in the West Bank. The IAs that were not utilizing the irrigation services were excluded from the sample.

Before the project, 38% of the respondents said that there is no water in the dry season, and 32% cited insufficient water in the rainy season. However, the situation changed significantly after the completion of the project. After the project, 90% reported that there is sufficient water in the dry season, and 64% said the same in the rainy season. On the other hand, more than 30% of the respondents said that water supply in the rainy season is excessive. The reasons are flood in the lower basin (20%) and insufficient drainage (10%). Inadequate fishpond drainage facilities were also pointed out as one of the causes.

(2) Changes of cropping pattern, planted area, and yield of rice

The figures below show a comparison of cropping pattern and planted area of rice before and after the project. 42% of the respondents said that they introduced double cropping of rice after the irrigation facilities were constructed. Many farmers irrigated their paddies by utilizing shallow tube wells or small pumps before the project. However, as shown in Figure 9, the irrigated area increased by about 60% after the project and the ratio of the irrigated area against the total planted area increased from 58% to 96%.

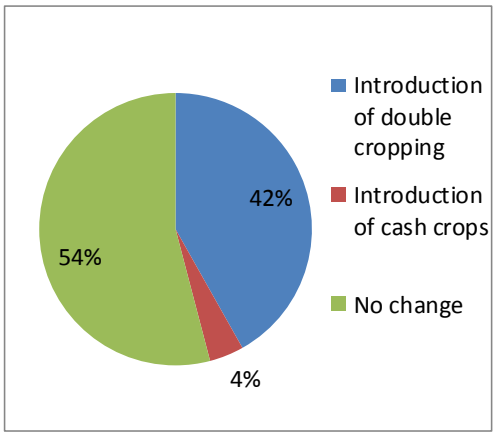


Figure 8: Changes of Cropping Patterns Before and After the Project

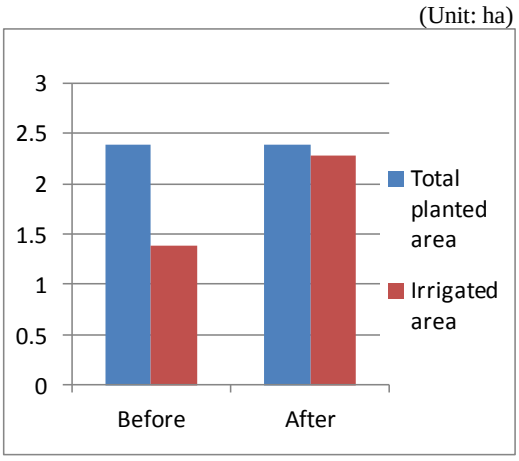


Figure 9: Changes of Irrigated Area of Rice Before and After the Project

Figure 10 shows a comparison of rice yield before and after the project. Out of the farmers surveyed, 45% responded that the yield increased in the rainy season, and 35% in the dry season after the project. In addition to the supply of irrigation water, the use of fertilizers, agricultural chemicals, and high-quality seeds, and the introduction of new agricultural technologies are mentioned as reasons for the increase in yield. 18% of the surveyed farmers received the training by the Philippine Rice Research Institute (PhilRice)[23] with the assistance by a JICA technical cooperation project. As a result, 12% adopted the palay check method introduced by PhilRice to monitor the rice production process and reported effects such as increased yield.

[23] The Philippine Rice Research Institute (PhilRice) of the Department of Agriculture of the Philippines is located in Central Luzon. Japan has been assisting PhilRice through such means as the construction of research facilities and technical cooperation of research capacity building since the 1980s. The Project on the Development and Promotion of Location-Specific Integrated High-Yielding Rice Technologies, a JICA technical cooperation project from 2004, promoted the method of "palay check" to monitor the necessary points and technologies to be followed in the rice production process.

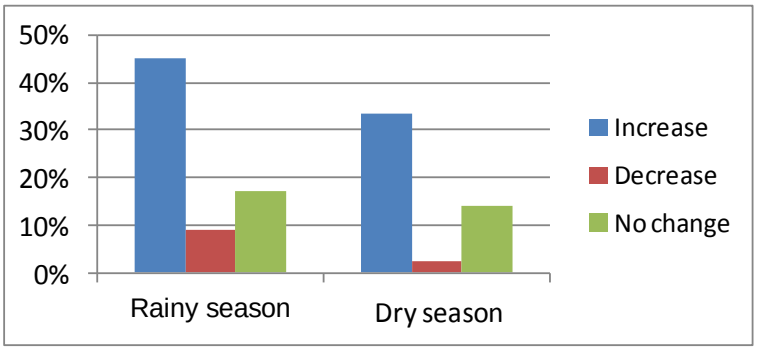


Figure 10: Yield of Rice[24] Compared with the One Before the Project

(3) Capacity building of NIA staff by technical support of this project and other related projects

This project supported the NIA staff in project implementation and supervision as well as formulation of a maintenance manual. The manual was in use at the ex-post evaluation. The long-term Japanese expert dispatched to the NIA Central Office also provided technical guidance. Moreover, after the completion of the project, NIA introduced a training module to strengthen IAs under the Irrigators Association Strengthening Support Technical Cooperation Project, another technical cooperation project of JICA. As a result, the capacity of NIA staff in charge of this project to train IAs has been enhanced. This module is currently used in the training of IAs.

3.3 Impact

3.3.1 Intended Impacts

(1) Improved living standards of local beneficiaries

According to the aforementioned beneficiary survey, farmer households who are using irrigation facilities reported that their net agriculture income increased by 90% on average after the project because of the introduction of double cropping of rice and the increase in yield. Other contributing factors are high market prices of rice due to stable demand and lower transportation costs after the construction of rural roads.

As shown in the figure below, 24% of the surveyed farmers answered that their standard of living improved significantly due to the increased income from agriculture, and 63% said that it slightly improved. Specifically, about half of the survey respondents reported improvement in food sufficiency and access to education for their children, 25% cited improvement of their residences, and 16% said that their savings increased.

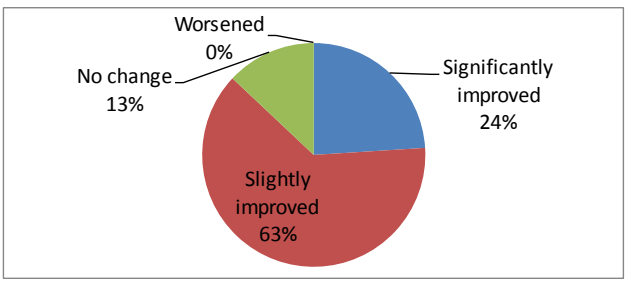


Figure 11: Changes in Living Standards

[24] This figure does not include the farmers (29% in the rainy season and 50% in the dry season) who did not plant rice before the project. It is not possible to compare their rice yield after the project with the one before the project, as the latter does not exist.

3.3.2 Other Impacts

(1) Impact on the natural environment

For this project, ECC was issued in February 1996 for the irrigation of 10,500 ha based on the plan revised by the SAPI[25].

In the beneficiary survey, 87% answered that there is no change in the natural environment by the project. 13% responded that there were changes in the environment including 7% citing negative impacts such as river pollution by dumping of garbage as responded by 3% of the respondents. However, no serious problems were reported. During the site visit, the environmental situation in various areas, including the one where dumping of garbage was reported, was checked, but no contamination of water in canals and rivers and other negative impacts were observed. It is thus fair to say that the project had no major negative impact on the natural environment.

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(2) Land Acquisition and Resettlement

In this project, the relocation of residents did not take place, but the land required for the construction work was acquired and compensation in accordance with the standards of the NIA was made to the land owners. However, in some parts of the downstream section of the pump irrigated areas, the site for the planned construction could not be secured because the NIA was unable to gain approval from the land owner and some canals were not constructed. Such factors may have resulted in the reduction of FUSA by 952 ha in the area.

(3) Unintended Positive/Negative Impact

In the beneficiary survey, 45% of the farmers reported positive impacts such as improved access to education of children due to increased income. No negative impact was observed.

As mentioned in the section on effectiveness, the irrigated and planted area of this project is 30% of the planned value of the SAPI and the yield is less than 80% of the target. Therefore, the annual production of rice by the project as a whole is estimated to be only 23% of the plan. However, in the beneficiary survey, farmers who use irrigation facilities (in the limited area because of the decrease in the beneficiary area) showed significant improvement in water supply, and increased planted area and yield due to the introduction of double cropping of rice. The impact of improved living standards due to increased agricultural income has also been reported. From the above, this project has achieved its objectives at a limited level, therefore its effectiveness and impact is low.

3.4 Efficiency (Rating: 2)

3.4.1 Project Outputs

(1) Civil Works

Table 4 shows the planned and actual major outputs of the project.

[25] In the ECC, conditions such as the prevention of soil erosion, noise and dust caused by construction work were required. However, the information on measures to deal with these conditions could not be obtained from the NIA staff in charge of project implementation.

Table 4: Planned and Actual Major Outputs of the Project

Item	At Appraisal	SAPI (Planned)	Actual
FUSA	11,540 ha	10,500 ha	11,920 ha (PCR, Project Completion Report)
Diversion dam		No change	No change
Fixed weir	Length: 850 m Height: 1.3 m Crest elevation: 8.6 m	Length: 850 m Height 1.3 m Crest elevation: 8.6 m	Length: 850 m Height: 1.3 m Crest elevation: 8.6 m
Movable weir	Length: 150 m Spillway gates: 3 Flushing sluice gate: 1	Length: 150 m Spillway gates: 3 Flushing sluice gate: 1	Length: 150 m Spillway gates: 3 Flushing sluice gate: 1
Water intake gates	5	5	5
Diversion channel	—	Width: 160 m Depth: 8 m Length: 3.3 km	Width: 160 m Depth: 8 m Length: 3.3 km
Pumping station	None	Added	Added
Pumps	—	3	3
Rehabilitation of pumps in Right Bank area	—	—	3 places (addition)
Canals	Total: 162.13 km	Total: 141.77 km	Total: 116.876 km
Main canals	36.96 km	29.35 km	31.828 km
Pump supply canal	—	(Addition) 2.66 km	2.66 km
Pump canals	—	(Addition) 17.44 km	14.136 km
Laterals	75.77 km	92.32 km	68.252 km
Sub-laterals	49.4 km		
O&M roads	Same as canals	N/A	Same as canals
Drains	Total: 116.06 km	Total: 100.80 km	Total: 192.08 km
Main drain	27.95 km	—	43.98 km
Secondary drain	33.17 km	—	55.35 km
Collector drain	54.94 km	100.80 km	80.85 km
Farm drain	—	—	11.90 km
On-farm facilities	1,208 km	Included in the drains	Included in the drains
Project facilities	7 buildings	N/A	7 buildings

Source: Appraisal documents, SAPI Report, JICA internal documents, NIA

Due to the impact of the eruption of Mount Pinatubo and changes in land use, the following changes were made to the scope in the SAPI in 1995. However, there is no change for the diversion dam.

1) Changes in the target area: Deletion of residential and industrial areas, flood-prone areas and lahar affected areas, addition of pump irrigation areas in the West Bank
2) Introduction of pumping irrigation facilities in the West Bank
3) Significant changes in the arrangement of the canals and drainage

There were also the following changes from the plan of the SAPI.

1) Adding the San Mateo area in the upstream region, rehabilitation of small pumps on the Right Bank, and increase of FUSA:

These changes were based on the needs of the areas and considered appropriate. By these changes, FUSA was increased from 10,500 ha planned by the SAPI to 11,920 ha.

2) River improvement works and increased drainage system:

The SAPI expected the accumulation of lahar and pointed out that, unless another responsible agency improved drainage of the Bungang Guinto river, it would be difficult to prevent flooding. Therefore, the SAPI excluded the construction of major drainage systems. However, the actual construction work added the improvement works of the river and construction of drainage system within the service area and included the down-stream areas which were affected by flood. These works were done based on the assumption that the river drainage improvement in the downstream area would be continued by the Pintatubo Commission, a government agency.

Nevertheless, the river improvement work was not continued by the Pinatubo Commission. Since the flood control measures to be done in collaboration with related projects were not implemented as planned, the inundation problem in the target area was not solved. As explained in the section on effectiveness, this has become one of the causes of the reduction in planted area in the rainy season.

3) Decrease of pump canals and sub-laterals

In the West Bank where pumping irrigation was introduced, some pump irrigation canals were not constructed due to land acquisition problems, and a few sub-laterals were not constructed due to soil problems. These changes were unavoidable but they led to the reduction of FUSA in the area by 952 ha[26].

(2) Procurement

At the time of the appraisal, procurement of equipment for maintenance was planned as shown in the table below. The SAPI does not explain details on the equipment to be procured, but it is assumed that the same equipment was to be procured since the same budget at the appraisal was planned. However, according to a NIA staff in charge of the project, the procurement was narrowed down to the necessary equipment in civil works and number of construction equipment and hydro-meteorological equipment was reduced during the project implementation, since the contractors already had these equipment items. On the other hand, data analysis and communication equipment was increased to facilitate the implementation of the project. In the face of the increased procurement cost, it may be inevitable to reduce the number of equipment items for procurement and purchase only the necessary ones for civil works[27]. It should be noted that the problems on operation and maintenance due to lack of equipment has not been reported.

[26] Please refer to *Note 2 in Table 2 on page 9.
[27] Reasons for the increased procurement cost could not be obtained.

Table 5: Planned and Actual Procurement of Equipment

Item	Appraisal	Actual	Item	Appraisal	Actual
Construction equipment	42	28	Hydro-meteo station equipment	22	8
Vehicles and motorbikes	27	24	Data analysis and communication equipment	17	22

Source: Appraisal documents, JICA internal documents

3.4.2 Project Inputs

3.4.2.1 Project Cost

As shown in the table below, the total project cost was 12.569 billion yen at the time of the appraisal but was reduced to 9.839 billion yen due to a change of the plan at the SAPI[28]. However, the actual cost increased to 12.443 billion yen, which is 126% of the planned value of the SAPI. In peso, the cost increase is larger with the actual value of 4.603 billion pesos against 2.674 billion pesos of the plan, amounting to 172% of the planned value. The difference in increase in the cost of the yen and peso is attributed to the yen appreciation during the project period. At the SAPI, the rate was 3.68 yen per pesos but the weighted average rate during the project period is 2.70 yen per pesos. Therefore, the total cost in yen increased differently from the cost increase in peso. The following are the major reasons for the increased costs.

1) Increase in the cost of civil works: Construction costs of additional canals and drainage systems, and the extension in the period for using equipment for constructing the diversion dam as well as reworking the facilities in downstream area in the Right Bank
2) Cost increase in consulting services: Extension of the construction period due to additional work and the increased ratio of man-months (M/M) of international consultants
3) Increase in administrative costs: Extension of the project period including the time for suspension of the project
4) Increased cost of land acquisition: Increase in the target area for land acquisition due to the design changes, increase in land value, compensation to farmers for crops affected by construction, etc.

Table 6: Planned and Actual Project Cost

Items	Appraisal		SAPI (Planned)		Actual		Actual/Plan	
	Mil. yen	Mil. peso	Mil. yen	Mil. peso	Mil. yen	Mil. peso	Mil. yen	Mil. peso
Total cost	12,569	1,848	9,839	2,674	12,443	4,603	126%	172%
Loan	9,427	1,386	9,427		9,303			
<Breakdown>								
Civil works	9,118	1,340.9	7,058	1,918	9,768	3,527	138%	184%
Procurement	216	31.8	217	59	266	84	123%	142%
Contingencies	466	68.5	1,549	421			0%	0%
Consulting service	489	71.9	596	162	769	379	129%	234%

[28] The possible reasons for the reduction of the total cost in yen from the appraisal to the SAPI are the appreciation of yen and that the SAPI does not include tax in the cost.

Land acquisition	265	39.0	105	28.4	581	239	556%	842%
Administration	580	85.3	313	85	914	331	292%	389%
Tax	1,435	211.0	N/A	-		0		
Agriculture/ institutional development	-	-		-	145	44		
Exchange rate (Yen/Peso)	6.8 yen (1990)		3.68 yen (1995)		4.15 yen (1996) - 2.11 yen (2003)			

Source: Appraisal documents, SAPI Report, JICA internal documents, NIA

3.4.2.2 Project Period[29]

The table below shows the planned and actual project period. At the time of the appraisal, the project was to be completed in 86 months. However, it was suspended for 38 months due to the Mount Pinatubo eruption. Therefore, the evaluation was done excluding the suspension period and based on the SAPI. In the SAPI, the implementation period after the resumption of the project was planned for 84 months and the total project period is calculated as 104 months including 20 months before the suspension of the project. The actual project period was 106 months, which was slightly longer than the SAPI plan. The main reason for the extension is the delay in approval of the changed project scope from the National Economic Development Authority (NEDA).

Table 7: Planned and Actual Project Period

Appraisal	SAPI (Planned)	Actual*	Actual/ Plan
September 1990 – October 1997 (86 months)	July 1991 - February 1993 + 84 months (20 + 84 = 104 months)	July 1991 - February 1993, April 1996 - May 2003 (20 + 86 = 106 months)	102%

Source: Appraisal documents, SAPI Report, JICA internal documents

*Note: Actual period shows the total months from the conclusion of the contract to the month when the project suspended due to the eruption of Mount Pinatubo and the period from the month when the project resumed till the completion of the civil works.

3.4.3 Results of Calculations of Economic Internal Rates of Return (EIRR)

The table below shows the results of the recalculation of the economic internal rate of return (EIRR) of this project using the almost same calculation method and the pre-conditions at the time of the appraisal[30]. There was no big change in the EIRR of 15.8% at the SAPI from 16.2% at the time of the appraisal. However, the re-calculated EIRR at the ex-post evaluation based on the actual irrigated and planted area is only 1.5%. The significant decrease from the EIRR of the SAPI was due to the reduction of planted area and the cost increase. It is assumed that substantial areas are actually irrigated and planted but not reported to the NIA; the EIRR may increase if these areas are included in calculation.

[29] The project period is from the conclusion of the loan contract to the completion of civil works.

[30] In re-calculating the EIRR at the ex-post evaluation, the economic benefits from fish ponds were taken into account.

Table 8: Results of Calculations of Economic Internal Rates of Return

Appraisal	SAPI (Planned)	Recalculation at Ex-Post Evaluation
16.2%	15.8%	1.5%
(Pre-conditions) Project life: 50 years Benefit: Increased production of rice and cash crops Cost: Project cost, O&M cost, replacement cost of dam facilities	(Pre-conditions) Project life: 50 years Benefit: Increased production of rice and cash crops Cost: Project cost, O&M cost, replacement cost of dam and pumping facilities	(Pre-conditions) Project life: 50 years Benefit: Increased production of rice, cash crops and fish ponds Cost: Project cost, O&M cost, replacement cost of dam and pumping facilities

Source: Appraisal document, SAPI Report, documents of NIA

From the above, the project cost and the project period slightly exceeded the plan. Therefore efficiency of the project is fair.

3.5 Sustainability (Rating: 2)

3.5.1 Structural Aspects of Operation and Maintenance (O&M)

Irrigation facilities constructed by the project were transferred to Regional Office of Region III of the NIA after the completion of the project and the Pampanga Delta River Irrigation System (PDRIS) office is in charge of O&M of the project facilities. The PDRIS is categorized as a national irrigation system and the O&M system of the facilities are as shown in the table below.

Table 9: O&M System of the Project Facilities at Ex-Post Evaluation

Organization	O&M activities in charge
Irrigation Associations (IAs)	O&M of sub-laterals and on-farm facilities (Some IAs are responsible for O&M of laterals and collection of water fees[31]; these functions will also be transferred to other IAs)
NIA PDRIS Office	O&M of diversion dam, pumping stations, main canals, and laterals; collection of water fees
NIA Region III Office	Supervision of NIA PDRIS Office
NIA Central Office	Provision of necessary cost for rework and construction of facilities based on the report of PDRIS

Source: NIA

The PDRIS office employed 34 staff members when the facilities were transferred. However, due to the NIA's rationalization plan, the number of staff was reduced to 27[32]. This is a significant decrease from 73 who were to be employed for the office responsible for O&M planned by the SAPI, and the shortage of staff is affecting O&M of the project facilities in such ways as delayed dredging of canals. In 2012, as part of the rationalization plan, the office with most of the staff was transferred to the NIA provincial office in Florida which is far from the

[31] IAs which are registered as Model 2 in the IMT.
[32] Seven staff members out of the 27 are in charge of water fee collection.

project site. Although several staff members including the project manager are to be stationed at the dam site office, the transfer must be done without affecting activities such as monitoring and guidance to IAs since most of the staff members are far from the project site[33].

The NIA introduced the Irrigation Management Transfer Program (IMT) in 2008 to transfer the maintenance activities of irrigation systems to IAs and improve the performance of the national irrigation systems. In the IMT, IAs sign a contract with the NIA with classification from model 1 to 4 depending on their O&M capabilities and the NIA will gradually transfer the O&M activities and collection of water fees to IAs[34]. The higher the model number, the higher maintenance capacity is required for the IA and the NIA trains IAs to strengthen their capacity.

In this project, 62 IAs were organized but only 45 IAs are functioning. 17 IAs including 12 IAs in the West Bank are not utilizing the irrigation services and thus are not functioning[35]. The NIA is promoting the IMT to the functioning 45 IAs. At the time of the ex-post evaluation, 15 IAs, i.e., one-third of the functioning ones, are registered as model 2 and conducting O&M of facilities such as sub-laterals and collecting water fees. The ratio of model 2 IAs in the project is much higher than the national ratio of 11%.

As for the entire structural aspect of maintenance, staff shortage in the PDRIS office is a concern. To address this concern, the PDRIS office plans to reduce the staff's burden by delegating O&M of sub-laterals and water fee collection to IAs. It is needed to transfer O&M to IAs in a smooth fashion and give guidance to them.

3.5.2 Technical Aspects of Operation and Maintenance

The staff members of the PDRIS office include three engineers with expertise and the office has implemented the necessary training for the staff using the maintenance manual that this project produced. No major problems are observed in the technical aspects of operation and maintenance by the PDRIS Office.

As for the IAs, according to the beneficiary survey, 89% of the respondents are satisfied with the services by IAs such as water management and 70% with their O&M activities[36]. 93%

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[33] The vice president of the IA Federation expressed the concern in an interview.

[34] Responsibilities of each model are as follows. (Source: IMT Manual of NIA 2009)

Model 1: The NIA is responsible for O&M of the entire irrigation system, while some O&M activities for sub-laterals and on-farm ditches, monitoring of irrigation water, production of the list of irrigated and planted area, and promotion of water fee payments are commissioned to IAs and the NIA pays the corresponding remuneration to IAs.

Model 2: IAs are responsible for O&M of facilities under laterals, collection of irrigation fees from members, and financial management of the fees. The NIA will pay the IA a certain percentage of the water fees collected, depending on the collection rate.

Model 3: In addition to the responsibilities of model 2, IAs will conduct O&M of the part of main canals excluding the main canals from dams to the first lateral.

Model 4: IAs are responsible for O&M of all the facilities, collection and management of water fees, and management of funds for O&M and construction of facilities. The NIA will conduct monitoring and evaluation of the system and provide technical support to IAs when necessary.

As of November 2011, 463 IAs, or 19% of all the IAs in the country, are registered as model 1, 270 (11%) as model 2, 30 as model 3, and 2 as model 4, and others are in the process to be registered at IMT. In Region 3, no IAs are registered as model 1, but 26% are registered as model 2, and 8% as model 3. (Based on NIA documents)

[35] Reasons for the non-functioning status of these IAs include the following: non-utilization of pumping irrigation facilities by 12 IAs; some areas needing construction and repair of irrigation facilities; and withdrawal of small pumps in the Right Bank areas due to the high cost of diesel fuel.

[36] Most of the responses indicating that they are not satisfied are due to deficiencies of drainage and delays in repair of the small pumps (often due to delays in funding) and not about the maintenance capacity of IAs.

responded that the organizational capacity of IAs is high. However, in the focus group discussions with IAs utilizing the irrigation services, it became clear that some IAs had not received training on O&M yet. The PDRIS office planned to conduct training courses on the IMT including ones on O&M for all the IAs in 2012. As described in the box below, an IA is engaged in various activities such as parcillary mapping, credit services to members, and joint marketing of rice in collaboration with related organizations.

Box 1: IA Which Is Engaged in Various Activities[37]

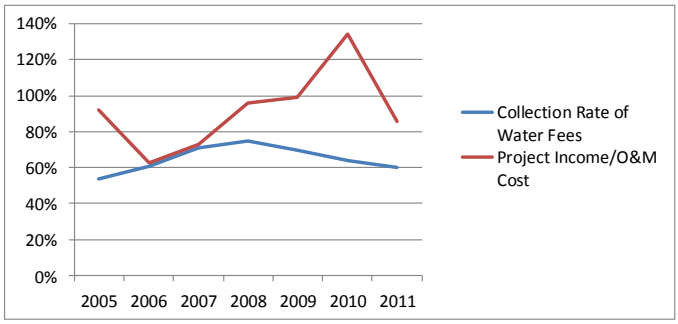
TA. RITA RICAP IA with 98 members is registered as a model-2 IA in the IMT and is engaged in the O&M of sub-laterals and water fee collection. The collection rate of water fees has been as high as 93 - 95%, with the exception of the years significantly affected by typhoons. Under the strong leadership of its president, the IA has also carried out the following activities.

- Parcillary mapping of FUSA: The mapping resulted in an increase of FUSA from about 80 ha to about 160 ha, and the IA can receive a larger share of the collected water fee from the NIA.
- Credit services to members utilizing a loan from the Land Bank of the Philippines: The IA got a loan of 2 million pesos at an annual interest rate of 8.5% from the Land Bank and on-lend it to its members by charging an additional interest of 4.5% as management fee. The members use the loan to purchase agriculture inputs.
- The IA has secured a high income for its members by selling rice produced by the members directly to the National Food Authority (NFA).

No major problems were observed in technical aspects of O&M of the project, although further training for IAs is needed.

3.5.3 Financial Aspects of Operation and Maintenance

The figure below shows the collection rate of water fees and the ratio of project income versus O&M cost[38].



Source: NIA

Figure 12: Collection Rate of Water Fees and Rate of Project Income/O&M CostThe PDRIS

[37] The president of the IA also serves as the vice president of the Federation of IAs.

[38] JICA uses the Sufficiency Rate of Operation and Maintenance Cost (Actual O&M cost divided by Planned O&M cost) as the Operation and Effect Indicator. However, since the data for the indicator was not available, alternative indicators were used to show how much of the O&M cost was covered by the income from the project and by the collected water fees. This was done because the NIA adopted a policy to cover the O&M cost by the income from water fee collection.

office has estimated that the water fee collection rate must be at least 80% for the collected fees to cover the regular O&M cost of the project facilities and set it as the target[39]. Until 2008, the water fee collection rate increased to nearly 80%, but decreased from 2009 because rice production decreased due to typhoons and floods.

The ratio of project income/O&M cost increased to nearly 100% or above from 2008 until 2010. However, this increase was due to the subsidy for diesel fuel cost and additional rental income of equipment; it was a temporary improvement and not sustainable[40]. The rate dropped to 86% in 2011.

To continue pumping irrigation, a subsidy is necessary. Thus the PDRIS office is seeking assistance from local governments, but there is no guarantee that a subsidy will be provided continuously. A deficit in the maintenance of each irrigation system is covered by regional offices of the NIA. However, since the NIA emphasizes the importance of keeping each system financially self-sufficient[41], the PDRIS Office must improve the financial status of the irrigation systems including increased collection rates of water fees.

3.5.4 Current Status of Operation and Maintenance

With regard to the maintenance situation of project facilities, the following issues have been observed at the time of the ex-post evaluation. However, the maintenance status of the diversion dam is good and has no major problems.

Here is a summary of problems in the O&M status of the facilities.

1) Main canal: Siltation on the part of the canal
2) Laterals: Erosion and accumulation of silt are seen in some parts of laterals
3) Drainage: Many drainage systems are clogged with water lilies and debris.
4) Mexico area: The major problems are the old small pumps and the lack of spare parts.

The necessary parts are likely to be secured. In addition, a check gate to raise the river water level was broken due to a typhoon[42].

The O&M situation is expected to improve, as the PDRIS office plans to rework facilities such as the laterals to address the erosion problem and dredge canals and drainage systems.

The project has no problem in the technical aspects of O&M, but faces the shortage of staff in the PDRIS office which is responsible for O&M and an unstable financial situation. Thus it has some problems in terms of the structure and financial aspects of O&M, and sustainability of the project is fair.

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[39] For the national irrigation systems, collected water fees are sent to the NIA central office which provides the O&M costs to the field offices that are engaged in maintenance. When IAs conduct O&M of the facilities, the PDRIS office pays them commissions from a share of the collected water fees. However, IAs that use small pumps are to pay for the repair cost of pumps.

[40] Major repair costs of facilities are paid by the NIA central office to the PDRIS office including the rental costs of necessary equipment. When the PDRIS office uses its own equipment, the rental fees become income of the PDRIS office. Therefore, in the years when the PDRIS office was engaged in many major reworking tasks, its income increased.

[41] The NIA regional offices cover the deficit of a non-self-sufficient system. However, when the deficit becomes large, it is difficult for regional offices to cover it. Thus the NIA provides incentive-based remuneration to project staff to promote self-sufficiency of each system.

[42] The check gate was not constructed by the project. However, breakages in the gate reduced the water level of the river and made it difficult for the small pump to draw the river water.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project is fully consistent with the development policies and development needs of the Philippines for the improvement of productivity and self-sufficiency rate of rice as well as Japan's aid policy to support agricultural development; therefore its relevance is high. Households of the beneficiary farmers reported effects and impacts of the project, such as an improved agricultural income due to the increase in rice production and improved living standards. However, the extent of these effects and impacts is very limited as the actual irrigated and planted areas were about 30% of the planned ones; hence the overall effects and impacts of this project are low. Efficiency of the project is fair because its cost and period exceeded the plan. Some problems have been observed in staff shortages of the local offices responsible for maintenance and financial sustainability; therefore sustainability of the project is fair. In light of the above, this project is evaluated to be unsatisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

The NIA is recommended to grasp the situation of the project area and to implement the following for the purpose of increasing the irrigated and planted area whose achievement rate of the target is low, and improving effective use and sustainability of the project facilities. It is also necessary that the NIA central office secures the budget for this purpose.

1) The PDRIS office will proceed with the rework and construction of necessary facilities based on their action plan. These works can expand the planted area by 1,000 ha.

2) The farmers may be using the irrigation facilities in the areas that are larger than what they have declared to the NIA. Therefore, it is recommended that the PDRIS Office conduct the parciliary mapping based on its action plan and identify the correct FUSA. Then, the information on revised FUSA should be shared among the PDRIS Office, IAs and IA members to increase transparency of the data, and water management should be jointly done by them. The NIA is required to continue to provide guidance to the farmers in order to increase their awareness on proactive management of FUSA. As for the application of planted area by farmers in the rainy season, the PDRIS will examine the areas which cannot be planted due to flood and the areas which are planted using rain water and not reported to NIA, and study how to collect water fees even when farmers use rain water for planting. It is also recommended that for the future projects, the NIA identify the irrigated area by conducting parcillary mapping in an early stage after the completion of the projects. The necessary budget for this purpose should be secured in the project cost.

3) Pump irrigation facilities were used only for 30 ha, or 1.25% of the planned area, at the time of the ex-post evaluation due to high diesel fuel cost and it cannot be said that the facilities have been effectively utilized. The low utilization rate of the facilities has caused lower collection of water fee, which has become a burden on the PDRIS office that bears the maintenance cost. Therefore, it is recommended to explore the effective use of irrigation pumps. For example, it may be worthwhile to create a system that can provide a subsidy for diesel fuel costs in a stable manner to promote the use of the facilities by the target farmers. The NIA will consult with IAs and farmers in the target area and study a possible revolving

subsidy mechanism in which the subsidy is provided before the planting season and collected at the harvest as an addition to the water fee so that the collected fee can be used for the next season[43].

4) It is estimated that about 3,000 ha can be irrigated by the project in the upstream part of the diversion dam. The PDRIS office has begun to identify the area which can be irrigated by the project, and study the cost to construct the necessary facilities and to organize IAs. The PDRIS office should fully review the costs and benefits of the expansion of FUSA and the system to provide advice for planting as well as for proper water management and take necessary measures to expand the FUSA.

5) To transfer the maintenance and management of the facilities below laterals to IAs, the PDRIS will continue to strengthen the capacity of the IAs and promote their registration under the IMT. Such undertaking will help reduce the PDRIS office's burden on maintenance.

4.2.2 Recommendations to JICA

1) Keep monitoring the status of addition of new FUSA and the action plan of the PDRIS office including parcillary mapping and repair of facilities, and provide advice.
2) For effective use of pumps, consult with the NIA and provide necessary advice.
3) Follow the implementation of dredging of the Bungang Guinto river, which has been proposed to the ongoing Pinatubo Hazard Urgent Mitigation Project III by JICA.

4.3 Lessons Learned

1) In this project, the utilization rate of irrigation pumps was greatly reduced due to the rising cost of fuel. For pumping irrigation, it is necessary to carefully review the beneficiaries' ability to pay water fees in the target area and consider the risk that facilities may not be utilized due to the rising fuel cost. For project planning, economic cost and benefit, financial sustainability, and necessary subsidies should be analyzed with the above factors taken into consideration.

2) The project planned to introduce cash crops but did not succeed. Even if cash crops are expected to have a high economic effect, such introduction has to be carefully considered in advance since many factors affect the outcome. The factors include not only climate, soil, profitability, and market, but also cropping patterns, willingness of farmers to introduce cash crops, and their financial capacity. The introduction of new crops should be included in the planned cropping areas after conducting a pilot project and confirming the results in planting, sales, and revenue, or after confirming the performances of cropping in neighboring areas.

3) The project faced problems of increased flooding caused by lahar accumulated in the river and an insufficient drainage system, which resulted in many areas that could not be planted in the rainy season. Increased risks of flooding due to lahar had been expected but were not

[43] This undertaking was proposed by the vice president of the federation of IAs. However, when the farmers are requested to make payment, it is necessary to carefully review their ability to pay in comparison with their revenue in the target area. It will be important to fully explain to the farmers the cost and benefit of pumping irrigation compared with shallow wells and engage in negotiations with them.

reflected in the target setting of planted area and yield in the rainy season. In the areas affected by flooding, it is necessary to analyze conceivable risks more carefully and set realistic goals and targets for planting in the rainy season.

Comparison of the Planned and Actual Scope of the Project

Item		Plan (SAPI)	Actual
1.Output			
(1) Civil Works	FUSA (ha)	10,500	11,920 (in PCR)
	Diversion Dam (Fixed weir)	Lenghth 850m、Height 1.3m、Crest Elevation 8.6m	Lenghth 850m、Height 1.3m、Crest Elevation 8.6m
	(Movable weir)	Length 150m, Spillway gates 3, Flushing sluice gate 1	Length 150m, Spillway gates 3, Flushing sluice gate 1
	(Water Intake Gates)	5	5
	(Diversion Channel)	Width 160m、Depth 8m, Length 3.3km	Width 160m、Depth 8m, Length 3.3km
	Pumping station	Pumps 3	Pumps 3
	Rehabilitation of pumps in Right Bank area	–	3 places
	Main Canals(km)	29.35	31.828
	Pump Supply/Pump Canals (km)	20.1	16.796
	Laterals・Sub-laterals (km)	92.32	68.252
	Drains (km)	100.8	192.08
	Project Facilities	N/A	7
2) Procurement	Construction equipment	42	28
	Vehicles・Motorbikes	27	24
	Hydro-meteo station equipment	22	8
	Data analysis & communication equipment	17	22
3) Consulting Service	Foreign (M/M)	N/A	172.6
	Local (M/M)	N/A	129.6
2. Project Period		July 1991 - February 1993 + 84 months (104months)	July 1991 - February 1993, April 1996 - May 2003 (20＋86＝106 months)
3. Project Cost	Amount paid in Foreign Currency	6,918 million yen	9,293 million yen
	Amount paid in local currency	2,921million yen (793 million Peso)	3,150 million yen (1,167 million peso)
	Total	9,839 million yen	12,443 million yen
	Japanese ODA loan portion	9,427 million yen	9,303 million yen
	Exhange rate	1 peso = 3.68 yen (As of 1995)	1 peso = 2.70 yen (Weighted average)