

India

FY2019 Ex-Post Evaluation of Japanese ODA Loan

“Andhra Pradesh and Telangana Irrigation and Livelihood Improvement Project

External Evaluator: Nobuko Shimomura, Almec Corporation

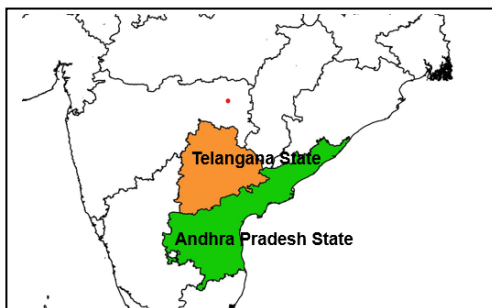
0. Summary

The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities¹, capacity building of operation and maintenance setup, and spread of farming technologies, in the states of Andhra Pradesh (AP) and Telangana (TS) in southern India, thereby contributing to the increase of farm income and the alleviation of poverty. Due to the improved water efficiency by transforming the rain-fed area to irrigated and renovating the existing facilities resources, the project relevance is high as project implementation was well in line with India's development policy and development needs, as well as with the ODA policy of Japan. The project cost was within the plan, but the project period was significantly longer than planned. Setting up the implementing framework after the bifurcation of AP state in 2014 took a while and longer in the land acquisition. The efficiency of the project is fair as the project period was significantly longer than planned. The targets in regard to irrigated area as well as crop yields had been achieved. On the other hand, the confirmed increase of household income was due to the fishery and livestock activities in the target areas, besides agriculture. The livelihood of target area of minor irrigation in TS where tribal communities and other disadvantaged communities reside were originally depend on rain-fed agriculture, in particular has considerably improved. Therefore, the effectiveness and impacts of the project are high since the planned effectiveness was achieved through project implementation. Regarding project sustainability, the technical aspect, and current status have no significant issues. However, there are issues with institutional / organizational aspect as well as finance since the need to support for beneficiary farmers as well as to secure and promptly disburse sustainable maintenance costs are confirmed. The sustainability of the project effects is, therefore, fair.

All things considered; the evaluation of this project is satisfactory.

¹ Minor irrigation is defined as up to 2,000 ha, while medium irrigation is from 2,000 ha to 10,000 ha

1. Project Description



Project locations



Renovated medium irrigation facility

1.1 Background

In India, the agricultural sector accounts for 13.9% of GDP (as of 2013 - 2014), and roughly 46% of the land area is dedicated to farmland use. Regarding population, nearly 70% live in rural areas with about half the working population engaged in agriculture². These figures demonstrate the importance of agriculture and rural development in achieving socio-economic balance and reducing poverty in India.

Nevertheless, seasonal fluctuations that affect the rivers or occurrence rainfall strongly influence the production of crops. The country has also become susceptible to climate change in recent years, from uneven distribution of rainfall or oscillate between flood and drought due to weather instability. In light of this, from the viewpoint of food security, stabilizing and boosting the production of crops is essential by utilizing efficient use of the available water resources. To achieve this goal, the Government of India has focused on large-scale irrigation development over the years, achieving a 49% irrigation rate for all arable land.³ In the 10th 5-Year Plan (April 2002 – March 2007), the Government of India advocates four priority issues: (1) increase public funding for irrigation facilities and water resource management; (2) rural infrastructure development (local roads, etc.); (3) development and extension of agricultural technologies; and (4) crop diversification. Furthermore, in the Common Minimum Program (May 2004), irrigation is one of the designated top priority areas.

Andhra Pradesh (hereafter AP) and Telangana (hereafter TS) bifurcated in 2014, both are located in southern India with more than 50% of crop land are rain-fed. In such condition, there have been frequent flood and drought⁴. The net sown areas of AP and TS are 8.05 million ha, and 4.66 million ha, respectively. The employment rate of AP and TS in the agriculture sector of the total population, meanwhile, are 62% and 55%, respectively, while the farm land has been small

² Ministry of Agriculture, Department of Agriculture & Cooperation, and Directorate of Economics & Statistics, 2014.

³ Same as above.

⁴ Heatwave causes death, especially among the poor, during the dry season. In May 2015, for example, the most severe heatwave hit in two decades resulted in approximately 1,800 and 600 victims in AP and TS respectively.

as to approximately less than one ha⁵. Livelihood support for the Scheduled Tribe⁶ (ST) population in the TS, which accounts for 9.34%⁷ of the total population, has been one of the most-prioritized policies of the TS Government after the bifurcation. Modernizing agriculture from rain-fed to irrigated farmland was highly needed.

Furthermore, the existing irrigation facilities are declining and water cannot reach the end of the facilities, making stable agricultural production difficult. AP, at the time of the project appraisal, was a state advanced in irrigation sector reform that focuses on improving management capacities for irrigation facilities. By promoting this reform through strengthening the capacities of Water Users' Associations (WUA), it may be anticipated that this project would become a model for other states.

1.2 Project Outline

The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities, capacity building of operation and maintenance setup, and spread of farming technologies, in the states of Andhra Pradesh(AP) and Telangana (TS) in southern India, thereby contributing to the increase of farm income and the alleviation of poverty.

Loan Approved Amount/ Disbursed Amount	23,974 million yen / 15,129 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2007 / March 2007
Terms and Conditions	Interest Rate 1.3% Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General Untied
Borrower / Executing Agencies	President of India / Water Resources Department, Government of Andhra Pradesh (WRD-AP), Irrigation and Command Area Development, Government of Telangana (I&CAD-TG).

⁵ *Initiative in Irrigation Sector*, Water Resource Department, Government of Andhra Pradesh, *Telangana Socio Economic Outlook 2020*

⁶ Scheduled Tribes, who reside in the mountainous region, were officially designated groups of people in the Constitution of India in 1935. They receive preferential treatment since their livelihoods are under-developed. The castes considered untouchable, also called Scheduled Caste (SC), are beneficiaries of the project.

⁷ Telangana Tribal Welfare Department mentioned that the share of ST was approximately 7% in the former AP state prior to bifurcation based on the Census 2011, thus, the share of ST in TS is higher. (<https://tstribalwelfare.cgg.gov.in/mainPage.do>, confirmed in December 2020)

Project Completion	July 2017
Target Area	Andhra Pradesh and Telangana States
Main Contractor(s) (Over 1 billion yen)	M/S Sri Satya Sai Infrastructures Pvt. LTD. (India) M/S Sai Datta Constructions (India) M/S TBPR Infra Projects Pvt. LTD. (India)
Main Consultant(s) (Over 100 million yen)	Nippon Koei (Japan)
Related Studies (Feasibility Studies, etc.)	Special Assistance for Project Formation (SAPROF) for Andhra Pradesh Irrigation and Livelihood Improvement Project (October 2006, JICA)
Related Projects	<p>【ODA Loan】</p> <ul style="list-style-type: none"> • Kurnool-Cuddapah Canal Modernization Project (I) (II)(January 1996 - May 2007) • Andhra Pradesh Irrigation and Livelihood Improvement Project (II) (December 2017- December 2024) <p>【Other Organisation】</p> <p>World Bank: Water Sector Improvement Project (2010~2018)</p>

2. Outline of the Evaluation Study

2.1 External Evaluator

Nobuko Shimomura, Almec Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: December 2019 – January 2021

Duration of the Study by the National Consultant: April 2020 – January 2021

2.3 Constraints during the Evaluation Study

When the COVID-19 pandemic spread worldwide, the Evaluator was not able to do the Field Study. The National Consultants conducted the interview survey to the implementing agencies and site survey to confirm the effectiveness and impact of the output. Movements across states have been restricted since April 2020 and, even with relaxed restrictions, the site external evaluator adopted precautionary measures to change the target of the field survey. Since the state headquarters of the respective implementing agencies and offices of the target districts have been working remotely, setting up interviews with others was difficult. The interview with the central

government for the implementation budget was even abandoned. Furthermore, the capacity building activities of the project were almost complete before the bifurcation in 2014. The staff assigned from the implementing agency has since been replaced, so only a limited number of cases at that time could be confirmed.

3. Results of the Evaluation (Overall Rating: B⁸)

3.1 Relevance (Rating: ③⁹)

3.1.1 Consistency with the Development Plan of India

Since 1951, India has been formulating five-year plans aiming to achieve food self-sufficiency, improve the lives of its citizens, and provide stability. At the time of appraisal, its 10th 5-Year Plan (April 2002 – March 2007) of India advocated; (1) increasing public funding on irrigation facilities and water resource management, (2) development of rural infrastructure (local roads, etc.), (3) development and extension of agricultural technologies, and (4) crop diversification.

The 12th Five-Year Plan for 2012-onwards sets an average real GDP growth rate target of 4% for the agricultural sector. Important challenges pointed out in realizing this are the effective utilization of water resources, popularizing sustainable technology, responding to climate change, and improving productivity. The priority is improving the productivity of irrigation agriculture as a basis to utilize water resources efficiently. During the ex-post evaluation of this project, NITI Aayog¹⁰ prepared “Doubling Farmers’ Income (2017) “ that focused on having a strong programme for agricultural transformation. In the state level, Vision 2029 by AP, Mission Kakatiya by TS elaborated the vision to develop new tanks, renovate irrigation facilities, and identify and improve malfunctioning minor irrigation facilities.

Hence, the Project was consistent with the development policies of both states from the appraisal in 2006 to completion in 2017.

3.1.2 Consistency with the Development Needs of India

As shown in Table 1, the growth rates of GRDP of both states exceeded over 7% comparing between the 2011–2012 and 2016–2017 fiscal years. The significance of agriculture, forestry and fishing especially high for AP, which represents 25% of the GRDP, and its annual growth rate was as high as over 8%. On the other hand, the growth rate of agriculture, forestry and fishing in TS was relatively small as 1.5%, as the capital of TS, Hyderabad is one of the hubs of IT export. However, the employment of agriculture sector was as high as 55% in TS¹¹ at the time of ex-post evaluation. The rural population share of AP was 67% (2011)¹² prior to the bifurcation.

⁸ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁹ ③: High, ②: Fair, ①: Low

¹⁰ National Institution for Transforming India. Aayog is Policy Commission in Hindi.

¹¹ *Telangana Socio Economic Outlook 2020*

¹² *The Handbook of Statistics on Indian States 2018 – 2019*

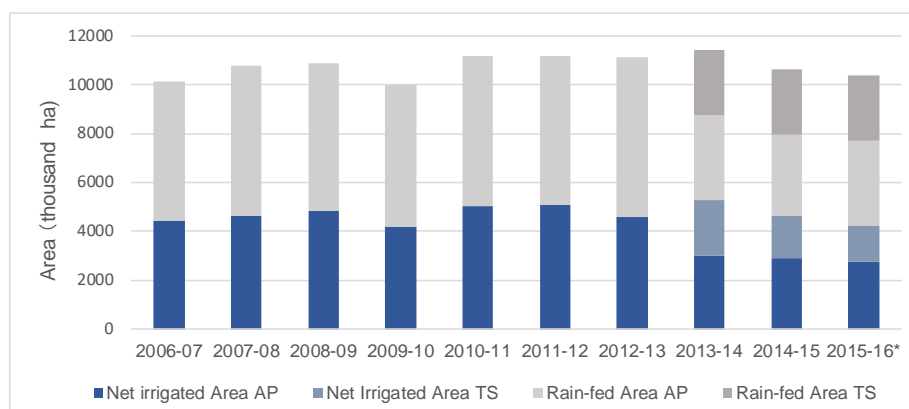
Table 1 Gross State Domestic Product by economic activity at constant (2011 – 2012) prices, its share of agriculture, forestry and fishing, population, of AP and TS

Item	State	2011–2012	2016–2017	CAGR
Gross State Domestic Product (Million Rs)	AP	3,794,015.8	5,470,214.5	7.6%
	TS	3,594,326.5	5,112,863.3	7.3%
Agriculture, forestry and fishing (Million Rs)	AP	940,080.5	1,388,332.9	8.1%
	TS	546,148.8	587,191.8	1.5%
Share of Agriculture Sector of GDP	AP	24.78%	25.38%	
	TS	15.19%	11.48%	
Population (Thousand)	AP	49,275	50,743	0.59%
	TS	35,682	37,505	1.00%

Source: The Handbook of Statistics on Indian States 2018 – 2019, 2019, Reserve Bank of India 2019

Note: Compound annual growth rate (CAGR) was estimated by the Evaluator.

Rs: Indian Rupee



Source: The Handbook of Statistics on Indian States 2018 – 2019, 2019, Reserve Bank of India 2019 originally from Ministry of Agriculture and Farmers Welfare, Government of India.

Figure 1 Shift in net irrigated area of AP and TS (After bifurcation in 2014)

The irrigated area in the total sown area from 2006 to 2015 has barely increased in both states, as shown in Figure 1. When irrigation facilities become too old to secure water, the payment of water user fees becomes increasingly difficult, and maintenance of irrigated land is impractical. There is a need for new irrigation facilities and rehabilitation for poorly maintained facilities as irrigated areas are not sufficient. Subsequently, the farmers, NGOs, and the relevant agricultural, livestock, and fisheries departments need to collaborate to secure water for agriculture and to improve livelihoods, which is in line with the development needs of both states at the time of appraisal and project completion.

3.1.3 Consistency with Japan’s ODA Policy

At the time of the project appraisal, “Rural Development Benefiting the Poor” was the priority sector in Japan’s Country Assistance Policy for India. The Country Assistance Program

(2006) set irrigation and flood-control as priorities. The objective of the project is consistent with both policies.

To conclude, this project is highly relevant to the development plan and development needs of the country, as well as Japan’s ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating:②)

3.2.1 Project Outputs

The plan versus actual of the outputs of this project are shown in Table 2.

Table 2 The outputs of this project (Plan and Actual)

Plan	Actual
(1) New construction of 59 minor irrigation facilities and rehabilitation of 11 medium irrigation facilities (irrigation tanks and canals)	(1) New construction 48 minor irrigation facilities and rehabilitation of 20 medium irrigation facilities (irrigation tanks and canals)
(2) Formation and capacity building of Water Users’ Associations (including farming assistance and assistance for the poor)	(2) Same as Planned
(3) Assistance with sector reform (capacity building of Water Users’ Associations at the state level and strengthening of departments and organizations related to irrigation)	(3) Same as Planned.
(4) Consulting Services Scope of Services: detailed design, bidding assistance, construction management, etc.	(4) Consulting Services International Consultant Service was terminated after the bifurcation in 2014.

Source: Documents provided by JICA and Implementing Agencies

Regarding the new construction and rehabilitation of irrigation facilities (tanks and canals), the minor irrigation facilities faced difficulties due to land acquisition. On the other hand, other medium irrigation facilities needed rehabilitation in addition to the originally planned. Eleven subprojects for new minor irrigation facilities were cancelled out of the 59 originally planned, and the number of subprojects for the rehabilitation of medium irrigation facilities increased from 11 to 20 after the start of the project. Without the revisions, the project would have required more time for land acquisition, extending the project period and making it difficult to expand the beneficiary area. In light of the project objectives, the above adjustments are reasonable and have had a positive effect on the realization of the project impact.

The activities to form and strengthen WUA included the following three aspects related to the maintenance of irrigation facilities and agricultural technology. A total of 950 farmers from AP and 974 farmers from TS participated in the project¹³. Although it was not possible to

¹³ Responses from the Implementing Agencies.

directly confirm the impact of the training during the site survey, there were some examples of diversification of agriculture and use of agricultural methods to increase yield.

- 1) Awareness raising regarding the role of WUA (water management, finance, monitoring) and participation in the exposure visit financed by the project (JICA).
- 2) Preparation for the Participatory Action Plan Preparation (PAP), water management by crops, financial plan, collaboration with the implementing agencies, WUA office establishment, and mitigation measures for the conflict on right water use.
- 3) Implementing the Farmer Field School, improving livelihoods through soil improvement and cultivation of vegetables and other crops in backyards.

As part of the actual support in the farming and poverty alleviation, there were also activities to form and strengthen water users' associations. Farmers prepared land and built facilities, such as warehouses, offices, dry land, and aquaculture ponds, to support livelihood improvement activities. Such activities stagnated in TS due to the condition that beneficiaries shoulder the 20% costs and insufficient budget allocation for WUA activities due to the budget shortage for irrigation works resulting from inflation. At the same time, AP facilities were also found incomplete despite approval in the five medium irrigation subprojects. On the other hand, the offices and logistics facilities serving the WUA, logistics facilities, post-harvest facilities, and aquaculture ponds conducive to associations were confirmed to be in service and utilized in the beneficiary areas after construction under the project at the time of ex-post evaluation (Table 3).

Table 3 Samples of the facilities built for capacity building of the WUA livelihood improvement programme conducted under the project

Name of subprojects	District (AP State)	Godowns / Office buildings		Drying yards / Fish ponds	
		Approved	Completed	Approved	Completed
Gajuladinne (Medium)	Kumool	12	10	12	11
Swarnamukhi (Medium)	Chitoor	6	1	6	3
Gandipalem (Medium)	Nellore	17	0	17	0
Lower Sagileru (Medium)	Kadapa	6	0	6	0
G.Mekapadu (Minor)	Prakasam	1	0	1	0

Source: Implementing Agencies

There were various forms of training on sector reform, such as strengthening the WUA, related organisation of irrigation as elaborated in “3.4 Sustainability”.

3.2.2 Project Inputs

3.2.2.1 Project Cost ③

In contrast with the total project cost of 28,672 million yen (of which the ODA loans

covered 23,974 million yen) planned at the time of the appraisal, the actual project cost was 18,422 million yen (of which the ODA loans covered 15,129 million yen), which was below the plan (at 64 %). The reasons for the actual project cost being lower than planned include the depreciation of the Indian rupee against the Japanese yen and that the contract for international consultants was not extended after the bifurcation in 2014.

Table 4 Project cost

Unit	Plan			Actual			
	Project Cost	JICA	Government of India		Project Cost	JICA	Government of India
Million Rs	11,377	9,513	1,864	AP	2,913	2,578	336
				TS	8,128	6,490	1,638
				Total	11,041	9,068	1,974
Million Yen	28,672	23,974	4,698	Total	18,422	15,129	3,293

Source: Documents provided by JICA and Implementing Agencies

Exchange Rate; Rs. 1.0 = Yen 2.52 (appraisal period in 2006), Rs. 1.0 = Yen 1.67 (ex-post evaluation in 2020).

3.2.2.2 Project Period ①

The planned project period during the appraisal was 73 months (from March 2007 to March 2013), while the actual project period was 125 months (from March 2007 to completion in July 2017). The actual project period was at 171%, far exceeding the planned period. The main reason for the extended period is the delay in land acquisition for the new minor irrigation, as previously mentioned. In addition, when the bifurcation of AP state in 2014 delayed the implementation work, an increase in compensation became mandatory per new land acquisition act in 2014, namely the Right to Fair Compensation and Transparency in Land Acquisition, amended in the same year to compensate the landowners generously and to facilitate land acquisition.

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

The Financial Internal Rate of Return (FIRR) was not calculated for this project at the time of appraisal, but the Economic Internal Rate of Return (EIRR) was at approximately 16.9%, based on the project cost, excluding taxes, operation and maintenance costs, and the increase in agricultural production as benefits, assuming a 10-year construction period and 30-year project life. The EIRR was not recalculated during the ex-post evaluation, given that the basis for comparison was different because of the changed cropping pattern during the project implementation period. Also, the data needed for recalculation was unavailable. However, it was expected higher than the target value of the EIRR estimated at the time of the appraisal,

because the project cost was lower than planned, the significant increase in the beneficiary area, and the increase in yield were confirmed.

Although the project cost was within the plan, the project period exceeded the plan; therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts¹⁴ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Among the operational and effectiveness indicators set for the appraisal, those directly related to the improvement of agricultural productivity and water management capacity in the Project area are (i) area benefited by the project, (ii) cultivated area by crop, (iii) water use charge collection rate, (iv) production output by major crops, (v) unit yield by major crops, and (vi) gross farm income per unit (Rs/year/unit). Since the Department of Agriculture oversees agriculture production and productivity of major crops, sufficient data for evaluation were not collected. Therefore, the data collected from 20 sites by site survey of the Evaluator were used¹⁵(Table 5). The item (6) which is related to impact has been discussed in section 3.3.2.

In addition to the questionnaire-based interviews with the implementing agencies in the command areas of the target subprojects, focus group discussions were also conducted with representatives of water users' groups and other users¹⁶ (including women's groups). The number of participants was 315 in AP and 526 in TS. The following topics were reviewed: farm management support to strengthen the capacity of water users, other activities implemented under the poverty alleviation program, collection of water user fees, crop diversification, introduction of new crops and technologies, and changes in yield and income.

The command area of the minor irrigation and medium irrigation subprojects varies in size. The average size of the command area is 300 ha and 6,700 ha respectively for minor and medium irrigation systems. More than half of the farmers own less than 0.8 ha of farmland, and many are small-scale farmers. The proportions of tenant farmers to the total command farmers was 12% of in the minor irrigation and 23% in the medium irrigation.

(1) Area benefited by the project

The planned benefiting project area was 105,522 ha through the formation of new minor irrigation and rehabilitation of medium irrigation systems. The total area benefited was 134,248 ha (with 16,073 ha from 48 new minor irrigation projects and 118,175 ha from 20 rehabilitated

¹⁴ Sub-rating for Effectiveness is to be put with consideration of Impacts.

¹⁵ A total of 20 subprojects, 7 from AP (1 minor irrigation and 6 medium-scale irrigation) and 13 from TS (9 minor irrigation and 4 medium-scale irrigation), were surveyed between June and September 2020. A balance was taken into consideration to avoid concentrating on subprojects in the same districts, but where the location was difficult to reach due to the COVID-19 pandemic, it was abandoned.

¹⁶ Some of the WUAs were already inactive, in which case the people involved were interviewed.

medium irrigation projects), which is about 127% of the planned area.

Table 5 Project indicators : area benefited by the project

	Area benefited by New Minor Irrigation and Renovated Medium Irrigation (ha)	Number of Subprojects	
		New Minor Irrigation	Renovated Medium Irrigation
Baseline (2005)	66,740		
Target (2 years after completion)	105,522	59	11
Actual (2020)	134,248	48	20
AP	49,412	1	9
TS	84,836	47	11

Source: Documents provided by JICA and the implementing agencies

(2) Cultivated Area by Crops

Since data from TS are limited, and crops in the benefiting areas changed after the irrigation in both states, it was impossible to compare them with the target values.

(3) Collection Rate of Water Charge

Water tax collection, at present, in the two states is widely varied. TS has changed its policy and discontinued water fee collection from the farmers finally in 2018. On the other hand, AP has continued with water tax collection¹⁷. According to the site survey, farmers were reluctant to pay water charges due to inadequate water supply. The implementing agency in AP reported that the average water user fee collection rate in the project area was about 20%, but in some areas were approximately 80% tax collection. Although the target water user fee collection rate was 70%, it was incomparable because TS does not currently collect the fee, and AP did not achieve the target.

(4) Production volume of major crops

As for the output of agricultural products, directly comparing it with the original targets due to the change in the scope of this project is impossible. There was, however, a remarkable increase in rice and cotton and confirmed crop diversification in the site survey. Accordingly, it was confirmed that once water for agriculture was secured through irrigation facilities, there was a shift to crops with higher commercial value. The main crops grown before the project were rice, cotton, soybeans, peanuts, sorghum, sesame, and bean. After the project, the crops may have been diversified since the number of farmers who cultivated vegetables, turmeric, fruits (mangoes), onions, and other commodity crops in addition to rice and cotton have increased.

¹⁷ Water tax was levied as Rs 200 per acre for medium irrigation, and Rs 100 per acre for minor irrigation by the AP Water Tax Act.

Table 6 Collection rate of water charge , cultivated area by crops, production volume of major crops, yield of major crops, gross annual average farm income in the project area

Indicators	Baseline(2005)		Target (Year 2015, 2 years after completion)		AP Actual Data		TS Actual Data	
	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation	Minor irrigation	Medium Irrigation
Collection Rate of Water Charge (%)		5	70	70	20% to 80% depending on the subproject sites		No fees are collected	
Cultivated Area by Crops (ha) (Data on TS are partial)								
Paddy	3,563	38,552	7,126	52,894	45	35,849	660	14,698
Cotton	4,455	392	8,910	756	No cultivation in project area	812	4,858	5,427
Groundnuts	1,781	392	3,561	1,134		3,282	876	0
Jowar	3,252	3,136	6,504	756		735	0	0
Maize	1,781	784	3,561	1,889		2,062	0	368
Chili	1,781	587	3,561	1,323		1,090	53	0
Other	2,985	5,472	5,970	12,272		65	848	2,301
Production volume of major crops (ton/year) (Data on TS are partial) *								
Paddy	5,345	57,828	22,091	163,972	260.1	207,058	3,812	84,893
Cotton	1,114	98	3,564	302	No cultivation in project area	1,796	10,745	12,004
Groundnuts	890	196	3,170	1,010		6,560	1,751	0
Jowar	1,626	1,568	6,700	779		832	0	0
Maize	1,781	784	11,186	5,932		14,599	0	2,605
Chili	1,781	587	11,395	4,234		2,238	109	0
Other (Ginger, Tomato, etc.) (Data on AP only)	315	3,920	3,774	56,670		270.4	3,528	9,573
Yield of major crops per unit area (ton/ha)(Actual values of TS are calculated from site survey outputs)*								
Paddy	1.50	1.50	3.10	3.10	5.78	5.78	6.04	5.9
Cotton	0.25	0.25	0.40	0.40	No cultivation in project area	2.19	3.19	4.54
Groundnuts	0.50	1.50	0.89	0.89		2.00	1.91	2.45
Jowar	0.50	0.50	1.03	1.03		1.13	2.37	4.63
Maize	1.00	1.00	3.14	3.14		7.08	4.36	5.99
Chili	1.00	1.00	3.20	3.20		2.10	-	2.45
Gross annual average farm income* (Rs/ year/ household)	12,692	12,692	22,000	22,300		23,678	92,733	34,310

Source: Documents provided by JICA and the implementing agencies

Note: As for the area planted by crop and the output by major crop (tons/year), the figures for TS are calculated based on 26 subprojects, reflecting only a part of 58 subprojects, and are not sufficient even as actual figures, so they are presented as reference figures. The yield of major crops per unit area and gross agricultural revenue per farmer was based on the data from the implementing agency in AP and calculated from the results of site surveys in TS.

(5) Yield of major crops per unit area (ton/ha)

There has been an increase in crop yields for all the crops in the site survey, though directly comparing it with the original targets is not possible due to the change in the scope of this project (Table 6). The increase in yields is twice the target and four times the baseline for paddy; 5 to 10 times the target for cotton; 1.5 to 2 times the target for maize. In particular, the increase in yield after the rehabilitation of medium irrigation is more pronounced than that of new minor irrigation.

The factors that led to the improved in crop yields include water availability, choice of seed varieties and better agronomic practices. The capacity building activities carried out during the project period have also played critical part in the yield increase. The content of the training (which were provided by NGOs) for the water users' association included agricultural technologies, such as the use of earthworms to convert organic waste into fertilizer, pest and soil management, and seedling management. In addition, demonstration farms were established to provide agricultural technology to farmers who have poorer skills to improve their livelihoods¹⁸. Demonstrations on SRI (The System of Rice Intensification)¹⁹, which is a water-saving rice cultivation method, have been confirmed. Although they have not been deployed on a large scale, they have contributed to an increase in the yield.



Pakala Medium Irrigation Facility: Reservoir, Renovated Water Sluice, and Buffalow tamed by the Beneficiary farmers.

3.3.1.2 Qualitative Effects (Other Effects)

(1) Livelihood Improvement Activities (During the Project Implementation)

While the rehabilitation of medium irrigation was mechanized in the project, the construction of new minor irrigation facility required a lot of manual labour.²⁰ In these areas, farmers learned how to maintain and operate the irrigation system by participating in the construction, which encouraged them to involve the O&M in the future²¹.

(2) Livelihood Improvement Activities after Completion of the Construction

Supported by the Department of Fisheries, Fisherman groups that have started inland water fisheries and aquaculture using reservoirs have been identified in 12 out of the 20 subprojects. Livestock farming has become visibly active with improved water and fodder availability around the reservoirs and irrigation canals²². It is estimated that the NGOs hired by the project or the Department of Agriculture have reduced the cost of farm management and contributed to improving the livelihood by implementing a variety of water-saving agricultural techniques,

¹⁸Interview from the Consultant in charge of demonstration farms.

¹⁹Confirmed at Wyra Medium Irrigation Subproject.

²⁰ For example, employment opportunities of approximately 70,000 person-day in Konadmpet (TS) and 180,000 person- day in Jaggaram (TS) were provided.

²¹ G Mekapadu Minor Irrigation subproject (AP), Kondampet Minor Irrigation subproject (TS)

²² Due to the increase in fodder plants and trees, Konadmpet minor irrigation subproject (TS) and Zandaguda minor irrigation subproject (TS) have also seen an increase in milk production, and in Asifnihar medium irrigation subproject(TS) , there was a case that a dairy farm has been started, and employs approximately 30 people.

organic fertilizer production, and reduction of chemical fertilizer and pesticide use in the field²³.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact expected from the project has been set as "improvement of livelihoods of beneficiary farmers" which contribute to increase in agricultural income and poverty alleviation. These aspects are confirmed quantitatively and qualitatively.

(1) Quantitative Impact

In the site survey referred to in Section 3.3.1.1, Quantitative Effectiveness (Operational and Effectiveness Indicators) is measured in terms of the gross average farm income (Rs/year/unit) which was estimated based on the crop yields and the number of farmers (Table 6). In comparing with the target for 2015, with achievement in 2020 (i.e., at the time of the ex-post evaluation), the inflation rate of 3 – 4.5% for the five-year period²⁴ was taken into account. The target was well achieved for minor irrigation subprojects, and significantly exceeded the target for medium irrigation subprojects.

Table 7 Overview of new economic opportunities for women after minor irrigation completed

Economic activities started after the project completion	Number of women participated	Number of days employed / year	Annual / increased (Rs)
Aquaculture, Fish Marketing	8	180	32,143
Vegetable vending	69	300	103,107
Milk Production	179	276	31,571
Wage employment	1,155	215	56,250
Retail shop	53	300	77,125

Source: Implementing Agency of TS

Note: Interviewing the implementing agencies and the women groups in the site survey confirmed the number of women participating in economic activities.

In AP, the implementing agency reported that the income of tenant farmers increased by 40% and that of farmers with their own land increased by 50% at the site survey. The increase in household income was also due to various factors other than the project (i.e., market conditions of agricultural products and changes in off-farm income). The project has sufficiently played an important role to the increased income, although this impact cannot be solely attributable to the project.

Interviews with women's groups confirmed that the completion of minor irrigation facilities in areas that were dependent on rain-fed agriculture had improved the livelihoods of women (Table 7).

²³ In Gajuladinne medium irrigation subproject (AP), NGOs trained the farmers on agricultural diversification and water management, and in Asifnagar medium irrigation subproject (TS), the respondents said that training by the Department of Agriculture has been conducted on a regular basis. In Bhairavanithipa medium irrigation subproject (AP), the Department of Agriculture and Department of Fisheries provide technical assistance as a livelihood improvement activity.

²⁴ IMF - World Economic Outlook Databases (October 2020)

(2) Qualitative Impact

The demand for daily agricultural labour has increased after the project so as employment opportunities with fishery, livestock, and retails. For instance, the average wage employment availability period in minor irrigation subproject areas in TS were less than half a year prior to the project, but it increased with the range being 20 days to 120 days per year based on the site survey. The figures varied from one subproject to other. Further, there was also increase in daily wage rates. The increase in daily wages is on an average Rs 70 for women and about Rs 130 per for men. Thus, the project has also contributed towards livelihoods enhancement of the poor and landless by increasing employment opportunities (Table 8). There were also cases where families who used to go other states for work stayed in the village for better wages and duration of employment.²⁵ Furthermore, the site survey demonstrated that seasonal migrant workers from other places in the same districts began to move in some subproject areas after the completion of irrigation facilities²⁶. In addition, there is a case of a flourishing dairy industry due to an increase in grass availability for livestock. Minor irrigation facilities created under the project have also contributed to groundwater recharge according to the site survey and implementing agencies. This has resulted in increase of ground water level in bore wells and reducing the problem of drinking water²⁷. It was reported that increased incomes have led to increased nutrition and education levels for children.

The percentages of Scheduled Castes (SC) and Scheduled Tribes (ST) to the total population in combined AP were 16.4% and 7%, respectively (Census 2011)²⁸. According to the site survey of 20 subprojects, the percentage of ST farmers in the project areas was more than half (51.7%), especially in the minor irrigation subprojects. In the medium irrigation subprojects, the share of other backward classes²⁹ was high as 50 percent³⁰. It has been observed in the site survey that the STs are making efforts to acquire more agricultural technologies and improve their livelihoods with the support of the Integrated Tribal Development Agency (ITDA)³¹.

Table 8 Changes in wage opportunities in the sample minor irrigation projects

Subproject	Wage employment availability period in the farm (days / year)	Wage rates (Rs / day)	
		Men	Women

²⁵ Based on the focus group discussion in the Tatiguda minor irrigation subproject.

²⁶ It was reported that in the Sathanla medium irrigation subproject (TS), there was an influx of laborers from other areas and land prices and wages increased significantly. The Asifnihar medium irrigation subproject (TS) has a labour inflow of thousands at harvest time.

²⁷ Chowpanguda minor irrigation subproject (TS), Gajuladinne medium irrigation subproject (AP)

²⁸ Census of India 2011, Office of the Registrar General & Census Commissioner, India

²⁹ Other Backward Class (OBC) is a collective term used by the Government of India to classify castes which are educationally or socially disadvantaged. It is one of several official classifications of the population of India, along with General Class, Scheduled Castes and Scheduled Tribes.

³⁰ The beneficiaries of minor irrigation subprojects Thatiguda and Chowpanguda are 100% ST, 63% ST and 27% SC in Kalegaon, 24% and 45% respectively in Kondampet. ST such as the Kolams and Gonds Lambada reside in this area.

³¹ Those receiving the support of ITDA were confirmed in Jaggaram, Chowpanguda, Kalegaon, Kondampet, Thatiguda of minor irrigation subprojects in TS.

	Pre-project	Post project	Pre-project	Post project	Pre-project	Post project
Dignoor	120	140	200	300	100	200
Jaggaram	180	300	300	500	250	350
Kalegaon	120	180	250	300	150	200
Kondampet	120	240	300	500	200	300
Sonakasa	180	250	250	350	150	200
Zandaguda	150	210	250	400	150	200
Tatiguda	100	180	200	300	150	200

Source: The Result of the Site Survey

		
Cotton Field of the Benefited Area of the Rallapadu medium irrigation subproject	Weir of the Kalegoan, minor irrigation subproject: operation and maintenance in good condition by removing weeds	Beneficiary of Women Groups (ST: Gonds) in the Kalegeon minor irrigation subproject:

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

Based on the JBIC Environmental Guidelines for ODA Loans (April 2002), this project was not applicable to susceptible sectors / characteristics and susceptible regions, thus, categorized as B. The preparation of an Environmental Impact Assessment (EIA) report for this project was not required under the Indian domestic law. However, when the land acquisition for minor irrigation facilities included forest areas, the Forest Department did not approve the land use change due to its high environmental impact. Consequently, the relevant subprojects were excluded from the project.

A monitoring report on the impact on biodiversity³² was compiled, in 2014, during the project period. However, the regular monitoring activities of the environment were not confirmed during the ex-post evaluation. As previously discussed, livestock farming has flourished in the project areas with enhanced water and fodder availability. While this is a positive impact from the project, environmental concerns were identified from over grazing of pastures near the reservoirs. The destruction of pastures near the reservoirs had caused soil erosion and silted up the irrigation systems that, in turn, affected the storage capacity of irrigation schemes. Provision of LPG by the government has generally reduced the consumption of fuelwood, but some farmers continued its usage. As a consequence, the

³² Biodiversity Assessment for Environmental Monitoring of Medium/Minor Irrigation Schemes in Andhra Pradesh 2014 Irrigation and CAD Department Government of Andhra Pradesh.

deterioration of catchment areas of the important river basins and irrigation projects were reported. Hence, the suggestion is to minimize negative environmental impacts by continuing to raise awareness of the importance of environmental considerations to farmers. At the same time, the report points out that the construction and rehabilitation of reservoirs has enriched biodiversity; and these reservoirs acted as support system for flora and fauna by providing food and water even during the dry season.

The project had hired the services of NGOs for capacity building and guidance to WUAs and the farmers. Support for NGOs has had a positive influence on pest and soil fertility management. The results of the site survey showed that using chemical fertilizers and pesticides in the project area tended to be lower when compared with their average use in the target districts (Table 9). Therefore, there are both positive and negative impacts on the natural environment.

Table 9 Average use of fertilizers and pesticides in the 20 subprojects and district average

State	Use of fertilizers (average. kgs/acre)			Use of pesticides (average. lit/acre)		
	Site survey area average	District average	Variation (%)	Site survey area average	District average	Variation (%)
TS	334.62	375.00	-12	2.34	6.48	-177
AP	235.71	435.71	-85	2.29	6.46	-183
Total	300 (average)	396.25	-32	2.32	6.48	-179

Source: Data obtained from the implementing organization, etc. during the site survey

(2) Resettlement and Land Acquisition

At the time of the appraisal, it was confirmed that the project would not result in resettlement, but would involve land acquisition of approximately 1,950 ha. The project had acquired 1,715 ha of land, between 2007 and 2014, for the formation of new minor irrigation systems. In some subprojects, the construction of canals could not be started due to land acquisition issues. As of 2014, only 13 subprojects for minor irrigation facilities could be fully completed. After the formation of the TS state in 2014, TS has issued the Government Order Ms. No. 123 for expeditious acquisition of lands from land owners for public purpose. The land acquisition has progressed to the point where 48 small-scale irrigation projects have been completed, except some partially unfinished works. Even at the time of ex-post evaluation, land acquisition issues were identified in two out of the ten minor irrigation subprojects surveyed. The implementing agencies were involved in resolving the situation in such subprojects³³.

In addition to agriculture, inland water aquaculture and livestock farming were observed

³³ The site survey confirmed there was no compensation for the flooded trees in the Nagulapally subproject. The landowners did not agree on the price of compensation due to the difference between the time of project formation and the time of construction start, and land acquisition for canal construction was not proceeding in the Tatiguda subproject.

to have flourished in the beneficiary areas, increasing employment opportunities even for those who do not have agricultural land and increasing incomes in the target areas. In particular, newly formed minor irrigation facilities are areas that depend on rain-fed agriculture, where many of the SC of Telangana reside, and the impact of the project on improving their livelihoods has been significant. The project has mostly achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

(1) Project Implementation Framework by Implementing Agency

In this project implementation units were formed under the implementing agencies and consultants were hired. NGOs services were taken for providing lateral support such as organizational formation and capacity building training for WUA. The committees were also established at the District and State levels to oversee the project implementation.

The division office is responsible for operation and implementation management, and the sub-division offices under that provide supervision and technical support for O&M activities. Monitoring of facilities such as sluices and canals is carried out by Work Inspector and Care Takers (Lascars) who are responsible for day-to-day maintenance and management and for responding to problems as they arise. In the event that a problem arises at a level that is difficult to deal with in the field, a system is in place to seek guidance from the sub-division office.

There is a large gap between the number of existing staff and sanctioned strength. This more so in the case of personnel below the technician level (Table 10). This situation, however, has continued for the past 20 years. The existing staff members, nonetheless, have been performing the necessary tasks for O&M, and personnel were taken, as needed, on contact basis. No major problems have occurred in the irrigation system to date.

Table 10 Staffing for O&M of the six medium irrigation sub projects(Unit: person)

Category	Position (Duty location)	AP		TS	
		Sanctioned	Existing	Sanctioned	Existing
Executing Agency	Chief Engineer: Responsible for the O&M of the project and budget arrangements with the State Government (Division Office)	3	3	3	3
	Superintendent Engineer: O&M of the project facilities (Division Office)	3	3	3	3
	Executive Engineer: (EE) Guides and manages the O&M of the project facilities (such as water supply), water management, the preparation of the O&M plan and cost estimates (Division Office)	3	3	3	3
	Deputy EE: Actual execution of the O&M of the project facilities (such as water supply, gate operation etc.) (Sub-Division Office)	3	3	3	3
	Assistant EE: (Sub-Division Office)	6	6	7	5

Category	Position (Duty location)	AP		TS	
		Sanctioned	Existing	Sanctioned	Existing
	Technician	8	0	4	0
	Skilled worker	8	0	2	0
	Gate operator	21	0	4	0
Facility	Work Inspector: Canal maintenance and Water regulation	7	0	7	2
	Care Taker (Lascar): Same as above, Including Drivers	33	1	40	16
Overall		86	10	70	30

Source: Survey responses from executing agency

(2) O&M by Farmers' Organizations

At the time of appraisal of the project, the O&M of the minor and medium irrigation facilities were to be done by the WUA. The Andhra Pradesh Farmer Management of Irrigation Systems (APFMIS) Act, enacted in 1997, provides for the establishment of WUA in the irrigation sector. Last elections to WUAs were held in the year 2008, and the term of WUAs elected in 2008 had expired in 2013. The TS had not held election to WUAs since then, and setting up WUA is not mandatory. In AP, however, elections for WUAs were held in 2015, farmers engage in O&M. Since this term was also ended in June 2020, no election was planned so far, transitional arrangements were made to handing over functions of WUA to concerned irrigation officials. Had WUAs existed, they would have implemented water allocation and maintenance, jointly along with the department, to maximize agricultural production. In some cases, farmers, beneficiaries of the project have been implemented O&M³⁴. The irrigation facilities constructed with the participation of the farmers were found to be in good condition even after the project period³⁵. However, the areas with the newly introduced irrigation inhabited by SC are often remote, limiting the support from implementing agencies and the Department of Agriculture. Continuous support is considered important for further effective use and maintenance of water resources in the future.

Although WUA was confirmed to implement O&M and WUAs were not functioning well at the time of appraisal, the field offices of implementing agencies are supplementing the functions, roles, and responsibilities of WUAs for O&M. Farmers groups were observed collaborating with the department officials in some cases, while technical assistance for water management in the SC living areas is limited. Therefore, there are some minor issues in the institutional aspect of the O&M.

³⁴ The Site Survey confirmed such cases in Asfinaahar medium irrigation subproject (TS), Rallapadu medium irrigation subproject, Sagileru medium irrigation subproject (AP).

³⁵ The beneficiary farmers formed a committee without the support of the implementing agency to remove silt from the waterways from the intake at the Kondampet minor irrigation subproject (TS).

3.4.2 Technical Aspects of Operation and Maintenance

The implementing agencies have the necessary framework for capacity building. The Capacity Building Unit of I&CAD, overseen by a training coordinator, had carried out the capacity building of I&CAD staff at various levels and WUAs in technical and management areas. The Water and Land Management Training and Research Institute (WALAMTARI) has been providing training to the implementing agency staff of quality management, soil management, water management, watershed management, and irrigation project operation and maintenance. The training programmes continue as of now (Table 11). In addition, the implementing agencies have participated in training programs in other states and in Japan.

Table 11 Trainings conducted for implementing agencies under the project

Training course title /subject	Qualification of trainees	Total no. of trainees
Basic computer skills, scrutiny of Estimates, familiarity with new state scheduled rate tendering, etc.	Technical officers	645
Training on office correspondence Establishment matters, Budget matters, Scrutiny of bills MS Office, Right to Information Act.	Ministerial staff	2,310
Contract and Quality Management in irrigation projects, Disputes and claims, causes and remedies, Arbitration and quality control, quality assurance – third party quality control.	Executive Engineers	163
Hydrology and Irrigation – APFMIS Act, Assessment of Flood control and management options, Flood forecasting, Reservoir Operation and maintenance, dam safety, hydrologic review, structural stability, crop water requirement, evaporate transpiration, crop yields, Preparation of DPR for minor irrigation projects, Bench marking in irrigation & Drainage sector, Soils for embankment, Quality control in construction.	Deputy Executive Engineers	482
	Asst Executive engineers and Assistant Engineers	1,329

Source: Implementing Agencies.

In addition to the implementing agencies, WALAMTARI, NGOs³⁶, the Department of Agriculture, and the Department of Fisheries have played a role in providing guidance and imparting skills in their respective areas—"management of irrigation facilities, capacity building of WUAs, agricultural technology, and inland fisheries." On the other hand, as mentioned earlier, farmers in the minor irrigation subprojects in remote areas have been requesting for continuous training, given the limited support from the implementing agencies.

Overall, it can be concluded that no problems have arisen that would compromise the sustainability and the operation and maintenance aspects, but there seems to be some issues in terms of the need for technical assistance to farmers in remote areas.

³⁶ The NGOs that participated in the project were Aranya (TS), Jana Chaitanya Rural Development, Society for Education and Economic Development, Pratibha Education Society, APARD: Awaking People's Action for Rural Development (AP).

3.4.3 Financial Aspects of Operation and Maintenance

Collection of water user fees, as mentioned earlier, was not implemented in TS and was not collected at a level sufficient to cover maintenance costs in AP. Some areas were exempted in times of drought. Respective irrigation facilities calculate their annual maintenance cost and request it to the state government, which is then incorporated into the budget. It is estimated that a medium irrigation subproject requires about 1 million Rs (about 1.4 million yen) per facility for maintenance every year, while a minor irrigation subproject requires about 150,000 to 500,000 Rs (about 200,000 to 700,000 yen)³⁷. Under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS³⁸), wages are paid for labour on the maintenance of irrigation facilities as well as construction of roads and public facilities. O&M also utilizes this scheme budget.³⁹

Table 12 Trends in O&M budgets and expenditures for entire states of respective implementing agencies

Unit: Million Rs

Year	2015-16		2016-17		2017-18		2018-19		2019-20	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
AP	550.0	452.9	550.0	323.7	452.8	331.2	400.0	306.7	341.7	325.9
TS	1,085	587.7	949.9	317.3	3,551	216.5	2,668	319.5	2,624	125.2

Source: Survey responses from the executing agency

There is also an example in AP where a maintenance budget has been set aside for the period 2015–2018 under the mission of "Water Management and Sustainable Development (Neeru- Chettu) "⁴⁰. Similarly, O&M was carried out in TS through the Mission Kakatiya funds under the Flood Damage Repairs, and lease amount from fishery activity. As shown in Table 12, both AP and TS have been able to secure maintenance budgets, but their expenditures are limited.

Although a certain number of O&M budgets were allocated in the two states, it can be observed that the substantial time is required from allocation to execution. Consequently, maintenance works were carried out by using other funds, such as MGNREGS. The collection of water user's fee, which was regarded as an important source, has been discontinued after year 2013 in TS, and the collection situation in AP has not improved in recent years. According to

³⁷ Based on interviews with implementing agencies having jurisdiction over the subprojects in the site survey. For example, a minor irrigation subproject in Jaggaram in Kothaguedm District (TS), with a beneficiary area of 211 ha, requires Rs 150,000 per year (approx. 210,000 yen).

³⁸ A program to guarantee employment in simple labour to the rural poor launched in February 2016. Wages will be provided for labour in the construction of rural roads, public facilities, and maintenance of minor irrigation projects. Wage labour are provided to agricultural workers who will have no income to absorb the rural surplus labor that occurs during the off-season.

³⁹ Interview with the implementing agency officer of Kondampet minor irrigation subproject (TS).

⁴⁰ Interview with the implementing agency officer of Bhairavanithippa medium scale irrigation (AP). No maintenance cost allocation for the last four years in the state budget and maintenance was done in the budget of Neeru-Cheetu

the implementing agencies, the current situation of subprojects does not necessitate considerable maintenance costs, hence, no major issues were identified at the time of the ex-post evaluation. But the future outlook is uncertain. Regarding the finances of O&M, it is necessary to consider securing sustainable maintenance costs and prompt disbursement, including reframing the system of water user fee collection.

3.4.4 Status of Operation and Maintenance

Various inspections and repairs of irrigation facilities were carried out by the implementing agencies as shown in Table 13. At the same time, some of the minor irrigation facilities do not receive sufficient support from the implementing agencies. Therefore, the farmers themselves carry out simple maintenance work. Among the 20 subprojects covered by the site survey, no major problems (i.e., failure of irrigation facility, poor construction, or other problems) were observed. The condition of the facilities created under the project was found to be good at the time of ex-post evaluation. The defect liability period has completed, but no major complaints were reported. Some irrigation canals remain partially constructed, and minor failures of canals were observed in minor irrigation facilities⁴¹. In the medium irrigation subprojects, there were cases of minor deficiencies in the drainage ditches⁴², insufficient weed removal in the canals⁴³, and illegal water intake by motor engines⁴⁴; but no malfunctions were observed. With the renovation of new and existing channels, seepage losses were reduced, the time for water to reach the end of the canal was greatly reduced, and access to water quantity was achieved to 80 – 90% of the planned level. Regarding the status of O&M, some of the subprojects have reported issues pertaining to irrigation facilities, inspection and repairs, and operation; but in general, no significant problems were observed.

Table 13 O&M activities of the project irrigation system

Frequency	Medium	Minor
Daily inspection	<ul style="list-style-type: none"> • De-silting • Weed removal • Embankment repairs • Revetment • Repairs to shutters • Repairs to masonry and lining • Cleaning and oiling of screw gearing shutters • Painting of hoists and gates etc. • Emergent breach closing works • Maintenance of inspection paths 	<ul style="list-style-type: none"> • De-silting • Weed removal • Revetment • Repairs to shutters
Periodic inspection	<ul style="list-style-type: none"> • Reconstruction of sluices • Reconstruction/repairs to drops and regulators • Reconstruction of measuring devices • Rehabilitation of the system 	<ul style="list-style-type: none"> • Reconstruction of sluices • Reconstruction of measuring devices • Canals

⁴¹ Nagulapally minor subproject (Vikarabad District, TS)

⁴² Gandipalem medium subproject (Nellore District, AP)

⁴³ Asifnagar medium subproject (Nalgonda District, TS)

⁴⁴ Pakhalmedium subproject (Warangal District, TS), Zandaguda minor subproject (Adilabad District, TS)

Frequency	Medium	Minor
Large scale works	<ul style="list-style-type: none"> • Modernization of the system • Other construction work in the irrigation system 	<ul style="list-style-type: none"> • Rehabilitation of the tank • Other construction works
System diagnosis	<ul style="list-style-type: none"> • Check condition of dam and reservoir • Mechanical / electrical system • Spillway, drains & outlet works • Inspection of each and every hydraulic structure and recording of its status before dry and wet seasons and identification of all critical reaches 	Diagnosis for Sluice, Surplus weir, Bunds, and Canals

Source: Documents from the Implementing Agency

In summary, some minor problems have been reported in the institutional / organizational aspect as well as the financial aspect. However, no significant issues were confirmed in the technical aspect and in the current condition of subprojects. Sustainability of the project effects, thus, is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project is to raise agricultural productivity and water management capacities through the construction of minor irrigation facilities, rehabilitation of medium irrigation facilities capacity building of operation and maintenance setup, and spread of farming technologies, in the states of AP and TS in southern India, thereby contributing to the increase of farm income and the alleviation of poverty. Due to the improved water efficiency by transforming the rain-fed area to irrigated and renovating the existing facilities resources, the project relevance is high as project implementation was well in line with India's development policy and development needs, as well as with the ODA policy of Japan. The project cost was within the plan, but the project period was significantly longer than planned. Setting up the implementing framework after the bifurcation of AP state in 2014 took a while and longer in the land acquisition. The efficiency of the project is fair as the project period was significantly longer than planned. The targets in regard to irrigated area as well as crop yields had been achieved. On the other hand, the confirmed increase of household income was due to the fishery and livestock activities in the target areas, besides agriculture. The livelihood of target area of minor irrigation in TS where tribal communities and other disadvantaged communities reside were originally depend on rain-fed agriculture, in particular has considerably improved. Therefore, the effectiveness and impacts of the project are high since the planned effectiveness was achieved through project implementation. Regarding project sustainability, the technical aspect, and current status have no significant issues. However, there are issues with institutional / organizational aspect as well as finance since the need to support for beneficiary farmers as well as to secure and promptly disburse sustainable maintenance costs are confirmed. The sustainability of the project effects is, therefore, fair. All things considered; the evaluation of this project is satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Enhancing the O&M Framework and Budget Optimisation

WUA has completely handed over the O&M system to the Implementing Agency in TS. The situation in AP, on the other hand, is the implementation of WUA elections after the bifurcation of the state and continuous effort to maintain WUA. The site survey also revealed the shortage of O&M personnel at the ground level in both states, noting the non-availability of an adequate number of support staff, such as lascars and work inspectors, has remained unaddressed for decades. Meanwhile, the sanctioned number of management level engineers were sufficiently filled. As of now, no major issues confirmed. With the WUAs barely functioning in TS, the future remains uncertain in case no system is in place for farmers, who are the beneficiaries, to do their own silt and weed removal. Implementing agencies in both states are recommended to deploy the required personnel and continue building cooperation with farmers on O&M management.

(2) Strengthening the Information Sharing System

The external evaluator faced difficulties obtaining information on the cultivated area, the yield of major crops, and the status of O&M of the respective subprojects. While there is a policy to establish the Management Information System, it has not reached the level of utilization to maximize the outputs of irrigation facilities. It is required to study and build methods to proactively collect, analyse, and share basic data for understanding the current status of water resources and their effective use of water resources and crops in collaboration with the Department of Agriculture, including the introduction of automatic management and control systems for agricultural water, and to conduct training to materialise these approaches.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Importance of preparatory activities for land acquisition for new irrigation facilities

Regarding the minor irrigation subprojects, some farmers may not agree to release land for new facilities even after explaining the benefits of livelihood improvement by shifting from rain-fed to irrigated agriculture. Also, obtaining approval from the Forest Department is difficult in case the subproject acquired the forest area for the formation of new tank. Therefore, a sufficient preparation period for discussions with the local residents from the time of project formation may have prevented significant delays in the Project. This demonstrated the importance of preparatory activities prior to the start of the Project.

Continuously required capacity building for beneficiary farmers

The beneficiary farmers requested continued support from the department to operate and maintain the irrigation facilities and the surrounding forest, including the environmental management and prevention of illegal water intakes, etc. On the other hand, farmers in some areas do not fully understand that they need to manage their irrigation facilities, such as the regular silt and weed removal in canals and maintenance of field channels. The site survey confirmed that the farmers involved in the construction of new irrigation facilities are also willing to involve themselves in maintenance activities. The series of training from the project or other government line departments had helped farmers in the efficient use of water and learn of agricultural technologies. Although the implementing agencies, cannot continue disseminating the agricultural technologies with it being outside the scope of work, strengthening the capacity of the beneficiary farmers was the prerequisite to maintain and efficiently use the irrigation facilities. Collaborating with the Department of Agriculture can address this. Additionally, the department shall continue focusing on the technical training and closely monitoring the activities.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	<p>1) Construction of 59 Minor Irrigation Facilities Rehabilitation of 11 Medium Irrigation Facilities</p> <p>2) Establishment and Strengthening of the WUA including agricultural extension service and support for the poorer.</p> <p>3) Support for the sector reform (Strengthening of WUA and the Irrigation Department)</p>	<p>1) Construction of 48 Minor Irrigation Facilities Rehabilitation of 20 Medium Irrigation Facilities</p> <p>2), 3) Same as planned</p>
Consulting service	<ul style="list-style-type: none"> • International: 110M/M • National: 438M/M 	<ul style="list-style-type: none"> • International: 81.5 M/M • National: 659 M/M
2. Project Period	March 2007 – March 2013 (73 months)	March 2007– July 2017 (125 months)
3. Project Cost		
Amount Paid in Foreign Currency	1,737 million yen	1,312 million yen
Amount Paid in Local Currency	26,935 million yen	17,108 million yen
Total	28,672 million yen	18,422 million yen
ODA Loan Portion	23,974 million yen	15,129 million yen
Exchange Rate	1 Rs = 2.52yen (As of Month year)	1 Rs = 1.67 yen (2020)
4. Final Disbursement	July 2017	

Appendix Table 1 Summary of the subprojects done by the site survey

Particulars	Minor	Medium	Particulars	Minor	Medium
Subprojects covered*	10	10	Actual storage / Planned Storage (%)	97.8	78.5
	TS:9, AP:1	TS:4, AP:6			
The project number by size of command area (Minor)			Beneficiaries(Those who own farm land)	2,296	88,560
< 200 ha	5	-	Social Profile	(%)	(%)
201 – 500 ha	2	-	Scheduled Caste (SC)	9.5	12.8
501 – 1000 ha	3	-	Scheduled Tribe (ST)	51.7	7.2
The project number by size of command area (Medium)			Other Backward Caste (OBC)	16.4	49.1
< 5000 ha	-	2	Open Category	19.0	25.5
5001 – 10000 ha	-	8	Minority (Christian, Muslim)	3.5	5.4
Average command area (ha)	314	6,726	% of women farmers to total farmers	27.5	23.2
Minimum(ha)	73	4,128	% of tenant farmers to total farmers	12.1	23.1
Maximum(ha)	809	9,863	Area of owned land	(%)	(%)
Total command area(ha)	3,108	66,480	Less than 0.4 ha	22	37
Average Project Cost (Million Rs)	93	371	0.4 –0.8 ha	36	33
Minimum	23.3	144	0.8 – 2 ha	27	19
Maximum	275.8	701	Over 2 ha	14	10

Source: Evaluator

Note: Though the survey targets were selected so that at least one target subproject would be selected in an District where the subprojects are located, the subprojects in Vizayanagram district in AP and Karimnagar district in TS were not included in the site survey.

Appendix Table 2 Participants profile of the site survey

Target Group	TS			AP		
	No. of sites	Total no. of Participants	Ave. no. of participants per site	No. of sites	Total no. of Participants	Ave. no. of participants per site
Farmers with command area	21	208	10	19	157	8
Meeting with Fishermen	12	81	7	4	18	5
Interaction with WUAs	8	35	4	16	36	2
Interaction with women Groups	19	99	5	17	52	3
Interaction with wage earners.	20	103	5	17	52	3

Source: Evaluator

Note: Regarding the survey for the medium irrigation subprojects, one or two water users' associations near the water intake and downstream were surveyed.