Republic of Indonesia

FY2022 Ex-Post Evaluation Report of Japanese ODA Loan

"Participatory Irrigation Rehabilitation and Improvement Management Project"

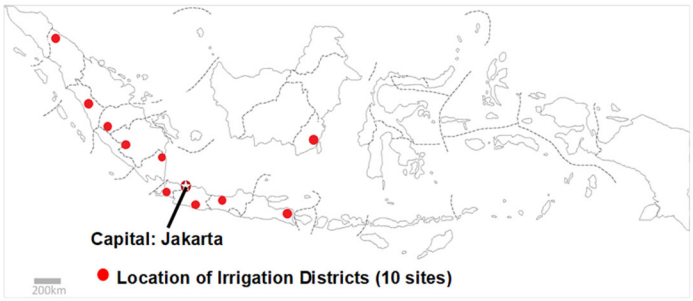
External Evaluator: Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project rehabilitated and expanded the irrigation facilities in the western region of Indonesia and supported the development of maintenance systems with the aim of increasing rice production, thereby contributing to national food security. Increasing rice production is an urgent issue in Indonesia, and irrigation is considered as major infrastructure that promotes increase in domestic food production. Therefore the objective is consistent with the policy and needs at the time of appraisal and the ex-post evaluation. In addition, project plan and design were appropriate. The project is consistent with Japan's development cooperation policy, and concrete results can be confirmed through collaboration with another project within JICA. The project also contributes to the SDGs, which is an international framework. Therefore, its relevance and coherence are high. In terms of project implementation, the project cost was within the plan but the project period significantly exceeded the plan. Therefore, efficiency of the project is moderately low. Regarding project effects, the indicators of quantitative effects set at the time of the appraisal has mostly achieved its objectives overall. It was confirmed from the interviews with the executing agency and the beneficiary farmers, along with concrete evidence and data, that the implementation of this project has contributed to the stable food supply in Indonesia and to the stabilization of farmers' income and the improvement of their living environment in the project area. In addition, from the interviews with the beneficiary farmers, it was confirmed that the project has contributed to raising farmers' awareness (confidence in irrigated agriculture, motivation to increase rice production and increased awareness of cooperation among farmers). Thus, effectiveness and impacts are high. Regarding operation and maintenance, slight issues have been observed in the current status, however, there are good prospects for improvement/resolution. Therefore, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location

Batang Anai Irrigation District

(Source: external evaluator)

1.1 Background

Agriculture is an important sector in Indonesia. Rice is the country's staple food, but due to external factors such as abnormal weather and soaring prices of fertilizers and pesticides after the currency crisis in 1997, rice production remained unstable, and imports were necessary. In addition, although Indonesia's population was on the rise, the area of arable land on the island of Java, the main rice producing area, was decreasing due to the advancement of urbanization and industrialization. The situation of having to rely on imports was likely to be continued because the nationwide expansion of the irrigated area could not be expected. Therefore, increasing rice production was an urgent issue for the country also from the perspective of food security. The western region of Indonesia (Java, Sumatra and Kalimantan Islands) is the main production area for rice in the country. Rehabilitation and new expansion of irrigation facilities in the region as well as development of an appropriate maintenance and management system would contribute to increasing rice production, which the Indonesian government considered to be an urgent issue.

1.2 Project Outline

The objective of this project is to increase rice production in the western region of Indonesia (Java, Sumatra and Kalimantan Islands) by rehabilitating and expanding irrigation facilities and supporting the development of operation and maintenance systems, thereby contributing to national food security.

Loan Approved Amount / Disbursed Amount	12,310 million yen / 12,260 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March 2008 / March 2008	
Terms and Conditions	Interest Rate Repayment Period (Grace Period Conditions for Procurement	1.4% (0.01% for Consultants) 30 years 10 years) General Untied
Borrower / Executing Agency	Republic of Indonesia / Ministry of Public Works and Housing, Director General of Water Resources (hereinafter referred to as "DGWR")	
Project Completion	August 2020	
Target Area	The western region of Indonesia (Java, Sumatra and Kalimantan Islands)	
Main Contractors (Over 1 billion yen)	PT. Brantas Abipraya (Indonesia), PT. Waskita Karya (Indonesia), PT. Waskita Karya (Indonesia) / PT. Adhi Karya (Indonesia) (JV), PT. Pembangunan Perumahan (Indonesia) / PT. Wijaya Karya (Indonesia) (JV), PT. Waskita Karya (Indonesia) / PT. Brantas Abipraya (Indonesia) (JV)	
Main Consultants (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan), PT. PPA Consultants (Indonesia), PT. Mitrapacific Consulindo International (Indonesia) / PT.Widya Graha Asana (Indonesia) / PT. Ciriajasa Engineering Consultans (Indonesia) (JV)	
Related Studies (Feasibility Studies, etc.)	Preparation of Implementation Program by the DGWR (March 2007)	
Related Projects	[ODA Loan] Rentang Irrigation Modernization Project (L/A signing: March 2017)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: September 2022-November 2023

Duration of the Field Study: December 27 2022-January 23 2023, May 14-16 and June 7-9 2023

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance/Coherence (Rating: ③[2])

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Indonesia

At the time of the appraisal, the Indonesian government set a priority target of increasing the average annual growth rate of the agricultural sector to 3.5% by 2009 and improving the income and welfare of farmers in *the National Medium-Term Development Plan (RPJM) (2004-2009)*. In addition, in order to realize economic growth and food self-sufficiency, the government also advocated the revitalization of agriculture, and promoted basic policies such as capacity building of farmers, strengthening of support organizations, food self-sufficiency, and improvement of productivity, competitiveness, and value-added of agricultural products.

At the time of the ex-post evaluation, the Indonesian government places a high priority on achieving national food security in its *Long-Term National Development Plan (RPJPN) (2005-2025)*. It points out the increase in conversion of farmland, low agricultural productivity, and dysfunction of irrigation networks and their facilities as issues for stable food supply. In addition, in *the National Medium-Term Development Plan (RPJMN) (2020-2024)*, irrigation is regarded as a major infrastructure that promotes increased domestic food production and contributes to the promotion of food security. *The RPJMN* places priority on enhancing agricultural productivity, improving access to agriculture, and advancing the quality of agricultural products, and aims to strengthen the organization of farmers' groups, etc. Furthermore, one of the pillars of the Ministry of Agriculture's *Agricultural Strategic Plan (2020-2024)* is to maintain national food self-sufficiency, and its major programs include "water supply through irrigation rehabilitation, etc." and "increased production of food crops including rice."

This project aimed to increase rice production and contribute to food security by supporting the development of irrigation facilities and maintenance systems, which is consistent with Indonesia's development policy at the time of appraisal and the ex-post

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[2] ④: Very High, ③: High, ②: Moderately Low, ①: Low

evaluation.

3.1.1.2 Consistency with the Development Needs of Indonesia

At the time of the appraisal, the area of arable land in Java, the main rice producing area, was decreasing due to the advancement of urbanization and industrialization. In addition, the nationwide expansion of the irrigated area could not be expected and the state of having to rely on imports was likely to be continued. Furthermore, as Indonesia's population continued to grow and demand for rice was expected to rise, increasing rice production was an urgent issue for the country also from the perspective of food security.

At the time of ex-post evaluation, overcoming the vulnerability of the food supply system and achieving self-sufficiency in rice continues to be a pressing issue in Indonesia. In order to achieve 100% self-sufficiency in rice, irrigation development to create new irrigated paddy fields and regular rehabilitation to maintain the developed irrigation scheme are necessary. In addition, in the western region of Indonesia, the irrigation system, including the operation and maintenance of irrigation facilities, is inadequate and improvements are still necessary.

Therefore, the project is in line with the development needs of Indonesia both at the time of the appraisal and the ex-post evaluation.

3.1.1.3 Appropriateness of the Project Plan and Approach

The project plan and design were based on the lessons learned from the similar projects, and the use of the lessons learned was appropriate and has generated the expected effects. Specifically, based on the lessons learned from similar projects, the project provided consulting services to strengthen the capacity for operation and maintenance of irrigation facilities. (See "3.2.1 Project Outputs.") In addition, project plan and design were based on the points to note in terms of project implementation and supervision that were recognized at the time of the appraisal. Specifically, the Irrigation Committees were established during the project implementation process, Coordination Meetings were held in order to ensure coordination among the central and local governments, relevant ministries and agencies, and farmers, and Working Groups were established and knowledge related to operation and maintenance of irrigation facilities was disseminated to the River Basin Offices (Balai Besar Wilayah Sungai, hereinafter referred to as "BBWSs") under the executing agency (DGWR), local government including provincial and district governments and to beneficiary farmers in a cascade manner.

In terms of equity, the project adopted a participatory approach to ensure equitable

water allocation among farmers. Specifically, the project provided consulting services to support capacity building in the operation and maintenance of irrigation facilities, including establishment, restructuring and capacity building of Water Users' Associations (hereinafter referred to as "WUAs"), and training for maintenance members. In addition, from the interviews with the executing agency and the WUAs, it was confirmed that decision-making process in the WUAs is fair, with one vote per farmer, regardless of whether the farmers own land or not, and regardless of the size or location of the farmland. Mechanisms for all farmers to participate in the decision-making process are in place. The WUAs have established rules for water allocation and water usage among farmers, and have established systems to provide guidance on water gate operation and to monitor and evaluate water distribution status so that water is distributed based on the agreements among farmers. (See "3.3.2.2 Other Positive and Negative Impacts," "4) Marginalized People.")

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

Japanese government placed "building a democratic and just society" as one of its priority areas in its *Country Assistance Program for Indonesia (November 2004)* and provided support for the development and management of related infrastructure as part of "agricultural and fishery development." In addition, JICA identified "support for poverty reduction," "building a foundation for sustainable growth" and "support for human resource development" as priority areas in its *Overseas Economic Cooperation Operation Strategy (April 2005)*. The project aims to increase rice production and contribute to food security through rehabilitation and expansion of irrigation facilities and development of maintenance and management systems, which was consistent with Japan's development cooperation policy at the time of the appraisal.

3.1.2.2 Internal Coherence

Collaboration with the ODA loan "Rentang Irrigation Modernization Project (schedule for March 2017-April 2024)," which was not expected at the time of the appraisal took place for this project. Specifically, water demand forecast for Rentang irrigation system and a study of water volume in Cimanuk River, the water source of the irrigation system, were conducted in this project. In addition, part of the project cost was allocated for the detailed design of the Rentang Irrigation Modernization Project. This measure took place in response to concerns raised by local farmers that the

implementation of the project (the Leuwi Goong irrigation district) would have a negative impact on the downstream Jatigede Dam and the Rentang irrigation system.[3] It was confirmed through the interviews with the executing agency that the study found no particular problems, and that in fact, water supply to the Rentang irrigation system is sufficient, and that no complaints have been received from local farmers.

3.1.2.3 External Coherence

It was confirmed through the interviews with the executing agency and the beneficiary farmers, along with concrete evidence and data, that the project contributes to the SDG goals of "1. No poverty," "2. Zero hunger" and "6. Safe water and sanitation for all." As detailed in "3.3.1 Effectiveness" and "3.3.2 Impacts," it is confirmed that the project contributes to stabilize the income of farmers and to reduce poverty in the provinces and areas where the project is located (goal 1), to stabilize food supply in Indonesia (goal 2) and to promote efficient use of water and to improve and strengthen management in the irrigation sector (goal 6).

The project is consistent with the Indonesia's development policy and development needs, and the project plan and approach were appropriate. The project is also consistent with Japan's development cooperation policy, and coordination with another project within JICA has taken place, and concrete results can be confirmed. The project also contributes to the SDG goals 1, 2 and 6, which is an international framework. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project rehabilitated and expanded irrigation facilities, and provided support for the development of maintenance systems in the western region of Indonesia. Tables 1 and 2 compare the planned and actual outputs of major outputs.

As a major change from the time of the appraisal, the Jabung irrigation district (new expansion work) was added to the scope using the unused balance of the ODA loan. According to the executing agency and the Japanese consultant in charge of construction supervision, Jabung was the highest priority among the candidate irrigation districts that were not included in the original scope, and the farmers expressed a strong need for the expansion work. It was appropriate to add the scope as it was in line with the local needs.

[3] The Jatigede Dam and the existing Rentang irrigation system are located in the lower reaches of the Cimanuk River, and the Leuwi Goong irrigation district of this project is located in the upper reaches of the same river.

In addition, there were some changes from the plan at the time of the appraisal regarding the area of rehabilitation and new expansion of each irrigation district, but all changes were based on the project site conditions and were reasonable changes. Furthermore, as mentioned above in "3.1.2.2 Internal Coherence," a water demand forecast for the Rentang irrigation system and a comprehensive water volume study of the Cimanuk River Basin and a detailed design (part of the work) of "Rentang Irrigation Modernization Project" were added. The addition of the scope was appropriate because they were conducted as a risk measure in consideration of the possibility of negative impacts on the Jatigede Dam and the existing Rentang irrigation system due to the implementation of the project in the Leuwi Goong irrigation district.

Table 1: Comparison of Major Planned and Actual Outputs (Civil Works)

Irrigation District	Plan	Actual	Comparison / Remark
1. Comal (Central Java Province)	Tertiary system: 8,947 ha (Rehabilitation)	Tertiary system: 8,882 ha (Rehabilitation)	8,882 ha was rehabilitated as there were no problems with project site conditions. Actual tertiary canal area is 8,947 ha.
2. Batang Anai (West Sumatra Province)	Tertiary system: 655 ha (Rehabilitation), 6,062ha (New expansion)	Tertiary system: 655 ha (Rehabilitation), 6,185 ha (New expansion)	Expanded area increased by 123 ha due to conversion to rice paddies, which was not originally planned.
3. Ciliman (Banten Province)	Tertiary system: 5,315 ha (Rehabilitation)	Tertiary system: 5,374 ha (Rehabilitation)	59 ha increase from the time of planning.
4. Namu Sira-Sira (North Sumatra Province)	Tertiary system: 6,280 ha (Rehabilitation)	Tertiary system: 2,256 ha (Rehabilitation), Secondary system: 4,930 ha (Rehabilitation)	Land use other than rice paddies (plantations, etc.) was identified during project implementation, and no rehabilitation work was conducted on land other than rice paddies. Secondary canals were rehabilitated.
5. Air Lakitan II (South Sumatra Province)	Tertiary system: 4,924 ha (New expansion)	Tertiary system: 4,766 ha (New expansion)	4,766 ha was expanded based on the project site conditions.

6. Sei Siulak Deras (Jambi Province)	Tertiary system: 3,721 ha (Rehabilitation), 2,098 ha (New expansion)	Tertiary system: 2,347 ha (Rehabilitation), 709 ha (New expansion)	2,347 ha of tertiary system were rehabilitated as there were no problems with project site conditions. 709 ha of expansion work was conducted based on the project site conditions. Actual tertiary canal area is 4,430 ha.
7. Sampean (East Java Province)	Tertiary system: 10,199 ha (Rehabilitation)	Tertiary system: 10,218 ha (Rehabilitation)	19 ha increase from the time of planning.
8. Alabio (South Kalimantan Province)	Tertiary system: 5,987 ha (Rehabilitation)	Tertiary system: 2,450 ha (Rehabilitation)	2,450 ha was rehabilitated based on project site conditions. Actual tertiary canal area is 5,987 ha.
9. Leuwi Goong (West Java Province)	Tertiary system: 3,071 ha (Rehabilitation), 2,242 ha (New expansion)	Tertiary system: 32 ha (Rehabilitation), 1,817 ha (New expansion)	After expiration of the loan disbursement period, the project continued using government's own funds, but the development areas decreased due to budget constraints and the situation of the project site. Actual tertiary canal area is 4,888 ha.
10. Jabung (Lampung Province)	-	Tertiary system: 5,638 ha (New expansion)	Addition of scope in response to strong requests from residents (utilization of unused balance of ODA loan).

Source: Information provided by JICA, results from questionnaire survey and interviews with the executing agency

Table 2: Comparison of Major Planned and Actual Outputs (Consulting Services)

Plan	Actual (Additional Outputs)	Comparison / Remarks
Tendering Assistance Construction Supervision Support for Strengthening Irrigation Facility Operation and Maintenance Capacity	The Jabung irrigation district was added	Additions as a result of additional irrigation district
-	Planning study and design for the Jabung irrigation district were added	Additions as a result of additional irrigation district
-	A water demand forecast for the Rentang irrigation system and a comprehensive water volume study of the Cimanuk River Basin were added Detail design (part of the work) of ODA loan "Modernization Support of Rentang Irrigation Project" was added	See "3.1.2.2 Internal Coherence" for background information

Source: Information provided by JICA, results from questionnaire survey and interviews with the executing agency

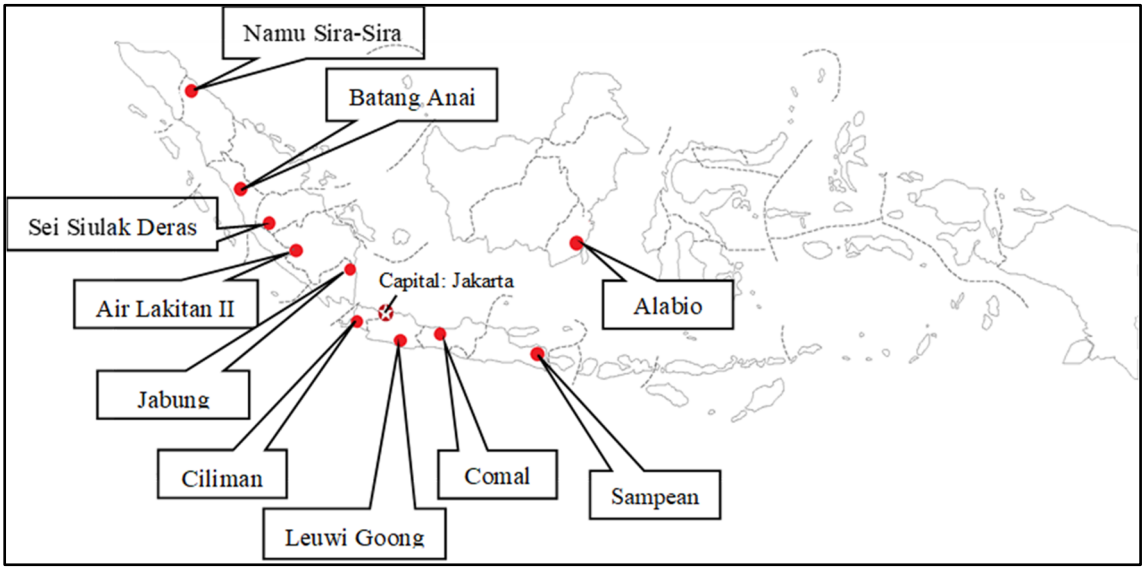
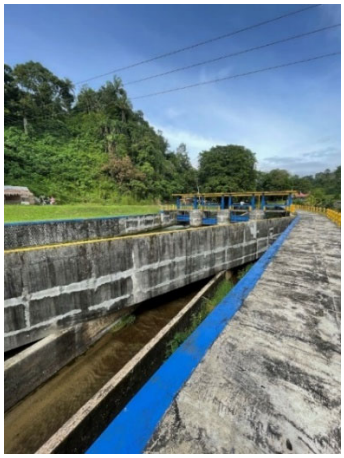


Figure 1: Location Map of the Project Site (Target Irrigation Districts for the Project)



Drainage Channel (Batang Anai)
(Source: external evaluator)

Weir (Sampean)
(Source: external evaluator)

Intake Gate (Jabung)
(Source: external evaluator)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 29,375 million yen (out of which 12,310 million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 28,127 million yen[4] (out of which 12,260 million yen was covered by Japanese ODA loan), which is within the plan (96% of the planned amount). There were additional scope, but as a result of appreciation of the yen and price competition in the bidding process, the project cost was kept within the plan.

3.2.2.2 Project Period

The project period was planned as 70 months as opposed to 150 months in actuality, which significantly exceeded the plan (214% of the planned period). As a result, the loan disbursement period was extended from July 2016 to October 2017. After the end of the loan disbursement period, the executing agency continued the project using its own funds. Table 3 summarizes the comparison of planned and actual project period.

The main reasons for the delay include (1) delay in selection of consultants and contractors, (2) delay in land acquisition, (3) additional project scope, (4) delay in budget allocation from the Indonesian government side, and (5) delay in civil works by the local contractors with low financial and construction capacity.

[4] The exchange rate was calculated at 1 IDR = 0.0087353 yen. (From the IMF International Financial Statistics 2008-2020 average rate))

Table 3: Comparison of Planned and Actual Project Period

Item	Plan	Actual
Total Project Period (Note 1)	Mar. 2008-Dec. 2013 (70 months)	Mar. 2008-Aug. 2020 (150 months)
Signing of Loan Agreement	Mar. 2008	Mar. 2008
Selection of Consultants	Apr. 2008-Dec.2008 (9 months)	Jun. 2008-Jun. 2010 (25 months)
Consulting Services	Jan. 2009-Dec. 2013 (60 months)	Jan. 2010-Sept. 2017 (93 months)
Land Acquisition	Jan. 2008-Sept. 2009 (21 months)	2015-Oct.2019 (Note 2)
Tendering and Conclusion of Contract	Jun. 2008–Sept.2009 (16 months)	Aug. 2008-Aug. 2017 (109 months)
Civil Works	Oct. 2009-Jun. 2013 (45 months)	Jun. 2009-Aug. 2019 (123 months)
Strengthening of WUAs / Water Management / Asset Management	Apr. 2008-Dec.2013 (69 months)	Apr. 2010-Dec. 2015 (69 months)
Warranty Period	Jun. 2013-Dec.2013 (7 months)	Mar. 2018-Aug.2020 (30 months)

Source: Information provided by JICA, results from questionnaire survey and interviews with the executing agency

Note 1: The definition of project completion is completion of warranty period (definitions at the time of project formation).

Note 2: The earliest start of the land acquisition process was in the Batang Anai irrigation district. The starting month is unknown. The land acquisition process for the Jabung irrigation district, where the project scope was added, started in December 2015 and the process was completed in October 2019.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

The economic internal rate of return (EIRR) of the project at the time of the appraisal was 20.8%, with the project cost (excluding taxes), and operation and maintenance costs as “costs,” the increased agricultural production income as “benefits,” and the project life as 30 years. In this ex-post evaluation, recalculation under the same conditions resulted in 22.1% (average of nine irrigation districts in the original plan) and 22.0% (average of ten irrigation districts including the added scope of the Jabung irrigation district), which exceeded the values at the time of the appraisal.

Therefore, efficiency of the project is moderately low.

3.3 Effectiveness and Impacts[5] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, (1) "irrigated area," (2) "cropping intensity," (3) "rice production," (4) "rice yield" and (5) "rate of WUA coverage[6]" were set as quantitative effect indicators of the project. Tables 4, 5 and 6 summarize the baseline values, target values and actual values for 2020 and 2021 for each indicator. (The nine irrigation districts are divided into rehabilitation work only (Table 4), rehabilitation and new expansion works (Table 5), and new expansion work only (Table 6).) For the Jabung irrigation district for the additional scope, the target values were not updated at the time of addition, so the actual values are shown in Table 7 for reference information.

As the project completion is August 2020, the target year to be compared is 2025, five years after completion. However, the ex-post evaluation was conducted ahead of schedule, and comparisons were made with the latest data available from the executing agency, the actual values for the year 2021.

Table 4: Operation and Effectiveness Indicators of the Project (Rehabilitation Work Only) (Note 1)

Indicators	Baseline Value	Target Value	Actual Value (Percentages in parentheses for 2021 indicate achievement rates)	
	2007	2018	2020	2021
		5 Years After Completion (Note 2)	Completion Year	1 Year After Completion
1) Irrigated Area (ha)	4,470	7,346	6,896	6,896 (94%)
2) Cropping Intensity (%/year)	112.6	151.2	201.4	203.9 (135%)
3) Rice Production (ton/year)	33,474	50,817	52,119	53,374 (105%)
4) Rice Yield (ton/ha/season)	Wet 3.2 Dry 3.9	Wet 3.8 Dry 4.5	Wet 6.1 Dry 5.7	Wet 6.3 (166%) Dry 5.9 (131%)
5) Rate of WUA Coverage	57.5	100	98.0	98.0 (98%)

Source: Information provided by JICA (baseline values and target values), results from questionnaire survey of the executing agency (actual value)

Note 1: Average of five irrigation districts with rehabilitation work only. (Comal, Ciliman, Namu Sira-Sira, Sampean, and Alabio)

Note 2: The target year is set at five years after project completion, since the production of agricultural products is expected to reach 50% of the expected production in the first year after project completion, and 100% in the fifth year thereafter.

[5] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

[6] Percentage of WUA membership to total beneficiary farmers.

The actual values for the five irrigation districts with rehabilitation work only were slightly below the targets for irrigated area and rate of WUA coverage (achievement rates of 94% and 98%, respectively), while other indicators (cropping intensity, rice production, and rice yield) exceeded the targets (achievement rates of 135%, 105%, 166% (wet season), and 131% (dry season), respectively).

Table 5: Operation and Effectiveness Indicators of the Project
(Rehabilitation and New Expansion Works) (Note 1)

Indicators	Baseline Value	Target Value	Actual Value (Percentages in parentheses for 2021 indicate achievement rates)	
	2007	2018	2020	2021
		5 Years After Completion (Note 2)	Completion Year	1 Year After Completion
1) Irrigated Area (ha)	2,482	5,950	4,811	4,811 (81%)
2) Cropping Intensity (%/year)	144.3	200	199	147 (74%)
3) Rice Production (ton/year)	26,918	51,319	46,796	47,354 (92%)
4) Rice Yield (ton/ha/season)	Wet 3.4 Dry 3.3	Wet 4.3 Dry 4.3	Wet 5.1 Dry 5.4	Wet 4.9 (114%) Dry 5.2 (121%)
5) Rate of WUA Coverage	41.6	100	100	100（100%）

Source: Information provided by JICA (baseline values and target values), results from questionnaire survey of the executing agency (actual value)

Note 1: Average of three irrigation districts for rehabilitation and new expansion works (Batang Anai, Sei Siulak Deras and Leuwi Goong).

Note 2: The target year is set at five years after project completion, since the production of agricultural products is expected to reach 50% of the expected production in the first year after project completion, and 100% in the fifth year thereafter.

The actual values for the three irrigation districts for rehabilitation and new expansion works were slightly below the targets for irrigated area, cropping intensity, and rice production (achievement rates of 81%, 74%, and 92%, respectively), but the targets for rice yield and rate of WUA coverage were achieved (achievement rates of 114% (wet season), 121% (dry season), and 100%, respectively).

Table 6: Operation and Effectiveness Indicators of the Project (New Expansion Work Only) (Note 1)

Indicators	Baseline Value	Target Value	Actual Value (Percentages in parentheses for 2021 indicate achievement rates)	
	2007	2018	2020	2021
		5 Years After Completion (Note 2)	Completion Year	1 Year After Completion
1) Irrigated Area (ha)	0	4,924	4,891	4,891 (99%)
2) Cropping Intensity (%/year)	132	176	250	250 (142%)
3) Rice Production (ton/year)	12,972	34,592	51,355	51,355 (148%)
4) Rice Yield (ton/ha/season)	Wet 2.0 Dry 2.0	Wet 4.0 Dry 4.0	Wet 4.2 Dry 3.8	Wet 4.2 (105%) Dry 3.8 (95%)
5) Rate of WUA Coverage	0	100	100	100 (100%)

Source: Information provided by JICA (baseline values and target values), results from questionnaire survey of the executing agency (actual value)

Note 1: Figures for irrigation district with new expansion work only (Air Lakitan II).

Note 2: The target year is set at five years after project completion, since the production of agricultural products is expected to reach 50% of the expected production in the first year after project completion, and 100% in the fifth year thereafter.

The actual values for the irrigated areas with only new expansion were slightly below the targets for irrigation district and rice yield in dry-season (achievement rates of 99% and 95%, respectively), but the cropping intensity, rice production, rice yield in wet-season, and rate of WUA coverage achieved their targets (achievement rates of 142%, 148%, 105%, and 100%, respectively).

Table 7: Actual Values for the Additional Scope of the Jabung Irrigation District (New Expansion Work Only) (for reference)

Indicators	Actual Value	
	2020	2021
	Completion Year	1 Year After Completion
1) Irrigated Area (ha)	4,361	4,361
2) Cropping Intensity (%/year)	133	133
3) Rice Production (ton/year)	35,822	39,036
4) Rice Yield (ton/ha/season)	Wet 4.8 Dry 6.5	Wet 6.0 Dry 6.5
5) Rate of WUA Coverage (%)	100	100

Source: Results from questionnaire survey of the executing agency

From the above, some indicators fell short of the target values, but considering the fact that comparative analysis with the actual values for 2021 was conducted ahead of the year in which the comparison should be made (2025) and the underachievement rate is minimal, it can be concluded that the project has mostly achieved its objectives on the whole.

[Column] Estimation of Areas Benefitting by Using Satellite Data[7]

In the ex-post evaluation of this project, estimation of the areas benefitting was made on a trial basis using satellite data. For three out of the ten irrigation districts under the project, Batang Anai, Comal, and Sampean, where coordinate data for the project areas was available, estimation of the areas benefitting was made based on the Normalized Difference Vegetation Index (NDVI). Specifically, the dry season, when precipitation decreases, was selected as the period for analysis, and the area where the NDVI exceeded a certain level (threshold) during this period was considered to be an area which had benefited. For accommodating variations in the areas benefitting due to weather conditions of each year, the averages of the areas benefiting for the three years (2020, 2021, and 2022) were analyzed. NDVI was calculated using Sentinel-2 Multi Spectral Instrument Level-2A, which was provided by the European Space Agency.

For setting the threshold, as the period when the NDVI exceeds 0.40 can be considered to be the growing season for major crops in the Asian monsoon region, the lower limit of the threshold was set at this level. In non-cultivated lands near the project sites, the NDVI was generally less than 0.5 during the analysis period and this level was set as the upper limit of the threshold. In addition, a further threshold was set at the midpoint (0.45) between the upper and lower limits.

In Comal and Sampean, the differences between the area analyzed and the area benefiting were very small, at less than 2% for all thresholds. Therefore, almost all the project area is considered to be the area had benefited from this project. In Batang Anai, the difference between the area analyzed and the area benefiting, based on satellite data, was at most 7.6%, suggesting that most of the project area had benefited from this project. However, the area benefiting decreased along with the increase of the threshold and the area declined over the past three years. This may suggest that the benefits were weak in some areas due to the damage of irrigation canals.[8]

[7] To complement the judgment of indicators for the quantitative effect, satellite data were used for the estimation of the areas benefitting. Nobuyuki Kobayashi (Principal Consultant, OPMAC Corporation) conducted the satellite data analysis in this column.

[8] Problems with the canals in Batang Anai are under repair in the FY2023 budget, and it has been confirmed with the executing agency that the work is scheduled to be completed in December 2023.

(1) Areas Benefiting in Comal Irrigation District

Threshold	(a)Analyzed area (ha)	Area Benefiting 2020 (ha)	Area Benefiting 2021 (ha)	Area Benefiting 2022 (ha)	(b)Average Area Benefiting (ha)	Difference (b)-(a)/(a)
0.40	8,669	8,604	8,604	8,593	8,601	-0.8%
0.45	8,669	8,591	8,590	8,580	8,587	-0.9%
0.50	8,669	8,571	8,569	8,561	8,567	-1.2%

(2) Areas Benefiting in Sampean Irrigation District

Threshold	(a)Analyzed area（ha）	Area Benefiting 2020 (ha)	Area Benefiting 2021 (ha)	Area Benefiting 2022 (ha)	(b) Average Area Benefiting(ha)	Difference (b)-(a)/(a)
0.40	9,690	9,613	9,601	9,604	9,606	-0.9%
0.45	9,690	9,588	9,576	9,580	9,581	-1.1%
0.50	9,690	9,545	9,534	9,539	9,540	-1.6%

(3) Areas Benefiting in Batang Anai Irrigation District

Threshold	(a)Analyzed area (ha)	Area Benefiting 2020 (ha)	Area Benefiting 2021 (ha)	Area Benefiting 2022 (ha)	(b)Average Area Benefiting (ha)	Difference (b)-(a)/(a)
0.40	7,011	6,936	6,765	6,769	6,823	-2.7%
0.45	7,011	6,880	6,607	6,556	6,681	-4.7%
0.50	7,011	6,785	6,366	6,279	6,477	-7.6%

3.3.1.2 Qualitative Effects (Other Effects)

The qualitative effects of “stable food supply in Indonesia” and “improvement of living environment with stabilization of farmers’ income in the target irrigation districts” were categorized as project impacts. Therefore, they are described below in “3.3.2.1 Intended Impacts.”

3.3.2 Impacts

3.3.2.1 Intended Impacts

The state of generation of effects on “stable food supply in Indonesia” and “improvement of living environment with stabilization of farmers’ income in the target irrigation districts,” which were categorized as the impacts of the project were confirmed from the results of questionnaire survey of the executing agency and the qualitative survey conducted at the time of observation of the project sites.[9]

[9] Qualitative survey was conducted in Sampean (rehabilitation work only), Batang Anai (rehabilitation and expansion works), and Jabung (expansion work only. additional scope) with a total of 30 beneficiary farmers

(1) Stable food supply in Indonesia

Figure 2 shows the rice production in the ten provinces where the irrigation districts of the project are located, as well as the total rice production across Indonesia from a comparative perspective. Also, Figure 3 shows the ratio of rice production in the ten provinces where the target irrigation districts are located to the total rice production in Indonesia. Although rice production in the ten provinces has remained mostly flat (Figure 2), it accounts for more than 70% of the rice production in the whole Indonesia. This indicates that the western region of Indonesia, where the project is located, is making a significant contribution to the stable food supply for the country as a whole. This proportion was on the rise from 2018 to 2020, but declined in 2021 and picked up moderately in 2022. Inferring from the qualitative survey results, it is thought that the spread of COVID-19 infection had an impact. In fact, 13 out of 30 (43%) farmers said that their agricultural activities were affected by the spread of COVID-19. Specifically, some respondents said that movement restrictions affected the distribution of fertilizers and pesticides, resulting in shortage of products, and that shipping and sales activities of rice were affected.

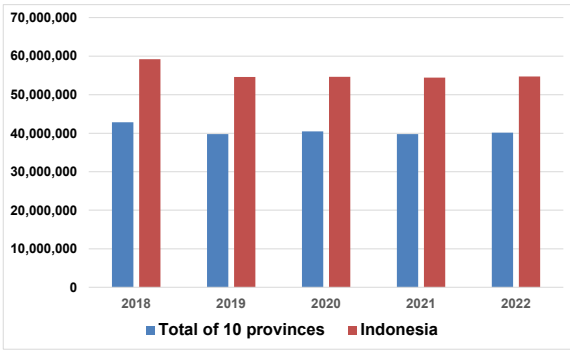
(10 in each subproject) within the irrigation beneficiary areas of the three subprojects. The breakdown is shown in the table below. The gender and age bias is due to the fact that the key informants, the board members of the WUAs (head of WUA, secretary, and treasurer), were all men and older, as well as due to local customs.

<Age breakdown of farmers in the qualitative survey (persons)>

Subproject	20s	30s	40s	50s	60s and above	Total
Sampean (rehabilitation work only)	0	0	1	5	4	10
Batang Anai (rehabilitation and new expansion works)	0	2	3	5	0	10
Jabung (new expansion work only)	0	0	4	5	1	10
Total	0	2	8	15	5	30

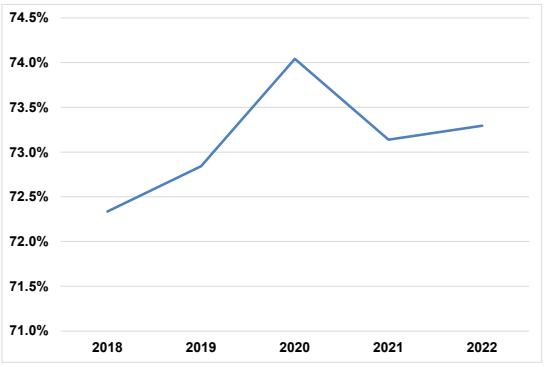
<Qualitative survey target farmers' gender, role, and impact of land acquisition>

Subproject	Women	Men	Total	Role	Impact of Land Acquisition
Sampean (rehabilitation work only)	0	10	10	Head of WUA:6, Secretary:1, Treasurer: 1, WUA member: 2	None are affected
Batang Anai (rehabilitation and new expansion works)	4	6	10	Head of WUA:5, Treasurer: 1, WUA member: 4	Five are affected
Jabung (new expansion work only)	0	10	10	Head of WUA:8, Secretary:1, WUA member: 1	Three are affected
Total	4	26	30		



Source: Central Bureau of Statistics Indonesia

Figure 2: Rice Production in the Ten Provinces (Total) where the Irrigation Districts of the Project are Located and the Total Rice Production in Indonesia (Tons)



Source: Central Bureau of Statistics Indonesia

Figure 3: Ratio of Rice Production in the Ten Provinces (Total) where the Irrigation Districts of the Project are Located to the Total Rice Production in Indonesia (%)

According to the qualitative survey, 21 out of 30 (70%) farmers responded that the project contributes to stable supply of rice. Specifically, they said that the project has made it possible to grow rice throughout the year, including the dry season, and has increased the number of crops per year (before the project, rice was grown in one season per year, but after the project, rice production increased to two seasons per year or five seasons in two years), and has increased the amount of rice for sale. Four respondents (13%) who answered that the project did not contribute to stable supply of rice were due to physical constraints such as changes in the land use of the farmland they owned, and the remaining five farmers (17%) did not answer. Regarding the change in the cropping area before and after the project, 19 out of 30 respondents (63%) answered that there was no change in the cropping area. On the other hand, many farmers commented that the stable supply of water has improved irrigation capacity and enabled them more efficient use of farmland, such as increasing the number of crops. As for changes in rice production before and after the project, 22 out of 30 respondents (73%) answered that rice production has increased. These qualitative survey results are consistent with the analysis results of quantitative effects described in "3.3.1.1 Quantitative Effects (Operation and Effect Indicators)" above.

From the above, it can be said that the project has contributed to the stable supply of food in Indonesia, despite the impact of movement restrictions due to the spread of COVID-19 infection.

(2) Improvement of living environment with stabilization of farmers' income in the target irrigation districts

Table 8 summarizes the changes in the Farmer's Terms of Trade Index (NTP[10]), an indicator of farmers' welfare in Indonesia, for the ten provinces where the irrigation districts of the project are located. The average value of the ten provinces was on an upward trend from 2017 to 2019, but declined in 2020 and 2021. It was also above 100 in 2018-2020, with the price index received by farmers exceeding the price index paid by farmers (farmers' profits increased), but fell below 100 in 2021. Inferring from the qualitative survey results, this can suggest that the spread of COVID-19 infection had an impact. In fact, in interviews with farmers, there were opinions that movement restrictions have affected the distribution of fertilizers and pesticides, resulting in their shortage and soaring prices.

Table 8: Changes in NTP (Farmer's Terms of Trade Index) for the Food Crops in the Ten Provinces where the Target Irrigation Districts of the Project are Located

Province (Irrigation District)	2017	2018	2019	2020	2021
Central Java Province (1. Comal)	95.8	102.5	107.4	103.9	100.3
West Sumatra Province (2. Batang Anai)	92.7	92.0	94.8	99.1	96.6
Banten Province (3. Ciliman)	100.6	104.5	108.0	102.9	96.6
North Sumatra Province (4. Namu Sira-Sira)	94.4	93.7	93.2	96.9	96.3
South Sumatra Province (5. Air Lakitan II)	99.2	99.7	100.4	98.3	90.3
Jambi Province (6. Sei Siulak Deras)	96.9	98.7	100.1	100.5	97.2
East Java Province (7. Sampean)	101.8	107.3	112.0	102.7	100.7
South Kalimantan Province (8. Alabio)	95.7	93.5	93.7	101.9	100.0
West Java Province (9. Leuwi Goong)	99.1	106.1	109.7	103.3	96.9
Lampung Province (10. Jabung)	104.2	116.1	115.4	94.3	92.3
Average of the above ten provinces	98.0	101.4	103.5	100.4	96.7

[10] Nilai Tukar Petani. The English translation is the Farmer's Terms of Trade Index. NTP is the ratio between the price index received by farmers and the price index paid by farmers, and is an indicator of the purchasing power of farmers.
NTP > 100: Price index received by farmers is greater than price index paid by farmers (farmers get surplus).
NTP = 100: Price index received by farmers and paid by farmers are at the same level.
NTP < 100: Price index received by farmers is less than price index paid by farmers. (farmers get deficit).
Source: Central Bureau of Statistics Indonesia (https://www.bps.go.id/subject/22/nilai-tukar-petani.html)

Source: Statistic Indonesia, Publication of Farmer's Terms of Trade

Note: Food crops include rice and secondary crops (including corn, wheat, beans, sweet potatoes, cassava, etc.).

Regarding the change in the amount of gross agricultural incomes before and after the project, according to the qualitative survey, 22 out of 30 farmers (73%) responded that they increased after the project. Two farmers (7%) who responded that their incomes decreased explained the reasons such as soaring fertilizer prices due to the spread of COVID-19 infection and poor cropping. One farmer (3%) reported that there was no change, and the remaining five farmers (17%) did not respond to the question.

From the above, while the average value of the Farmer's Terms of Trade Index (NTP) in the ten provinces where the target irrigation districts of the project are located has declined since 2019, according to the qualitative survey, more than 70% of the farmers have increased their gross agricultural incomes after the project. From this, it can be said that the project has contributed to stabilizing the income of the beneficiary farmers, although it is thought that the spread of COVID-19 infection had an impact.

Table 9 summarizes the changes in the poverty rates in the irrigation districts in the provinces and regencies where the targeted irrigation districts of the project are located. Looking at the average values, they decreased to 9.41% in 2018 and 9.00% in 2019, but increased to 9.24% and 9.66% in 2020 and 2021, respectively. Inferring from the qualitative survey results, this can suggest that the spread of COVID-19 infection had an impact. In fact, in interviews with the farmers, there were opinions that movement restrictions have affected their rice shipments and marketing activities, resulting in decreases in their farm incomes.

Table 9: Changes in the Poverty Rates in the Irrigation Districts in the Provinces and Regencies where the Targeted Irrigation Districts of the Project are Located (%)

Province / Regency (Irrigation Districts)	2018	2019	2020	2021
Central Java Province (1. Comal)	11.32	10.80	11.41	11.79
Padang Pariaman Regency (2. Batang Anai)	8.04	7.10	6.95	7.22
Banten Province (3. Ciliman)	5.24	5.09	5.92	6.66
North Sumatra Province (4. Namu Sira-Sira)	9.22	8.83	8.75	9.01
South Sumatra Province (5. Air Lakitan II)	12.80	12.71	12.66	12.84
Jambi Province (6. Sei Siulak Deras)	7.92	7.60	7.58	8.09
Situbondo Regengy (7. Sampean)	11.82	11.20	12.22	12.63
South Kalimantan Province (8. Alabio)	4.54	4.55	4.38	4.83
West Java Province (9. Leuwi Goong)	7.45	6.91	7.88	8.40
East Lampung Regency (10. Jabung)	15.76	15.24	14.62	15.08
Average values of irrigation districts in the above provinces/regencies	9.41	9.00	9.24	9.66

Source: Statistics Offices of each province

Note: The above poverty rates are the percentage of the population living below the poverty line for each province/regency.

*The poverty line is the sum of the "Food Poverty Line" and "Non-Food Poverty Line." The poverty line varies by province and regency. The population who have an average expenditure per capita per month below the poverty line is categorized as poor.

According to the qualitative survey, 14 out of 30 farmers (47%) responded that the project has contributed to reducing the number of poor farmers, which exceeded the 11 (37%) who responded that there has been no decrease in poor farmers. One farmer (3%) said that there was no change before and after the project, and four farmers (13%) did not respond to the question.

Based on the above, existing statistical data show that the poverty rate (average value) in irrigation districts in the provinces and regencies where the target irrigation districts of the project are located has been on increasing since 2019, while the qualitative survey showed that nearly 50% of farmers reported an increase in gross agriculture income after the project. Therefore, it can be said that the project has contributed to a certain extent to poverty reduction among the beneficiary farmers, although the spread of COVID-19 infection had an impact.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

The project was classified as Category B based on the *JBIC Guidelines for*

Confirmation of Environmental and Social Considerations (April 2002) since it does not fall under any sensitive characteristics or sensitive areas. According to the executing agency, the Environmental Impact Assessment (EIA) approvals for seven out of the nine irrigation districts in the initial scope have been completed by the start of construction. The remaining two irrigation districts of Comal and Ciliman (both rehabilitation work only) have not had EIAs prepared and approved. According to the executing agency, this was because the EIA was not mandatory for rehabilitation work prior to 2016. For the additional scope, the Jabung irrigation district, the EIA report was submitted to the Governor of Lampung Province in June 2013 and was approved in November 2013, as confirmed from the results of questionnaire survey and interviews with the executing agency.

According to the executing agency and the Japanese consultant in charge of construction supervision, regular monitoring was conducted during construction, and water quality protection measures (sedimentation treatment measures for canals, measures against inflow of eroded soil into canals, and water quality measures for river during headworks construction) and dust control measures (watering of access roads) were taken during construction. It was also confirmed that no negative impacts on the environment were reported.

2) Resettlement and Land Acquisition

From the results of questionnaire survey and interviews with the executing agency, the project only had land acquisition and resettlement did not take place. The results of land acquisition are shown in Table 10.

In the Batang Anai, Leuwi Goong, and Jabung irrigation districts, some landowners could not agree on the amount of compensation, and the executing agency finally reached an agreement after long negotiations with the landowners. According to the executing agency, the land acquisition procedures were conducted in accordance with the Indonesian law, and the affected people were identified and briefing sessions were held for them.

Of 30 farmers interviewed in the qualitative survey, eight farmers (five in Batang Anai and three in Jabung) were affected by land acquisition for this project. Five of the eight agreed to the compensation amount without any particular problems, but the remaining three took a long time to reach an agreement. No complaints or troubles have arisen after the project completion.

Table 10: Results of Land Acquisition

Irrigation District	Land Acquisition
1. Comal (rehabilitation work only)	None
2. Batang Anai (rehabilitation and new expansion works)	65.5 ha
3. Ciliman (rehabilitation work only)	None
4. Namu Sira-Sira (rehabilitation work only)	None
5. Air Lakitan II (new expansion work only)	8.44 ha
6. Sei Siulak Deras (rehabilitation and new expansion works)	None
7. Sampean (rehabilitation work only)	None
8. Alabio (rehabilitation work only)	None
9. Leuwi Goong (rehabilitation and new expansion works)	29 ha
10. Jabung (new expansion work only)	217.68 ha

Source: Results from questionnaire and interview survey of the executing agency

3) Gender Equality

It was confirmed from the results of questionnaire survey and interviews of the executing agency, and interviews with farmers in the qualitative survey that the burden of agricultural work and operation and maintenance work has not disproportionately distributed to specific gender due to the development of irrigation facilities.

4) Marginalized People

From the results of questionnaire survey and interviews with the executing agency, all WUAs in the irrigation districts have established the WUA rules and regulations, regular meetings are held to discuss water requirements based on the crop cultivation plan, cleaning and repair of canals, etc. According to the farmers interviewed in the qualitative survey, the decision-making process of the WUA is fair, with one vote per farmer, regardless of whether the farmer owns land or is landless, the size of the farmland, or the location of cultivation, and that all member farmers can participate in the substantive decision-making process. (See “3.1.1.3 Appropriateness of the Project Plan and Approach.”)

According to the qualitative survey, 24 out of 30 (80%) farmers answered that water is being distributed fairly and adequately. The six respondents who answered that fair and adequate water distribution was not being provided were farmers in the Jabung irrigation district, who indicated that water distribution was uneven due to damaged or malfunctioning irrigation facility. (See “3.4.7 Status of Operation and Maintenance.”)

5) Social Systems and Norms, Human Well-being and Human Rights

From the results of questionnaire survey and interviews with the executing agency, the rate of WUA coverage is almost 100%, and arrangements and decisions regarding operation and maintenance are made by the WUAs. They also commented that after the project, there have been no more major problems that developed into conflicts and disputes among farmers over the allocation of water.

Regarding changes in farmers' awareness before and after the project, as a result of interviews with 30 farmers[11] who were conducted qualitative survey, it was confirmed that the project has also contributed to the improvement of farmers' awareness (confidence in irrigated agriculture, willingness to increase rice production, and increased sense of cooperation among farmers). Specifically, their responses were as follows.

Regarding confidence in irrigated agriculture, 23 out of 30 respondents (77%) said that their confidence has increased, six (20%) have confident even before the project, and one[12] (3%) has lost confidence because the farmland was flooded due to the damage of the irrigation facilities.

Regarding farmers' willingness to increase rice production, 23 of the 30 respondents (77%) said that their willingness has increased, six (20%) were willing even before the project, and one[13] (3%) was less willing because the farmland was flooded due to the damage of irrigation facilities.

Regarding sense of cooperation among farmers, 15 of the 30 farmers (50%) said that their sense of cooperation has increased, ten (33%) said that their sense of cooperation was high even before the project, and five (17%) said that they were able to easily obtain irrigation water and that cooperation among farmers only occurred when necessary.

6) Unintended Positive / Negative Impacts

<Collaboration with ODA loan "Rentang Irrigation Modernization Project">

As mentioned above in "3.1.2.2 Internal Coherence," risk measures were taken in the project to address the potential negative impacts on the Jatigede Dam and the Rentang irrigation system due to the project in the Leuwi Goong irrigation district. The Jatigede dam has started its operation since 2016. It was confirmed through the executing agency and the Japanese consultant in charge of construction supervision

[11] See footnote 9 for the breakdown.
[12] A farmer in the Jabung irrigation district.
[13] The same Jabung irrigation district farmer as in footnote 12.

that water supply to the Rentang irrigation system is sufficient, no complaints have been received from the farmers, and no problems have been reported.

<Changes in livestock raising conditions before and after project>

According to the qualitative survey, 18 of the 30 farmers are raising livestock, and 11 of them (61%) answered that they started raising livestock after the project and that it became easier to raise livestock. Specifically, they started raising duckling and ducks using paddy fields before the start of planting, and they have increased the number of breeding. It was confirmed that irrigation water also contributes to raising livestock.

This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Policy and System

There are no changes in the objective and focus of *the National Medium-Term Development Plan (RPJMN) (2020-2024)* and *the Agricultural Strategic Plan (2020-2024)* at the time of the ex-post evaluation, and the government's policy of increasing rice production through rehabilitation and expansion of irrigation facilities and strengthening of maintenance systems. In addition, it was confirmed from the interviews with the executing agency that the new Law on Water Resources enacted in 2019 and the government regulations based on this law have not changed the system for operation and maintenance of irrigation facilities.

From the above, sustainability of policy and system of the project is assured.

3.4.2 Institutional/Organizational Aspect

As for the operation and maintenance of each irrigation district after project completion, in principle, the provincial governments are responsible for the operation and maintenance of the primary and secondary canals from the headworks and weirs, and the WUAs (beneficiary farmers) are responsible for the operation and maintenance of the tertiary canals. However, there are some irrigation systems, such as Batang Anai and Sampean irrigation districts, where the central government operates and maintains some of the infrastructure, although they are originally under the authority of the provincial governments.[14]

[14] Operation and maintenance of the government's irrigation systems is conducted by different levels of

The government staff exchange memorandums with the WUAs to conduct daily operation and maintenance work, and the division of roles and authority are clear. The government staff in charge of the operation and maintenance at the site consists of the Technical Implementation Unit for Irrigation Scheme, Headworks Operation Officers, Electric / Pump Operation Officers, Water Gate Operators, etc. Table 11 shows the number of staff in each irrigation district. According to interviews with the executing agency and the BBWSs, the number of staff is almost sufficient for the entire irrigation districts, but it was pointed out that in Jabung and Ciliman and others, there is a need to replenish staff due to transfers and planned retirements.

Table 11: Number of Staff in Charge of Operation and Maintenance at the Site

Irrigation District	Number of Staff in Charge of Operation and Maintenance
1. Comal	84
2. Batang Anai	19
3. Ciliman	21
4. Namu Sira-Sira	84
5. Air Lakitan II	61
6. Sei Siulak Deras	51
7. Sampean	119
8. Alabio	25
9. Leuwi Goong	6
10. Jabung	35

Source: Results of questionnaire survey of the executing agency and interviews with the executing agency and the BBWSs.

Regarding the coordination system among those involved in operation and maintenance, staff of the BBWSs under the DGWR, the central government, staff of provincial government offices, and staff of the WUAs (beneficiary farmers) hold regular meetings and formulate water management plans based on cultivation plans, water requirements,

government depending on the size of the irrigated area. In principle, the rules are as follows.

- The central government, the DGWR, is responsible for the operation and maintenance of irrigation facilities (other than terminal irrigation facilities) with a beneficiary area of 3,000 ha or more which traverse provincial boundaries.
- District governments are responsible for the operation and maintenance of irrigation facilities (other than terminal irrigation facilities) located within one district with a total area of 3,000 ha or more, while provincial governments are responsible for the actual operation and maintenance of irrigation facilities that traverse districts, receiving budget allocation from the central government.
- WUAs are responsible for the operation and maintenance of terminal irrigation facilities beyond tertiary canal, with support from the central and local governments.

weather conditions, etc., and conduct communication and coordination related to operation and maintenance. For example, in the case of the Sampean irrigation district, quarterly meetings are held to report the results of monitoring and evaluation of the water distribution situation, and comprehensive discussions regarding the operation status of irrigation facilities, maintenance activities, budget / expenditures, personnel / systems, etc., have been conducted. For the Batang Anai irrigation district, meetings have been held three times a year to discuss operation and maintenance activity reports, budgets and expenditures, etc. Issues have been extracted based on the results of monitoring and evaluation of the water distribution situation, and discussions are held for improvement. It was also confirmed from the interviews with the executing agency, the BBWSs, and the WUAs that communication, coordination, and decision-making have been conducted without any particular problems.

From the above, no particular problem has been identified regarding the institutional/organizational aspect of operation and maintenance.

3.4.3 Technical Aspect

It was confirmed from the executing agency and the BBWSs that the staff in charge of operation and maintenance at the site meet the specified requirements and qualifications,[15] and have acquired the basic skills necessary to conduct daily operation and maintenance works. In addition, staff in charge of operation and maintenance have received assistance by this project to strengthen their capacity for irrigation facility operation and maintenance, and have been utilizing the knowledge and skills they acquired through training in their daily maintenance work. They are also receiving training from the Ministry of Public Works and Housing to improve their technical capabilities.[16]

According to the qualitative survey, 15 (50%) of the 30 farmers interviewed received assistance under the project to strengthening their capacity for irrigation facility operation and maintenance, and they have been utilizing their skills and knowledge in water gate operation and water resource management in their daily maintenance and management activities. The BBWS staff expressed their opinion that the farmers of the WUAs have sufficient technical capacity for routine maintenance of tertiary canals.

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[15] The requirements and qualifications for operation and maintenance staff are stipulated in the Ministerial Regulation No. 12/2015 of the Ministry of Public Works and Housing. For example, the head of the Technical Implementation Unit for Irrigation Scheme is required to have a record of operation and maintenance of irrigated area of 5,000 to 7,500 ha, and to be a holder of a diploma (D-III) in civil engineering.

[16] According to the executing agency, a competition is held every year for water gate operation personnel, in which talented personnel compete in Jakarta with those from all over Indonesia. The competition consists of both paper exams and practical tests, and the winner will receive an award from the Minister and receive additional prize such as motorcycles.

From the above, it is considered that the staff in charge of operation and maintenance at the site and the farmers of the WUAs have sufficient technical capacity to conduct ordinary operation and maintenance work, and there are no particular problems.

3.4.4 Financial Aspect

The operation and maintenance budget for the headworks, primary canals, and secondary canals is allocated by the central government. For example, in the case of Batang Anai and Sampean irrigation districts, the central government allocates the operation and maintenance budget to the subordinate BBWSs and provincial governments. The BBWSs are responsible for the maintenance of headworks and weirs, and the provincial governments are responsible for maintenance of primary and secondary canals. Table 12 shows the operation and maintenance costs (actual) of each irrigation district in Batang Anai, Sampean, and Jabung, where project site visits were conducted during the field survey. From the results of questionnaire survey of the executing agency and interviews with the BBWSs, it was confirmed that there were no particular problems with the financial aspect of operation and maintenance. From the results of questionnaire survey and interviews with executing agency, it was also confirmed that there were no particular concerns regarding operation and maintenance costs for other irrigation districts.

Table 12: Operation and Maintenance Costs (Actual) of Batang Anai, Sampean, and Jabung Irrigation Districts

Unit: Million IDR

Irrigation District	2020	2021	2022
Batang Anai	923	1,084	1,103
Sampean (BBWS)	1,116	674	1,015
Sampean (Provincial Government)	6,567	6,442	5,725
Jabung	1,101	1,690	4,488

Source: Results of questionnaire survey of the executing agency.

Note: The Jabung irrigation district have started allocating operation and maintenance budget from 2022. In 2020 and 2021, only operation budget and urgent maintenance budget were allocated.

Maintenance costs for cleaning and repairing tertiary canals are covered by the water users fees collected from the farmers by the WUAs. In addition to cash, water users fees may also be collected in the form of harvested paddy rice (in kind). The amount and

other details are determined by each WUA (based on the articles of incorporation and bylaws of each WUA) and differ from WUA to WUA.[17] According to the interviews with the farmers in Batang Anai, Sampean, and Jabung irrigation districts where project site visits were conducted, no particular concerns have been reported regarding the collection of water users fees.

From the above, there are no particular problems with the financial aspects of operation and maintenance.

3.4.5 Environmental and Social Aspect

As a result of confirmation with the executing agency, there were no unexpected environmental and social considerations.

3.4.6 Preventative Measures to Risks

The implementation of the project in the Leuwi Goong irrigation district has not resulted in any negative impacts on the Jatigede Dam and the Rentang irrigation system, and no complaints have been reported from the beneficiary farmers of this irrigation system. Responses to risks have been conducted appropriately. (See "3.3.2.2 Other Positive and Negative Impacts," "6) Unintended Positive / Negative Impacts.")

3.4.7 Status of Operation and Maintenance

The executing agency has been conducting performance evaluations of the irrigation systems in accordance with the Ministerial Decree No. 12 (2015) of the Ministry of Public Works and Housing. The evaluation is based on the Irrigation System Performance Index (IKSI[18]), using an online system called ePAKSI (a geospatial database of irrigation districts and facilities). According to the executing agency, no major problems have been identified in most irrigation districts with the irrigation facilities developed under this project.

It was confirmed from the executing agency and the BBWS that drainage is poor in the Jabung irrigation district and that some areas (about 10% of the irrigated area) are flooded all year round. The reason was that the central part of the irrigation district was higher than the flooded area, which prevented water from flowing into the primary drainage canal. To address this issue, the BBWS plans to raise the secondary and tertiary canals in the flooded area to allow water to flow into the primary drainage canal. In the

[17] Some WUAs set a minimum amount depending on the planted area and the yield (e.g., 2,000 IDR/ha or 10% of the yield in each cropping season). Some WUAs collect fees only when repair costs are necessary.
[18] IKSI: Indeks Kinerja Sistem Irigasi. By accessing the ePAKSI, facility (point), canal (polyline), and irrigation district (polygon) data for each irrigation district can be obtained online. (http://103.211.51.198/)

course of the survey, problems such as damage to the canals were found, and the necessity of repairing the irrigation facilities was also confirmed. Thus, the BBWS is coordinating with the relevant departments[19] to secure the necessary measures and budget for raising the canals and repairing. Regarding the budget, the possibility of using part of the financial resources of the ongoing irrigation development projects by another donor[20] has been explored.

According to the qualitative survey, the WUAs in Batang Anai, Sampean, and Jabung irrigation districts have been actively engaged in maintenance activities. Not all the WUA members possess maintenance manuals, but it was confirmed that there were no particular problems as information has been shared verbally.

Spare parts are stored in the warehouse of the BBWSs, etc., and are replenished and procured, as necessary. No particular concerns have been reported regarding the procurement of spare parts.

From the above, there are some problems in the operation and maintenance status at the time of the ex-post evaluation, but as a whole, there is no problem because facilities are properly operated and maintained.

Slight issues have been observed in the current status of operation and maintenance, however, there are good prospects for improvement / resolution. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project rehabilitated and expanded the irrigation facilities in the western region of Indonesia and supported the development of maintenance systems with the aim of increasing rice production, thereby contributing to national food security. Increasing rice production is an urgent issue in Indonesia, and irrigation is considered as major infrastructure that promotes increase in domestic food production. Therefore the objective is consistent with the policy and needs at the time of appraisal and the ex-post evaluation. In addition, project plan and design were appropriate. The project is consistent with Japan's development cooperation policy, and concrete results can be confirmed through collaboration with another project within JICA. The project also contributes to the SDGs, which is an international framework. Therefore, its relevance and coherence are high. In

[19] Directorate of Irrigation and Low Land and Directorate of Operation and Maintenance.
[20] The executing agency is considering using the financial resources of the ongoing Korean EDCF project (The Urgent Rehabilitation of Strategic Irrigation Project for Western Region of Indonesia (URSIP)) and is currently approaching the Korean EDCF.

terms of project implementation, the project cost was within the plan but the project period significantly exceeded the plan. Therefore, efficiency of the project is moderately low. Regarding project effects, the indicators of quantitative effects set at the time of the appraisal has mostly achieved its objectives overall. It was confirmed from the interviews with the executing agency and the beneficiary farmers, along with concrete evidence and data, that the implementation of this project has contributed to the stable food supply in Indonesia and to the stabilization of farmers' income and the improvement of their living environment in the project area. In addition, from the interviews with the beneficiary farmers, it was confirmed that the project has contributed to raising farmers' awareness (confidence in irrigated agriculture, motivation to increase rice production and increased awareness of cooperation among farmers). Thus, effectiveness and impacts are high. Regarding operation and maintenance, slight issues have been observed in the current status, however, there are good prospects for improvement/resolution. Therefore, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is important for the executing agency and the BBWS to work with relevant departments to secure necessary budget and take measures as soon as possible to elevate secondary and tertiary canals in flooded areas and repair damaged irrigation facilities in the Jabung irrigation district.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Importance of preparation and coordination for land acquisition from the time of project formulation for projects consisting of multiple irrigation districts with potential additional scope.

In the land acquisition for several irrigation districts in the project, the executing agency had difficulty to agree on the amount of compensation with some landowners, and it took a long time to reach an agreement. Regarding the irrigation districts planned at the time of the appraisal, for example, in the case of the Batang Anai irrigation district, the executing agency had made preparations from an early stage (2005) prior to the start of the project, and efforts were made to explain the specific benefits of the development of irrigation facilities to the beneficiary farmers to gain their understanding. However, it took time to

negotiate with the farmers. Preparation for the land acquisition for the Jabung irrigation district, where the scope was added, began in December 2015, and it took time to reach an agreement on the amount of compensation, which also caused project delays.

For a project such as this project, which consists of multiple irrigation districts, it is fully expected that the number of irrigation districts will increase or decrease as the project cost rises or falls. For projects where there is a certainty that additional scope will be implemented, in anticipation of an increase in the number of irrigation districts, it is desirable to make advance preparations for land acquisition from the initial stage of project formulation, just as with other irrigation district candidates. Therefore, it is important for the executing agency to ensure sufficient preparation time for discussions with the farmers from the time of project formation for projects that consist of multiple irrigation districts and are expected to increase or decrease in the number, and to conduct negotiations with the landowners after extensive coordination and collaboration with the relevant agencies in advance.

5. Non-Score Criteria

5.1. Performance

5.1.1 Objective Perspective

It was an appropriate response to add the scope of the project after the start of this project and to take risk countermeasures for the ODA loan “Rentang Irrigation Modernization Project” that was scheduled to be implemented. In formulating the said ODA loan project, JICA was able to fully consider the relationship with this project, anticipate risks, and work effectively with the executing agency to prevent them from occurring.

5.2. Additionality

None.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Works 1. Comal tertiary canal: 8,947 ha (rehabilitation) 2. Batang Anai tertiary canal: 655 ha (rehabilitation), 6,062 ha (new expansion) 3. Ciliman tertiary canal: 5,315 ha (rehabilitation) 4. Namu Sira-Sira tertiary canal: 6,280 ha (rehabilitation) 5. Air Lakitan II tertiary canal: 4,924 ha (new expansion) 6. Sei Siulak Deras tertiary canal: 3,721 ha (rehabilitation), 2,098 ha (new expansion) 7. Sampean tertiary canal: 10,199 ha (rehabilitation) 8. Alabio tertiary canal: 5,987 ha (rehabilitation) 9. Leuwi Goong tertiary canal: 3,071 ha (rehabilitation), 2,242 ha (new expansion) 2) Consulting Services ・ Tendering assistance, construction supervision, support for strengthening irrigation facility operation and maintenance capacity (nine irrigation districts)	1) Civil Works 1. Comal tertiary canal: 8,882 ha (rehabilitation) 2. Batang Anai tertiary canal: 655 ha (rehabilitation), 6,185 ha (new expansion) 3. Ciliman tertiary canal: 5,374 ha (rehabilitation) 4. Namu Sira-Sira tertiary canal: 2,256 ha (rehabilitation) secondary canal: 4.930 ha (rehabilitation) 5. Air Lakitan II tertiary canal: 4,766 ha (new expansion) 6. Sei Siulak Deras tertiary canal: 2,347 ha (rehabilitation), 709 ha (new expansion) 7. Sampean tertiary canal: 10,218ha (rehabilitation) 8. Alabio tertiary canal: 2,450 ha (rehabilitation) 9. Leuwi Goong tertiary canal: 32 ha (rehabilitation), 1,817 ha (new expansion) 10. Jabung tertiary canal: 5,638 ha (new expansion) 2) Consulting Services ・ Tendering assistance, construction supervision, support for strengthening irrigation facility operation and maintenance capacity (ten irrigation districts) ・ Planning study and design for the Jabung irrigation district ・ Addition of a water demand forecast for the Rentang irrigation system and a comprehensive water volume study of the Cimanuk River Basin ・ Addition of the detail design (part of the work) of ODA loan "Modernization Support of Rentang Irrigation Project"
2. Project Period	March 2008-December 2013 (70 months)	March 2008-August 2020 (150 months)

3. Project Cost		
Amount Paid in Foreign Currency	574 million yen	12,260 million yen
Amount Paid in Local Currency	28,801 million yen (local currency 2,165,489 million IDR)	15,867 million yen (local currency 1,816,397 million IDR)
Total	29,375 million yen	28,127 million yen
ODA Loan Portion	12,310 million yen	12,260 million yen
Exchange Rate	1 IDR = 0.0133 yen (As of September 2007)	1 IDR = 0.0087353 yen (Average between 2008 and 2020)
4. Final Disbursement	October 2017	

(End)