

India

FY2018 Ex-Post Evaluation of Japanese ODA Loan Project

“Rengali Irrigation Project (I) (II) (III)”

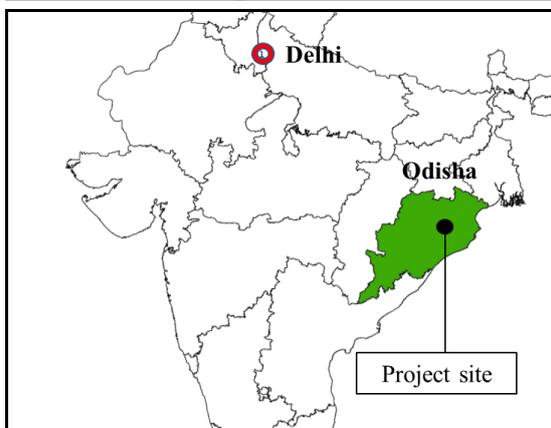
External Evaluator: Yumiko Onishi, IC Net Limited

0. Summary

In the central part of Odisha State located in eastern India, annual rainfall is unevenly distributed in the rainy season. Without the development of irrigation systems, cultivation in the dry season in the area has been difficult. Therefore, the Rengali Irrigation Project was implemented with the objective to increase agricultural production and to diversify crops by newly constructing an irrigation system in the Brahmani River Basin, establishing Water Users' Associations (Pani Panchayats) and improving farming practices, thereby contributing to increasing the income of farmers in the project target area. From the time of the appraisal to the ex-post evaluation, agriculture/irrigation has been an important sector for the governments of India and Odisha State. Although the development needs identified at the time of the appraisal have been partially satisfied by the time of the ex-post evaluation, the necessity for irrigation in the target area remains unchanged. The objective of the project also matches Japan's ODA policy; thus, the project's relevance is high. The irrigation beneficiary area of the project has become smaller than the plan because of the micro-plans prepared at the farm level after the project started and the expansion of residential areas and national roads. The project's costs and duration have significantly exceeded the plan, and the efficiency is low. As regards operation and effect indicators, the yields of some of the crops have almost achieved the targets, and that of paddy has increased with the start of irrigation. Although the cultivated area and production volume of major crops have not reached its target, because of reduction in irrigated area (beneficiary area), given the future irrigation plan, achieving the cultivated area by target year of 2021 is theoretically possible. To achieve the objective, irrigation shall be provided as per the irrigation plan created, and strengthening the Pani Panchayats will be important. No particular adverse impact on the natural environment has been observed. Although the effectiveness and impact of the project are currently limited, in the future, achieving the revised target on the basis of reduced beneficiary area is expected for many of the indicators specified. Therefore, the expected outcome will become possible, and the evaluation is high. As regards operation and maintenance, there are some issues related to institutions and finance. Collaboration between Pani Panchayat and the Department of Water Resources, as well as the Department of Agriculture, and strengthening the internal system of Pani Panchayats are required. Moreover, to secure maintenance costs, such as a system for collecting and redistributing water tariffs, and the timely release of grants to Pani Panchayats, it is necessary to pay particular attention to the finances of Pani Panchayats. Given the situation, the sustainability of the project is assessed as fair.

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

1. Project Description



Project Location



Rengali Left Bank Canal

1.1 Background

The Government of India has targeted achieving food self-sufficiency and improving and stabilizing people's lives since 1951. In fiscal year (FY) 1991, the country's agricultural sector had approximately a 30% share in the Gross Domestic Product (GDP) while 67% of its working population was employed in the sector, affirming that, from the perspective of poverty alleviation and employment creation, it was an important sector in the national development plan at that time. On the other hand, unstable production, dependent on rainfall in the rainy season (monsoon) was an issue in the agriculture sector. To improve the situation, the development of irrigation systems was essential. Particularly, the rainfall in the target area, located in the central part of Odisha State¹, was unevenly distributed between June and September during the monsoon, and farming in the dry season was difficult without the development of irrigation systems. Despite such situations, Odisha's irrigation rate in 1997 was low at 10.5%, and, because the share of poor and marginal farmers was high, agricultural productivity was lower compared to that in other areas. To improve the lives of the poor in the target area, increasing the agricultural production and income through the development of irrigation systems was an important issue.

1.2 Project Outline

The objective of this project was to increase agricultural production and diversify crops by constructing irrigation systems along the Brahmani River in Odisha State in eastern India, establishing Water Users' Associations, and improving farming practices, thereby contributing to increasing the income of farmers in the project area.

¹ Erstwhile Orissa State; however, the name changed in 2011. Therefore, this report uses Odisha in place of Orissa.

Loan Approved Amount/ Disbursed Amount	I 7,760 million yen / 6,844 million yen II 6,342 million yen / 6,273 million yen III 3,072 million yen / 3,067 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	I October 1997 / December 1997 II March 2004 / March 2004 III March 2010 / March 2010
Terms and Conditions	Interest Rate I: 2.3%, II: 1.3%, III: 1.4% (main portion), 0.01% (consultancy portion) Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General untied
Borrower / Executing Agency	The President of India / Odisha Department of Water Resources
Project Completion	March 2017
Target Area	Dhenkanal District, Odisha
Main Contractor(s) (Over 1 billion yen)	Bhagheeratah Engineering Ltd (India)
Main Consultant(s) (Over 100 million yen)	Nippon Koei (Japan) / Water and Power Consultancy Services Limited (India)
Related Studies (Feasibility Studies, etc.)	F/S Odisha Department of Water Resources (1989)
Related Projects	<Japanese ODA Loan> Rengali Irrigation Project Phase 2 (March 2015), Upper Kolab Irrigation Project (December 1988), Upper Indravati Irrigation Project (December 1988) <Japanese Technical Cooperation> Formulation of Rengali Irrigation Project Phase 2 (2013–2015) <Other International Agencies> World Bank: Orissa Water Resources Consolidation Project (1995–2004) Asian Development Bank: Orissa Integrated Irrigated Agriculture and Water Management Investment Program (Project 1: 2009–2017, Project 2: 2018–)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yumiko Onishi, IC Net Limited

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2018–September 2019

Duration of the Field Study: November 12–25, 2018 and January 28–February 6, 2019

3. Results of the Evaluation (Overall Rating: C²)

3.1 Relevance (Rating: ③³)

3.1.1 Consistency with the Development Plan of India

In the *Eighth Five-Year Plan* (FY 1992–1997), India’s national development plan at the time of the project’s Tranche I appraisal, agriculture was an important sector inherited from previous national policies. The sector continued to be important at the time of the Tranche II and III appraisals as well. In addition, around the time of the Tranche II appraisal, the *National Water Policy* (2002) was revised. Further, completing ongoing projects early, securing equitable water distribution, maximizing the irrigation potential, and securing sustainability through participatory water management by the Water Users’ Association were emphasized. Similarly, the Government of Odisha initiated restructuring aiming to secure the agriculture sector’s productivity and sustainability; plan for multi-purpose water resource development projects; manage water through farmers’ participation; and strengthen the State government’s institutional capacity for planning, construction, and management of irrigation, by bringing together government agencies related to the irrigation sector, which were dispersed earlier, under the jurisdiction of the Department of Water Resources (DoWR) since 1990.

The Indian government’s *Three-Year Action Agenda* (FY 2017–2019), effective at the time of the ex-post evaluation, still indicates the importance of developing irrigation systems for increasing agricultural productivity. The *National Water Policy* was once again revised in 2012, but, regarding the irrigation sector, it stated that water is a limited and precious resource and emphasized the importance of efficient use of irrigation water and the introduction of agricultural practices that would maximize the effects. Odisha State’s plan for the irrigation sector beyond FY 2019 is in the process of being formulated. However, according to an interview with the DoWR, the State government intends to prioritize expanding the irrigated areas in the future as well, and, between FY 2019 and 2024, it proposes to develop 1 million hectares of irrigation systems.

From the time of the appraisal to the ex-post evaluation, the agriculture and irrigation sectors have been given importance in the development plans of India and Odisha. Therefore, the project is relevant with development policies of India and Odisha State.

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ②: Fair, ①: Low

3.1.2 Consistency with the Development Needs of India

In 1994, agriculture was a main industry, with a share of 33% in Odisha State's GDP, while 75% of the working population was employed in the sector. At the same time, as described in "1.1 Background," the target area was dependent on rainfed agriculture, the rates of irrigation and agriculture productivity were low, and the poverty rate was high.

According to a survey at the time of the ex-post evaluation, the share of Odisha's GDP from agriculture has remained in the first half of 20% since FY 2012. Sixty-five percent of the population was engaged in agriculture according to the 2001 census and this became 62% of the population in 2011. Although the percentage has decreased compared to the time of the appraisal, agriculture remains the livelihood of many. Odisha's poverty rate has been decreasing and Dhenkanal District has one of the lowest poverty rates in the State⁴. On the other hand, agriculture in the target area depends on erratic rainfall⁵, without irrigation systems. Therefore, the development needs identified at the time of the appraisal have been partially met, but necessity for the project still exists.

3.1.3 Consistency with Japan's ODA Policy

At the time of the Tranche I appraisal, based on the findings of an economic cooperation study team dispatched on a government mission in 1995 and the policy dialogue thereafter, the focal areas for the ODA for India were: a) economic infrastructure development, b) poverty alleviation, and c) environmental conservation. As part of poverty alleviation, agriculture and rural development, including increasing agricultural production and development of agricultural infrastructure, were given priority. At the time of the Tranche II and III appraisals, efforts to address poverty were given due importance in the *Medium-Term Strategy for Overseas Economic Cooperation Operations Country Assistance Strategy* (FY 2002–2004), *Country Assistance Policy for India* (2003), and *Country Assistance Policy for India* (May 2006). Therefore, through the Tranche I to III appraisals, efforts to address poverty through development of irrigation systems were aligned with Japan's ODA policy.

The project has been highly relevant to India's and Odisha's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

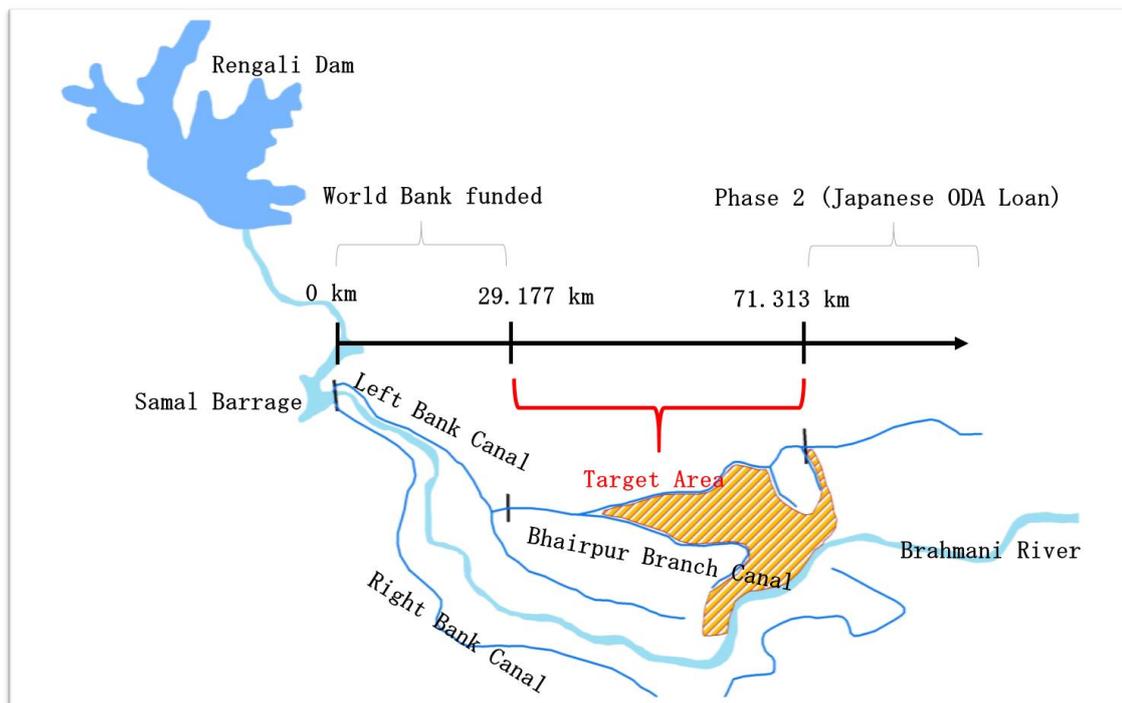
3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

⁴ In 2011, Odisha State's poverty rate was 18.9% compared to India's average rate of 21.9% (Planning Commission, India). According to a study by the State government, although the State's average poverty rate is 35%, that of Dhenkanal District is 14%, making it a district with one of the lowest poverty rates within the State (Odisha Directorate of Economics and Statistics).

⁵ 80 percent of the annual rainfall occurs in monsoon season (Odisha State Agriculture Policy 2013).

The project takes water from the Rengali multi-purpose dam, which was constructed in 1985. It targets the irrigated beneficiary area between 29.177 km and 71.313 km on Left Bank Canal, which is part of the irrigation canal branching out to the left and right from Samal Barrage located downstream of Rengali Dam. Figure 1 indicates the location of the project's target area among other areas. On Left Bank Canal, the system up to 29.177 km was implemented with funds from the World Bank. The Canal beyond 71.313 km is under construction with Japanese ODA loan as a successive project.



Source: Prepared by the external evaluator

Figure 1: Diagram Showing Different Parts of Rengali Irrigation Project

The project involves constructing one section of Left Bank Canal, Bhairpur Branch Canal, and other related structures and comprises a) civil works, b) technical assistance, and c) consulting services.

a) Civil works

Table 1: Comparison of Planned and Actual Civil Works

	Plan	Actual
Main canal ⁶	41.313 km	42.136 km
Branch canal	34.780 km	34.780 km
Minor and sub-minor canals	1 set	1 set
Field channels	1 set	1 set
Lift irrigation area (inclusive of incomplete portion)	2,230 ha	2,780 ha
Irrigation area (inclusive of lift irrigation area)	29,176 ha	26,202 ha

Source: DoWR

Table 1 shows the planned and actual works. Originally, the beneficiary area was planned for total of 29,176 ha⁷ consisting of 26,946 ha of flow irrigation⁸ and 2,230 ha of lift irrigation. However, the actual area irrigated by flow irrigation became 23,422 ha because of changes that occurred at the time of designing the micro-plan (caused by height differences within the irrigation area), an expansion of the nearby residential area into agricultural land, and a reduction in agricultural land due to the widening of national roads. As regards lift irrigations, 19 such irrigations and 2,780 ha were included in the project, for a total beneficiary area of 26,202 ha. However, two of the lift irrigations have not been completed (the prospect of completion is described in “3.2.2 Project Period”). In flow irrigation areas, the project assisted with the formation of Pani Panchayats, and 53 of them have been formed. However, one of the Pani Panchayats has not completed the election for selecting executive committee members. Therefore, a part of the field channels has not been completed.

Moreover, as regards civil works, concrete lining of minor and sub-minor canals, which was not originally planned, was added to improve the durability of the canals. For other related structures (head regulators, village road bridges, cross drainages, etc.), the number of bridges has increased, based on requests from the locals. In addition, to secure a migration passage for wild elephants, which was a condition for forest clearance, an additional bridge was set up.

b) Technical assistance

The components planned for technical assistance have been implemented as planned.

- Agricultural intensification and construction of field channels: implemented by the Command Area Development Authority (CADA), a subsidiary organization of the

⁶ Originally, the main canal was to be constructed from 30 km to 71.313 km. However, because the 29.177 km point was mistaken as the 30 km point and the works started, the total length of Left Bank Canal for the project is different from the plan.

⁷ According to the interview to project official, the planned beneficiary area was calculated as 85% of irrigation potential of the target area.

⁸ Surface irrigation using natural gravity.

DoWR. For agricultural intensification, in addition to 1,000 ha of demonstration conducted by the CADA initiative, farm training has been conducted for more than 5,000 farmers between FY 2014 and FY 2017. As described earlier, because of a delay in the formation of Pani Panchayats, field channels in one location (353.64 ha) have not been completed, but are expected to be completed by March 2019.

- Training: implemented by the Water and Land Management Institute (WALMI) under the DoWR. Trainings on water management and participatory water management have been imparted to DoWR engineers and to executive committee members of Pani Panchayats.
- Strengthening of WALMI: upgrading existing classrooms, development of a library and laboratories, and procurement of furniture for the auditorium at WALMI headquarters.
- Formation of Pani Panchayats and handing over of systems: implemented by WALMI. Formed 53 Pani Panchayats within target area. All the Pani Panchayats have been registered.
- Incentive scheme (Entry Point Activities): implemented in one Pani Panchayat in the Upper Kolab Irrigation Project and one in the Upper Indravati Irrigation Project, which were implemented earlier by Japanese ODA loans, and in eight Pani Panchayats in the Rengali Irrigation Project. Of the Pani Panchayats already formed, those exhibiting eagerness for participation were selected for the activities. Soil testing, grants for procuring agricultural implements, formation of Self Help Groups⁹ (SHGs), microcredit for SHGs, and so on were provided. However, according to the field survey during the ex-post evaluation, of the eight Pani Panchayats where the scheme was implemented, only two were confirmed to have implemented SHG formation and provision of microcredit. The effects of the scheme can be found in “3.3.1.2 Qualitative Effects.”
- Malaria mitigation measures: The target area is a high malaria-risk area and the possibility of irrigation water becoming a breeding source for malaria was a concern. To mitigate the risk of malaria infection, activities such as renovation of testing labs in health clinics, procurement of microscopes, distribution of mosquito nets treated with insecticide to the local people, and an awareness program were conducted.

c) Consulting services

Consulting services have also been implemented as planned, in the form of overall project management, detailed planning and designing, assistance for bidding and procurement, as well

⁹ A group of 10 to 20 residents whose socio-economic backgrounds are similar. Normally, for the purpose of poverty alleviation, small monetary amounts are collected for saving regularly within the group and lent to members who need it.

as agricultural intensification and construction of field channels, training, assistance for land acquisition, and environmental management.

3.2.2 Project Inputs

3.2.2.1 Project Cost

Table 2 shows the planned and actual project costs.

Table 2: Project cost

	Plan ¹⁰	Actual	Actual against plan
Total project cost	JPY 17,752 million	JPY 27,994 million	158%
Japanese ODA Loan	JPY 14,838 million	JPY 16,184 million	109%

Source: Prepared by the external evaluator

The total project cost at the time of the Tranche I appraisal was JPY 15,327 million, but the planned project costs in Table 2 take into account the scope (in terms of technical assistance) and structures (additional costs for bridges, concrete lining of the main canal and minor and sub-minor canals, a bridge for elephant migration, upgrading district roads located in the target area to the standard of national roads, etc.) added at the time of the Tranche II appraisal. These were added as they were necessary for the project, and the total costs were recalculated, adding the corresponding amounts. The need for concrete lining for the main canal was caused by the use of blasting for breaking hard rock, which had excavated the canal slope excessively and reshaping was required. Regarding the bridge for elephant migration, necessary action was sought considering the impact on the ecosystem of the target area in the *OECD Guideline for Environmental Consideration* (1989).¹¹ In addition, considering that securing a migratory path for elephants was one of the conditions for forest clearance for the project, certain costs could have been expected from the time of the first appraisal.

The following are the main reasons that the project cost has substantially exceeded the planned cost: an increase in the compensation related to land acquisition, an increase in the price of materials and equipment as well as costs due to delays in civil works, and additional costs incurred for mobilizing machinery and labor from new contractors after re-tendering as a result of original contractors defaulting. All these factors were difficult to foresee.

In the project, an additional loan (Tranche III) was requested, considering the increase in project cost after Tranche II was provided. While additional funding was being considered, the DoWR strove to avoid adverse effects to the project progress by temporarily using funds from other projects so as not to halt ongoing construction. Moreover, there have not been any issues

¹⁰ Total project cost at the time of the Tranche I appraisal was JPY 15,327 million (out of which JPY 13,713 million was ODA loan). Planned cost was recalculated by adding scopes and structures included at the time of the Tranche II appraisal to the previously mentioned cost.

¹¹ Environmental and social consideration guideline applied in the project.

with financing by the DoWR during the implementation.

3.2.2.2 Project Period

The project period was originally planned from December 1997, the signing of Loan Agreement, to March 2003. However, the implementation period for technical assistance was not taken into account at the time of the Tranche I appraisal. Therefore, for comparing the plan and actual at the time of the ex-post evaluation, the planned period has been extended to December 2007, including the duration planned for technical assistance. This has resulted in the planned period being 121 months. As described earlier, the field channels of Pani Panchayat no.53 and two lift irrigations were not completed during the project. For the Magarmuhan lift irrigation, it was found that a new railway is being constructed in the target area and, until a bridge over the railway is built, distribution pipes cannot be laid in some of the areas. Both the field channels of Pani Panchayat no.53 and the Magarmuhan lift irrigation are expected to be completed by March 2019¹². Because works at Magarmuhan depend on the progress of railway construction, they need to be monitored hereafter as well. On the other hand, the Gadaparjang lift irrigation was not complete because of a delay in the formation of the Pani Panchayat;¹³ however, the Pani Panchayat has already been formed and tendering for the civil work is under process. It is expected to be completed by the end of 2019 and the progress needs to be monitored.

The actual project period was 232 months, from December 1997 to March 2017, when all the scopes were completed,¹⁴ and it significantly exceeded the plan (192% of what was specified in the plan). The main reasons for the prolonged project duration were: delays in obtaining forest clearance and approval for felling trees on land required for the construction, land acquisition, retendering of constructors, hindrance to construction by local people (opposing the use of blasting materials), additional works due to complex geological formations (discovery of hard rock), and delays in procurement of construction materials caused by shortage of domestic steel materials.

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

In the project, only the Economic Internal Rate of Return (EIRR) was calculated at the time of the appraisal. To calculate EIRR, the construction costs, including the Rengali multi-purpose dam, and maintenance costs were used and for the benefits, the increase in agricultural production from the development of the irrigation system was used. At the time of the Tranche I

¹² Information at the time of second field survey of the ex-post evaluation.

¹³ Formation of Pani Panchayats under lift irrigation was out of the scope of the project.

¹⁴ Exclusive of incomplete portions of lift irrigations and field channels. Since the share of incomplete portions in the entire scope is small, the date on which all the remaining scope was completed was determined to be the completion of the project.

appraisal, the project duration was considered to be 30 years based on the standard life of canals. However, from the appraisal of Tranche II onwards, the project duration became 50 years, which is the standard life of a dam, because the project includes the dam located upstream. The EIRR calculated at the time of Tranche III was 10.4%. When EIRR was recalculated at the time of the ex-post evaluation using the same parameters from the appraisals and based on the project costs and maintenance costs up to that point for the irrigated areas, it was 7.9%. The reason for EIRR becoming smaller than the figure at appraisal time is the reduction in beneficiary areas.

Both the project cost and project period significantly exceeded the plan. Therefore, the efficiency of the project is low.

3.3 Effectiveness and Impacts¹⁵ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

In the project, the target year was set for four years after project completion, considering that the timing for water tariffs to begin being collected from the beneficiary farmers according to the rules in the State of Odisha¹⁶ and for the production volume of crops by the irrigation to change. Moreover, target figures for the project's indicators, such as cultivated areas and production volumes, were determined based on the beneficiary area of 29,176 ha (same as the irrigation area mentioned in Table 1 as output). When the project was considered to be complete in 2017, at the time of the ex-post evaluation, four years had not passed since project completion. Therefore, the project is evaluated by revising the target year to 2021 and considering whether the target can be met for each indicator based on the achievements heretofore, by 2021, that is, four years later.

The table below shows the baseline, target, and actual values of operation and effect indicators at the time of the ex-post evaluation.

¹⁵ Sub-rating for Effectiveness is to be put with consideration of Impacts.

¹⁶ According to the rules of Odisha State, 100% water tariff collection becomes possible three years after irrigation has started. It was determined appropriate to assume that measuring the rate of water tariff collection will become possible one year after that, resulting in a total of four years after the project completion in June 2012, which falls in 2016.

Table 3: Operation and Effect Indicators

	Baseline	Target	Actual
	2002	2016	2017
		Four years after project completion	Year of project completion
Cultivated area	29,287 ha	55,438 ha	22,897 ha
Water tariff collection rate	-	40%	0%
Annual sufficiency rate of operation and maintenance costs	-	80%	100%
Number of beneficiary farm households	-	39,588	37,388
Production volume of major crops	84,363 t/year	518,202 t/year	90,576 t/year
Production volume of paddy	53,102 t/year	107,223 t/year	37,609 t/year
Yield of major crops (monsoon)			
Paddy	2.4 t/ha	3.5 t/ha	3.16 t/ha
Pulses	0.4 t/ha	0.8 t/ha	0.58 t/ha
Groundnuts	0.9 t/ha	1.7 t/ha	2.0 t/ha
Vegetables	5.0 t/ha	20.0 t/ha	9.98 t/ha

Source: Prepared by the external evaluator based on the materials provided by JICA and data provided by the DoWR and the Department of Agriculture

Note 1: Because data capturing only the project target area are not available, the actual figure of production volume of major crops was calculated based on the cultivated area and production volume of major crops in all of Dhenkanal District, taking into account the share of the project target area in the cropped area of the district in the monsoon and dry seasons. Data on yield of major crops is of whole of Dhenkanal District.

Note 2: Sugarcane, one of the indicators at the time of the appraisal, is not becoming a major crop in the target area at the time of the ex-post evaluation. In the ex-post evaluation, the actual figures of the crops that continue to be major crops have been confirmed.

So far, irrigation has been provided only during the monsoon season because of lining works for the canals located upstream of the project's canal. The first dry season irrigation was to start in February 2019, when the ex-post evaluation was conducted. In addition to this background, because the target year since the irrigation systems have been constructed has not been reached and the beneficiary area has decreased from the plan at the time of the appraisal, the cultivated area has not reached the target set at the time of the appraisal¹⁷. When the cultivated area is calculated against the future irrigation plan based on the total beneficial area of 26,202 ha, even if the maximum cropping intensity of 190% is achieved as envisaged in the project, the target of 55,438 ha cannot be achieved. However, if the target is revised considering the reduced beneficiary area, it becomes 49,783 ha. Further, if irrigation is provided as per the irrigation plan (irrigated area for the dry season) of the DoWR and the farmers cultivate the corresponding area, then, theoretically, 49,783 ha of cultivation is possible by 2021. The table below shows the

¹⁷ Apart from reduction of beneficiary area, one of other reasons that the actual values of 2017 being less than the baseline is that for calculation of baseline value, cultivated areas of summer and perennial crops were also included in addition to monsoon and dry seasons. For calculation of actual values, the data on cultivated areas of summer and perennial crops could not be obtained.

cultivated area as of FY 2018 and forecasted changes, including the irrigated area that will be completed in the future.

Table 4: Future Changes in Cultivated Area in the Target Area (Forecast)

(Unit: ha)

FY	Monsoon	Dry Season	Total
2018	25,642	7,530	33,172
2019	26,002	15,000	41,002
2020	26,202	23,581	49,783
2021	26,202	23,581	49,783

Source: Prepared by the external evaluator based on data provided by the DoWR

Regarding the water tariff collection rate, the water tariffs and irrigation area are finalized jointly with the Revenue Department after the field channels are constructed; therefore, tariff collection has not yet begun. The confirmation of the irrigation area is to be completed within 2019 and, thereafter, water tariffs will be collected subsequently, in accordance with the Odisha Irrigation Act.¹⁸ Based on the Act, a collection rate of 0% in 2019, 50% in 2020, and 75% in 2021 are possible. Therefore, if the farmers understand their responsibility to pay the water tariff and actually pay it, it will be possible to achieve the target of 40% by 2021. However, tariff collection, together with the strengthening of Pani Panchayats described later, requires careful consideration.

The annual sufficiency rate of operation and maintenance (O&M) costs is associated with the budget of the DoWR. It appears that the O&M budget of the DoWR does not have any shortages and there are no issues with the annual sufficiency rate of O&M costs (the financial situation of the DoWR is described in “3.4.3 Financial Aspect of Operation and Maintenance”).

Because the two lift irrigations have not been completed, the number of beneficiary households has not reached its target. On the other hand, farm households generally divide their landholdings among the next generation; thus, measuring the effect of the project by the number of households does not seem to be appropriate in the ex-post evaluation.

The production volume of major crops has not reached its target at the time of ex-post evaluation. For the same reasons as in the case of cultivated area, the original target will not be achieved even in 2021¹⁹, which is four years after the project completion. However, when the target is revised based on the reduced beneficiary area, the target for production volume of major crops would be 432,643 t/year (calculated by the external evaluator). When the estimate for production volume of major crops is calculated for 2021 based on that achieved during the monsoon in the target area,²⁰ with an assumed cropping intensity of 190%, the annual

¹⁸ In the Act, water tariffs are not collected in the year when irrigation services start (first year). From the second year onwards, 50%, 75%, and 100% of the demand raised are to be collected.

¹⁹ Reduction of beneficiary area is one of the reasons that actual value of the production volume of paddy in 2017 is less than the baseline value.

²⁰ The forecast up to 2021 is calculated based on the actual production volume of major crops from 2010 to 2017,

production volume of major crops becomes 198,178 t/year, and about only 46% of the target can be achieved.

As regards the yield of major crops during the monsoon season, groundnuts and paddy have already either achieved the target or are close to it. From interviews with the farmers, it has been revealed that rice yields in the monsoon season have increased two to three times compared to previous years since the irrigation has started. In fact, the yields of Dhenkanal District, the target area, had been lower than the state average in the past; however, since 2010, when the irrigation started, Dhenkanal District's average yields have exceeded the state average yield.²¹ Cultivation of pulses and vegetables is limited during the monsoon, and the fact that farmers have little experience in cultivating these crops appears to be one of the factors the yield has not reached the target.



Figure 2: Irrigated Paddy Cultivation



Figure 3: View of Beneficiary Area

3.3.1.2 Qualitative Effects (Other Effects)

For the project, the following were set as qualitative effects: a) access to domestic water, b) crop diversification, and c) improving irrigation efficiency through the development of irrigation systems. Moreover, d) mitigation of malaria risks from implementing malaria measures, was also expected. In addition, while the project has formed Pani Panchayats, it has introduced training and incentive schemes so that Pani Panchayats can assume the responsibility of maintenance after the transfer of field channels. Considering that the project was envisaging Pani Panchayats to be independent in the medium to the long-term, e) the functioning of Pani Panchayats, has been also checked for its effectiveness in the ex-post evaluation. For confirming these effects, group interviews with 20 out of 53 Pani Panchayats²² were conducted during the

excluding drought years.

²¹ Against the average yield of paddy for Odisha State in FY 2016, which was 2,472 kg/ha, that of Dhenkanal District was 2,861 kg/ha (Source: Odisha State government).

²² For a qualitative survey targeting the Pani Panchayats, interviews of two Pani Panchayats each from upper, middle and tail end reaches of Rengali Left Bank Canal and Bhairpur Branch Canal (12 in total) were planned at the time of formulating the evaluation framework for the project. However, Pani Panchayats could not be selected as per the

ex-post evaluation, to hear from executive committee members and farmers who are the members of the Pani Panchayats in addition to reviewing existing documents. Female members of Pani Panchayats have also participated in group interviews. According to the interviews, concerning a), access to domestic water, because there were wells in the villages, not many people used water in the irrigation canal as a source of domestic water. However, as described in “3.3.2.1 Intended Impacts” of this section, other usage of the irrigation canal was observed.

Regarding b), crop diversification in the target area, during the field survey of the ex-post evaluation, farmers cultivating small quantities of pulses and vegetables were seen, although paddy cultivation in the monsoon remains to be mainstream. Some of the farmers, who have their own irrigation pumps and access to ponds, are growing pulses and vegetables by irrigating on their own in the dry season. Because irrigation for the dry season by the project has only started in 2019, when irrigation in the dry season stabilizes in the future, diversification of crops can be expected.

From the perspective of c), improving irrigation efficiency, because the target area practiced rainfed agriculture before the project, an improvement in the irrigation efficiency due to the development of irrigation systems (presently only in the monsoon season) has been confirmed from the interviews with the farmers and the paddy yield data.

As the project target area was a high malaria-risk area, activities for malaria mitigation (such as renovation of testing labs in health clinics, procurement of microscopes, distribution of insecticide-treated mosquito nets to the local people and an awareness program) were conducted. As regards d), mitigation of malaria risks, according to the post evaluation for malaria mitigation conducted by the Indian Council of Medical Research (ICMR) in 2009 at four health clinics in Dhenkanal District, the annual blood examination rate and parasite index for four years since 2004 are as follows.²³

Table 5: Annual Parasite Index and Blood Examination Rate in Dhenkanal District

	2004	2005	2006	2007
Annual parasite index (%)	11.50	9.45	9.03	10.23
Annual blood examination rate (%)	10.99	11.39	10.83	9.85

Source: Prepared by the external evaluator based on an ICMR report

Among the four health clinics, there are no significant differences in the average annual parasite index. Concerning the annual blood examination rate, there is no significant change. Although it cannot be inferred from the data that malaria infection has been controlled by prevention and early treatment through blood testing, the ICMR report indicates that the use of

original plan because some of them had issues with the DoWR regarding the availability of irrigation water, while in others, there were conflicts among the farmers. Therefore, 20 Pani Panchayats were chosen mainly by the DoWR and group interviews were conducted. In these 20 Pani Panchayats, upper, middle, and tail end reaches of Left Bank Canal and Bhairpur Branch Canal were included. In the interviews, membership structure, activities so far, and status of cultivation were covered. The number of participants from each Pani Panchayat was approximately 30 on average.

²³ It was not possible to obtain data for the years other than those between 2004 and 2007.

mosquito nets by the local people has increased because of better awareness (regarding the cause of the disease, its prevention, etc.) through the awareness program. It is an indication that the awareness program and distribution of mosquito nets have contributed to reducing the malaria risks.

Regarding e), the functioning of the Pani Panchayats, the field survey revealed that the situation differs among Pani Panchayats. When the extent of irrigation project beneficiaries joining Pani Panchayats was checked, on average, 92% of the beneficiaries have become members. According to Odisha Pani Panchayat Act, one third of the quota for general members and members of executive committee is given to women. However, in reality, the members of Pani Panchayats are the owners of the irrigated land and, in most cases, the land title is in the name of a male family member, limiting the participation of women in Pani Panchayats. Executive committee members are supposed to be selected through an election. Nevertheless, there are many cases where individuals with power, such as the village head, are assuming the position, and there have been Pani Panchayats where the members were unaware how the committee members had been chosen. As regards the effects of the incentive scheme, according to the interview with the people who have implemented it, such as WALMI, it was found that eight Pani Panchayats targeted in the project were selected from those that had motivation when the Pani Panchayat was being formed and that were active after formation, such as actively holding meetings for members. From interviews at Pani Panchayats, members only remembered purchasing agriculture implements and there was no indication of the scheme contributing to building or strengthening cooperation within Pani Panchayats.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The expected impact of the project was increasing farmers' income by an increase in agricultural production (gross farm income). Gross farm income at the time of the Tranche II appraisal (2004) was INR (Indian rupees) 10,066. The target figure was INR 62,128 after four years of project completion. At project completion (2017), gross farm income has already reached INR 60,627. The reason that agricultural income has already exceeded the target, although irrigation for the dry season has not started yet, seems to be the rise in the trading price of rice. At the time of the Tranche II appraisal, the minimum support price of rice was INR 420 per 100 kg, but, in 2017, it has become INR 1,550.

In addition, during farmers' interviews, there was testimony that the water levels of existing ponds and wells have risen because the groundwater was recharged by the irrigation systems. Although no one said that women's workload in fetching water has decreased, some people were seen bathing and fishing in the canals.

3.3.2.2 Other Positive and Negative Impacts

a) Impacts on the Natural Environment

For the project, an Environmental Impact Assessment report was prepared in 1996 and environmental clearance from the Ministry of Environment and Forests was obtained. Forest clearance was obtained in 2003 and, for the construction of the canals, the route that minimized the area of tree felling was taken while compensatory afforestation was planned for.

Concerning environmental and forest clearances for the project, the following conditions were mainly given for compliance:

- Implementation of a wildlife management plan
- Declaring a Kapilash wildlife sanctuary
- Establishing an environment monitoring committee
- Conducting compensatory afforestation of the same size as the area of trees felled
- Construction of an elephant corridor

At the time of the project completion, these conditions were all complied with. The forest areas required for construction were 2,107 ha for the entire Rengali Irrigation Project (combined total for Right Bank and Left Bank) and compensatory afforestation of the same size was implemented by the state's Forest Department. Moreover, an additional 2,107 ha of afforestation along the canal were also conducted. As regards an environmental monitoring committee, a project level environmental management committee was created, having representation from the state's Forest Department, NGOs, and research institutions. The committee is monitoring mainly the compliance to the conditions of environmental and forest clearances. The committee was reconstituted in 2017 and continues to monitor Phase 2 of the project.



Figure 4: Bridge for Elephant Migration Covered with Trees



Figure 5: Birds-Eye View of Bridge for Elephant Migration (Photo courtesy: Nippon Koei)

Regarding the impact on the ecosystem of the area, a local NGO raised a concern in 2005 saying that the elephant habitat would be cut off because of canal construction. However, as it

was in compliance with environmental clearance from the beginning, the project has taken actions such as the construction of a bridge for elephants to cross over. In interviews with the Forest Department, it was confirmed that there is no report of a reduction in the number of elephants caused by the construction in the project. Although there exist no data on the number of elephants in the target area when the project began, according to 2002 data, the number has been increasing. Therefore, it appears there has not been a significant adverse impact in the target area.

Table 6: Number of Elephants in Dhenkanal Forest Division

Year	Number
2002	80
2005	102
2007	132
2010	157
2012	162
2015	164
2017	174

Source: Dhenkanal Forest Division

b) Land Acquisition and Resettlement

During the project, in addition to the forest land mentioned earlier, 3,192 acres of private land have been acquired. A total of INR 252 million were paid as compensation for the land acquisition. Resettlement did not take place. According to the DoWR, prior explanation was not provided to the affected people. The procedure for land acquisition seems to be carried out in accordance with the Orissa Resettlement and Rehabilitation Policy formulated in 1994. The amount of compensation was determined by referring to the price mentioned in the records of land transactions for the past three years, based on the village the land belongs to and the land use. However, according to the materials provided by JICA, the compensation paid at that time appeared to be much lower than the market price. In India, the land value mentioned in the records of land transactions is often lower than the actual price at which it is transacted, so as to avoid tax calculated on the price of transaction. As a result of being calculated based on official documents, the compensation probably became lower than the market price. Apparently, an official grievance address system was not established, but there were cases where compensation was reconsidered based on complaints from the affected people to the DoWR and those being considered in the court. Moreover, there was no information of affected people who would have lost means of livelihood due to land acquisition, and thus, support for rehabilitation of livelihood was not provided.

In terms of operation and effect indicators, the yields of paddy and groundnuts in the monsoon season have more or less achieved the target, and particularly, the yield of paddy has increased with the start of irrigation. Because of reduced beneficiary area, the cultivated area and production volume of major crops have not reached the target at present, but when the target is revised based on the beneficiary area after reduction, given the future irrigation plan, achieving the target of cultivated area by 2021 is possible. Providing irrigation as per the plan and strengthening Pani Panchayats will be the key to achieving the objectives. As regards the impact on the natural environment, specific adverse impacts were not observed. Overall, although the effectiveness and impact of the project are limited at present, many of the indicators specified are expected to achieve the revised target in the future, and thus, the objectives are expected to be achieved and the evaluation is high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

In the project, from the time of the appraisal, it was decided that the DoWR would attend to the maintenance of facilities down to distributary canals whereas maintenance of minor and sub-minor canals and field channels was to be undertaken by Pani Panchayats. Institutional arrangements for O&M are as per the plan and the responsibility for main and branch/distributary canals rests with the Rengali Left Bank Canal Division of the DoWR. The Rengali Left Bank Canal Division is under the authority of the Chief Engineer in charge of Brahmani River Basin irrigation and there are 18 engineer posts, including that of Executive Engineer. At the time of the ex-post evaluation, two posts are vacant. Left Bank Canal is further divided into three sections for management. According to the DoWR, 20% of the posts are vacant at any given time, but O&M is performed with the available workforce and no serious issue has arisen from a shortage of staff. The target area is divided into three sections, each of which is supervised by a Superintendent Engineer. Below that level, a Junior Engineer is positioned at each major structure. For each engineer, there are broad job guidelines and, as per the conditions on the field, instructions are given by the Executive Engineer.

The maintenance of below-minor canals is the responsibility of Pani Panchayats. As in the case of this project, Pani Panchayats, comprising the beneficiary farmers of the major irrigation projects, are formed in accordance with the Orissa Pani Panchayat Act (2002) and have a four-tier structure. At the field level, several farms are clubbed, approximately 40 ha of size, and a group called Chak Committee is formed. However, in the interviews with the farmers, many were not aware of the existence of the Chak Committee and the committee presently did not appear to have any activities. Members of several Chak Committees constitute Pani Panchayats and there are 53 Pani Panchayats in the project. Twenty-six Pani Panchayats located in the

beneficiary area of the Bhairpur Branch Canal have created a Distributary Committee. In addition, a Project Committee is to be established to unite all the Pani Panchayats in respective irrigation systems at its apex.

As a result of interviews with the DoWR and Pani Panchayats to ascertain the current status of the major roles expected of Pani Panchayats,²⁴ because cultivation using irrigation is presently limited, the Pani Panchayats have not been in a position to sufficiently fulfill their responsibilities. Moreover, concerning the Pani Panchayats visited in the ex-post evaluation, a weak linkage with the DoWR and the Department of Agriculture was notable in most of them. In the Pani Panchayat Act of the state, officers in charge of the DoWR, Department of Agriculture and Fisheries Department, are appointed as members of the executive committee of a Pani Panchayat without voting rights. In reality, government officers are not necessarily called for Pani Panchayats meetings and the role of officers from government departments is not recognized by the committee members. Given these situations, Pani Panchayats have not reached a point where they can implement a cropping pattern that uses irrigation systems or receive the technical assistance required for crop diversification. When irrigation in the dry season begins, fulfilling these roles will be most important for Pani Panchayats. Furthermore, strengthening the coordination mechanism within each Pani Panchayat and the collaboration with government departments such as the Department of Agriculture to access various grants and schemes will be required.

The water tariffs collected from the farmers are deposited to the state Revenue Department. Thus, they do not become direct revenue for the DoWR or Pani Panchayats. Because the latter are responsible for collecting the tariffs, and to secure sustainable maintenance cost, the need to restructure the system has been indicated since the time of the appraisal. The systems for water tariff collection and redistribution have not changed from the initial stage, even at the time of the ex-post evaluation. In the current system, the extent of water tariff collection is doubtful; however, a system of depositing the water tariffs collected by the Pani Panchayat in the Pani Panchayat itself is under consideration in the Odisha state government, and there is sign of future improvement.

As described above, the O&M institutional arrangement of the DoWR does not exhibit any particular issues. However, Pani Panchayats need to strengthen coordination within themselves and with government departments to prepare for the irrigation, which is to start in full-scale in the near future.

3.4.2 Technical Aspect of Operation and Maintenance

The questionnaire survey and interviews at the DoWR revealed that the engineers posted for

²⁴ Preparation of a cropping pattern based on soil and climate conditions, formulation of a maintenance plan for irrigation systems, equitable distribution of irrigation water, assessment and collection of water tariffs, and so on.

O&M of the project are equipped with civil engineering degrees. WALMI, which lies under the umbrella of the DoWR, has various training courses for farmers, while new recruits (engineers) of the DoWR are also trained on O&M of irrigation at WALMI. Engineers in charge of O&M in the DoWR possess the required technical standards, and trainings for maintaining and improving the capacity can be received as required at WALMI and other institutions. An O&M manual for the project was prepared in 2011 and it appears to be used by the staff. There has been no report of problems regarding the technical standard of the staff or manual.

Technical skills required for Pani Panchayats for O&M include preparation of cropping patterns, determining the amount of irrigation water required for each crop, in addition to the knowledge and capacity to implement canal maintenance and distribution of water in line with the irrigation schedule. In addition to trainings conducted during the project implementation phase, WALMI is conducting capacity building for executive committees of Pani Panchayats and study tours to other irrigation areas targeting the farmers throughout the year. From experiences in the project so far, it is difficult to determine whether the Pani Panchayats have required knowledge and technical skills; however, maintenance of the canals does not require advanced expertise, and should pose no issue in technical aspects. On the other hand, because many of the Pani Panchayats in the project only received trainings targeting executive committees, there was a great demand for trainings for the general members from the farmers. The capacities of Pani Panchayats vary and irrigation will be conducted in full-scale soon, and the operational capacity of Pani Panchayats and their collaboration and coordination with government departments will be required more than before. Therefore, trainings and assistance tailored to the current situation of the Pani Panchayats in the project are required.

3.4.3 Financial Aspect of Operation and Maintenance

Table 7 shows the DoWR's budget allocation and expenditure from FY 2002 to 2017 and changes in the maintenance cost of the Rengali Left Bank Canal from FY 2007 onward. From FY 2006 onward, the budget has been on an increasing trend and execution for each year is almost 100%.

Table 7: Budget of DoWR and Maintenance Cost of Rengli Left Bank Canal
(Unit: INR million)

FY	DoWR		Maintenance cost of Rengali Left Bank Canal	
	Budget	Expenditure	Budget	Expenditure
2002	6,940	7,014		
2003	5,601	5,831		
2004	5,606	6,981		
2005	6,589	7,241		
2006	10,488	10,069		
2007	20,154	18,943	34	34
2008	21,961	20,191	64	44
2009	23,906	25,637	64	49
2010	29,604	25,168	73	58
2011	32,511	27,420	73	67
2012	30,415	30,919	73	61
2013	40,348	36,577	112	79
2014	44,012	42,787	87	86
2015	60,191	60,435	126	106
2016	75,827	77,462	122	110
2017			147	145

Source: DoWR budget from the materials provided by JICA, and maintenance cost of Rengali Left Bank Canal provided by the DoWR

Based on the available data up to FY 2009, the water tariff collection across the state of Odisha is about 50% of the demand raised. The Irrigation Commission of India recommends that the structure of water tariffs be revised every five years, but because of resistance from beneficiaries and for political reasons, it has not been revised in Odisha since 2002.

In Odisha state, grants are provided to Pani Panchayats for their maintenance for the first four years since their formation. When 75% of the beneficiaries enroll in the Pani Panchayats, the grant in the first year is provided at the rate of INR 100/ha. Subsequently, the grant amount is calculated proportionately to the number of farmers becoming members of the Pani Panchayat in the following three years. From the fifth year, amount to be provided to the Pani Panchayat depends on the amount of water tariff collected (against demand raised). For the Pani Panchayats of the project, grants for the first or up to the second or third year have been confirmed depending on the Pani Panchayat. Heretofore, Pani Panchayats have not submitted documents proving the utilization of grants, which are required for receiving grants for the second time onward. Furthermore, although the tenure of executive committees has lapsed, an election has not been conducted to select new committee members. Therefore, in the present situation, grants have not been provided regularly.

At the time of the ex-post evaluation, although none of the Pani Panchayats claimed a shortage of funds, in case the maintenance budget is insufficient, action is taken temporarily using the DoWR's budget. In the future, provision of the grant is expected to resume after the Pani Panchayat election is conducted. However, the grant is available only up to four years, and to

secure maintenance costs, the collection of water tariffs becomes important from the fifth year onward. In the future, restructuring of the system will be required so that Pani Panchayats can assume the responsibility of collecting the water tariffs.

3.4.4 Status of Operation and Maintenance

During the field survey in the ex-post evaluation, no large damage to the canals was observed, except in small patches in the main canal, where the soil was eroding in portions without concrete lining. No issues were observed in facilities such as cross-regulators. In facilities maintained by Pani Panchayats, although there have currently been no significant issues, there were places where wastes and sand were piled and weeds were growing in the canal, perhaps because there is no irrigation at the moment. The DoWR needs to continue to monitor the situation to ensure that arrangements are made to remove the silting and wastes in the canals as required and that an irrigation schedule is created and the water distributed as per the plan. Especially because significant differences exist among Pani Panchayats in the rules set up for the members and in their implementation, support to strengthen Pani Panchayats as institutions seems to be required.

Regarding O&M technical skills, both the DoWR and Pani Panchayats have no issues and currently, there are no specific problems with regard to the status of O&M, either. On the other hand, there are issues related to O&M institution and finance. Regarding institution, continuing efforts to strengthen the coordination among Pani Panchayats, the DoWR and the Department of Agriculture, as well as strengthening the system within each Pani Panchayat, are required to prepare for the beginning of full-scale irrigation. In financial aspects, Pani Panchayats require special attention to secure the necessary maintenance costs and aspects such as a system of water tax collection and redistribution and the timely release of grants to Pani Panchayats. As described, some minor problems have been observed regarding the institutional and financial aspects. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In the central part of Odisha State located in eastern India, annual rainfall is unevenly distributed in the rainy season. Without the development of irrigation systems, cultivation in the dry season in the area has been difficult. Therefore, the Rengali Irrigation Project was implemented with the objective to increase agricultural production and to diversify crops by newly constructing an irrigation system in the Brahmani River Basin, establishing Pani Panchayats and improving farming practices, thereby contributing to increasing the income of farmers in the target area. From the time of the appraisal to the ex-post evaluation,

agriculture/irrigation has been an important sector for the governments of India and Odisha State. Although the development needs identified at the time of the appraisal have been partially satisfied by the time of the ex-post evaluation, the necessity for irrigation in the target area remains unchanged. The objective of the project also matches Japan's ODA policy; thus, the project's relevance is high. The beneficiary area of the project has become smaller than the plan because of the micro-plans prepared at the farm level after the project started and the expansion of residential areas and national roads. The project's costs and duration have significantly exceeded the plan, and the efficiency is low. As regards operation and effect indicators, the yields of some of the crops have almost achieved the targets, and that of paddy has increased with the start of irrigation. Although the cultivated area and production volume of major crops have not reached its target, because of reduction in irrigated area (beneficiary area), given the future irrigation plan, achieving the cultivated area by target year of 2021 is theoretically possible. To achieve the objective, irrigation shall be provided as per the irrigation plan created, and strengthening the Pani Panchayats will be important. No particular adverse impact on the natural environment has been observed. Although the effectiveness and impact of the project are currently limited, in the future, achieving the revised target on the basis of reduced beneficiary area is expected for many of the indicators specified. Therefore, the expected outcome will become possible, and the evaluation is high. As regards operation and maintenance, there are some issues related to institutions and finance. Collaboration between Pani Panchayat and the Department of Water Resources, as well as the Department of Agriculture, and strengthening the internal system of Pani Panchayats are required. Moreover, to secure maintenance costs, such as a system for collecting and redistributing water tariffs, and the timely release of grants to Pani Panchayats, it is necessary to pay particular attention to the finances of Pani Panchayats. Given the situation, the sustainability of the project is assessed as fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

There are incomplete portions in the construction of the field channels and lift irrigations in the project. For the Magarmuhan lift irrigation, which crosses the railway line, the DoWR should coordinate with other organizations so as to avoid any further delays while monitoring the progress of railway construction. Although necessary works are underway for construction of field channels by CADA (completion expected by March 2019) and by Gadaparjang lift irrigation (completion expected by end of 2019) also, action is needed to avoid further delays from the current status.

In addition, attention needs to be paid to O&M institution and finance in the future. Particularly, strengthening Pani Panchayats as institutions and securing funds for them will be

essential to achieve the objectives of the project in the future. Although efforts have been made to strengthen the capacity of Pani Panchayats during the project implementation, further support for capacity development of committee members and other Pani Panchayat members is desired.

The Pani Panchayat Support Unit of Odisha's DoWR is conducting rating of the Pani Panchayats in the state, which evaluates the performance of each Pani Panchayat based on several parameters such as frequency of meetings and availability of a maintenance plan. In addition to evaluating the performance of Pani Panchayats, by working with WALMI on capacity building training based on the current performance, support that matches the demand can be provided and it is expected to strengthen the institution of Pani Panchayats and their finances as well as to strengthen their coordination with government departments.

4.2.2 Recommendations to JICA

As indicated in "4.2.1 Recommendations to the Executing Agency," for the incomplete portion of the project, JICA also needs to keep monitoring the progress. If a delay is foreseen or a problem occurs, it is recommended to aid the executing agency in appealing to the state government.

The project has not reached the target year set for effectiveness, and irrigation in the dry season will start soon. To ensure that irrigation is provided as planned and that it leads to the achievement of the targets, the project's effects should also be monitored in the medium term.

4.3 Lessons Learned

Support for Capacity Building of Pani Panchayats during and after the Project

In the project, trainings for Pani Panchayats were conducted through WALMI during the project implementation. However, at many of the Pani Panchayats, there are issues such as substantial time having passed since the training was conducted, the irrigation services not having commenced for them to function in full, and only some of the members having received the training. As the irrigation in the target area will become full-scale soon, strengthening the system in and out of Pani Panchayats will be much more important. The effectiveness of an irrigation project takes a long time to emerge, and this is even truer for a major project like this. Therefore, it is necessary to prepare trainings for strengthening the capacity of Pani Panchayats even after project completion and provide support from the government departments soon after project completion.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
a) Civil work	Main canal 41.313 km Branch canal 34.780 km Minor and sub-minor canals 1 set Field channels 1 set Lift irrigation 2,230 ha Irrigation area 29,176 ha (inclusive of lift irrigation)	42.136 km As planned As planned As planned 2,780 ha 26,202 ha
b) Technical assistance	<ul style="list-style-type: none"> • Agricultural intensification and construction of field channels • Training • Strengthening of WALMI • Formation of Pani Panchayat and handing over of systems • Incentive scheme • Malaria mitigation measures 	As planned
c) Consulting services	<ul style="list-style-type: none"> • Overall project management, detailed planning and designing • Assistance for bidding and procurement, as well as maintenance and management • Assistance for agricultural intensification and construction of field channels, land acquisition and environmental management. • Assistance and advise for technical instructions and training 	As planned
2. Project Period	December 1997 – December 2007 (121 months)	December 1997 – March 2017 (232 months)
3. Project Cost		
Amount Paid in Foreign Currency	JPY 4,677 million	JPY 1,347 million
Amount Paid in Local Currency	JPY 13,075 million (INR 4,261 million)	JPY 26,647 million (INR 11,720 million)
Total	JPY 17,752 million	JPY 27,994 million yen
ODA Loan Portion	JPY 14,838 million	JPY 16,185 million yen
Exchange Rate	INR 1 = JPY 3.41 and JPY 2.59 (As of April 1997 and August 2003)	INR 1 = JPY 1.80 (Average between January 1998 and March 2017)
4. Final Disbursement	November 2015	