Indonesia

Ex-Post Evaluation of Japanese ODA Loan "Project Type Sector Loan for Water Resources Development (II)"

External Evaluator: Junko Fujiwara, OPMAC Corporation

## 0. Summary

The objective of this project was to enhance food production, particularly in rice, to achieve the nation's self-sufficiency in food supply through the construction and rehabilitation of moderate scale irrigation facilities in Western and Central Indonesia thereby contributing to the reinforcement of the agricultural production infrastructure and poverty reduction in rural Indonesia. This objective was well in line with Indonesia's development policy and the nation's developmental needs for increased food production as well as with Japan's ODA policy. However, it was assessed that some problems were evident in the project planning. The project relevance is evaluated as fair.

With regard to the effectiveness of this project, it was confirmed qualitatively that the farming water supply and rice production improved and that the crop intensity of rice increased through this project by the interview surveys. Although some target figures in the Operation and Effects indicators were not achieved, the objective "to enhance food production particularly in rice to achieve self-sufficiency in food supply" was almost accomplished as a whole, as the unit yield and crop intensity of rice improved steadily. Accordingly, the effectiveness of utilizing irrigation facilities constructed under this project was confirmed as they contributed to the improvement of whole farming gross income and average annual income. Moreover, the intended project impact, "contribution to the enhancement of the farming production infrastructure and to poverty reduction in rural Indonesia" was confirmed, no issues were recognized in the areas of the natural environment, land acquisition and resettlement, and there were no other negative impacts. Therefore it is concluded that the project are evaluated as high.

The efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of operation and maintenance, there were no issues with the institutional aspects and the present condition of the irrigation facilities covered under the project. However, there have been some minor problems with the technical and financial aspects, which may give a negative impact on the operation and maintenance systems and the physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

In light of the above, the project is overall evaluated as partially satisfactory.

#### 1. Project Description



Project Location

Dam Constructed under the Project (Batang Tongar)

#### 1.1 Background

The Government of Indonesia identified self-sufficiency of the rice supply as the nation's main goal to ensure national food security and deployed various policies to increase rice production such as the introduction of high-yield varieties and the expansion of irrigated farmland.

These policies were effective, resulting in increased rice production in the 1980s, with the nation's self-sufficiency rate in rice reaching 100% in 1984. However, the demand-supply balance of rice remained unstable as the population increased at 1.6% annually and rice consumption increased at 3.1% annually. Combined with the slow growth in cultivated areas due to the decrease in farmland on Java Island and so on, rice production was finally not able to catch up with demand.

In 1996, Japan signed a loan agreement for "Project Type Sector Loan for Water Resources Development (I)" with the Government of Indonesia and provided assistance for the new construction and rehabilitation of small-scale irrigation facilities, ponds and flood control facilities in 24 provinces throughout the country. However, the nation's agricultural production capacity was reduced due to a series of severe weather events such as the droughts of 1994 and 1997 as well as with the high prices of agricultural chemicals and materials caused by the depreciation of the Rupiah in 1998. As a result, the nation's self-sufficiency rate in rice supply dropped to 84.2% in 1999. It was increasingly difficult to maintain self-sufficiency in rice, and the country came to rely on imported rice constantly.

The Indonesian government was facing difficulties in securing sufficient funding for new public works. Under these circumstances, this project was expected to widely contribute to increased rice production in Indonesia and to revitalize local economies through the construction and rehabilitation of moderate-scale irrigation facilities in Western Indonesia (Sumatra Island) and Central Indonesia (Java Island and Kalimantan Island).

## 1.2 Project Outline

The objective of this project was to enhance food production mainly in the rice crop for the accomplishment of self-sufficiency in the food supply by building and rehabilitating moderate-scale irrigation facilities at 19 sites in 12 provinces in Western and Central Indonesia, thereby contributing to reinforcement of the rural agricultural production infrastructure and poverty reduction:

Loan Approved Amount / Disbursed Amount	18,676 million yen / 18,47	3 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March 30, 2001 / July 5, 2001		
Terms and Conditions	[Main portion] Interest rate: Repayment period: (Grace period) Conditions for procurement: [Consulting portion] Interest rate: Repayment period:	1.80% 30 years (10 years) general untied 0.75% 40 years	
	Conditions for procurement:	(10 years) bilateral tied	
Borrower/Executing Agency	Government of Indonesia / Director General of Water Resources, Ministry of Public Work		
Final Disbursement Date	December, 201	1	
Related Studies (Feasibility Studies, etc.)	N/A		
Related Projects	<ul> <li>N/A</li> <li>Related Japanese ODA loans <ul> <li>"Project Type Sector Loan for Water Resources Development" (L/A Signing: FY1996, approved amount: 11,797 million yen)<sup>1</sup></li> <li>"Participatory Irrigation Rehabilitation and Improvement Management Project" (L/A Signing: FY2007, approved amount: 12,310 million yen)<sup>2</sup></li> <li>Way Rarem Irrigation Project (Phase 1-4) (L/A Signing: FY1978, FY1980, FY1987, FY1991, approved amount: Total 22,260 million yen)<sup>3</sup></li> <li>"Way Curup Irrigation Project" (L/A Singing: FY1991, approved amount: 1,422</li> </ul> </li> </ul>		

<sup>&</sup>lt;sup>1</sup> This project was implemented as the phase 1 of Project Type Sector Loan for Water Re-sources Development (PTSL-II). <sup>2</sup> This project was processed following PTSL II. Some subpresents of PTSL II.

<sup>&</sup>lt;sup>2</sup> This project was processed following PTSL-II. Some subprojects of PTSL-II were taken over to Participatory Irrigation Rehabilitation and Improvement Management Project (PIRIMP).

<sup>&</sup>lt;sup>3</sup> Rehabilitation of the irrigation facilities which were constructed under this project was included in PTSL-II.

<sup>&</sup>lt;sup>4</sup> Ditto.

## 2. Outline of the Evaluation Study

- 2.1 External Evaluator Junko Fujiwara (OPMAC Corporation)
- 2.2 Duration of Evaluation Study

Ex-post evaluation of the project was conducted as below: Evaluation period: January 2014 – April 2015 Site survey: April 6 - May 9, 2014, and August 6 - 16, 2014

#### 2.3 Constraints during the Evaluation Study

2.3.1 Limitations in Site Surveys and Beneficiary Surveys

In order to evaluate the project efficiently in a limited timeframe for this ex-post evaluation, 5 subprojects out of the total 19 subprojects were chosen for site surveys to study how the facilities are currently managed (Table 1). Four out of these 5 subprojects were selected for the beneficiary survey in order to evaluate how effective the project has been and what kind of impacts were realized (same table).

The 5 subprojects were chosen carefully to ensure balanced evaluation including different design elements such as new construction or the rehabilitation of existing facilities, weirs or dam irrigation. Also, among the 12 provinces located in Sumatra Island, Java Island, and Kalimantan Island, 5 provinces were selected from each island to ensure balanced sampling from the provinces and islands. These 5 locations have different climates and their annual precipitations differ significantly.

Subproject	Island	Province	Site Survey	Beneficiary Survey
Batang Tongar Irrigation Improvement Project	Sumatra Ialand	West Sumatra	0	0
Way Curup Irrigation Improvement Project	Sumaira Island	Lampung	0	0
Lanang Irrigation Improvement Project	Jour Johnd	Central Java	0	0
Bajulmati Dam Irrigation Improvement Project	Java Island	East Java	0	0
Amandit Irrigation Project	Kalimantan Island	South Kalimantan	0	-

Table 1: Subprojects Selected for Site Survey and Beneficiary Survey

Source: Developed by Evaluator

Note 2: An outline of all the 19 projects is shown in the Table 18.

Note 1: Among 5 subprojects, Batang Tongar, Lanang and Bajulmati have both facilities which were newly constructed and rehabilitated, while Way Curup has only rehabilitated facilities and Amandit has newly constructed facilities under the Project.

## 2.3.2 Limitations in Data/Information Collection

Due to the decentralization of government authorities in Indonesia, local government and central government do not always communicate successfully with regard to grasping the current status of the 19 subprojects and how their Operation and Effect indicators are performing. As a result, it was difficult to collect and study survey results except for the 5 subprojects where site surveys were conducted.

Given the limitations in site surveys and beneficiaries' survey, as well as in data / information collection, analyses of the effectiveness, impacts and sustainability of the project will be based on the 5 subprojects where the Evaluator was able to study the current status of the project and to analyze the survey results in detail. This will constitute the overall evaluation of this project.

## **3.** Evaluation Results (Rating: C<sup>5</sup>)

- 3.1 Relevance (Rating:  $2^6$ )
  - 3.1.1 Relevance to the Development Plan of Indonesia
  - (1) National development plan level

Indonesia's 6th 5-year plan (Repelita VI: 1994/95 - 1998/99), on which the appraisal of the project was based in 2001, identified "improvements in agricultural produce in both quality and quantity" and "improvements in the living standard of farmers and rural society through diversification and increased efficiency in agriculture" as national goals. In addition, the subsequent 5-year national development plan (Propenas 2000-2004) identified agricultural development as a focus area, with the goal of "overcoming poverty and satisfying the people's basic needs".

At the time of the ex-post evaluation of this project, the National Long Term Development Plan (RPJPN) (2005-2025) and the second term National Medium Term Development Plan (PRJMN2) (2010-2014) were underway. These plans identified "food security" (competitive agriculture products, increased income for farmers, securing of natural resources and the environment, the building and maintaining of irrigation infrastructure and facilities) as a priority development agenda.

## (2) Sector development plan level

At the time of appraisal (2001), the national development 5-year plan (2000 - 2004) had focus strategies which included the expansion of agricultural production particularly in rice (the nation's main staple), the diversification of produce to satisfy agroindustry needs and to increase income for farmers.

<sup>&</sup>lt;sup>5</sup> A: Highly satisfactory, B:Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>&</sup>lt;sup>6</sup> ③: High, ②: Fair, ①: Low

At the time of the ex-post evaluation, the 5-year Agriculture Development Plan (2009 - 2014) laid out by the Ministry of Agriculture (MOA) (2010) was under way. This plan listed four main goals: 1) enhancement of food security with improved self-sufficiency in the main staples; 2) diversification of agricultural production to correct the heavy reliance on rice; 3) value-added and internationally competitive agricultural products to promote exports; 4) improvement of welfare for farmers.

## 3.1.2 Relevance to the Development Needs of Indonesia

The self-sufficiency rate of the food supply reached 100% in 1984 in Indonesia. In the years that followed, however, growth in population and income standards led to an increased consumption of rice. Combined with the decrease in farmland particularly on Java Island, the nation's structural shortage of rice was evident at the time of project appraisal. Self-sufficiency in food, particularly rice, is one of the pillars of Indonesia's national policy. To achieve this goal, the development of irrigation facilities was given the highest priority.

At the time of the ex-post evaluation, Indonesia's consumption of grains other than rice, such as wheat, was increasing along with rice, indicating a more diverse diet. However, demand for rice, as well as the need for increased rice production, was still high. In 2011, the country imported 2 million tons of rice.

The Western region of Indonesia (the area combing Sumatra Island, Java Island and Kalimantan Island), which was the target area of this project, has 85% of the nation's population (2010). The demand for rice in this region is proportionate to its population (86% of the national figure). Particularly on Java Island, where the population is dense, the demand for rice is at its highest (approximately 18.2 million tons) reaching approximately 68% of the demand for the entire Western region (approximately 26.7 million tons). The project area has an important role as the prime supply source for Java Island, where rice demand is highest in the nation. As for annual growth in rice production, the required growth rate was 1.5% both in the Western region and nationwide (Table 2).

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Item	Unit	Nationwide	Nationwide	Nationwide	Nationwide	Nationwide	Nationwide Region		Sumatra Island	Java Island	Kalimantan Island
Population (2010)	person	237,641,326	201,029,352	56,632,931	136,610,590	13,787,831					
Demand for Rice (2013)	Million tons	31.1	26.7	6.7	18.2	1.8					
Annual Demand for Rice Production Increase (2013)	%	1.5%	1.5%	1.5%	1.5%	1.5%					

Source: Statistics Indonesia, survey results

While the demand in food is increasing along with population growth, cultivated areas for rice farming in North Sumatra province and Riau province on Sumatra Island are decreasing. In West Java province and Central Java province on Java Island, rice farming areas repeatedly increase and decrease resulting in little expansion. In Sumatra Island, it was confirmed that some farmland was converted for higher profit farming such as oil palm and rubber plantation, and in Java Island, industrialization and modernization are affecting the usage of farmland. Under these circumstances, any significant increase in rice planting cannot be expected. Given the limitation of cultivated areas, more efficient production of main staples is desired.

Looking at the shift in population living below the poverty line (2007 - 2014: Figure 1), the poverty rate is improving steadily in each province covered by this project. However, in the southern part of Sumatra Island (South Sumatra province, Bengkulu province, and Lampung province) and the middle-eastern part of Java Island (Central Java province, Special Region of Yogyakarta, and East Java province) the poverty rate is still over the national average. The need for poverty reduction in the project area is remaining, especially in these provinces.



Source: Developed by Evaluator based on figures published by Statistics Indonesia



To summarize, the need for continued support for the development of irrigation facilities in order to increase unit yields and to enhance production capabilities for rice and other produce is still recognized.

## 3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal (2001), Japan's ODA policy for Indonesia (2001) recognized the following priority areas: 1) securing equality 2) human resources and education 3) conservation of the natural environment 4) support for the reorganization of the industry structure 5) building an industrial foundation (economic infrastructure). This project is relevant to 5) of the above. In addition, Japan International Cooperation Agency (JICA)'s Medium-Term Strategy for Overseas Economic Cooperation Operations identified "development of the economic/social infrastructure" as one of the priority areas for Indonesia, and "agriculture" was positioned as an important pillar for the development of the economic infrastructure. The project is in line with this policy.

#### 3.1.4 Validity of Project Planning and Project Implementation Approach

This project consolidates multiple subprojects. At the time of project designing, 180 candidate subprojects in the areas of irrigation, pond, swamp development and flood control were reviewed for consideration. These candidates were narrowed down to a shortlist of 22 which met the following conditions: 1) where the subproject would contribute to an increase in rice production; 2) where an early realization of project effects could be expected; 3) where the project is a mature case with no significant technical challenges 4) (in the case of rehabilitation projects) where the project is currently under appropriate operation and maintenance 5) where the project has had an Environmental Impact Assessment (EIA) completed if the subproject is classified as Category A under "JBIC Environmental Guidelines for ODA Loans (October, 1999)"; 6) where the project is not in an area of political unrest at the time of appraisal which would make project supervision difficult.

These 22 subprojects were prioritized based on their economic internal rate of return (EIRR), and the final 19 were selected to be included in this project. However, after the project went underway, many flaws were discovered in the geological and topographical data that formed the basis for the engineering details as well as in the engineering design elements themselves. As a result, each subproject had to go through re-survey, and the design elements also had to be reviewed thoroughly. For example, it had been expected since the time of project formulation that land acquisition would be required for 8 subprojects, and irrigation systems were being designed and scaled based on this assumption. However, after the design review, it turned out that the number of subprojects that required land acquisition was actually 12, increasing the scope for land acquisition and relocation significantly. In addition, land acquisition negotiations with residents proceeded with difficulty at the project implementation stage, and consequently additional changes in canal routes and design (scaling down) were unavoidable.

Meanwhile, the mid-term review (2009) proposed the addition of new Operation and Effects indicators to those defined at project appraisal (2001) to include unit yields of rice,

annual rice cropping intensity, average annual income per household, average agricultural gross income per household, and Water User Association (WUA) coverage ratio. Also, it was proposed that the unit yield of maize should be removed from all indicators as maize is not planted in some of the subproject areas. It was also proposed that the target figures be revised, given the design changes mentioned above, and the decrease in the planned irrigated area expected from the changes made.

Due to these unexpected circumstances, additional services were incurred such as repeating the geological and topographical surveys, re-designing facilities and re-calculating the project cost. The project budget and expenditure was managed tightly during the implementation period with a possible budget over-run in mind. For example, when it became apparent that not all subprojects could be implemented due to the significant increase in cost and escalation in prices, the 3 subprojects proceeding at the slowest pace were canceled<sup>7</sup>. As a result, as described in the "Efficiency" section below, the project cost came in within the planned budget although the project period was significantly longer than planned.

It is considered that the project supervision of the Project Management Unit, solutions applied to the problems as well as their approach were all valid. However, it is not possible to overlook the fact that inadequate quality in project planning led to various problems including design changes, revisions of indicator target figures for measuring project effects and the prolonged project period.

In summary, it can be said that the project has been highly relevant to Indonesia's development plan and development needs, as well as to Japan's ODA policy. However, there were problems at the time of project planning. Therefore, its relevance is evaluated as fair.

## 3.2 Effectiveness<sup>8</sup> (Rating: ③)

#### 3.2.1 Quantitative Effects (Operation and Effect Indicators)

The Operation and Effect indicators of the project were analyzed comparing the base figures (set in 2000), target figures at the timing of project appraisal, target figures revised at mid-term review, actual figures at mid-term review (2009), project completion (2011) and ex-post evaluation (2013) (Table 3 - Table 7) for the 5 subprojects (Batang Tongar Irrigation Improvement Project, Way Curup Irrigation Improvement Project, Lanang Irrigation Improvement Project, Bajulmati Dam Irrigation Improvement Project, and Amandit Irrigation Project - See Table 1.) As mentioned above, the Operation and Effects indicators were revised at the time of the mid-term review to reflect a more realistic project scale after the design changes were made. Since these revised figures were used by the JICA Indonesia Office and the

<sup>&</sup>lt;sup>7</sup> Two out of the remaining 16 were not completed as part of this project as their contracts were terminated and continued by the national budget of the Government of Indonesia or under the following project.

<sup>&</sup>lt;sup>8</sup> Project impacts will also be taken into consideration when rating effectiveness.

executing agency when monitoring the project<sup>9</sup>, this ex-post evaluation uses the revised target figures to compare against the actuals in order to study the degree of accomplishments in quantitative effects of the project. (The original target figures defined before project implementation are also listed for reference.)

The intended outcome of the project is "enhanced agricultural production mainly in rice to achieve self-sufficiency of the nation's food supply". The project effectiveness will be analyzed mainly from such indicators as irrigated area, production volume and yield per unit area, and the annual cropping intensity of rice. Gross annual average income and farm income per household will also be taken into consideration as reference indicators for a comprehensive evaluation.

Although the WUA formulation rate was also listed as an Operation and Effects indicator, this indicator shows a project output rather than the effectiveness of the project and can be better used to measure the institutional capabilities of maintenance and management. Therefore this aspect will be analyzed in detail under "3.5 Sustainability".

Analysis results for the 5 subprojects are described separately below:

## (1) Batang Tongar Irrigation Improvement Project (Table 3)

the irrigated area at the time of the ex-post evaluation is above the revised target, and compared against the actual at project completion it can be seen to have increased by around 100 ha. Rice production volume at the time of this ex-post evaluation had increased by over 1,000 tonnages comparing against that at the time of project completion. However, it was almost same as the actual figure at the time of mid-term review and was below the revised target. The reasons for this comparatively low level of rice production are the relative decline in the price of rice causing the shift to oil palm and rubber plantations, wider areas of farmland per household causing shortages in the labor force, and so on. In addition, in some areas where the development of secondary and tertiary canals was delayed, water was not distributed sufficiently to the tail end of the irrigation system, where some farmers switched from rice to maize, which can be grown with less water.

The yield of rice per unit area was above the target. The slow growth in the unit yield compared to the time of project completion is largely due to shortages in the labor force. The annual cropping intensity of rice had improved compared to the time of project completion, but it was below the revised target and the actual figure at the time of mid-term review<sup>10</sup>. The prime reason for this is that the cropping pattern changed by recent shifts in farmland to other uses.

<sup>&</sup>lt;sup>9</sup> It was confirmed at the time of the ex-post evaluation that the JICA Indonesia Office and the executing agency had agreed on these revisions (note that no official written agreement was confirmed).
<sup>10</sup> No information was obtained as a result of the survey regarding the background reasons for low cropping intensity

<sup>&</sup>lt;sup>10</sup> No information was obtained as a result of the survey regarding the background reasons for low cropping intensity at the time of project completion.

Household gross annual average income was almost the same as the time of project completion, but it highly exceeded the target. The gross annual average farm income per household also highly exceeded the target.

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	0	4,391	1,566	1,207	2,469	2,599
Crop Production of Paddy (ton / season)	15,369	29,508	12,528	9,526	8,208	9,551
Unit Yield of Rice (average) (ton/ha/crop)	3.5	4.2	4	3.3	4.8	4.6
Rice Cropping Intensity (average) (%/year)	100	160	200	177	69	148
WUA Formulation Rate (%)	-	100	No change	11.3	30	39
Gross Annual Average Income (million rupiah/year)	-	-	16.1	6.96	43.42	43
Gross Annual Average Farm Income (million rupiah/year)	-	-	13.57	4.43	33.38	27.1

# Table 3: Shift in Operation and Effect Indicators(Batang Tongar Irrigation Improvement Project)

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates an area irrigated within a cultivated area. Crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times a crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: Through the revisions during the survey, investigation and design (SID), the new construction of the secondary canal was downsized from a planned 77 km to 62.4 km, and that of the tertiary canal from 4,391 ha to 603 ha. Although additional rehabilitation work was carried out for 6.1 km of primary canal, 20.3 km of secondary canal and 60.0 ha of tertiary canal, the target irrigated area shrank to 1,566 ha. The target figure of the rice production volume was revised from 29,508 tonnages at the time of project appraisal to a lower 12,528 tonnage accordingly. Note 3: The revised target of rice production volume (12,528 tonnages) is in fact lower than the base figure (15,369 tonnage). Information attached to the internal document of September 2000 provided by JICA describes the base

(2) Way Curup Irrigation Improvement Project (Table 4)

figure of the irrigated area as being 2,100 ha, not 0 ha, which does not cause a contradiction.

The actual for the irrigated area at the time of the ex-post evaluation was approximately 10% below the revised target, the actual at the mid-term review and the actual at project completion. The decrease in irrigation coverage can be explained by the relative decline in the price of rice causing a shift to oil palm/rubber plantations and cotton growing, by shortages in the labor force and by more farmland being converted into residential space due to population growth. On the other hand, the rice production amount at the time of the ex-post evaluation

exceeded the revised target as well as the actual at project completion. Despite the recent decrease in farmland and irrigated areas as well as the situation where a better rice variety and soil improvements are desired, it is apparent that a sufficient water supply is secured through the irrigation system contributing to the steady growth in the yield per unit area and the rice cropping intensity, resulting in good performance exceeding the target. The average income per household as well as farming income per household are growing steadily exceeding the target in both. It is conceivable that the steady growth in rice production and the partial conversion of farmland to high-profit produce are working well.

The WUA formulation rate has gone up since the time of project completion (2011) reaching the target of 100%.

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	2,176	4,307	4,073	1,961	3,913	3,629
Crop Production of Paddy (ton / season)	15,232	27,405	27,473	27,473	32,301	38,280
Unit Yield of Rice (average) (ton/ha/crop)	3.5	3.5	4.5	3.5	4.71	5.5
Rice Cropping Intensity (average) (%/year)	101	182	150	112	175	192
WUA Formulation Rate (%)		100	No change	0	100	100
Gross Annual Average Income (million rupiah/year)			9.25	4.51	28.97	43.8
Gross Annual Average Farm Income (million rupiah/year)			6.74	2.00	23.82	36.3

Table 4: Shift in Operation and Effects indicators (Way Curup Irrigation Improvement Project)

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

## (3) Lanang Irrigation Improvement Project (Table 5)

The irrigated area mostly reached the target. Rice production increased steadily throughout the project implementation period and exceeded the target at the time of ex-post evaluation. Cropping intensity and unit yield of rice exceeded the target. WUA formulation rate had grown since the time of mid-term review (2009) reaching the target of 100%. The gross average annual income per household and farm income both exceeded the target.

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	1,871	1,871	1,900	0	1,410	1,817
Crop Production of Paddy (ton / season)	7,578	12,349	19,000	7,650	14,100	24,844
Unit Yield of Rice (average) (ton/ha/crop)	4.5	5.5	5.0	3	5.0	8
Rice Cropping Intensity (average) (%/year)	90	120	200	134	-	250
WUA Formulation Rate (%)	-	100	No change	40	-	100
Gross Annual Average Income (million rupiah/year)	-	-	8.84	6.19	-	19
Gross Annual Average Farm Income (million rupiah/year)	-	-	3.71	2.37	-	7.5

Table 5: Shift in Operation and Effect indicators (Lanang Irrigation Improvement Project)

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

## (4) Bajulmati Dam Irrigation Improvement Project (Table 6)

Irrigation coverage increased steadily throughout the project implementation period and exceeded the revised target significantly at the time of the ex-post evaluation. Rice production also increased steadily and exceeded the target at the time of the ex-post evaluation. The unit yield of rice yield has shown a steady increase since the time of project execution although the actual came in just under the revised target. Similarly, the rice cropping intensity showed a steady performance, exceeding the target at the time of ex-post evaluation. Gross income and the farm income per household both exceeded the target. The WUA formulation rate reached the target of 100%.

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	1,004	1,980	779	779	779	1,417
Crop Production of Paddy (ton / season)	5,544	19,800	11,038	6,501	7,493	13,533
Unit Yield of Rice (average) (ton/ha/crop)	3.5	5.0	5.8	4.1	5.26	5.5
Rice Cropping Intensity (average) (%/year)	80	200	238	204	180	250
WUA Formulation Rate (%)	-	100	No change	100	53	100
Gross Annual Average Income (million rupiah/year)	-	-	26.81	25.44	23.86	42.5
Gross Annual Average Farm Income (million rupiah/year)	-	-	23.73	22.35	17	30

## Table 6: Shift in Operation and Effect indicators(Bajulmati Dam Irrigation Improvement Project)

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: The target figure for the irrigated area (779 ha) revised at the time of the mid-term review is in fact below the base figure (1,004 ha) due to the scaling down of the facility design with less irrigated area than the planned at the time of project appraisal. As the result of revisions during SID and the re-estimation of the project cost, new construction of dams, weirs, primary canals and secondary canals, and both new construction and rehabilitation of tertiary canals were excluded. Instead, tunnel construction and rehabilitation of weirs and primary canals was newly implemented.

## (5) Amandit Irrigation Project (Table 7)

Irrigation coverage increased steadily through the project implementation period and exceeded the revised target significantly at the time of the ex-post evaluation. Both the rice production amount and the yield per unit area increased steadily and exceeded the target significantly. On the other hand, the actual for the rice cropping intensity came in below the target, and lower than the actual recorded at the time of project completion<sup>11</sup>. Both household income and farming gross income exceeded the target as well as the actual at project completion reflecting the growth in rice production and yield per unit area. The WUA formulation rate remained at 20%. Among the entire irrigation system of Amandit, some tertiary canals have not

<sup>&</sup>lt;sup>11</sup> No information was obtained as a result of any survey on the backgrounds and their reasons.

been completed where they were not included in the scope of assistance of the project<sup>12</sup>.

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	0	7,399	2,341	0	2,700	4,089
Crop Production of Paddy (ton / season)	14,798	33,665	9,387	4,023	23,244	29,981
Unit Yield of Rice (average) (ton/ha/crop)	2.5	3.5	No change	3	4.39	5.2
Rice Cropping Intensity (average) (%/year)	80	130	200	100	196	141
WUA Formulation Rate (%)	-	100	No change	0	48	20
Gross Annual Average Income (million rupiah/year)	-	-	11.86	7.5	28.36	33.6
Gross Annual Average Farm Income (million rupiah/year)	-	-	5.53	1.17	17.47	23.2

Table 7: Shift in Operation and Effect indicators (Amandit Irrigation Project)

Source: Information provided by JICA (disclosed / internal, as of July 2001), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: Through the revisions during SID, the new construction of secondary canals was downsized from the planned 49 km to 4.2 km, and that of tertiary canals from 7,399 ha to zero. The target irrigated area shrank from 7,399 ha to 2,341 ha accordingly. The target figure for the rice production volume was revised from 33,665 tonnages at the time of project appraisal to the lower 9,387.

Note 3: The revised target of rice production volume (9,387 tonnages) is in fact lower than the base figure (14,798 tonnages). The information as of September 2000 describes the base figure of the irrigated area as being 3,358 ha and the target figure as being 7,399. The base figure of the rice production amount was 6,716 tonnages and the target figure was 33,665, which does not cause a contradiction.

To summarize the quantitative effects observed at each site, the unit yield of rice and the rice crop intensity rate have improved steadily indicating that the irrigation facilities developed through the project have been effective. The gross farm income earned from the agricultural activities as a whole and the average annual income show good figures at each subproject.

<sup>&</sup>lt;sup>12</sup> The WUA formulation rate at the time of ex-post evaluation was lower than that at the time of project completion (48%). According to the executing agency, the 48% figure is a result of excessive recording, but that the reliability of data collected at project completion was unable to verify.

## 3.2.2 Qualitative Effects

As part of this evaluation, beneficiary surveys were conducted at 4 sites in 4 provinces in the project area with a total of 239 households<sup>13</sup>. In order to study how rice planting may be done differently in upper / middle / lower stream areas, survey targets were selected from each stream area through the Ministry of Public Works (MOPW)'s River Basin Management Office (Balai Office). The selected farmers were mainly WUA participants.

Almost all the survey respondents were heads of households, and their average age was 48.7. The breakdown by area is 53, 78, 108 from upper stream, middle steam, lower stream respectively. 237 of 239 farmers were WUA members, and 216 of them participate in WUA activities (Table 8).

							Unit: person	
				ning Loca	ation	Memberships of WUA		
Subproject	Number of Respondents (households)	Average Age of Household Head	Upper- stream	Mid- stream	Lower- stream	No of members (members / total respondents)	No of active members (active members / total members)	
Batang Tongar Irrigation Improvement Project	51	42.6	6	17	28	49 (96.1%)	46 (93.9%)	
Way Curup Irrigation Improvement Project	67	50.3	12	0	55	67 (100.0%)	63 (94.0%)	
Lanang Irrigation Improvement Project	60	51.1	24	14	22	60 (100.0%)	51 (85.0%)	
Bajulmati Dam Irrigation Improvement Project	61	46.1	11	47	3	61 (100.0%)	56 (91.8%)	
Total	239	48.7	53	78	108	237 (99.2%)	216 (91.1%)	

Table 8: Overview of Beneficiary Survey Respondents

**.**...

Source: Beneficiary survey results

## (1) Improvement in farming water supply

Over 70% of all respondents (174) answered that the water supply to farmland had increased / been improved by the development of irrigation facilities (Table 9). By subproject, this tendency was high in Lanang (85.0%) and in the upper steam area (84.9%) by river area. Just under 70% of the beneficiary farmers who plant rice in the lower stream area answered that the water supply "increased / improved". However, the score for "aggravated / decreased" was also high in the lower stream area (22.2%). Water gate operations and water distribution monitoring are done mainly by local farmers under the supervision of the Balai Office or the

<sup>&</sup>lt;sup>13</sup> Survey target: Beneficiary farmers. Survey method: Structured questionnaire (face-to-face interview). Locations and dates are as follows: Batang Tongar: Pasaman Sub-district of West Pasaman District, West Sumatra Province (15 and 16 April 2014), Way Curup: Labuhan Maringgai Sub-district, Way Jepar Sub-district, Mataram Baru Sub-district of East Lampung District, Lampung Province (18 April 2014), Lanang: Penawangan Sub-district of Grobogan District, Central Java Province (21 and 22 April 2014), Bajulmati: Banyuputih Sub-district and Wongsorejo Sub-district of Banyuwangi District, East Java Province (24 and 25 April 2014).

local government's department of water resources (DOWR). It is apparent that there is a room for improvement in maintenance activities and operation skills in order to distribute water sufficiently to the lower stream areas.

				U	nit: person			
		Answer						
By Subproject / by Farming Location	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	Total			
Total	174 (72.8%)	30 (12.6%)	28 (11.7%)	7 (2.9%)	239			
Breakdown by Subproject		-						
Batang Tongar Irrigation Improvement Project	28 (54.9%)	9 (17.6%)	12 (23.5%)	2 (3.9%)	51			
Way Curup Irrigation Improvement Project	54 (80.6%)	3 (4.5%)	7 (10.4%)	3 (4.5%)	67			
Lanang Irrigation Improvement Project	51 (85.0%)	0 (0.0%)	7 (11.7%)	2 (3.3%)	60			
Bajulmati Dam Irrigation Improvement Project	41 (67.2%)	18 (29.5%)	2 (3.3%)	0 (0.0%)	61			
Breakdown by Farming Location								
Upper-stream	45 (84.9%)	5 (9.4%)	1 (1.9%)	2 (3.8%)	53			
Mid-stream	57 (73.1%)	17 (21.8%)	3 (3.85%)	1 (1.3%)	78			
Lower-stream	72 (66.7%)	8 (7.4%)	24 (22.2%)	4 (3.7%)	108			

Table 9: Changes	in	Water	Supply	to	Farmland
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Source: Beneficiary survey results

#### (2) Increase in rice yield

176 respondents (over 70%) answered that unit yield of rice increased / improved from ex-ante project implementation. By subproject, Lanang showed the highest score (56 respondents: 93.3%) (Table 10). This is closely related to the result that almost 80% (47 beneficiaries) answered that the farming water supply had been improved / had increased. By river area, the upper stream area shows the highest score in "increased / improved" at 86.8%. Although in the upper stream area, the water supply was sufficient even before project implementation, especially in the rainy season, the updated irrigation facilities provided by the project allocated an adequate water supply at appropriate times annually and, hence, the rice yield was improved / increased.

147 farmers out of 239 checked both the answers "improved / increased rice yield" and "improved / increased farming water supply" indicating a strong correlation between these two, as shown in the case of Lanang. It is possible that the project allowed farmers to secure sufficient water when required, such as at the time of planting and during the dry season, realizing a significant effect in rice farming. Improvements in water distribution in the lower stream area may lead to further improvements in rice production in the future.

				Ur	nit: person			
	Answer							
By Subproject / by Farming Location	Increased / Improved from ex-ante Project	Same as before Project	Decreased / Aggravated from ex-ante Project	Others / N/A	Total			
Total	176 (73.6%)	39 (16.3%)	8 (3.3%)	16 (6.7%)	239			
Of whom the number of beneficiaries who also stated their farm water supply increased:	147	21	1	5	174			
Breakdown by Subproject								
Batang Tongar Irrigation Improvement Project	28 (54.9%)	13 (25.5%)	6 (11.8%)	4 (7.8%)	51			
Way Curup Irrigation Improvement Project	53 (79.1%)	11 (16.4%)	1 (1.5%)	2 (3.0%)	67			
Lanang Irrigation Improvement Project	56 (93.3%)	4 (6.7%)	0 (0.0%)	0 (0.0%)	60			
Bajulmati Dam Irrigation Improvement Project	39 (63.9%)	11 (18.0%)	1 (1.6%)	10 (16.4%)	61			
Breakdown by Farming Location								
Upper-stream	46 (86.8%)	5 (9.4%)	0 (0.0%)	2 (3.8%)	53			
Mid-stream	53 (67.9%)	12 (15.4%)	2 (2.6%)	11 (14.1%)	78			
Lower-stream	77 (71.3%)	22 (20.4%)	6 (5.6%)	3 (2.8%)	108			

## Table 10: Changes in the Unit Yield of Rice

Source: Beneficiary survey results

## (3) Increase in rice plantings

Table 11 shows the current status of rice farming with the 239 beneficiary farmers by season and river area. About 80% of all beneficiaries planted rice either twice or three times a year, and 129 out of 156 farmers who planted twice a year and 30 of 36 farmers who planted three times a year answered that their rice production increased.

Unit: person									
	No of Crop: 0 time	No of Crop: 1 time	No of 0 2 tin	C <b>rops:</b> mes	No of ( 3 ti	Crops: mes			
By Subproject / by Farming Location	rainy season: 0 dry season: 0	rainy season: 1 dry season: 0	rainy season: 2 dry season: 0	rainy season: 1 dry season: 1	rainy season: 2 dry season: 1	rainy season: 1 dry season: 2	Total		
Total	25 (10.5%)	22 (9.2%)	44 (18.4%)	112 (46.9%)	25 (10.5%)	11 (4.6%)	239		
Of whom the number of beneficiaries who also stated their unit yield of rice increased:	5	12	41	88	21	9	176		
Breakdown by Subpr	roject								
Batang Tongar Irrigation Improvement Project	13 (25.5%)	1 (2.0%)	0 (0.0%)	29 (56.9%)	8 (15.7%)	0 (0.0%)	51		

Table 11: Changes in the Number of Rice Plantings

	No of Crop:No of Crop:0 time1 time		No of 2 ti	Crops: mes	No of 3 ti	Crops: mes	
By Subproject / by Farming Location	rainy season: 0 dry season: 0	rainy season: 1 dry season: 0	rainy season: 2 dry season: 0	rainy season: 1 dry season: 1	rainy season: 2 dry season: 1	rainy season: 1 dry season: 2	Total
Way Curup Irrigation Improvement Project	0 (0.0%)	2 (3.0%)	0 (0.0%)	64 (95.5%)	1 (1.5%)	0 (0.0%)	67
Lanang Irrigation Improvement Project	0 (0.0%)	3 (5.0%)	41 (68.3%)	16 (26.7%)	0 (0.0%)	0 (0.0%)	60
Bajulmati Dam Irrigation Improvement Project	12 (19.7%)	16 (26.2%)	3 (4.9%)	3 (4.9%)	16 (26.2%)	11 (18.0%)	61
Breakdown by Farmi	ing Location						
Upper-stream	3 (5.7%)	4 (75%)	24 (45.3%)	17 (32.1%)	5 (9.4%)	0 (0.0%)	53
Mid-stream	12 (15.4%)	16 (20.5%)	7 (9.0%)	22 (28.2%)	10 (12.8%)	11 (14.1%)	78
Lower-stream	10 (9.3%)	2 (1.9%)	13 (12.0%)	73 (67.6%)	10 (9.3%)	0 (0.0%)	108
Source: Banaficiary	urvov roculte						

Source: Beneficiary survey results

Note 1: Those respondents who grow rice during dry season also grow rice during rainy season.

Note 2: Beneficiary farmers who grow rice in dry seasons also grow rice in rainy seasons. Of the 5 farmers who answered "rice yield increased" with no rice planting, 2 were in Batang Tongar, and 3 were in Bajulmati. These farmers had either converted their farmland into higher profit produce such as oil palm, despite its increased rice yield, or had an increased yield in produce other than rice.

As seen in the results by subproject, 95.5% of the Way Curup beneficiaries and 95.0% of Lanang beneficiaries planted rice twice a year. Bajulmati has the highest score for triple rice-planting at 44.2%. The score for double-planting is high in the upper and middle stream areas (77.4% and 79.6% respectively), and the triple-planting score is high in the middle stream area (26.9%). In Batang Tongar, for over 25% of beneficiaries, rice is not the main crop in the lower stream area. According to beneficiary interviews, this is because farmers "can't secure enough labor force required for rice farming", "switched to secondary crops such as maize, which does not require as much work" and "converted farmland for higher profit farming like oil palm". In Way Curup, many residents moved into the area in the 1970's. They have an established and tight-knit community, and WUA members work closely together (Photo 1). They have used irrigation systems for over 15 years, and rehabilitation completed through this project made it possible to plant rice twice a year in a stable manner. In Lanang, where precipitation is low in the dry season, a stable water supply was secured throughout the year thanks to this project (Photo 2).



Photo 1: WUA Organizational Chart (Way Curup)



Photo 2: Weir constructed under the Project (Lanang)

In Bajulmati, it was confirmed that about 20% of the beneficiaries didn't grow rice, mainly in the middle stream area. This is because some farmers grew secondary crops with less water requirement such as maize, as the dam was not complete as of April 2014, and the water supply was short, mainly in the highlands.

From the beneficiary survey, it was confirmed that the farming water supply, rice production and planting frequency all improved and that there was qualitative effectiveness.

Therefore, in terms of qualitative and quantitative effectiveness as mentioned in the above, the objective "to enhance agricultural production particularly in rice to achieve self-sufficiency of food supply" has almost been achieved.

#### 3.3 Impacts

The irrigation facilities developed through this project are used well, and the intended effects of the project such as improvements in the farming water supply, unit yield of rice and cropping intensity were confirmed from the beneficiary survey results. In addition, certain positive impacts were observed such as improvements in farming income, the production infrastructure, the living environment and the standard of living. Environmental considerations were properly addressed. The scope of land acquisition and resettlement expanded due to the project design review, but this was only after thorough discussions with the residents. The plan was executed appropriately in accordance with Indonesian law and no problems have been reported.

Details will be described below.

## 3.3.1 Intended Impacts

- (1) Household finances
- 144 beneficiary farmers (60.3%) answered that their farming income increased, and 124

(51.9%) answered that their farming expenses increased. A part of these expenses was for securing a stronger labor force and purchasing seedlings and chemicals. 77 farmers (32.2%) indicated that a stronger labor force was required after project implementation. With regard to employment opportunities for family members, the number of farmers who indicated "increased after project" went up to 88 (36.8%). Farmers whose "non-farming income increased" were up to 84 (35.1%), and farmers whose "non-farming expenses increased" were also up to 73 (30.5%). As for savings, 78 (32.6%) indicated that they had "increased", but 20 (8.4%) answered that they were the "same as before project". Also, livestock such as farm animals and other non-cash savings raised the number for "Other/Not Applicable" (138, 57.7%).

	Answer							
Question Item	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	Total			
Household Farm Income	144 (60.3%)	81 (33.9%)	11 (4.6%)	3 (1.3%)	239			
Farm Labor	77 (32.2%)	119 (49.8%)	26 (10.9%)	17 (7.1%)	239			
Farm Expenses	124 (51.9%)	83 (34.7%)	29 (12.1%)	3 (1.3%)	239			
Job opportunities for family members	88 (36.8%)	41 (17.2%)	2 (0.8%)	108 (45.2%)	239			
Household Non-farm Income	84 (35.1%)	39 (16.3%)	3 (1.3%)	113 (47.3%)	239			
Non-farm Expenditure	73 (30.5%)	52 (21.8%)	4 (1.7%)	110 (46.0%)	239			
Savings	78 (32.6%)	20 (8.4%)	3 (1.3%)	138 (57.7%)	239			

Table 12: Household Finances

Unit: person

Source: Beneficiary survey results

Note: For "Job opportunities for family members", "non-farming household income" and "non-farming expenses", almost half of all respondents indicated "Other/Not applicable". This is because few beneficiaries engage in occupations other than farming.

## (2) Improvement in life infrastructure

The number of beneficiaries who answered that "farming / residential water quality improved" reached 206 (86.2%). The water distributed through the canals is intended for farming, but the residents also use it for other general purposes such as laundry, bathing and swimming. With the rehabilitation and new construction of canals, the water became cleaner as wood debris, sand and other impurities were removed regularly. Farmers seem to feel the effect of well-maintained irrigation systems and the outcome of their maintenance activities. Asked about the water supply to households, 51.9% answered "same as before project", but 109 beneficiaries (45.6%) answered "Increased / Improved". This may be because water is available for residents' daily use if they go to a canal, to a certain degree, satisfying their need for water for general purposes.

Unit: pe										
	Answer									
Question Item	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	Total					
Water Quality	206 (86.2%)	16 (6.7%)	12 (5.0%)	5 (2.1%)	239					
Water Supply to Household	109 (45.6%)	124 (51.9%)	2 (0.8%)	4 (1.7%)	239					
Road Access	145 (60.7%)	28 (11.7%)	57 (23.8%)	9 (3.8%)	239					

## Table 13: Improvement in Life Infrastructure

Source: Beneficiary survey results

Note: Beneficiaries' answers to the condition of the water supply to households implies mainly water for general purposes water (laundry, swimming and such).

Similarly, 145 farmers (60.7%) answered that road access near irrigation facilities "improved", indicating that road works around canal development contributed to improvements in the living environment of beneficiaries (Photo 3).

- (3) Improvements in health, hygiene and education
- 167 farmers (69.9%) answered that



Photo 3: Road improved along the tertiary canal (Bajulmati)

"health and hygiene improved". Also, 164 farmers (68.6%) answered that "children's education opportunities improved". Expenses for health and education add up as they include medical supplies, clothing, transportation costs for getting to schools and healthcare facilities. Increased farming income achieved through the project appears to have made these non-farming expenses more affordable indicating a correlation with the responses observed above, in 1) Household finances. Improvements in health and education are an essential factor for getting out of poverty. It is likely that cash surplus invested in these areas will further increase in the future.

## Table 14: Improvements in Health, Hygiene and the Education Environment

Unit: pe										
	Answer									
Question Item	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	Total					
Health and Hygiene of Household	167 (69.9%)	67 (28.0%)	2 (0.8%)	3 (1.3%)	239					
Education Level for Children	164 (68.6%)	41 (17.2%)	1 (0.4%)	33 (13.8%)	239					

Source: Beneficiary survey results

(4) Diversity in local markets and business

165 farmers (69.0%) out of the total 239 answered that "the local market became more active after the project". It is conceivable that the project contributed to increased yields in rice and other crops and that farmers started selling their surpluses at the local market.

As for "diversity in local businesses", on the other hand, only 68 farmers (28.5%) answered that they "diversified", and 140 farmers (58.9%) answered "same as before project". It is not confirmed yet that there is any trend where surplus in crops is invested to manufacture processed agricultural products for new business development. It is advisable that future trends are monitored on an ongoing basis.

	Answer							
Question Item	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	Total			
Local Markets	165 (69.0%)	53 (22.2%)	6 (2.5%)	15 (6.3%)	239			
Diversity of Local Businesses	68 (28.5%)	140 (58.6%)	0 (0.0%)	31 (13.0%)	239			

Table 15: Diversity in Local Markets and Businesses

Unit: person

Source: Beneficiary survey results

In summary, post-project improvements are recognized in farming income, which suggests effectiveness of the project. Savings and other ways to secure surpluses from increased income also improved. On the other hand, securing the required labor force proved difficult, and farming expenses are on the rise. As for life infrastructure, the farming water supply provided through the project contributed to better water quality and more convenience in residents' daily water use. In addition, the living environment of beneficiaries improved as seen in better road conditions. Farmers' standard of life, measured by health, hygiene and education is mostly improving. Although local markets are becoming more active, signs of business investment and new business development, which would require specific technology and skills, are yet to be seen. Short-term, rapid income increase is not expected, but it is still apparent that the quality of life of beneficiaries is improving steadily.

Thus, the impact of this project, "contribution to the enhancement of the rural production infrastructure and poverty reduction" is confirmed.

#### 3.3.2 Other Impacts

(1) Impact on the natural environment

In accordance with the "JBIC Environmental Guidelines for ODA Loans (October 1999)", two subprojects (Air Lakitan, Bajulmati) were classified as Category A and it was required that an Environmental Impact Assessments (EIA) report be submitted. In this ex-post evaluation, it was confirmed that these two subprojects did have EIAs completed and approved based on the initial plan.

Table 16 summarizes environmental approvals and how environmental monitoring is conducted for the 5 subprojects where the site survey was conducted. Some subprojects were required to have EIAs completed by Indonesian environmental laws<sup>14</sup> even though they were not classified as Category A under the guidelines above mentioned. The executing agency took one of the measures required by domestic law (either the implementation of EIA or the elaboration of an environmental management plan and an environmental monitoring plan). Environmental monitoring was taken over either by the Balai Office or the provincial government DOWR. Monitoring is still continuing and no negative impacts on the environment have been confirmed.

Subproject	Assessment Conducted	Time Approved	Monitoring Status
Batang Tongar Irrigation Improvement Project	Environmental Impact Assessment	Approved in April, 2000	Monitored by the DOWR, Provincial Government
Way Curup Irrigation Improvement Project	Environmental Assessment	Conducted in 1993	Monitored by the Balai Office as of the time of ex-post evaluation
Lanang Irrigation Improvement Project	Environmental management plan/environmental monitoring plan	Approved in December, 2003	Monitored by the DOWR, Provincial Government
Bajulmati Dam Irrigation Improvement Project	Environmental Impact Assessment	Approved in October, 2002	Monitored by the Balai Office from 2008 up until the time of ex-post evaluation
Amandit Irrigation Project	Environmental Impact Assessment	Approved in November, 2002	As of the time of ex-post evaluation monitored by the Balai Office as part of maintenance and operation activities

Table 16: Environmental Assessments and Monitoring Status

Source: Beneficiary survey results

#### (2) Land acquisition and resettlement

Table 17 shows the original plan and actuals for land acquisition and resettlements for this project.

Out of 8 subprojects where land acquisition was originally planned, 6 subprojects required more land area for acquisition. Furthermore, it turned out that 4 other subprojects needed land acquisition. As a result, the total land acquired for the project was 1,981.07 ha, larger than originally planned. In order to minimize land acquisition and relocation of residents, canal routes and other designs were changed and scaled down after consulting with the residents. Various measures were taken including the construction of temporary facilities and access pathways in order to avoid cutting down teakwood. Since land acquisition was scaled down, the relocation of residents that was expected in Air Lakitan was cancelled, and relocation in

<sup>&</sup>lt;sup>14</sup> The Decree of the State Minister of the Environment No.17/2001 and the Decree of the State Minister of the Environment No.11/2006

Amandit was scaled down. However, additional households in Karau needed to be relocated.

These changes caused a delay in the project implementation, but it was all executed appropriately in accordance with Indonesian law. According to interviews with the Balai Offices in each area, conducted in this ex-post evaluation, no additional land acquisition or resettlement was required after project completion, and there were no specific long-term issues with land acquisition and relocation during the project implementation period.

		Plan	Actual			
	Scale	Subproject	Scale	Subproject		
Land Acquisition	1,334.5 ha (8 sites)	<ul> <li>Batang Angkola Irrigation Improvement Project (198 ha)</li> <li>Panti Rao Irrigation Improvement Project (118 ha)</li> <li>Batang Tongar Irrigation Improvement Project (65 ha)</li> <li>Okak Irrigation Project (30 ha)</li> <li>Air Lakitan Irrigation Project (353 ha)</li> <li>Muko-Muko Kanan Irrigation Improvement Project (100.5 ha)</li> <li>Karau Irrigation Project (300 ha)</li> <li>Amandit Irrigation Project (170 ha)</li> </ul>	1,981.1 ha (12 sites)	<ul> <li>Batang Angkola Irrigation Improvement Project (241.36 ha)</li> <li>Panti Rao Irrigation Improvement Project (282.62 ha)</li> <li>Batang Tongar Irrigation Improvement Project (119.72 ha)</li> <li>Okak Irrigation Project (103.52 ha)</li> <li>Air Lakitan Irrigation Project (228.61 ha)</li> <li>Muko-Muko Kanan Irrigation Improvement Project (196 ha)</li> <li>Karau Irrigation Project (518 ha)</li> <li>Amandit Irrigation Project (126.44 ha)</li> <li>Lodan Dam Irrigation Improvement Project (11.1 ha)</li> <li>Lanang Irrigation Improvement Project (2.01 ha)</li> <li>Sapon Irrigation Improvement Project (2.93 ha)</li> <li>Bajulmati Dam Irrigation Improvement Project (148.76 ha)</li> </ul>		
Resettlement	27 households (2 sites)	<ul> <li>Air Lakitan Irrigation Project (16 households)</li> <li>Amandit Irrigation Project (11 households)</li> </ul>	51 households (2 sites)	<ul> <li>Amandit Irrigation Project (6 households)</li> <li>Karau Irrigation Project (45 households)</li> </ul>		

Table 17: Status of Land Acquisition and Resettlement

Source: Project Completion Report (June 2012)

(3) Unintended positive/negative impacts None.

To summarize, improvements in the farming water supply, the unit yield of rice and cropping intensity were confirmed qualitatively. The effectiveness of the project impact, "contribution to the enhancement of the rural production infrastructure and poverty reduction" was also confirmed. There were no problems with the natural environment, relocation of residents and land acquisition and were no other positive or negative impacts.

It was confirmed that effects were realized almost as planned through this project. Overall, the effectiveness and impacts of the project are evaluated as high.

## 3.4 Efficiency (Rating: 2)

- 3.4.1 Project Output
  - (1) Survey, Investigation and Design (SID)

SID was originally planned for all 19 subprojects. However, due to an expected budget over-run, it was carried out for 12 subprojects only (Table 18).

## (2) Number of subprojects

At the time of project appraisal, the construction and rehabilitation of irrigation facilities were planned for 19 subprojects. However, during the project implementation period, limitations in budget and the construction period became apparent, resulting in the cancellation of 3 subprojects including Batang Batahan, Jabung, and Leuwi Goong was implemented under a Japanese ODA loan project "Participatory Irrigation Rehabilitation and Improvement Management Project" (PIRIMP). The scope for the remaining 16 subprojects was also changed; some design elements were modified, and some part of the construction work was transferred to different projects. The quality of work undertaken by a local contractor for the Okak subproject was extremely poor, so the contract was terminated in 2011 before the construction was completed. The subproject was removed from this project and implemented using the Indonesian government national budget. Having been partly conducted under this project, the Air Lakitan subproject is now placed under PIRIMP.

No	Name of	Ducying		Plan	Actual	
190.	Subprojects	Province	SID	Components	SID	Components
1	Batang Angkola Irrigation Improvement Project	North	Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
2	Simodong Irrigation Improvement Project	Sumatera	Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
3	Panti Rao Irrigation Improvement Project		Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
4	Batang Batahan Irrigation Project	West Sumatera	Planned	New construction / rehabilitation	Not implemented	Excluded out of scope
5	Batang Tongar Irrigation Improvement Project		Planned	New construction	Implemented	New construction / rehabilitation
6	Okak Irrigation Project	Riau	Planned	New construction	Implemented	New construction (contract terminated. Construction continued by national budget)
7	Air Lakitan Irrigation Project	South Sumatera	Planned	New construction	Implemented	New construction (Partly implemented under other project) <sup>15</sup>

#### Table 18: Subprojects Planned and Implemented in the Project

<sup>&</sup>lt;sup>15</sup> Implemented under the Participatory Irrigation Rehabilitation and Improvement Management Project (PIRIMP).

No	Name of	Decenter of		Plan		Actual
INO.	Subprojects	Province	SID	Components	SID	Components
8	Muko-Muko Kanan Irrigation Improvement Project	Bengkulu	Planned	New construction	Implemented	New construction / rehabilitation
9	Jabung Irrigation Improvement Project		Planned	Rehabilitation	Not implemented	Excluded out of scope
10	Way Curup Irrigation Improvement Project <sup>16</sup>	Lampung	Planned	Rehabilitation	Implemented	Rehabilitation
11	Way Rarem Irrigation Improvement Project <sup>17</sup>	Lampung	Planned	Rehabilitation	Implemented	Rehabilitation
12	Lemah Abang / Kedung Gede Irrigation Improvement Project	West Java	Planned	Rehabilitation	Implemented	Rehabilitation
13	Leuwi Goong Irrigation Project		Planned	New construction	Not implemented	Excluded out of scope <sup>18</sup>
14	Lanang Irrigation Improvement Project		Planned	New construction	Implemented	New construction / rehabilitation
15	Lodan Dam Irrigation Improvement Project	Central Java	Planned	New construction	Not implemented	New construction / rehabilitation
16	Sapon Irrigation Improvement Project	Yogyakarta Special Region	Planned	Rehabilitation	Not implemented	New construction / rehabilitation
17	Bajulmati Dam Irrigation Improvement Project	East Java	Planned	New construction	Not implemented	New construction / rehabilitation
18	Karau Irrigation Project	Central Kalimantan	Planned	New construction	Not implemented	New construction
19	Amandit Irrigation Project	South Kalimantan	Planned	New construction	implemented	New construction

Source: Developed by the Evaluator based on related documents.

## (3) Consulting services

Due to the additional work mentioned below, more consulting services (498.28 man months) were required. The total consulting services required were 3,517.45 man months (International: 452.89, Local 3,064.56).

## (4) Civil Works

New constructions for dams, weirs, primary / secondary / tertiary / drainage canals were reduced significantly. On the other hand, rehabilitations for weirs and primary / secondary / tertiary canals were increased significantly (See "Comparison of the original and actual scope of the project" at the end of this report). As mentioned previously, these changes were caused

<sup>&</sup>lt;sup>16</sup> Constructed in the Way Curup Irrigation Project.

<sup>&</sup>lt;sup>17</sup> Constructed in the Way Rarem Irrigation Project (Phase 1 to 4).

<sup>&</sup>lt;sup>18</sup> Implemented under PIRIMP.

while re-implementing the geographical and topographical survey, re-estimating project cost, and when faced with difficulties in land acquisition where new constructions of facilities were planned. These changes were deemed appropriate in order to cope with the current situation.

Although all of the construction works for the 16 subprojects were to be procured through local competitive bidding (LCB), some were procured through international competitive bidding (ICB) in order to secure competition and the quality of the works. In the end, 13 subprojects were procured through ICB, and 9 were procured through LCB.

The project required considerable design changes resulting in significant differences between the original plans and the actuals. However, since the solutions and the problem-solving approach taken by the project management teams during the implementation period were suitable, the output actuals are evaluated as appropriate.

## 3.4.2 Project Input

3.4.2.1 Project Cost

The actual cost of the project was 21,795 million yen. The project was completed within the planned budget of 21,972 million yen (99% of the budget).

	Unit: million yen											
	Plan						Actual					
Budget Item	Foreign Currency		Local Currency		Total		Foreign Currency		Local Currency		Total	
	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan
Construction	0	0	15,038	15,038	15,038	15,038	15	15	15,369	15,369	15,384	15,384
SID	0	0	103	103	103	103	0	0	93	93	93	93
C/S	1,027	1,027	1,886	1,886	2,913	2,913	1,115	1,115	1,879	1,879	2,995	2,995
Contingency	0	0	757	622	757	622	0	0	0	0	0	0
Land Acquisition	0	0	670	0	670	0	0	0	1,113	0	1,113	0
Administration	0	0	1,203	0	1,203	0	0	0	973	0	973	0
Tax	0	0	1,288	0	1,288	0	0	0	1,237	0	1,237	0
Total	1,027	1,027	20,945	17,649	21,972	18,676	1,131	1,131	20,664	17,342	21,795	18,473

Table 19: Plan and Actual of Project Cost

Source: Survey response from executing agency

Note 1: Numbers are rounded to the millions, so there is some discrepancy between the total amount and sum of items

Note 2: C/S: Consulting Services, SID: Survey, Investigation and Design.

Some unexpected additional works were incurred during the project implementation period, such as geological and topographical surveys, engineering designs and calculations of project cost, which had to be redone for each subproject. However, the project cost was managed tightly with a possible budget run-over in mind. Some subprojects were cancelled, and others had their design scope reduced. Consequently, the project was completed within the original budget, which was appropriate against the project output.

## 3.4.2.2 Project Period

The planned project period was 68 months from July 2001 (L/A signed) to February 2007 (expected completion of consulting services contract), but the actual project duration was 124 months from July 2001 to November 2011, exceeding the original plan significantly (182% of the plan). The main reasons for the extended project period are listed below. The extension was unavoidable to achieve an appropriate project outcome given the reasons below:

(1) Delays in signing consulting services contracts

The project plan assumed that consulting services contracts would be signed within two months of L/A signing. In reality, it took 9 months (3.5 months for developing the terms of reference and sending invitations for bidding, and 5.5 months for tender evaluations and contract negotiation) to complete the process.

#### (2) Prolonged design reviews

Design details and geological information prepared by local consultants had to be re-evaluated. Additional geological and topographical surveys, hydraulic model tests and modifications to design plans were required. As a result, design reviews took longer than planned. The start for each subproject was planned for 2002, which was a delay of 2 to 4 years in most cases.

#### (3) Reconsideration of construction plans

Modification of the entire plan up to the loan amount was required due to cost increases derived from rapid inflation in the local currency portion, to design modifications and to design changes that reflected the intention of residents. Therefore, the procurement of construction work for each subproject was carried out gradually, and the commencement of construction was from 2003 to 2009 (in most cases from 2004 to 2006).

## (4) Delay in project budget execution

Delays occurred in budget approval by the Directorate General of Water Resources (DGWR) of the MOPW, in local currency budget arrangements, and in budget transfers from central to local government.

#### (5) Delay in the land acquisition process

Consultation with the beneficiary was carefully carried out in order to minimize the scale of land acquisition and resettlement. Also, there was downsizing of design in accordance with the wishes of residents, and changes were also made to canal routes and designs. These measures led to the delay in the project implementation.

## (6) Performance of the local contractor

Progress was delayed in the subprojects of Muko-Muko Kanan, Okak, Lanang and Karau due to financial incapability of the local contractor. The original construction plan was 3 years in each subproject, and this was extended to 4 to 6 years.

## (7) Additional works

Works such as the emergency response to the earthquake which occurred in Yogyakarta<sup>19</sup> and assistance for a succeeding project were added to the consulting service.

#### 3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

FIRR was not calculated while EIRR was 13.6% at the time of appraisal. The calculation basis for the EIRR is as follows:

Cost:	Cost required for the project (civil work and administration cost) and maintenance cost to be increased as a result of the project implementation
Benefit:	Net farm income increase
Project Life:	30 years after commencement of operation

In this ex-post evaluation, FIRR is not calculated as in the appraisal. Since the output content is very different from what was planned initially, a comparison of before and after the project cannot be done appropriately. Therefore, it is not possible to analyze EIRR in this ex-post evaluation.

To summarize, the project cost was lower than planned, but the project period was significantly longer than planned. Therefore, the efficiency of this project is fair.

#### 3.5 Sustainability (Rating: 2)

3.5.1 Institutional Aspects of Operation and Maintenance

The domestic law and government regulations stipulated in 2004 and 2006<sup>20</sup> define the operation and management frameworks based on the difference in irrigation area. When the area becomes smaller-scale, subordinate organizations become responsible for the operation and maintenance of primary and secondary canals. These range from the MOPW and provincial governments, to district governments. The WUAs also take major roles in the operation and

<sup>&</sup>lt;sup>19</sup> This was to rehabilitate the irrigation facilities located in Yogyakarta Special Region which were severely damaged in the earthquake which occurred in Central Java in May 2006 in order to mitigate the crop loss of the upcoming cropping season in the affected area. Sapon, one of the subprojects under the Project, was located in the lower-stream of the recovery target area, and it was decided that assistance would be provided to the recovery target area as part of this Project since, to a certain extent, an impact was anticipated in Sapon.

<sup>&</sup>lt;sup>20</sup> The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006). Since 2006, there has been no revision of existing regulations regarding canal management, nor stipulation of new regulations.

maintenance of tertiary canals no matter how big the irrigated area is. The above government regulation stipulates an exception that "when a subordinate organization does not have financial / managing abilities, its supervising organization shall be accountable".

	Primary Canal		Second	lary Canal	Tertiary Canal	
Irrigation Schemes	Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible
Over 3000 ha and overlaps multiple provinces	MOPW	DGWR, MOPW	MOPW	DGWR, MOPW	Determined by WUA	WUA
Over 1000 ha and less than 3000 ha; overlaps multiple districts	Provincial government	DOWR, Provincial government	Provincial government	DOWR, Provincial government	Determined by WUA	WUA
Less than 1000 ha	District government	Department of Irrigation, District government	District government	Department of Irrigation, District government	Determined by WUA	WUA

Table 20: Responsible Organizations for O&M under Law

Source: The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006)

Table 21 shows the present operation and maintenance organizations of the five subprojects where the site surveys were conducted. On-site level coordination and cooperation with the local government's department of agriculture (DOA) is one of the important factors for proper facility operation and maintenance. On the ground level, efforts have been made such as establishing an official collaboration between the DOWR and the DOA of local governments by exchanging a memorandum for their roles and responsibilities. For the O&M of tertiary canals, operation and maintenance by the WUA has been carried out as stipulated in the rules and regulations except in Lanang. The rates of WUA formulation at the rest of the four subprojects are 40%, 100%, 100% and 20% respectively. The whole length of the tertiary canal has not yet been covered in Batang Tongar and Amandit, as the construction schedule of secondary canals at Batang Tongar has been delayed due to the delay in land acquisition, which has caused another delay in the construction of tertiary canals and the establishment of WUA, which is still progressing. District DOA has been giving support for the time being. In Amandit, WUA has not been organized yet where tertiary canals, not under the Project, are planned for the provision of water in the surrounding area. On the other hand WUA is functioning as management in areas covered by the Project.

	Irrigated	Primary Canal		Second	Secondary Canal		y Canal	WUA
Subproject	Area (ha)	Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible	Formulation Rate
Batang Tongar	2,599	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	Guided by DOA, District Government	40%
Way Curup	3,629	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	WUA	100%
Lanang	1,817	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Local Government	DOWR, District Government	100%
Bajulmati	1,417	MOPW	DOWR, Provincial Government	MOPW	Dept of Irrigation, District Government	-	WUA	100%
Amandit	4,089	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	WUA	20%

Table 21: Organizations Responsible for O&M at Each Site

Source: Survey response from executing agency

Figure 2 shows an example of operation and maintenance conducted among the related organizations in the irrigation system of Bajulmati covered under the Project. The Balay Office under the MOPW conducts O&M by coordinating and working together with the provincial and district government which belongs to the Ministry of Home Affairs. The role and responsibility for enforcing the capacity of WUA is given to the MOA as stipulated in the government regulation<sup>21</sup>. Farmers' Associations, which are also under the MOA, are taking over WUA members and activities as part of their roles and responsibility. Local government DOA conducts the management of WUA and also carry out supporting activities on behalf of the MOA in Amandit. The same is also true in Bajulmati.

<sup>&</sup>lt;sup>21</sup> The Government Regulation No.38 of 2007 (PP 38/2007)



Source: Developed by the Evaluator based on the survey response from the executing agency

Note1: It depends on each province and district as to how the local government is involved in the management of the irrigation systems. This figure shows the institutional arrangements of Banyuwangi District of East Java Province for the management of the irrigation system of Bajulmati as one example.

Note2: The solid lines in the figure shows the direct relations for jurisdiction and chain of command in-between. The dashed lines show indirect and relevant conditions among organizations. For instance, WUA is under the jurisdiction of the MOA, and the solid line between the District DOA and the WUA shows the DOA leading role vis-à-vis WUA in Bajulmati. On the other hand, the dashed line between WUA and the MOPW shows indirect relations.

Figure 2: Organizational Structure for O&M at the Bajulmati Irrigation Improvement Subproject

To summarize, legislative arrangements have been well developed in terms of irrigation facilities management, and the roles and responsibilities of relevant organizations for operation and maintenance have become tangible. They cooperate and support each other based on the established framework as described above. Where the rate of WUA formulation remains low, the DOA of local governments supports tertiary canal management on their behalf, which is one proof of the enforcement of operation and maintenance at ground level. In conclusion, there are no specific problems found in the institutional aspect.

## 3.5.2 Technical Aspects of Operation and Maintenance

Table 22 describes the jurisdiction of responsibilities and the frequency of maintenance activities of the 5 subprojects in detail. According to the responses to the questionnaires by the executing agencies and local government authorities and the site survey, various efforts were made for O&M through the mutual support of local residents, and WUAs have greatly contributed to the sustainable management of facilities and activities since project completion. They periodically conduct dialog among themselves to solve technical problems in tertiary canal management and soil improvement, to conduct monitoring of the irrigation water level, and to take action for emergency response in the case of landslides.

In Lanang, for instance, WUAs check if water is distributed towards the tail farm land by supporting weir operation and by monitoring water management. They often remove garbage from the canals, hold discussions among farmers' groups on water management, state their view from the ground on which crops should be chosen according to the water budget. They support the DOWR in cases of emergency such as landslides. In Bajulmati, they employ retired staffs to meet the demand for human resources, and they provide technical advice and information on agriculture productivity twice a year. However, there are some cases, as seen in Amandit, where the shortage of WUA members makes it impossible to fully manage tertiary canals. There are also some other cases where technical guidance and organizational enforcement cannot be expected, or where landless farmers cannot participate.

Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
	Agency Responsible	DOWR, Provincial Government	DOWR, Provincial Government / Balai Office, MOPW	Balai Office, MOPW
Batang Tongar	Frequency	Twice a year	Once a year	Once a year
	Contents	-	-	Weir, primary and secondary canals
Agency Responsible		DOWR, Provincial Government	DOWR, Provincial Government / Balai Office, MOPW	Balai Office, MOPW
Way Curup	Frequency	Every two months (voluntary)	Once a year (voluntary)	Once a year
	Contents	Grass removal	Removal of mud	Weir
	Agency Responsible	Balai Office, MOPW	Balai Office, MOPW	Balai Office, MOPW
Lanang	Frequency	Four times a year	Twice a year (voluntary)	Once a year
	Contents	Garbage removal, gate maintenance	Grass removal and gate maintenance	Facility rehabilitation
	Agency Responsible	WUA	Irrigation Dept, District Government	Balai Office, MOPW
Bajulmati	Frequency	Twice a month	Once a year	Upon requirement
	Contents	-	Canal maintenance	Repair of major damages

Table 22: Agencies	Responsible for	Maintenance Works,	Frequency and Contents
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	<b>-</b> .			
Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
Amandit	Agency Responsible	Balai Office, MOPW / WUA	Balai Office, MOPW	Balai Office, MOPW
	Frequency	Twice a year	Once a year	Once every two years
	Contents	Maintenance of weir and canals / grass removal and garbage removal	Weir and canal maintenance	Weir maintenance

Source: Survey response from executing agency

Human resource development conducted in the five subprojects varies, as seen in Table 23. Provision of appropriate training opportunities and upgrades of the irrigation facility management techniques are further expected based upon the present quality of human resources at each site. For instance, at the timing of this ex-post evaluation, in Batang Tongar, a committee had been established among relevant stakeholders, while WUA was still under formulation and the maintenance works of canals were left to individuals under leadership of village heads. The maintenance and management capacity of staff members is not sufficient in terms of water management of the irrigation facilities and canals at each level, and capacity development is expected. No information was obtained at Way Curup as a result of any survey. In Lanang and Amandit, there are training opportunities provided, including for WUA members, as shown by the survey. In Bajulmati training opportunities are provided only one time per three years for two people.

As for the capacity enforcement of WUA, the Government Regulation No.38 promulgated in 2007 introduced a training framework in which the MOA provides training opportunities for organizational support and capacity development through NGO, agriculture activities and water management, and operation and maintenance techniques for the existing irrigation facilities. However, no guidance was confirmed in this survey to have been given to WUA by the MOA, or by the DOA of local governments.

Subproject	Program	<b>Contents / Purposes</b>	Target	Frequency
Batang Tongar Irrigation Improvement Project	Staff training on irrigation operation	Improvement of irrigation facilities operation skills	4 people from each irrigation area (2 in charge of weir flushing, 2 in charge of water gate management)	Once a year
Way Curup Irrigation Improvement Project	-	-	-	-
	Training on irrigation operation and management	Improvement of operation management skills	<ul> <li>Department of Technical Service</li> <li>Irrigation Assistant</li> <li>Weir management</li> <li>Weir flushing</li> </ul>	Once a year
Lanang Irrigation Improvement Project	Operation of measurement devices	Improvement of operation skills of measurement devices	<ul> <li>O&amp;M staff</li> <li>Irrigation Assistant</li> <li>Weir management</li> <li>Weir flushing</li> <li>WUA</li> </ul>	Once a year
	Management of irrigation facilities	Improvement of irrigation facility management skills	<ul> <li>Department of Technical Service</li> <li>O&amp;M staff</li> <li>Irrigation Assistant</li> <li>Weir management</li> <li>Weir flushing</li> <li>WUA</li> </ul>	Once a year
	Agriculture improvement by using SRI method	Improvement of agriculture management and water management skills	<ul> <li>Irrigation Assistant</li> <li>Weir management</li> <li>Weir flushing</li> <li>WUA</li> </ul>	Once a year
Bajulmati Dam Irrigation Improvement Project	Quality control	Improvement of construction work progress management skills	Two persons	Once every three years
Amandit Irrigation	Human resources development	Technical operation and management	30 staff members	Twice a year
Project	Human resources development	Enforcement of WUA	30 WUA members	Three times a year

Table 23: Training	g Opportunities	for O&M	Staff of 5	Subprojects
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Source: Survey response from executing agency

Note: SRI stands for System of Rice Intensification. It indicates the technology of increasing unit yield of rice while saving resources.

To summarize, in terms of the technical aspects of operation and maintenance, further efforts are found to be necessary, such as employing more human resources, improving the quality of existing human resources, and enforcing the technical capacity of organizations.

## 3.5.3 Financial Aspects of Operation and Maintenance

In the 5 subprojects where the site survey was conducted, it was the MOPW who should provide the budget of primary and secondary canal operation and management. Local governments or WUA should provide the budget for tertiary canal management. The budget for regular checkups and repairs was the responsibility of local governments or the Balai offices. The transition of budget allocation by the MOPW on the maintenance of the irrigation facilities is shown in the following Table 24. The O&M Department of the MOPW, which was recently established, has not completed institutional arrangements yet for timely budget allocation to each Balai office when requests for budget are made.

				Unit	: 1,000 Rupiah
Subproject	2009	2010	2011	2012	2013
Batang Tongar Irrigation Improvement Project	996,600	1,063,040	1,063,040	1,195,920	1,328,800
Way Curup Irrigation Improvement Project	540,000	540,000	750,240	844,020	937,800
Lanang Irrigation Improvement Project	-	-	-	-	100,000,000
Bajulmati Dam Irrigation Improvement Project	810,000	862,000	865,000	970,000	1,072,000
Amandit Irrigation Project	-	-	-	-	50,000,000

Table 24: O&M Cost for Each Subproject allocated by the MOPW

Source: Survey responses from the executing agency

Note: Lanang was under construction up to 2011, and 2012 was under the warranty period covered by the contractor. Amandit was under construction up to 2009, before when there was no O&M cost allocation.

Information on budget and expenditure data from local governments was not confirmed during this study. In 3 out of 5 sites where WUA members pay for the maintenance costs of the tertiary canals, the comment was made that it was "not sufficient", but the exact amount collected at the end of the survey was not shared.

To summarize, the financial aspect of operation and maintenance has some problems. It is necessary to promote the institutional capacity development of the O&M Department of the MOPW, and to enforce budget allocation. Although it is not known to what extent the local governments provide the budget for maintenance, their roles on the ground for prompt action are important and it is expected that their budget allocation should reach a sufficient level. Securing financial contributions from the WUA members is an urgent task that needs to be tackled and confirmed.

#### 3.5.4 Current Status of Operation and Maintenance

Although there were some subprojects where the construction of the irrigation facilities continued to be paid for by the national budget, and where malfunction of canals occurred caused by landslides following deluges, the site survey conducted in this ex-post evaluation (2014) confirmed that the facilities of the 5 subprojects were more or less appropriately maintained. Out of 5 subprojects, 3 (Batang Tongar, Way Curup and Bajulmati) were the rehabilitation of existing facilities and partly new construction. The O&M framework seemed stable as seen in Way Curup where the local community has existed for a long-time and is stable, which helps smooth cooperation among stakeholders. The remaining two are new projects and no major problems have been admitted yet. Some facilities were partly damaged because of

deluges and slope failures, but the staff members responded well and within regular maintenance work.

The results of site survey are shown as follows:

Table 25: Ph	vsical (	Condition	of 5 Sul	projects a	t the ]	Fime of	Site	Survey
	2			1 ./				2

Subproject	Physical Condition of Project Facilities
Batang Tongar Irrigation Improvement Project	The design of the irrigation network was partly altered as it was decided not to construct some secondary canals when part of the land was converted into oil palm plantation. Primary and secondary canals were properly managed by the Balai Office of the MOPW.
Way Curup Irrigation Improvement Project	Facilities were well managed. Communication and coordination among WUAs, Farmers' Associations and the DOWR were good. However, linings of tertiary canals were not all completed, and they were waiting for the budget allocation for continuance of construction. There were conversions of land use from agriculture to other purposes observed.
Lanang Irrigation Improvement Project	Only two years had passed since project completion, which kept meant there was a lack of experience in coordination among the relevant organizations for the water supply. More time was needed for the establishment of a better operation and management structure although the facilities were well managed.
Bajulmati Dam Irrigation Improvement Project	Facilities were well managed. Communication and coordination among WUAs, Farmers' Associations and the DOWR were good and quality service was provided as a result. However, The water quantity at the secondary canals downstream was insufficient, which meant that farmers changed crops to maize and chilies.
Amandit Irrigation Project	Facilities were well managed and there was no specific problem found.

Source: Site survey results

To summarize, no issues are recognized with the institutional aspect and present condition of the irrigation facilities covered under the project. However, there are some minor problems with the technical and financial aspects, which may have a negative impact on the operation and maintenance systems and physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

## 4. Conclusion, Lessons Learned and Recommendations

#### 4.1 Conclusion

The objective of this project was to enhance food production, particularly in rice, to achieve the nation's self-sufficiency in food supply through the construction and rehabilitation of moderate scale irrigation facilities in Western and Central Indonesia thereby contributing to the reinforcement of the agricultural production infrastructure and poverty reduction in rural Indonesia. This objective was well in line with Indonesia's development policy and the nation's developmental needs for increased food production as well as with Japan's ODA policy. However, it was assessed that some problems were evident in the project planning. The project relevance is evaluated as fair.

With regard to the effectiveness of this project, it was confirmed qualitatively that the farming water supply and unit yields of rice improved and that the crop intensity of rice increased through this project as was seen through the interview surveys. Although some target

figures in the Operation and Effects indicators were not achieved, the objective "to enhance food production particularly in rice to achieve self-sufficiency in food supply" was almost accomplished as a whole, as the unit yield and crop intensity of rice improved steadily. Accordingly, the effectiveness of utilizing irrigation facilities constructed under this project was confirmed as they contributed to the improvement of whole farming gross income and average annual income. Moreover, the effectiveness of the intended project impact, "contribution to the enhancement of the farming production infrastructure and to poverty reduction in rural Indonesia" was confirmed, and no issues were recognized in the areas of the natural environment, land acquisition and resettlement, and there were no other negative impacts. Therefore it is concluded that the project demonstrated effectiveness almost as planned, and the effectiveness and impacts of the project are evaluated as high.

The efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of operation and maintenance, there were no issues with the institutional aspects and the present condition of the irrigation facilities covered under the project. However, there have been some minor problems with the technical and financial aspects, which may give a negative impact on the operation and maintenance systems and the physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

In light of the above, the project is overall evaluated as partially satisfactory.

#### 4.2 Recommendations

- 4.2.1 Recommendations to the Executing Agency
  - (1) Establishment of an official collaboration framework with relevant organizations

While government bodies were reorganized and their roles and functions were reshuffled after the project designing, the MOPW and its Balai Offices, DOWR, and DOA of local government (province and district) coordinate and cooperate well for the maintenance of the irrigation facilities developed under the project. Ground level coordination and cooperation with the DOA is the vital key. In order to respond to changes in the preconditions while dealing with various stakeholders it is anticipated that inter-coordination beyond the mandated roles and responsibilities stipulated in the existing rules will be necessary. It is recommended that official agreements be left as written consent, not verbal, through concluding memorandums and so on between the MOPW, the MOA, and local government departments, for securing the project sustainability.

(2) Support for residents' maintenance activities and their skill development

At ground level, members of WUAs and Farmers' Associations have carried out periodic meetings and discussions on tertiary canal management and emergency responses. Although residents' solidarity and group efforts have been found effective, they have less opportunity to learn about water management or to develop technical skills. It is also difficult for residents to recognize where they stand vis-à-vis the whole irrigation system. There are cases in which organization enforcement is not conducted effectively.

It is strongly recommended that the executing agency, in collaboration with relevant organizations such as the MOA, extend long-term and continuous support to residents and their groups to promote role-sharing and transfer of their roles to others.

4.2.2 Recommendations to JICA None.

## 4.3 Lessons Learned

4.3.1 Further Consideration and investigation for data collection and design content in the project planning stage

It became difficult to implement the 19 subprojects originally planned due to a significant increase in cost associated with the fundamental amendment of the design contents of each subproject. This is because surveys needed to be conducted again during the project implementation period as deficiencies were found in the geographical and topographical data that had been relied on in the design at the time of the project formulation stage, as well as in the design content which was based on the above data. The scale of land acquisition and resettlement increased as a result of the re-examination after the project start, even though the irrigation areas had been set with land acquisition as a precondition, as the necessity for land acquisition was raised from the project formulation stage. (As the result of negotiations with local residents, various countermeasures were taken such as the alteration of canal routes and the reconsideration of design (downsizing of the irrigation systems, etc.). These actions were one of the causes of the longer project period, but the increase in land acquisition was kept to a minimum and the acquisition process was careful and respectful, based on the laws and rules stipulated in Indonesia. No problems have been observed since project completion.)

For an examination of whether the project plan is appropriate, it would be necessary to secure ample time for thorough technical assessment with qualified experts for analyzing data and estimating the project cost, which are the basis of the project planning, when formulating similar projects near future. Whether or not land acquisition is possible greatly affects the project scale and design, and it is recommended that the scale and area of land to be acquired should be accurately identified based on an accurate design at the project planning stage, and that acquisition of land takes place as early possible in order not to harm project implementation.

## 4.3.2 Thorough Implementation of Project Monitoring and Review

The planned project design was largely reviewed and revised prior to the Mid-term Review of 2009. The Mid-term review report became public and a third party evaluator was proposed on the occasion of the Mid-term Review to review and change the target figures of the operation and effect indicators

This project is a project-type sector loan in which subprojects were well formulated and collected as a project package for implementation. Although the project-type loan requires a certain level of design quality at the planning stage, projects with a long implementation period may need, in some cases, reexamination of the operation and effect indicators due to the change of project scope when the situation changes during project implementation. When processing future project-type projects in the irrigation sector in similar conditions, though the design should be as accurate as possible at the planning stage, it is strongly recommended that the project progress and related problems and tasks be worked out and understood through regular monitoring and data collection in the project implementation stage. When the causes of the problems and tasks to be tackled become tangible, it is strongly recommended that JICA and the executing agency conduct a joint project review in a timely manner and make an official agreement for revisions for smooth project monitoring in due course of time and by the ex-post evaluation.

#### 4.3.3 Feedback on Similar Cooperation Projects

JICA has greatly supported the irrigation sector in Indonesia by extending ODA loans along with technical cooperation and grant aid. This project was processed and formulated following the phase I in Central and Western Indonesia, and there is another project under implementation following this project. A cross-scheme evaluation among irrigation sector projects can examine and draw lessons, from a universal and long-term perspective, regarding holistic poverty reduction among farmers in the target area (including cooperation in other sectors), and progress of the skills improvement of government officials of Indonesia

When conducting irrigation projects which are long-term and have a broad area coverage, it is recommended that, by implementing a cross-scheme evaluation and by an examination of project direction, an effective outcome of the examination is sought and lessons drawn for the formulation of similar projects in other countries

End

Item	Plan	Actual
1. Project Outputs a. Civil Works	<ul> <li>Dam: 2 (newly constructed)</li> <li>Weir and intake: 8 (new) and 2 (rehabilitated)</li> <li>Main canal: Approx. 196km (new) and 76km (rehabilitated)</li> <li>Primary canal: 34km (new) and 3km (rehabilitated)</li> <li>Secondary canal: 548km (new) and 156km (rehabilitated)</li> <li>Tertiary canal: 52,230km (new) and 6,633km (rehabilitated)</li> <li>Land development: 7,490 ha (new)</li> <li>Drainage canal: 273 km (new)</li> <li>Supply canal: 9 km (new)</li> <li>Flood control dyke: 5 km (new)</li> <li>Covering dyke: 0.4 km (new)</li> <li>Tunnel: 0.6 km (new)</li> <li>Main drain: 3 km (rehabilitated)</li> <li>Secondary drain: 49 km (rehabilitated)</li> <li>Siphon: 2 (rehabilitated)</li> <li>State road: 0.2km (rehabilitated)</li> </ul>	<ul> <li>Dam: 1 (newly constructed)</li> <li>Weir and intake: 6 (new) and 5 (rehabilitated)</li> <li>Main canal: 115km (new) and 58km (rehabilitated)</li> <li>Primary canal: Approx. 12km (new) and 4km (rehabilitated)</li> <li>Secondary canal: Approx. 12km (rehabilitated)</li> <li>Secondary canal: Approx. 187km (new) and 183km (rehabilitated)</li> <li>Tertiary canal: 14,697km (new) and 2,898km (rehabilitated)</li> <li>Land development:604 ha (new)</li> <li>Drainage canal: approx. 137 km (new)</li> <li>Supply canal: 2.5 km (new)</li> <li>Covering dyke: 0.1 km (new)</li> <li>Tunnel: 174.6 km (new)</li> <li>Secondary drain: 22 km (rehabilitated)</li> <li>Floodway: Approx. 5 km (rehabilitated)</li> <li>Siphon: 1 (rehabilitated)</li> <li>Crump de Gruyter diversion: 42 (rehabilitated)</li> <li>Spillway for weir: 1 (new)</li> </ul>
b. Consulting Services	3,019.17 man / months	3,517.45 man / months
2. Project Period	July 2001 to February 2007 (68 months)	July 2001 to November 2011 (124 months)
3. Project Cost Amount paid in Foreign Currency	1,027 million yen	1,131 million yen
Amount paid in Local Currency	20,945 million yen (1,611,154 million rupiah)	21,299 million yen (1,905,605 million rupiah)
Total	21,972 million yen	22,430 million yen
Japanese ODA loan portion	18,676 million yen	18,473 million yen
Exchange Rate	1 rupiah = 0.013 yen (as of July 2001)	1 rupiah = 0.011 yen (average between 2001 and 2011)

## Comparison of the Original and Actual Scope of the Project