Republic of Iraq

FY2021 Ex-Post Evaluation Report of Japanese ODA Loan
"Irrigation Sector Loan"
External Evaluator: Masami Tomita, i2i Communication, Ltd.

0. Summary

This project aimed to revitalize existing irrigation drainage canals and irrigated farmland by providing equipment and machinery used for irrigation and drainage throughout Iraq. The relevance and coherence of the project are high, as the project plan is consistent with the development plans and needs of Iraq and Japan's ODA policy, and as collaboration was achieved with a technical cooperation project of the Japan International Cooperation Agency (JICA). However, the area benefited from the project has not increased since the time of the project appraisal, and the total annual volume of water pumped of the drainage pumps installed in the project is significantly below the target volume. Although the improvement in the maintenance status of existing irrigation drainage canals and water conveyance efficiency was qualitatively confirmed, the achievement of the production target by major crops varied widely by region and crop, and the effect of the project on the revitalization of irrigated farmland appears to be limited. Regarding the expected impact of the project, i.e., contribution to Iraq's economic and social recovery through the revival of its irrigated agriculture, although it is presumed that the project has contributed to a certain extent, the degree of contribution could not be clearly confirmed. Therefore, the effectiveness and impacts of the project are moderately low. The efficiency of the project is moderately low because the project period significantly exceeded the plan. Sustainability of the project effects is moderately low because there are some problems with institutional/organizational aspects of operation and maintenance (O&M) and the maintenance status and for low prospects for improvement and resolution.

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

1. Project Description

Project Locations (source: 3kaku-K)

East Gharraf Drainage Pump Station
(source: Ex-Post Evaluation Team[1])

[1] The photo was taken by DIJLAH Company for Engineering Consultancies Ltd. (local consultant).

1.1 Background

Annual rainfall in Iraq is low, about 600 mm in the north and about 200 mm in the rest of the country, and irrigated agriculture is indispensable in many regions. However, at the time of the project appraisal (2006), only 35% (1.93 million ha) of the irrigable land (5.5 million ha) in Iraq was being irrigated. In addition, due to many years of conflicts and economic sanctions, adequate maintenance had not been conducted, leaving irrigation and drainage pumps in disrepair, and coupled with a lack of materials and equipment, irrigation drainage canals had not been thoroughly maintained. As a result, the country's irrigation capability was significantly declining, and there was a fear that if nothing was done to alleviate this situation, the irrigated area of the land used for farming would further decrease. Meanwhile, in Iraq, the United Nation's Oil For Food Program (hereinafter referred to as "OFFP")[2] ended in 2003, and the need to improve food self-sufficiency through agricultural revitalization became increasingly important. Thus, it was necessary to revitalize the existing irrigation drainage canals and irrigated farmland by procuring irrigation and drainage pumps, and equipment and machinery used for maintenance and dredging of irrigation drainage canals. This project was implemented under these circumstances as one of the first Japanese ODA loan projects in Iraq when the international community's assistance to the country was shifting from emergency and recovery assistance to development assistance.

1.2 Project Outline

The objective of this project is to revitalize the existing irrigation drainage canals and irrigated farmland by providing equipment and machinery necessary for irrigation and drainage throughout Iraq, thereby contributing to Iraq's economic and social recovery through the revival of its irrigated agriculture.

Loan Approved Amount/ Disbursed Amount	9,514 million yen / 9,376 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	January 2007 / January 2008	
Terms and Conditions	Interest Rate	0.75%
	Repayment Period (Grace Period	40 years 10 years)
	Conditions for Procurement	General Untied

[2] The OFFP was implemented from 1996 to 2003 based on the UN Security Council Resolution 986 of April 1995, which, in view of the plight of the Iraqi people, allowed Iraq to export oil on a limited basis to enable it to purchase humanitarian supplies such as food and medicine. (Source: website of the Ministry of Foreign Affairs, URL: https://www.mofa.go.jp/mofaj/press/danwa/17/dga_0908.html (accessed on September 5, 2022))

Borrower / Executing Agency	The Government of the Republic of Iraq / Ministry of Water Resources (MOWR)
Project Completion	December 2017
Target Area	Throughout Iraq
Main Contractors (Over 1 billion yen)	Sumitomo Corporation (Japan), Toyota Tsusho Corporation (Japan), Coelmo Società a responsabilità limitata (Italy), Al Mabrook Construction Contracting Co. Ltd. (Iraq) / JSM Ltd. (Japan) / Kubota Corporation (Japan) (JV)
Main Consultants (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan) / Dar AI-Handasah Consultants (Lebanon) (JV)
Related Studies (Feasibility Studies, etc.)	・ Special Assistance for Project Formation (SAPROF) for Irrigation Sector Loan Project ・ Special Assistance for Project Implementation (SAPI) for "Irrigation Sector Loan" The Republic of Iraq
Related Projects	[Technical Cooperation] ・ Third Country Training Program "Water Management in Irrigated Farms" (2006-2008) ・ "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water" (2012-2015) [ODA Loan] ・ "Irrigation Sector Loan" (Phase 2) (May 2018)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masami Tomita, i2i Communication, Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: January 2022 – January 2023

Duration of the Field Study: March 27, 2022 – March 31, 2022, August 22, 2022 – August 25, 2022 (Meetings with the local consultant in the third country (Jordan)) (The field study

conducted by the local consultant: May to June, 2022)[3]

2.3 Constraints during the Evaluation Study

In this ex-post evaluation, the local consultant conducted the field survey under the direction of the evaluator because the evaluator was unable to conduct the survey in Iraq due to security reasons. While pump stations targeted by the project are located in Wasit and Thi Qar governorates, the local consultant conducted the survey only in Thi Qar governorate due to security reasons. For Wasit governorate, officers in charge at the Kut regional office of MOWR were invited to Baghdad for an interview. Due to the lack of field visits by the evaluator, it was not possible to obtain sufficient information, especially on the effectiveness of the project (irrigated areas benefited from the project, cultivated areas, production volume and unit yield of major crops, specific improvement status of soil salinity in the benefited areas, etc.) and the impact (average farm income per household). For data for which information was lacking, measures were taken to the extent possible, such as qualitative confirmation through interviews with the executing agency and supplementing information through the use of publicly available statistical data, etc. For data for which accuracy was deemed insufficient, trends were extrapolated from figures that were (or considered to be) accurate.

The equipment and machinery for the maintenance of irrigation drainage canals procured under the project (18 types in total) were distributed to 15 governorates. However, taking into account the security issues in Iraq, it was rather challenging to examine the effect of using procured equipment in all 15 governorates. Therefore, interviews with the MOWR headquarters and the officials in charge of regional offices of Wasit and Thi Qar governorates were used to verify, to the extent possible, the status of equipment utilization and the extent to which maintenance status of irrigation drainage canals has been improved through the use of equipment procured under the project.

3. Results of the Evaluation (Overall Rating: C[4])

3.1 Relevance/Coherence (Rating: ③[5])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Iraq

At the time of the project appraisal, the *National Development Strategy (2005-2007)* pointed out the importance of agriculture in the Iraqi economy and the need for irrigation development. The Strategy focused on rehabilitation of irrigation infrastructure, including desalination of saline soils of farmland, improvement of agricultural production technology, and agricultural research.

[3] Some of the interviews with the executing agency were conducted online by the ex-post evaluator.
[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[5] ④: Very High, ③: High, ②: Moderately Low, ①: Low

In addition, in the development plan of MOWR (2004-2008), the Ministry regarded rehabilitation of existing irrigation and drainage facilities, procurement of equipment and machinery necessary for maintenance of irrigation canals, etc., replacement of deteriorated pumps, and capacity development in O&M at MOWR as highly important projects, and identified a total of 262 subprojects for implementation including the above-mentioned projects, from which high-priority subprojects were identified as potential targets of this project.[6]

At the time of the ex-post evaluation, in the *National Development Plan (2018-2022)*, the importance of agriculture in the Iraqi economy remained high, and the goals for the agricultural sector during the period of the Plan included (1) increasing the share of the agricultural sector in the gross domestic product (non-oil economy) to 5.2% by 2022 (from 4.5% in 2015), (2) increasing food self-sufficiency, and (3) securing sustainable amount of water for agricultural, industrial, and domestic use and improving the water balance by reducing annual water demand by 500 million cubic meters. In addition, the *Strategy for Water and Land Resources in Iraq (2015-2035)* (hereinafter referred to as "*SWLRI*"), developed mainly by MOWR, predicts that water inflows into Iraqi rivers in 2035 will decrease by about 30% compared to 2015 due to the development of water resources in upstream countries such as Turkey and Syria. Thus, as a strategy to reduce agricultural water consumption while ensuring water and food security, the Strategy proposes to improve irrigation efficiency for effective water use, increase cropping intensity, complete irrigation of a total of 3.23 million ha of farmland, and increase the area under cultivation. To achieve this strategy, a total of 142 irrigation projects have been selected, including the rehabilitation of existing dams, weirs, regulating reservoirs, pump stations, and canals, and the development of agricultural drainage networks, and the priority areas include Wasit and Thi Qar governorates covered by the project.[7]

Therefore, the project is highly consistent with the development plans of Iraq both at the times of the project appraisal and the ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of Iraq

At the time of the project appraisal, as mentioned above, the breakdown of irrigation and drainage pumps and the lack of maintenance of irrigation drainage canals had worsened due to long years of conflict and economic sanctions, and irrigation capability had deteriorated

[6] Subsequently, SAPROF was conducted, and based on its results and discussions with the Iraqi side, it was decided to select about eight pump stations, about 30 items of equipment and machinery for the maintenance of irrigation drainage canals, and about 60 generators from among the priority subprojects identified. From the viewpoint of the urgency of the support, etc., the loan agreement was signed under the condition that MOWR would prepare the Implementation Plan (IP) for the selection of specific prospective subproject sites and contents after the start of the project and submit it to JICA, and JICA's consent must be obtained. After the project started, the baseline survey (procurement support study) was conducted (June-December 2008) and a draft IP was prepared, which was reviewed and revised by MOWR and submitted to JICA as the official IP in March 2009, which was concurred by JICA.

[7] Source: *SWLRI* (2015-2035) pp. 48-50, *Data collection survey on water resource management and agriculture irrigation in the republic of Iraq - Final Report (2016)* pp.37, 125-127

significantly; thus there was a high need for the provision of irrigation and drainage equipment and machinery.

Moreover, as shown in Table 1, irrigation and drainage pump stations and canals have been steadily developed since the time of the appraisal, indicating the importance of the development of irrigation and drainage facilities in Iraq at the time of the ex-post evaluation.

Table 1: Development of Irrigation and Drainage Facilities in Iraq at the Time of Appraisal and Ex-post Evaluation

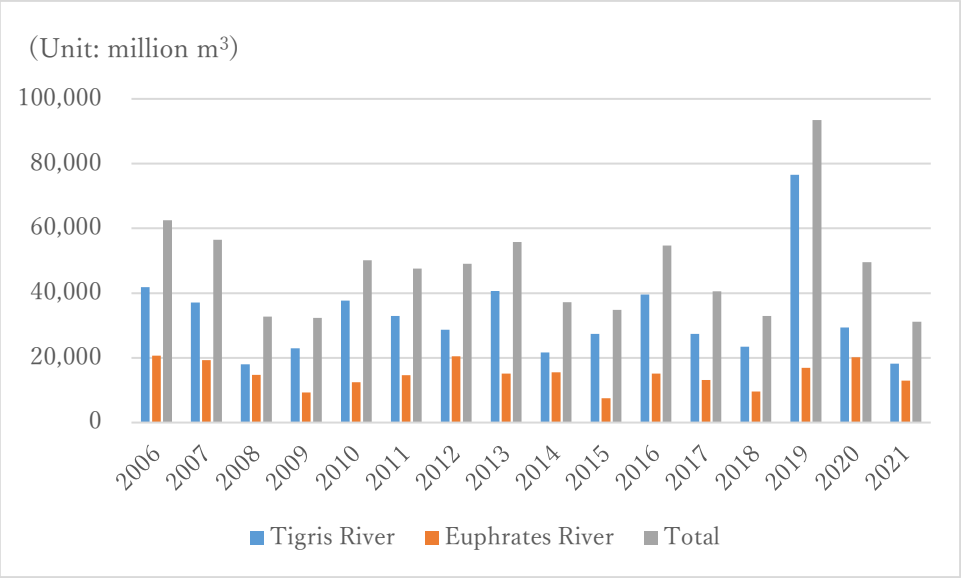
	Appraisal (2006)	Ex-post Evaluation (2022)
Number of Irrigation Pump Stations	90	172
Number of Drainage Pump Stations	84	90
Length of Irrigation Canals	46,600 km	53,000 km
Length of Drainage Canals	85,000 km	97,000 km

Source: documents provided by JICA and MOWR

In addition, as shown in Figure 1, although the flows of the Tigris and Euphrates rivers fluctuate considerably from year to year depending on the climate conditions and rainfall, river inflows into Iraq have been decreasing year by year due to the development of water resources in the upstream countries that started in the 1970s, and except for 2019 when rainfall was particularly high, flows that were already declining at the time of the appraisal have further declined in recent years,[8] and this has also reduced the amount of water available for agricultural use in Iraq. Therefore, a more efficient use of water resources is required at the time of the ex-post evaluation. Furthermore, in Iraq (especially in the central and southern regions), the salinity of irrigation water has been increasing due to the decrease in river flow,[9] and there is a high need for improving irrigation and drainage facilities.

[8] The median total flow for the period 2006-2013 (eight-year total) is 49,615 million m^3 while the median total flow for the period 2014-2021 (eight-year total) is 38,865 million m^3.

[9] According to the *National Development Plan (2018-2022)*, the salinity of the Tigris River is projected to increase from 320 ppm (at the time of preparing the plan) to 500 ppm (2035) and the salinity of the Euphrates River from 540 ppm (at the time of preparing the plan) to 930 ppm (2035).



Source: data provided by MOWR

Figure 1: Flow of the Tigris and Euphrates Rivers in Iraq

Regarding the considerations for and fairness to marginalized people, there is no mention of these aspects in the appraisal documents. According to MOWR and the consultants who were involved in the project, while there were no discussions with JICA regarding the fairness to the poor and other groups at the time of the appraisal or during the implementation of the project, there were no situations where certain beneficiaries were excluded from water rights as a result of the implementation of the project, and the project did not disadvantage marginalized people including the poor.

Therefore, the project is highly consistent with the development needs of Iraq both at the times of the project appraisal and the ex-post evaluation.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

In the International Conference on Reconstruction in Iraq held in Madrid in October 2003, the Japanese government announced that it would provide a total of 3.5 billion dollars in ODA loans to support medium-term reconstruction beginning in 2005, in addition to grand aid amounting to 1.5 billion dollars to meet urgent reconstruction needs in Iraq. Moreover, in the Medium-Term Strategy for Overseas Economic Cooperation Operations of JICA (formerly Japan Bank for International Cooperation (JBIC)) (April 2005), support for global issues and peacebuilding was one of the priority areas, and support for the reconstruction of Iraq's economic infrastructure was consistent with this policy, as its society was still in a state of instability after the conflict.

3.1.2.2 Internal Coherence

At the time of the project appraisal, since the project was expected to consider collaboration with JICA through the Third Country Training programs, etc., the project was expected to generate synergistic effects between it and such training programs.

JICA conducted the Third Country Training Program "Water Management in Irrigated Farms" (2006-2008) (commonly known as "Karbala Project") in Jordan for Iraq, and implemented the "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water" (2012-2015) to spread the results of the training program throughout the country. The project aimed to improve the capacity of agriculture-related organizations to properly guide irrigation water management by water users' associations (WUAs) at pilot sites in a total of 15 governorates through training in third countries and Japan. According to interviews with consultants involved in the project and the results of the ex-post evaluation of the project,[10] the maintenance equipment and machinery procured under the ODA loan project were managed by the regional offices of MOWR as WUAs lacked capacity to handle them, and, as a result, there was no direct collaboration with the technical cooperation project. However, effects on the technical cooperation project through indirect collaboration with the loan project were observed: the proper dredging of canals through the use of the equipment and machinery by MOWR contributed to the proper distribution of water (proper use of irrigation water) to each WUA district covered by the technical cooperation project.

3.1.2.3 External Coherence

At the time of the project appraisal, the United States and the Food and Agriculture Organization of the United Nations (FAO) were implementing projects in Iraq to improve facilities such as irrigation canals and irrigation and drainage pump stations, and this project sought to avoid duplication with assistance provided by other donors by collecting information on projects already implemented or planned by them. In addition, while MOWR presented high-priority subprojects as candidates for this project from among the total of 262 subprojects listed in the Ministry's development plan (2004-2008), SAPROF selected the subprojects for the project with "no overlap with other donors" as one of the selection criteria. During the project implementation, MOWR managed the project to ensure that there was no duplication or discrepancy between different projects implemented by multiple donors. Thus, from the time of the appraisal to the completion of the project, duplication with other donor support was avoided in this project.

This project is highly consistent with the development plans and needs of Iraq both at the

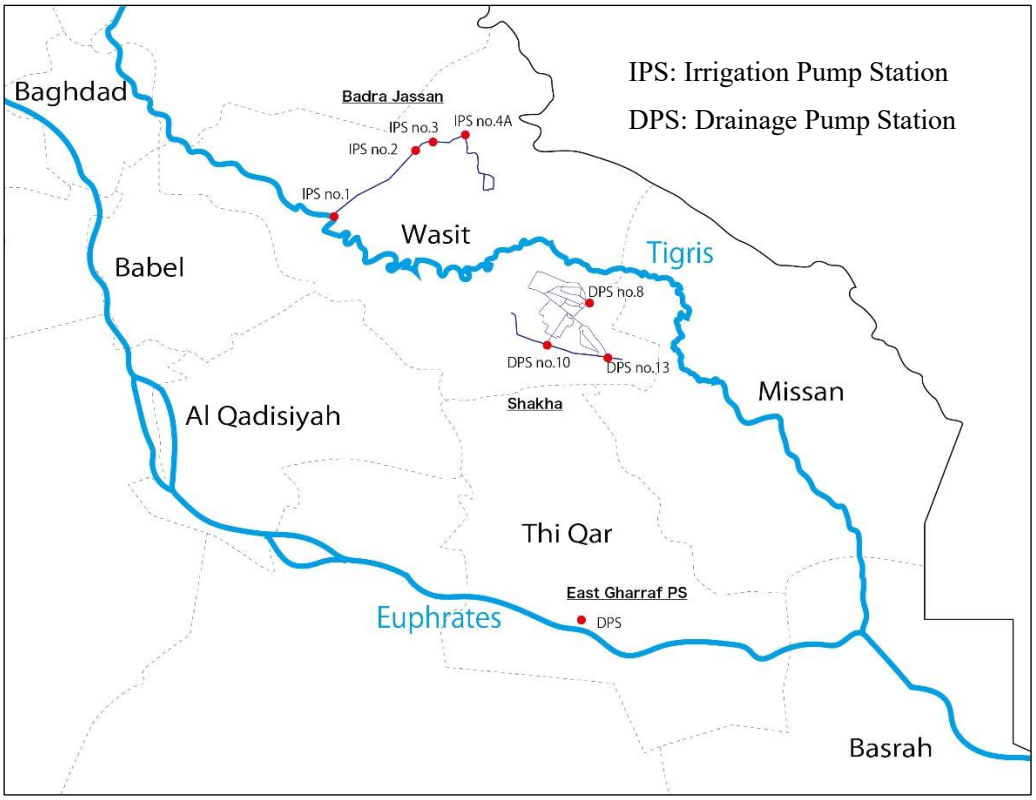
[10] The ex-post evaluation of the project was being conducted as of September 2022.

times of the project appraisal and the ex-post evaluation, as well as Japan's assistance policy at the time of the appraisal. Moreover, internal coherence exists, and no issues are found with respect to external coherence. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The location map of the project's pump stations is shown below.



Source: 3kaku-K (prepared by the evaluator based on the map in the project completion report (PCR))

Figure 2: Project Location Map

The outputs following the implementation of this project are shown in Tables 2 through 4.

Table 2: Renewal of Irrigation and Drainage Pumps

Location	Plan	Actual
Badra Jassan Irrigation Pump Station No.1	Irrigation pump 2 sets (Discharge 3.0 m^3/s)	Irrigation pump 2 sets (Discharge 3.4 m^3/s)
Badra Jassan Irrigation Pump Station No.2	Irrigation pump 2 sets (Discharge 3.0 m^3/s)	Irrigation pump 2 sets (Discharge 3.4 m^3/s)
Badra Jassan Irrigation Pump Station No.3	Irrigation pump 2 sets (Discharge 3.0 m^3/s)	Irrigation pump 2 sets (Discharge 3.2 m^3/s)
Badra Jassan Irrigation Pump Station No.4A	Irrigation pump 2 sets (Discharge 3.0 m^3/s)	Irrigation pump 2 sets (Discharge 3.4 m^3/s)
Shakha Drainage Pump Station No.8	Drainage pump 5 sets (Discharge 1.5 m^3/s)	Drainage pump 5 sets (Discharge 1.5 m^3/s)
Shakha Drainage Pump Station No.10	Drainage pump 3 sets (Discharge 1.25 m^3/s)	Drainage pump 3 sets (Discharge 1.0 m^3/s)
Shakha Drainage Pump Station No.13	**Drainage pump 4 sets** (Discharge 2.2 m^3/s)	**Drainage pump 6 sets** (Discharge 2.2 m^3/s)
East Gharraf Drainage Pump Station	Drainage pump 5 sets (Discharge 6.5 m^3/s)	Drainage pump 5 sets (Discharge 6.0 m^3/s)
N/A（Portable/Standby）	Metric pump 20 sets (Discharge 1.0 m^3/s)	Metric pump 20 sets (Discharge 1.0 m^3/s)

Source: documents provided by JICA and MOWR

Irrigation and drainage pumps were renewed mostly as planned. The reason why the actual number of pumps at Shakha Drainage Pump Station No. 13 increased by two sets from the plan is that since the existing number of pumps was six sets from the beginning, the plan should have stated six sets, but the implementation plan (IP) stated four sets instead.

Table 3: Procurement of Equipment/Machinery for Maintenance of Irrigation Drainage Canals

Equipment/Machinery	Plan	Actual
1. Sheep Foot Roller	5	5
2. Steel Roller	5	5
3. Concrete Truck Mixer	**8**	**21**
4. Grader	7	7
5. Trailer (with prime mover)	9	9
6. Water Tanker	14	14
7. Fuel Tanker	20	20
8. Hydraulic Excavator	9	9
9. Long Boom Hydraulic Excavator	10	10
10. Wheel Loader	**9**	**19**
11. Movable Workshop	**2**	**5**
12. Concrete Plant	**2**	**Mobile Batching Plant 8**[*1]
13. Hydraulic Lift	**7**	**Truck Crane 7**[*2]
14. Bulldozer (39-ton class)	6	6
15. Bulldozer (20-ton class)	10	10
16. Dump Truck	20	20
17. Submersible Pump	20	20
18. Wheel Excavator	-	**22**

Source: documents provided by JICA and MOWR

Note: *1: While the plant was planned as a fixed type at the time of the appraisal, a mobile type was purchased because a mobile type was more convenient for the maintenance of irrigation drainage canals. Six of the mobile batching plants are mobile dosing stations.
*2: While hydraulic lifts were planned at the time of the appraisal, the specifications were changed to truck cranes for convenience.

A total of 54 additional pieces of equipment and machinery (13 concrete truck mixers, three movable workshops, ten wheel loaders, six mobile dosing stations, and 22 wheel excavators) were procured for the maintenance of irrigation drainage canals using the remaining funds from the ODA loan.

Table 4: Procurement of Generators for Pumps

(Number of units)

Capacity	Plan	Actual
1. 50 kVA	**9**	**0**
2. 150 kVA	**4**	**2**
3. 250 kVA	2	2
4. 350 kVA	3	3
5. 500 kVA	**6**	**1**
6. 750 kVA	2	2
7. 1,000 kVA	**19**	**23**
8. 1,200 kVA	**1**	**0**
9. 1,250 kVA	**6**	**0**
10. 1,500 kVA	**8**	**10**
11. 2,500 kVA	**-**	**2**
Total	60	45

Source: documents provided by JICA and MOWR

The generators were procured using the project funds, the Iraqi government's own funds, and other donor funds. The number of generators for which the project was responsible decreased by 15 units due to delays in the procurement process in the project.

Consulting services included tendering support and construction management. The actual person-month was 269 person-months (43 foreign and 226 local) compared to the planned total of 157 person-months (54 foreign and 103 local). The overall person-months increased due to the extension of the contract period. The reason for the decrease in person-month for foreigners and the increase in person-month for locals was that the person-month for foreigners needed to be reduced and those for locals needed to be increased due to the deteriorating security situation and the need for more person-month to upgrade pump equipment.

In all cases where the output was changed, any increase or decrease was based on reasonable reasons and such changes were made after they were examined and agreed upon between the executing agency and JICA. Thus, no particular problems are found with these changes.

Drainage Pumps Installed under the Project
(source: Ex-Post Evaluation Team)

Transformer Installed under the Project
(source: Ex-Post Evaluation Team)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned project cost at the time of the project appraisal was 12,685 million yen (9,430 million yen in foreign currency and 3,255 million yen in local currency), of which 9,514 million yen was covered by the ODA loan. The actual project cost was 9,389 million yen (9,376 million yen in foreign currency and 13 million yen in local currency), of which 9,376 million yen was covered by the ODA loan, well within the plan (74% of plan). According to the JICA officials who were in charge at the time of the project implementation, the reasons why the actual project cost was much lower than the planned amount were as follows: (1) In implementing the very first Japanese ODA loan project in Iraq under an unstable security situation, stakeholders believed that service delivery would be possible even in areas and locations where contractors could not operate due to security concerns by using an equipment/machinery procurement package that allowed MOWR transport and install on its own, and that transportation and installation could be added to the main contract should security be restored later on; (2) Although transportation cost, including customs duties, was estimated to be higher than expected, the transportation went more smoothly than expected due to the efforts of MOWR; and (3) some of the equipment that was planned to be procured was repaired rather than procuring new equipment.

3.2.2.2 Project Period

The project period planned at the time of the project appraisal was 54 months in total from January 2008 (signing of the loan agreement) to June 2012 (completion of the procurement and installation of equipment and machinery as well as consulting services); however, the actual project period was 120 months in total from January 2008 (signing of the loan agreement) to December 2017 (completion of the procurement and installation of equipment and machinery),

which significantly exceeded the plan (222% against the plan). However, according to the United Nations Development Programme (UNDP) Iraq Office, which was engaged in the monitoring of the project, the security situation deteriorated during the project implementation due to the invasion by the "Islamic State of Iraq and the Levant (ISIL)," which led to a national budget shortage due to a significant increase in military spending and drops in oil prices since 2015. The bidding process was suspended from August 2015 to February 2016 (for a total of seven months) due to the inability to secure project funds for this project, and the project site was closed for about three months in the summer of 2016 due to the lack of budget, which resulted in delayed salary payments to local civil servants and demonstrations. If we deduct from the actual project period the ten-month period in which project implementation was suspended due to the worsening security situation by assuming that this was caused by an external factor, the actual project period would be 110 months (204% against the plan). The reasons why the actual project period significantly exceeded the plan are as follows.

The significant delays in the bidding and contract procedures were due to the following reasons: (1) The Iraqi side was unfamiliar with these processes, as this was its first Japanese ODA loan project (e.g., it took time to process foreign exchange losses and respond to frequent requests from the top officials at MOWR for explanations regarding many procedures stipulated in the JICA guidelines); (2) The consultants explained the bid evaluation results, including the JICA guidelines, to the evaluation committee members. However, since the members were selected from various departments of the Ministry, the meetings of the evaluation committee were rarely held due to scheduling conflicts of the members;[11] and (3) Additional procurement of equipment and machinery for the maintenance of irrigation drainage canals was made using the remaining funds from the ODA loan.

The major delay in pump installation was due to the following reasons: (1) Although the pump installation had to be carried out when the farmers, who were the users of the facilities, were not using the irrigation and drainage pumps, MOWR had difficulty in coordinating with the farmers regarding the construction schedule, etc.; and (2) It was difficult for the consultants to stay at the construction sites due to security and budget constraints. Therefore, the consultants' site visits were limited to confirming the progress of the construction works. At the same time, errors occurred between design drawings and the dimensions of the actual structures, often resulting in inconsistencies between existing civil engineering structures and the dimensions of newly procured equipment, which took time to resolve.[12][13]

While the actual project period significantly exceeded the planned period even after taking

[11] Source: SAPI Final Report pp.3-6
[12] Source: SAPI Final Report pp.1-2, 3-7
[13] Since Lots 2, 3, and 4 included the delivery of equipment to the ISIL invasion area, the deteriorating security situation might have affected the procurement of equipment and machinery. However, the specific length of the delay caused by it could not be confirmed.

into account the worsening security situation, with a view to prevent further extension of the project period, MOWR requested support from other ministries and local government agencies for smooth implementation of the project and discussed and coordinated with contractors and experts from other ministries on issues that arose at the project sites as needed.

Table 5: Comparison of the Project Period

Content	Plan	Actual
Selection of Consultant	May 2008 – April 2009 (12 months)	April 2009 – May 2010 (14 months)
Consulting Service	April 2009 – June 2012 (39 months)	July 2010 – September 2016 (75 months)
Bidding/ Contracting	June 2009 – June 2010 (13 months)	Lot 1: May 2009 – April 2012 (36 months) Lot 2: May 2009 – December 2012 (44 months) Lot 3: May 2009 – April 2012 (36 months) Lot 4: June 2009 – January 2010 (8 months) Lot 5: March 2014 – August 2016 (30 months)
Procurement/ Installation of Equipment and Machinery	June 2010 – June 2012 (25 months)	Lot 1: December 2012 – December 2016 (49 months) Lot 2: March 2012 – December 2013 (22 months) Lot 3: July 2012 – November 2013 (17 months) Lot 4: October 2010 – June 2013 (33 months) Lot 5: January 2016 – December 2017 (24 months)

Source: documents provided by JICA and MOWR

Note: Lot 1: irrigation and drainage pumps, Lot 2: equipment and machinery for the maintenance of irrigation drainage canals, Lot 3: generators, Lot 4: metric pumps and submersible pumps, Lot 5: additional procurement using the remaining funds from the ODA loan (maintenance equipment and machinery)

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

At the time of the project appraisal, the economic internal rate of return (EIRR) was expected to be 21% for Badra Jassan Irrigation Pump Stations No. 1 and No. 2, and 20% for Badra Jassan Irrigation Pump Stations No. 3 and No. 4A. However, the EIRR at the time of the ex-post evaluation cannot be calculated because data on cropping intensity, prices by crop other than wheat and barley, production costs, etc. for the benefited areas at the time of the ex-post evaluation were not available.

While the project cost was within the plan, the project period significantly exceeded the plan. Therefore, efficiency of the project is moderately low.

3.3 Effectiveness and Impacts[14] (Rating: ②)

3.3.1 Effectiveness

The project aimed to "revitalize the existing irrigation drainage canals and irrigated farmland" as a direct outcome. The effectiveness was examined through the following quantitative effect indicators and qualitative validation.

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

1. Irrigated area benefited from the project (operation indicator)

Although the baselines of the areas benefited from the project had been specified in the IP as shown in the table below, no targets had been set at that time. The targets in the table below, which were set by the consultant at the time the PCR was prepared (2017), are presented here only as reference because they cannot simply be compared with the baselines due to significant deviations from the baselines and an unknown calculation method. Regarding the actual figures, with the exception of Badra Jassan Irrigation Pump Station No. 4A, figures that were (or presumed to be) highly accurate were not available. The actual figures are between 52% and 100% against the baselines and have not increased since the time of the appraisal. This is due to the fact that, according to MOWR, the Ministry of Agriculture (MOA) determines the area for agricultural use according to the amount of available water given that the amount of river inflows into Iraq is decreasing year by year and the country is facing severe water shortages. MOWR also explained that the actual figures for Shakha Drainage Pump Stations were the same as the baselines because the area used for farming was set at the same level as the level at the time of the appraisal due to severe water shortages. However, considering the fact that the actual figures tended to be lower than the baselines in Badra Jassan, it is reasonable to assume that the actual figures are below the baselines in Shakha as well.

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

Table 6: Irrigated Area Benefited from the Project

(Unit: ha)

Pump Station	Baseline	*Target*	Actual		
	2008	*2020*	2019	2020	2021
			1 year after completion	2 years after completion	3 years after completion
Badra Jassan Irrigation Pump Station No. 1	6,250	*9,700*	5,600	5,600	5,600
Badra Jassan Irrigation Pump Station No. 4A	12,500	*N/A*	6,487	8,682	8,419
Shakha Drainage Pump Station No. 8	19,175	*40,700*	19,175	19,175	19,175
Shakha Drainage Pump Station No. 10	7,500		7,500	7,500	7,500
Shakha Drainage Pump Station No. 13	19,000		19,000	19,000	19,000
East Gharraf Drainage Pump Station	17,500	*71,000*	N/A	N/A	N/A

Source: documents provided by JICA and MOWR

Note: Badra Jassan Irrigation Pump Stations No. 2 and No. 3 are not included in the table because they are connected to No. 1 and No. 4A to perform pump-up operation (to assist No. 1 and No. 4A).

2. Annual total volume of pumped water for each pump (operation indicator)

The baselines and targets for the total annual volume of water pumped by each pump at the pump stations under the project were specified in the IP, as shown in the table below. As for the actual figures, according to MOWR, no operational records for the pumps exist, and thus the data in the table below was calculated based on the average operating hours of the pumps in recent years. The actual figures for irrigation pump stations have reached more than 70% against the target, while the actual figures for the drainage pump stations have fallen far below the target, ranging from 27% to 60% against the target. According to MOWR, this is due to the fact that (1) flood risk (and associated drainage demand) was considered when the targets were set at the time of the appraisal, but the actual occurrence of flooding was limited, and (2) the drainage volume has been reduced due to severe water shortages resulting from reduced inflows into Iraq (especially due to the fact that cultivation is limited in the summer months when water shortages are severe and, as a result, the operating hours of drainage pumps are shorter in the summer). The operating hours calculated based on the actual figures in the table below and the capacities of pumps procured under the project are 11 to 23 hours/day on average for the irrigation pumps but three to five hours/day on average for the drainage pumps, from which we can infer that the operating hours of the drainage pumps at the time of the ex-post evaluation are low.

Table 7: Annual Total Volume of Pumped Water for Each Pump

(Unit: 1,000 m^3/year/pump)

Pump Station	Baseline	Target	Actual	
	2008		2021	
		After completion	3 years after completion	
Badra Jassan Irrigation Pump Station No. 1	40,824	58,320	88,128	151%
Badra Jassan Irrigation Pump Station No. 2	40,824	58,320	44,064	76%
Badra Jassan Irrigation Pump Station No. 3	40,824	58,320	44,064	76%
Badra Jassan Irrigation Pump Station No. 4A	36,742	52,488	38,916	74%
Shakha Drainage Pump Station No. 8	11,030	19,440	9,720	50%
Shakha Drainage Pump Station No. 10	9,072	16,200	4,350	27%
Shakha Drainage Pump Station No. 13	15,967	28,512	14,250	50%
East Gharraf Drainage Pump Station	0	67,392	40,355	60%

Source: documents provided by JICA and MOWR

Note: The right most column shows the percentage of target achievement.

3. Production volume of major crops (effect indicator)

The baselines and targets for the production volume of wheat and barley in the project's benefit areas were specified in the IP, as shown in the table below. Regarding the actual figures, with the exception of Badra Jassan Irrigation Pump Station No. 4A, data on cultivated areas or unit yield was not available for the benefit areas, and thus the production volume data provided cannot be verified. The actual wheat production volume is above the target at Badra Jassan Irrigation Pump Station No. 1 and Shakha Drainage Pump Station areas, while the actual barley production volume is significantly below the target in all areas. According to MOWR, this is due to the fact that: in recent years, rainfall has been very low in some years, making the already mentioned water shortages even worse; due to water shortages, MOA determines the area to be planted and the cropping intensity by crop for each year, and farming is conducted accordingly; and farmers' agricultural techniques are often poor and fail to reach the cropping intensity determined by MOA. Moreover, according to a report published by the U.S. Department of Agriculture (USDA), in addition to severe water shortages, especially in 2021, MOA's subsidy system for farmers has been changed. Previously, farmers who followed MOA's annual agricultural plan were allocated certified seeds at a 70% subsidy rate. However, the subsidy rate was reduced to 30%. The amount of subsidized fertilizer was also reduced from 120 kg/ha to 20 kg/ha.[15] This could be the reason for the lower production volumes of both wheat and barley in 2021 as shown in the table below.

[15] "Grain and Feed Annual: Extreme Water Shortages and Policy Changes Impact Iraq Grain Production" (USDA, April 15, 2022)

Table 8: Production Volume and Unit Yield of Major Crops

Pump Station	Baseline	Target	Actual		
	2008		2019	2020	2021
		After completion	1 year after completion	2 years after completion	3 years after completion
Production Volume of Wheat (Unit: ton/year)					
Badra Jassan Irrigation Pump Station No. 1	15	10,000	14,000 (140%)	12,000 (120%)	11,000 (110%)
Badra Jassan Irrigation Pump Station No. 4A	15	30,000	16,866 (56%)	16,589 (55%)	7,796 (26%)
Shakha Drainage Pump Station No. 8	46,400	97,620	120,000 (123%)	100,000 (102%)	90,000 (92%)
Shakha Drainage Pump Station No. 10					
Shakha Drainage Pump Station No. 13					
East Gharraf Drainage Pump Station	8,400	42,000	N/A	N/A	N/A
Unit Yield of Wheat (Unit: ton/ha)					
Badra Jassan Irrigation Pump Station No. 4A	0.0012	4.0	3.7 (93%)	2.74 (69%)	N/A
Production Volume of Barley (Unit: ton/year)					
Badra Jassan Irrigation Pump Station No. 1	15	15,000	2,000 (13%)	2,000 (13%)	1,500 (10%)
Badra Jassan Irrigation Pump Station No. 4A	15	20,000	4,620 (23%)	1,652 (8%)	N/A
Shakha Drainage Pump Station No. 8	29,600	65,080	9,000 (14%)	8,000 (12%)	9,000 (14%)
Shakha Drainage Pump Station No. 10					
Shakha Drainage Pump Station No.13					
East Gharraf Drainage Pump Station	4,200	28,000	N/A	N/A	N/A
Unit Yield of Barley (Unit: ton/ha)					
Badra Jassan Irrigation Pump Station No. 4A	0.0012	4.0	2.21 (55%)	1.43 (36%)	N/A

Source: documents provided by JICA and MOWR

Note: Badra Jassan Irrigation Pump Stations No. 2 and No. 3 are not included in the table because they are connected to No. 1 and No. 4A to perform pump-up operation (to assist No. 1 and No. 4A).

Percentages in parentheses indicate the percentage of target achievement.

3.3.1.2 Qualitative Effects (Other Effects)

The exact locations of the equipment and machinery for the maintenance of irrigation drainage canals procured under the project are unknown at the time of the ex-post evaluation. According to MOWR, while most of the equipment and machinery for the maintenance of irrigation drainage canals owned by the Ministry are in operation, some of them were procured through the project and some were procured through other donors' funds or MOWR's own funds, and it is difficult to identify which ones were procured through the project. However, most of the maintenance equipment and machinery owned by the Ministry have been used for cleaning and maintaining irrigation drainage canals, and the maintenance status of the canals has improved considerably compared to the time of the appraisal. MOWR explained that the water conveyance efficiency in the project benefit areas had been about 45% before the project was implemented, but after the completion of the project, the efficiency improved to about 58%. In addition, as mentioned above, effects were observed that the proper dredging of canals through the use of the equipment procured under the project by MOWR contributed to the proper distribution of water to each WUA district covered by the "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water" (2012-2015).

Soil salinity in the project benefit areas has been improved to some extent, according to MOWR. For reference, according to the data provided by the Ministry on the concentration of total dissolved solids (TDS) in the drainage canal where East Gharraf Drainage Pump Station is located, the average TDS concentration from January to December 2018 was 14,141 ppm, while the average TDS concentration from January to December 2021 was 13,108 ppm, showing a decrease of about 7%. However, as mentioned above, since the actual volume of pumped water at the drainage pump stations covered by the project is much lower than the target, the contribution of the project to the improvement of salinity may be somewhat limited, although it cannot be judged solely on the basis of the amount of water discharged by the pumps.

3.3.2 Impacts

3.3.2.1 Intended Impacts

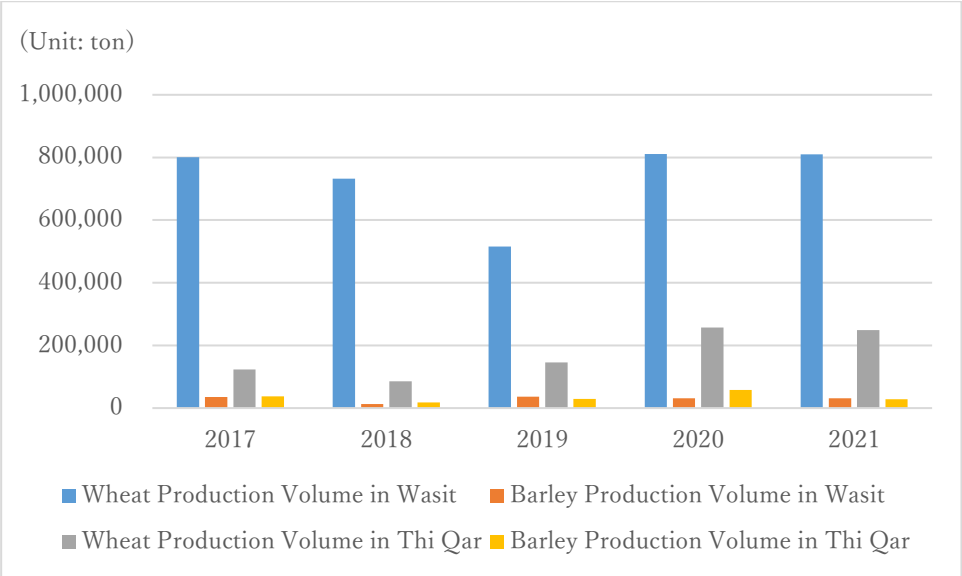
(1) Quantitative Impacts

The intended impact of this project was to "contribute to Iraq's economic and social recovery through the revival of its irrigated agriculture." We attempted to verify this impact by obtaining data on gross farm income per household in the project's benefit areas, but the only data that were available clearly lacked reliability. Thus, publicly available statistical data were used for verification.

1. Production volume of major crops in Wasit and Thi Qar governorates

According to data published by Iraq's Central Statistical Organization (CSO), the production

volumes of wheat and barley in recent years in Wasit and Thi Qar governorates, where the project's benefit areas are located, are shown in the figure below. Wheat production in both governorates has been increasing since 2019. Although this trend differs from the trend in the project benefit areas shown in Table 8, the reason is unclear. The data on cultivated areas by crop in the project's benefit areas was not available. However, it was assumed that the area planted with wheat is the largest in the project's benefit areas in Wasit governorate, given that wheat is the most produced major crop in Iraq (especially in the project's benefit areas) and wheat production is flourishing in Wasit governorate. Comparing the average wheat cultivated area in Wasit governorate in 2017-2021 (238,079 ha), taken from the CSO data, and the total actual area benefited from the project in Wasit governorate (59,579 ha),[16] the area benefited from the project is 25% of wheat cultivated area in Wasit governorate. While it is not an accurate comparison, it can be inferred that the project has contributed to a certain extent to the increase in wheat production in Wasit governorate in recent years. In addition, according to the USDA report mentioned above, Iraq suffered from severe water shortages as well as high temperatures and droughts in 2021/2022, resulting in a significant decrease in wheat production in rainfed agricultural areas in northern Iraq, with the highest share of wheat production in the country (19.1%) reported in Wasit governorate. Thus, it is considered that this project is also contributing to a certain extent to ensuring domestic food self-sufficiency.



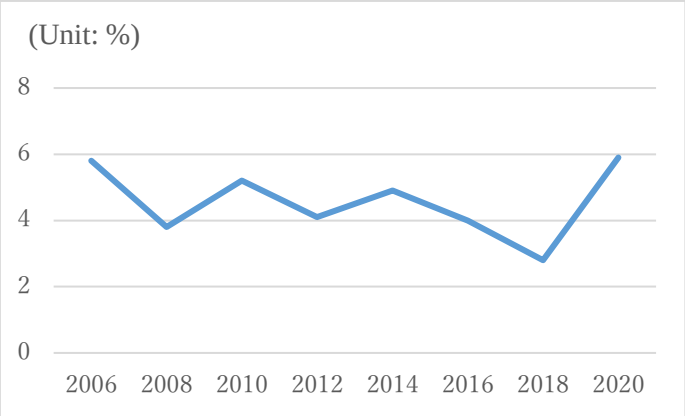
Source: CSO (URL: https://cosit.gov.iq/ar/agri-stat/veg-prod) (accessed on September 15, 2022)

Figure 3: Production Volume of Wheat and Barley in Wasit and Thi Qar Governorates

[16] Only for Badra Jassan Irrigation Pump Station No. 4A, the average cultivated area with wheat from 2017 to 2021 is known (8,304 ha), so this was used.

2. Agricultural sector as a percentage of Iraq's Gross Domestic Product (GDP)

Data on the gross regional domestic product (GRDP) of Wasit and Thi Qar governorates and the share of agriculture in this GRDP were not available, and thus the World Development Indicators data shown on the right were used instead. Figure 4 shows that the share of the agriculture (including forestry and fishing) sector in Iraq's GDP was 5.8% at the time of the appraisal (2006), then dropped to the 2% level, and recovered to 5.9% in 2020. While the decline from 2014 to 2018 appears to have been affected by the deteriorating security situation caused by ISIL, it has recovered in the past few years to the same level as at the time of the appraisal. As mentioned above, although the target achievement rate of the production volume by major crop in the project benefit areas has been limited, some areas have exceeded the target, and the project seems to have contributed to a certain extent to the growth of this particular agricultural sector through the revitalization of irrigation drainage canals and irrigated farmlands.



Source: World Bank (URL: https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS) (Accessed on February 25, 2022)

Figure 4: Agricultural sector as a percentage of Iraq's GDP

(2) Qualitative Impacts

According to MOWR, during the project implementation, local residents were employed as workers and guards for the installation of pumps and associated electrical work, resulting in a certain amount of job creation in the areas covered by the project. In addition, there were some areas where the project resulted in an increase in crop production (in fact, wheat production in some areas significantly exceeded the target as shown in "Table 8: Production Volume and Unit Yield of Major Crops"), and it is reasonable to assume that the project has had, although to a limited extent, a certain positive impact on domestic job creation and the revitalization of the Iraqi economy.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Natural Environment

This project was classified as Category FI under the "Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations" (established in April 2002) because subprojects could not be identified prior to JICA's loan

approval and there were concerns that such subprojects might have environmental impacts. Since the project is mainly for the provision of irrigation and drainage equipment and machinery, no significant negative environmental impacts were foreseen from the subprojects, and the project was not required to conduct an environmental impact assessment (EIA). According to the consultants for the project, they prepared the guideline for water quality monitoring during the project, while other environmental monitoring works were conducted by MOWR itself. MOWR explained that the project was implemented in accordance with internationally accepted and appropriate environmental management regulations, and that no significant negative impacts on the natural environment were identified during the implementation of the project.

2) Resettlement and Land Acquisition

At the time of the project appraisal, it was assumed that the project would primarily provide irrigation and drainage equipment and machinery and that no resettlement would occur. According to MOWR, no resettlement or land acquisition occurred under the project.

3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights and Other Impacts

As mentioned above, although there was no particular discussion at the time of the appraisal regarding considerations for and fairness to marginalized people, according to MOWR and the consultants involved in the project, the project did not disadvantage any marginalized people including the poor.

Although there is a special circumstance that MOA determines the area for agricultural use according to the amount of available water in light of the severe water shortages faced in Iraq caused by declining river inflows, the results of the validation of the quantitative and qualitative effects mentioned above do not seem to provide enough grounds to claim that the direct outcome, "revitalization of the existing irrigation drainage canals and irrigated farmland" has been achieved. In addition, although it is presumed that the project has contributed to some extent to the recent increase in the production volume of major crops in the target governorates and the increase in the share of the agricultural sector in Iraq's GDP, available data did not clearly confirm the extent of the contribution. This project has achieved its objectives only to a certain extent. Therefore, effectiveness and impacts of the project are moderately low.[17]

[17] Examination of the effectiveness (direct outcome) found that the actual areas benefited from the project were below the baselines, the actual volume of pumped water was 27%-151% (71% on average) against the targets, and the actual production volume of wheat and barley was 8%-140% (62% on average in 2019, 52% on average in 2020, and 50% on average in 2021) against the targets. In light of these facts, and by taking into account positive effects observed to a certain extent in terms of qualitative effects and impacts, the results of our examination satisfy the evaluation criteria for JICA's ex-post evaluation, "moderately low (guideline: target achievement rate of 50% to 70%)." Therefore, we determined that it is appropriate to evaluate the effectiveness and impacts of the project as "moderately low." In addition, in JICA's ex-post evaluation, while natural disasters, war, and temporary evacuation

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

As mentioned in "3.1.1 Relevance," at the time of the ex-post evaluation, the importance of agriculture in the Iraqi economy and the need for the development and maintenance of irrigation and drainage pumps and canals were mentioned in *the National Development Plan* and strategic documents related to water resources. Therefore, it is reasonable to say that policies and systems are in place to ensure the sustainability of the project effects.

3.4.2 Institutional/Organizational Aspect

At the time of the project appraisal, MOWR's regional offices in each governorate were, under the management and supervision of the headquarter of MOWR, to be in charge of the O&M of irrigation and drainage pumps and equipment and machinery for the maintenance of irrigation drainage canals to be procured under the project. At the time of the ex-post evaluation, O&M are conducted under the same system. The Kut regional office in Wasit governorate is in charge of the O&M of Badra Jassan Irrigation Pump Stations No. 1, 2, 3, 4A and Shakha Drainage Pump Stations No. 8, 10, 13, while the Nassiriya regional office in Thi Qar governorate is in charge of the O&M of East Gharraf Drainage Pump Station. The number of maintenance staff at each pump station at the time of the ex-post evaluation (as of 2022) is as follows.

Table 9: Number of Maintenance Staff at the Pump Stations Covered by the Project

(Unit: persons)

Pump Station	Number of Maintenance Staff
Badra Jassan Irrigation Pump Stations No. 1, 2, 3, 4A	32
Shakha Drainage Pump Stations No. 8, 10, 13	15
East Gharraf Drainage Pump Station	22

Source: documents provided by MOWR

It is assumed that the equipment and machinery for the maintenance of irrigation drainage canals procured under the project are operated and maintained by the State Commission for Operation of Irrigation & Drainage Projects, the State Commission for Maintaining Irrigation & Drainage Projects, the Directorate of Executing River Dredging Works, etc. of MOWR (although their exact locations are unknown as previously mentioned). The State Commission for Operation of Irrigation & Drainage Projects is mainly in charge of budget planning, bidding and contract

due to deterioration of security situation etc. are considered as external factors, the following factors are not considered as external factors: (1) any indispensable factor or precondition for achieving the project objectives; (2) any event that has been occurring continuously or frequently in the project area; or (3) any risk that was identified at the time of planning/appraisal. The water shortage and deterioration of the security situation observed in this project fall into one or more of these categories, and therefore, we decided not to treat them as external factors.

procedures, implementation supervision, and the O&M of pump stations for irrigation and drainage projects; the State Commission for Maintaining Irrigation & Drainage Projects is mainly in charge of the maintenance of irrigation and drainage networks; and the Directorate of Executing River Dredging Works is mainly in charge of dredging rivers, dam reservoirs, and other water bodies. The number of staff in the above State Commissions and Directorate in 15 governorates at the time of the ex-post evaluation (as of 2022) is as follows.

Table 10: Number of Staff in the State Commission for Operation of Irrigation & Drainage Projects, the State Commission for Maintaining Irrigation & Drainage Projects, and the Directorate of Executing River Dredging Works

(Unit: persons)

Governorate	State Commission for Operation of Irrigation & Drainage Projects	State Commission for Maintaining Irrigation & Drainage Projects	Directorate of Executing River Dredging Works
Kirkuk	107	30	3
Salah Al-Din	94	12	11
Diyala	201	45	6
Wasit	169	89	12
Maysan	85	21	6
Thi Qar	169	83	21
Basrah	82	45	20
Muthanna	39	28	13
Al-Qadisiyah	140	100	17
Najaf	137	51	11
Babil	206	118	28
Karbala	81	56	12
Baghdad	465	479	234
Anbar	107	39	14
Mosul	221	28	16

Source: documents provided by MOWR

Note: Figures include both engineers and support staff members, who are roughly equal in number, as well as several administrative staff members.

MOWR explained that, while an increase in the number of electrical engineers and technicians would improve the efficiency of operations, the number of staff is mostly sufficient to maintain pump stations and equipment and machinery for the maintenance of irrigation drainage canals. On the other hand, at the time of the project appraisal, JICA and the Iraqi side agreed that all the maintenance equipment and machinery procured under the project would be placed under the responsibility of MOWR headquarters and registered in the asset management records, and that the Ministry would update the asset management records upon receiving periodic progress reports on the status of the equipment and machinery from the regional offices to which the equipment and machinery were distributed. However, according to MOWR, the asset management records were prepared when the PCR for this project was drafted (2019), but they have not been updated

since then. MOWR has reported that although it believes that the assigned locations for some of the equipment and machinery have been changed, it would be difficult to trace and manage all locations due to the number of person-hours required for these tasks and the impact this may have on other works, as such tasks would involve requesting each regional office through an official letter to perform the check and collecting and compiling their responses. As mentioned above, most of the maintenance equipment and machinery owned by the Ministry are being used for cleaning and maintaining irrigation drainage canals; however, concerns remain from the perspective of ensuring the sustainability of the project effects.

3.4.3 Technical Aspect

At the time of the project appraisal, a lesson was learned from the ex-post evaluation of similar projects in the past that the establishment of an appropriate O&M system is important for smooth O&M of the facilities after the start of operation. Thus, it was agreed that this project would pay an adequate amount of attention to the establishment of an O&M system by including training for MOWR in the project components. The project actually provided O&M training (about two weeks per lot) and manuals for MOWR staff in each procurement lot. According to MOWR, the training participants have provided guidance to and shared information with other staff members, and MOWR also receives technical assistance from private contractors as needed. It was also confirmed that the O&M manuals provided in each procurement lot have been distributed to and used by the regional offices in charge of the pump stations covered by the project. Moreover, MOWR has a training center at its headquarters, where its staff receives various training programs annually on the design of irrigation systems, how to maintain pumps and other equipment, how to use various software, etc. On-demand training is also provided based on training requests from various departments. Although data on the number of training participants was not available, a system to ensure O&M techniques is in place, and there are generally no technical problems.

3.4.4 Financial Aspect

The amount of the national budget allocated to MOWR at the times of the project appraisal and the ex-post evaluation is as follows. At the time of the ex-post evaluation, the amount allocated to the Ministry was significantly higher than at the time of the appraisal.[18]

[18] According to MOWR, the increase in 2019 is to cover expenditures for major projects undertaken in 2017 and 2018.

Table 11: Amount of the National Budget Allocated to MOWR

(Unit: million dinars)

	2006	2018	2019	2021
Allocated Amount	300,000	406,109	911,250	547,722
Of which, maintenance cost	N/A	31,586	87,310	N/A

Source: documents provided by JICA, website of the Ministry of Finance, Iraq
(URL: http://mof.gov.iq/obs/en/Pages/about.aspx) (accessed on August 23, 2022)

The actual maintenance costs for each pump station at the Kut regional office and the Nassiriya regional office are as follows.

Table 12: Actual Maintenance Costs for Pump Stations

(Unit: 1,000 dinars)

Pump Station	2019	2020	2021
Badra Jassan Irrigation Pump Stations No. 1, 2, 3, 4A			35,000/year*1
Shakha Drainage Pump Stations No. 8, 10, 13			5,000/year*2
East Gharraf Drainage Pump Station	40,300	22,300	4,650

Source: documents provided by MOWR
Note: *1: Although yearly disbursements are unknown, the figure was calculated by dividing the total amount of disbursements between 2016 and 2021 reported, which was 212 million dinars, by the number of years. *2: The figure was calculated by dividing the total amount of disbursements reported between 2016 and 2021 reported, which was 30 million dinars, by the number of years.

The maintenance costs for the pump equipment procured under the project are secured annually as shown in the table above. According to MOWR, the amount of expenditure varies depending on the details of maintenance in a given year, but maintenance costs are kept low thanks to the higher quality of the pumps compared to previous pumps, and the Ministry has secured the necessary budget for the O&M of the equipment and machinery. As described below, two of the five pumps procured under the project malfunctioned at East Gharraf Drainage Pump Station around February 2021, and the budget for repairs was finally approved at the time of the ex-post evaluation. It appears that although it takes time to secure a budget when repairs become necessary, MOWR has been able to obtain necessary budgets.

3.4.5 Environmental and Social Aspect

As mentioned above, no negative impacts on the natural or social environment were observed, and no sustainability risks from an environmental and social perspective were identified.

3.4.6 Preventative Measures to Risks

The project was implemented in Iraq, where the security situation was unstable. According to MOWR, the project was implemented in accordance with the safety regulations of each

governorate where the project site was located, and the Ministry's regional offices provided support to ensure the safety of contractors and consultants. In addition, two fuel tankers, one water tanker, one generator (250 kVA), one wheel loader, one grader, one bulldozer, and five submersible pumps were stolen or robbed by ISIL. MOWR explained that it has already procured new equipment through World Bank assistance and its own funds. Therefore, it is reasonable to say that appropriate measures have been taken to address risks.

3.4.7 Status of Operation and Maintenance

At the pump stations covered by the project, daily maintenance tasks are conducted such as visual inspection of pump equipment, etc.; inspection of control panel (current and voltage), lubricating oil system, and cooling system; vibration check; and fixing nuts and bolts as necessary. In addition, once a year (between August and October), each pump is inspected in detail and consumable parts are replaced. At Badra Jassan Irrigation Pump Station No. 1, which is located near the Tigris River and is prone to debris inflow from the river into the pump station, it was necessary to replace the pump impellers; they have already been replaced with spare parts procured under the project. At East Gharraf Drainage Pump Station, two of the total of five pumps procured under the project have been out of order since about February 2021, and another one has been out of order since around February 2022, with only two pumps in operation at the time of the ex-post evaluation. According to MOWR, while the two units that have malfunctioned since 2021 have been out of operation due to a problem with the electromagnetic contactor of the motor and control equipment included as part of the pump set, the repair budget has finally been approved and the pumps will be repaired as soon as spare parts are procured. The remaining one unit has a problem with the transformer coil; however, it was found that the problem was not serious and repairs will be arranged by the State Commission for Operation of Irrigation & Drainage Projects. In addition, while one metric pump, one generator (1,500 kVA), one truck crane, and five wheel excavators were reported to be out of order at the time the PCR was prepared, as mentioned above, the asset management records have not been updated and the locations of the equipment and machinery for the maintenance of irrigation drainage canals procured under the project are unknown at the time of the ex-post evaluation. Thus, the status of these equipment and machinery is also unknown.

Regarding the operation and maintenance of the project, generally no problems have been identified in terms of the policy/system, technical, financial, environmental and social aspects, and preventive measures to risks. However, some issues have been observed in the institutional/organizational aspect of MOWR and the current status of operation and maintenance, as the locations of the maintenance equipment and machinery procured under the project are unknown. They are not expected to be improved/resolved. Therefore, sustainability of the project

effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to revitalize existing irrigation drainage canals and irrigated farmland by providing equipment and machinery used for irrigation and drainage throughout Iraq. The relevance and coherence of the project are high, as the project plan is consistent with the development plans and needs of Iraq and Japan's ODA policy, and collaboration was achieved with a technical cooperation project of JICA. However, the area benefited from the project has not increased since the time of the project appraisal, and the total annual volume of water pumped of the drainage pumps installed in the project is significantly below the target volume. Although the improvement in the maintenance status of existing irrigation drainage canals and water conveyance efficiency was qualitatively confirmed, the achievement of the production target by major crops varied widely by region and crop, and the effect of the project on the revitalization of irrigated farmland appears to be limited. Regarding the expected impact of the project, i.e., contribution to Iraq's economic and social recovery through the revival of its irrigated agriculture, although it is presumed that the project has contributed to a certain extent, the degree of contribution could not be clearly confirmed. Therefore, the effectiveness and impacts of the project are moderately low. The efficiency of the project is moderately low, because the project period significantly exceeded the plan. Sustainability of the project effects is moderately low, because there are some problems with institutional/organizational aspects of O&M and the maintenance status and for low prospects for improvement and resolution.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Of the total of five drainage pumps procured under the project at East Gharraf Drainage Pump Station, the three pumps that were out of order at the time of the ex-post evaluation should be repaired as soon as possible.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) Necessity of conducting proper monitoring

As mentioned above, the exact locations of the equipment and machinery for the maintenance of irrigation drainage canals procured under the project are unknown at the time of the ex-post

evaluation. At the time of the project appraisal, JICA and the Iraqi side agreed that all the maintenance equipment and machinery procured under the project would be placed under the responsibility of MOWR headquarters and registered in the asset management records, and that the Ministry would update the asset management records upon receiving periodic progress reports on the status of the equipment and machinery from the regional offices to which the equipment and machinery were distributed. An equipment list and a deployment map were prepared, and it was agreed between the JICA office and MOWR that these would be updated and shared on a regular basis (every six months), with the formatting having been completed. However, they have not been updated by MOWR. In future projects, with respect to important matters agreed upon, the status of implementation should be regularly checked and monitored through the JICA office.

(2) Measures and points to keep in mind for implementing projects in conflict-affected situations and as first ODA loan projects

- As mentioned above, the implementation of this project was suspended for a total of ten months due to the deteriorating security situation, and the bidding and contract procedures were significantly delayed because the Iraqi side was unfamiliar with the procedures as this was its very first ODA loan project. Therefore, when implementing a project under similar circumstances, the project period should be set with sufficient time to spare.
- In this project, since the consultants could not be stationed at the site due to the deteriorating security situation, the executing agency and the consultants held regular consultations in a third country (Jordan), and the JICA Iraq Office participated in these consultations as much as possible to facilitate the project through thee-way consultations. In addition, the JICA Iraq Office commissioned the UNDP Iraq Office to provide monitoring support during project implementation for all the projects implemented by JICA in Iraq to receive assistance in surveying and reporting the status of sites that JICA could not visit due to security reasons and in coordination between the Iraqi side and JICA. Furthermore, for all projects, a Monitoring Committee was held once a quarter, where the Iraqi Prime Minister's Advisory Commission (PMAC), executing agencies, the Japanese Embassy, JICA, and others met to report on the progress of each project. We believe that these efforts have been instrumental in avoiding further delays in the implementation of this project, which was the first ODA loan project to be implemented in a conflict-affected situation, and can serve as a useful reference when implementing projects under similar circumstances.

5. Non-Score Criteria

5.1. Performance

5.1.1 Objective Perspective

According to MOWR, the fact that JICA, as a donor, conducted a detailed study and established

an appropriate supervision system in Iraq, where the ODA loan project was implemented for the first time, helped solve problems associated with bidding and contract procedures encountered by the executing agency during the implementation of the project and avoid further delays in the project.

5.2. Additionality

Since 2009, the UNDP Iraq Office has entered into a monitoring contract with the JICA Iraq Office to monitor all JICA projects from a neutral ground as a third-party organization. A staff member was assigned to each project to report on the site situation, to coordinate between the Iraqi government and JICA, to provide assistance to the Iraqi government on its internal procedural matters, and to provide training on capacity gaps identified through the monitoring. Examples of training include a series of procedures for letters of credit (L/C) (from opening to closing, considerations for exchange rates, how to handle problems, etc.). The monitoring, follow-up, and consultation by UNDP contributed to the smooth implementation of the project, and the project period might have been further extended without such assistance. This was a value-adding initiative in Iraq, where it was difficult to implement a project for security concerns.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs Renewal of irrigation and drainage pumps, procurement of the equipment and machinery for the maintenance of irrigation drainage canals Consulting services	Irrigation pumps: 8 sets Drainage pumps: 17 sets Metric pumps: 20 sets Equipment and machinery for the maintenance of irrigation drainage canals: 163 Generators for pumps: 60 Support for IP preparation, tendering support, construction management etc. 157 P/M in total	Irrigation pumps: as planned Drainage pumps: 19 sets Metric pumps: as planned Equipment and machinery for the maintenance of irrigation drainage canals: 217 Generators for pumps: 45 Tendering support, construction management etc. 269 P/M in total
2. Project Period	January 2008 – June 2012 (54 months)	January 2008 – December 2017 (120 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	 9,430 million yen 3,255 million yen (40,535 million IQD) 12,685 million yen 9,514 million yen 1 IQD = 0.0803 yen (As of January 2006)	 9,376 million yen 13 million yen (177 million IQD) 9,389 million yen 9,376 million yen 1 IQD = 0.0817 yen (Average between 2010 and 2015)
4. Final Disbursement	July 2018	