

Country Name	<b>The Project for Improvement of Irrigation System at the Abda Doukkala Irrigated Area</b>		
Kingdom of Morocco			

## I. Project Outline

Background	<p>In Morocco, the agriculture sector was accounted for 15% of GDP, and around 40 % of the national labor force engaged in the sector in 2008. Traditional agriculture in arid or semi-arid lands was long dependent on such uncertain rainfall patterns, farmers were suffering from increased droughts in Morocco. Moreover, water demand for drinking water and industrial use was projected to increase onward, it was thus crucial to invest in irrigation systems in order to promote efficient, water-saving techniques in the sector. To use water resources effectively as well as to ameliorate farmer's income in the Abda Doukkala irrigated area, irrigation facilities were developed by the Japanese ODA loan project: "the Abda Doukkala Irrigation Project" (1996-2002). However, it did not amply secure the necessary water amount in the area, particularly during the dry season. Consequently, it was difficult to engage in profitable agricultural production, and thus irrigation water charges had remained relatively expensive for farmers considering the given profit level.</p>														
Objectives of the Project	<p>Through the introduction of water-saving irrigation, profitable farming management as well as the improvement of water management and extension systems, the project aimed at establishing models for efficient irrigation and improving the irrigation management system in the target irrigated area in Abda Doukkala, thereby contributing to greater efficiency in irrigation and higher profitability in agricultural production in the Abda Doukkala irrigated area.</p> <ol style="list-style-type: none"> <li>Overall Goal: Efficient irrigation models are adopted in the Abda Doukkala irrigated Area.</li> <li>Project Purpose: <ol style="list-style-type: none"> <li>The models for efficient irrigation are established in the pilot project site.</li> <li>The irrigation management system is improved in the Abda Doukkala irrigated Area.</li> </ol> </li> </ol>														
Activities of the Project	<ol style="list-style-type: none"> <li>Project site: Abda Doukkala region</li> <li>Main activities: (1) improvement of Agricultural Water Users Association (AWUA) and techniques of water-saving irrigation in the pilot sites, (2) introduction of high profitable agricultural products to local farmers in the project sites, (3) improvement of capacities on maintenance and operation of irrigation facilities, (4) strengthening of extension systems on water-saving irrigation and agriculture.</li> <li>Inputs (to carry out the above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Moroccan Side</td> </tr> <tr> <td>1) Experts: 19 persons</td> <td>1) Staff allocated: 18 persons</td> </tr> <tr> <td>2) Trainees received: 17 persons</td> <td>2) Facilities: Pilot site, office space, and its utilities for the experts in ORMVAD</td> </tr> <tr> <td>3) Third country training: 2 persons (Turkey), 4 persons (Egypt)</td> <td>3) Local cost: Administrative and operational expenses</td> </tr> <tr> <td>4) Equipment: Vehicles, Water, and Soil measurement devices, GPS, PCs, Copiers, etc.</td> <td></td> </tr> <tr> <td>5) Local cost: Construction of Pilot WUA office and visitor centers, Farm ponds, 2 units of the piping network and pump station, Installation of flowmeter, etc.</td> <td></td> </tr> </table> </li> </ol>			Japanese Side	Moroccan Side	1) Experts: 19 persons	1) Staff allocated: 18 persons	2) Trainees received: 17 persons	2) Facilities: Pilot site, office space, and its utilities for the experts in ORMVAD	3) Third country training: 2 persons (Turkey), 4 persons (Egypt)	3) Local cost: Administrative and operational expenses	4) Equipment: Vehicles, Water, and Soil measurement devices, GPS, PCs, Copiers, etc.		5) Local cost: Construction of Pilot WUA office and visitor centers, Farm ponds, 2 units of the piping network and pump station, Installation of flowmeter, etc.	
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Project Period	July 2011 – July 2016 (Extension period: June 2016 – July 2016)	Project Cost	(ex-ante) 590 million yen, (actual) 645 million yen												
Implementing Agency	Ministry of Agriculture, Marine Fisheries, Rural Development and Water and Forests (MAPMDREF) Department of Irrigation and Agricultural Land Management (administrative reform in 2017 changed the designation formerly known as the Ministry of Agriculture and Marine Fisheries) Office Régional de Mise en Valeur Agricole des Doukkala (ORMVAD)														
Cooperation Agency in Japan	Ministry of Agriculture, Forestry, and Fisheries (MAFF), Rural Development Bureau														

## II. Result of the Evaluation

### <Constraints on Evaluation>

Due to travel restrictions and lockdown measures raised during the COVID-19 Pandemic, data gathered in the rural areas during the ex-post evaluation was lower both in quantity and quality as on-site data collection and direct observation were not as feasible as planned. Nonetheless, mitigation measures were taken as follows; 1) rely more on existing monitoring data collected prior to COVID-19, 2) increase scope of desk-based review of administrative data, 3) use of remote data collection and analysis methods where available.

### 1 Relevance

#### <Consistency with the Development Policy of Morocco at the Time of Ex-Ante Evaluation >

The project was consistent with the development policies of Morocco at the time of ex-ante evaluation. The "Green Morocco Plan" (2008-2020) was formulated to set the direction of the development of the agricultural sector. It eminently emphasized promoting high-valued/ high productive agriculture to be attained through water-saving irrigation. Furthermore, in order to mitigate adverse effects of water scarcity in the sector, the "National Programme of Water Saving Irrigation Phase I (PNEEI)" (2007-2020) was addressed to aim at a conversion of surface irrigation and sprinkler to drip irrigation for an area of 550,000 ha by the year 2020. In the Abda-Doukkala region, it aligned the regional policy with the PNEEI to aim at a conversion of a total of irrigated 96,000ha to drip irrigation for an area of 50,000 ha

by the year 2020.

<Consistency with the Development Needs of Morocco at the Time of Ex-Ante Evaluation >

The project was consistent with the needs of Morocco at the time of ex-ante evaluation. Due to looming climate change in recent years, it has become increasingly besieged by drought. Moreover, it was deemed that water demand in total would continue to increase as entailed economic development at large. Thus, to make the agriculture sector compatible as well as productive to make the development sustainable, it required a considerable level of anticipatory investment for the promotion of an irrigation system to the extent to adopt the use of efficient, water-saving techniques as broadly as possible.

<Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan’s ODA policy towards Morocco. As per strengthening economic competitiveness and sustainable economic growth, Japan intended to support sustainable development through environmental measures and appropriate resource management that utilize Japan's technologies. Also, concerning the reduction of economic and social disparities, Japan was to assist economic and social development, specifically focusing on infrastructure development for rural livelihood, including the water and health-related fields<sup>1</sup>.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the project completion. The cropping intensity ratio in the dry season was improved to 57.9% in the pilot project surpassed the target value of 50% (Indicator 1). The water productivity was increased by 83% (dry season), 55% (rainy season) in the pilot project site, both surpassed the target value of 30% (Indicator 2). The sales of agricultural products were almost doubled after the introduction of the drip irrigation system in the pilot site (Indicator 3). The water management system at the distribution level by ORMVAD was improved for increasing the efficiency ratio of irrigation and effective water operation through the analytical capacity improvement (Indicator 4). The extension plan on water-saving irrigation and agriculture was established, after being substantiated based on the empirical study and observation of the pilot site. (Indicator 5).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have been partially continued since project completion. According to the survey results of the ex-post evaluation, the cropping intensity ratio dropped to 34~35% in recent years although it used to remain around 50% several years after project completion. As for the water productivity, it palpably went through both an upsurge and plunge. At first, it rather drastically increased right after project completion in 2017. However, it was reversely directed in 2019 because water scarcity was too severe even for drip irrigation. On the other hand, despite the appeared recession in agriculture suggested above, the sales of the products did not experience that much decline. It remained larger in the sales in nominal terms compared to the figure before the introduction of drip irrigation. However, concerning the water management system once improved for upgraded irrigation system by the project, ORMVAD has been faced with the daunting task to deal with exceedingly scarce water distribution in recent years, rather than responding to expected irrigation demand for a water supply. In the meantime, the irrigation extension and water-saving agriculture plan have been mostly implemented as planned.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been partially achieved at the time of ex-post evaluation. According to the survey results of the ex-post evaluation, although the target level was not attained, 19.2 % of the area is equipped with drip irrigation (Indicator 1) The area of high profitable agricultural products is increased by 21.3 % (Indicator 2)

<Other Impacts at the time of Ex-post Evaluation>

There was no resettlement and land acquisition by the project so that no ramifications in this regard. However, it was reported that there was a concern that the electric expense for water pumping may have pushed down the profit margins of farmers who started using the irrigation system. Without preferential electricity fare structure, it would negatively affect the sustainable operation of the irrigation system in a long run. As such, the government has planned to set up a solar energy subsidy system for agriculture as part of the new “Generation Green” national strategy which is scheduled to be established in 2021-2030. ORMVAD has launched feasibility studies in order to ensure water-saving by optimization of the cost and benefit in operation. In addition, Moroccan Agency for Sustainable Energy (MASEN) has been in close contact with AWUA to study the possibility of financing solar pumping in the region.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results
(Project Purpose 1) The models for efficient irrigation are established in the pilot project site.	Indicator 1 The cropping intensity ratio in the dry season is improved to 50% in the pilot project site.	Status of the Achievement: achieved (partially continued) (Project Completion) • Compared to the baseline data of the indicator1 (1.3%, 3-year average data of 2008/09-2010/11), the cropping intensity ratio in the dry season in the pilot project site was improved by more than 50% (57.9%) in the 2014/15 dry season. (Ex-post Evaluation) • Although the total cropping area in the dry season was once markedly expanded from 30 ha in 2012/13 to 104 ha in 2014/15, But it was gradually shrunk to 53ha in 2018/19. As a result, the cropping intensity ratios dropped to 34% proportionally in 2018/19.
	Indicator 2 The water productivity is increased by 30% in the pilot project site.	Status of the Achievement: achieved (not continued) (Project Completion) • Compared with the data obtained after the introduction of drip irrigation, the water productivity in the dry season is improved by about 83%

<sup>1</sup> Ministry of Foreign Affairs, “ODA Country Databook” (2011)

		<ul style="list-style-type: none"> <li>and that in the rainy season is increased by about 55% from 2013 to 2015.</li> </ul> <p>(Ex-post Evaluation)</p> <ul style="list-style-type: none"> <li>Compared with the baseline data in the dry season in 2013, water productivity was drastically improved by 465% in the same season in 2017, one year after project completion. In 2019, however, it was sharply declined by -11% compared to a figure of the baseline year 2013, largely because of severe water scarcity.</li> </ul>
	<p>Indicator 3</p> <p>The sales of agricultural products are improved in the pilot project site.</p>	<p>Status of the Achievement: achieved (continued)</p> <p>(Project Completion)</p> <ul style="list-style-type: none"> <li>The sales of agricultural products were increased from 4,081,747DH (2012/13) to 7,665,900DH (2013/2014) after the introduction of the drip irrigation system in the pilot site in June 2014.</li> </ul> <p>(Ex-post Evaluation)</p> <ul style="list-style-type: none"> <li>After project completion, if ruled out the price fluctuation, the sales of agricultural products have remained within the range since 2014 as follows; 7,433,000DH (2014/15), 6,285,000DH (2015/16), 5,777,000DH (2016/17), 6,421,000DH (2017/18), 6,126,000DH (2018/19). It notably dropped in 2016/17, but it went back up in 2017/18. On the whole, it should be noted that it did not drop to the sales level of 2012/13 (4,081,747DH) before the introduction of the drip irrigation system.</li> </ul>
<p>(Project Purpose 2)</p> <p>The irrigation management system is improved in the Abda Doukkala irrigated Area.</p>	<p>Indicator 4</p> <p>The water management system at the distribution level by ORMVAD is improved for increasing the efficiency ratio of irrigation and effective water operation.</p>	<p>Status of the Achievement: achieved (not continued)</p> <p>(Project Completion)</p> <ul style="list-style-type: none"> <li>The project established a basis for a better water management system by installing 4 water flow meters in Prise 21 (P21) and neighboring three canals and another 4 water flow meters in a part of the Haut Service Principal Canal (HSPC) between P21 and haut service station (pump station).</li> <li>The project developed and shared digital maps and they developed thematic maps for hydraulic blocks. Furthermore, the Project established a support system operated by ORMVAD staff for facilities (water flow meters) procured by the Project by promoting the ORMVAD staff to keep operation records and developing the emergency communication system.</li> </ul> <p>(Ex-post Evaluation)</p> <ul style="list-style-type: none"> <li>The water management system at the distribution level managed by ORMVAD has not been improved to increase irrigation efficiency rate and the efficient use of water. Due to the chronic droughts in recent years, the quantity of irrigation water allocated to ORMVAD action zone has been lower than the quantity of water required for the realization of the planned irrigation campaign. The total volume of annual water consumption has been constantly dwindled to about 30 % of the level of 2013/14 by the year 2018/19. Under the circumstances, ORMVAD has been requested to be dedicated to the conventional method of periodic water release, rather than to respond to irrigation demand.</li> </ul>
	<p>Indicator 5</p> <p>The extension plan on water-saving irrigation and agriculture is established.</p>	<p>Status of the Achievement: achieved (continued)</p> <p>(Project Completion)</p> <ul style="list-style-type: none"> <li>Based on the results of the introduction of drip irrigation in the dry season of 2014, the project substantiated an extension plan for necessary procedures, the period of implementation, and agreed roles and responsibilities assigned for ORMVAD and AWUAs to convert irrigation farming areas into drip irrigation farming area. As identified above, the extension plan on water-saving irrigation and agriculture was duly established.</li> <li>In 2 selected sites (Al Laghawna al Fayd (CGR 310) and Assidq (CGR 311)), the construction work was started in 2016 with the due diligence process of local consensus on the drip irrigation system. Furthermore, Arrahma (CGR 351) was selected as a potential candidate by ORMVAD.</li> </ul> <p>(Ex-post Evaluation)</p> <ul style="list-style-type: none"> <li>The irrigation extension and water-saving agriculture plan have been implemented in a three-phased approach. So far, for the target of the 1<sup>st</sup> phase (12,000 ha), 80% of the target was completed. The 2<sup>nd</sup> phase (22, 000ha) was in progress at the time of the ex-post evaluation. The 3<sup>rd</sup> phase (10,000 ha) would be launched in 2021.</li> </ul>

(Overall Goal) Efficient irrigation models are adopted in the Abda Doukkala irrigated Area.	Indicator 1 25% of the area is equipped with drip irrigation.	(Ex-post Evaluation) partially achieved the percentage of irrigated area converted into drip irrigation was 10.4 % (= 10,043ha/ 96,000 ha) in the baseline year, whereas it was 19.2% (18,467ha/96,000ha) in 2019.				
			Baseline 2016	Target 2019	Actual 2017 2018 2019	
		Collective Irrigation (ha)	2,592	9,000	3,526	5,526 8,716
		Individual Irrigation (ha)	7,451	12,000	8,161	8,941 9,751
		Total	10,043	21,000	11,687	14,467 18,467
		Change ratio from baseline (%)	--	109.1%	16.3%	44.0% 83.8%
	Indicator 2 The area of high profitable agricultural products is increased by 40%.	(Ex-post Evaluation) partially achieved				
			Baseline 2015/16	Target 2018/19	Actual 2016/17 2017/18 2018/19	
		The area of high profitable agricultural products (ha)	16,4518	23,117.3	16,647.5	19,021.5 19,964.6
		Change ratio from baseline	--	40%	1.1%	15.6% 21.3%

Source : Questionnaire responses from ORMVAD

### 3 Efficiency

Both the project cost and project period slightly exceeded the plan (ratio against the plan: 109% and 102%, respectively). The outputs were produced as planned. Therefore, the efficiency of the project is fair.

### 4 Sustainability

#### <Policy Aspect>

The promotion of an efficient irrigation system has retained its importance in the national policy of the Government of Morocco. The “Green Morocco Plan” (2008-2020) remained valid for the promotion of the high-valued, productive agricultural sector. In line with national efforts to support the transition to green growth, the “National Programme of Water Saving Irrigation: Phase II (PNEEI 2)” (2020-2027) has been a policy instrument to ensure water resources protection and improve the living conditions of rural population through irrigation system through water-saving irrigation.

#### < Institutional/Organizational Aspect>

The major role of MAPMDREF has continued to ensure and supervise the promotion of the irrigation system. It has remained engaged in monitoring the progress. In addition to the follow-ups of the project, ORMVAD has continuously held itself responsible for the management and supervision of the newly introduced drip irrigation system in the Abda Doukkala region. Also, Office National du Conseil Agricole (ONCA) was established at the national and regional level in 2013 to reinforce agricultural development. In terms of the promotion of the project, ONCA agents and private supervisors have been involved through close liaison with farmers at the field level. According to the survey results, ORMVAD staff members have been assigned and they are all ex-counterpart staff who had on-site training and instruction on the drip irrigation system during the project. However, they perceive that manpower has been insufficient for the ever-increasing required workload and lack of human resources so that ONCA extension staff and advisors are expected to share the role. The capacities of AWUA have been reinforced by the project to ensure the sustainable management of the irrigation system including water distribution, maintenance of the canal network, and management of cropping patterns; however, farmers were affected by climate change, particularly water scarcity in the last 3 years, which had a negative influence on their production as well as income level. Given that no budget has been publicly allocated to AWUA and the principal financial resources of AWUA should be funded by payment of the membership fee of which became harder than ever for most farmers to afford, they are not able to fully involve in the project activities, regardless of the will.

#### <Technical Aspect>

According to the survey results, ORMVAD members acquired competencies and know-how through hands-on experience and on-the-job training in order to promote the system and activities introduced by the project. All the skills acquired during the project period have been maintained and shared with ONCA staff members. Also, the manuals produced by the project and other partners such as FAO have been amply utilized in the operation whenever needed.

#### <Financial Aspect>

Although there is no public budget allocation earmarked specifically to the dissemination of the drip irrigation system, the basic expenses for the mandatory operation of ORMVAD have been subsidized as a public corporation, also locally entitled to the revenue from water charge collection. Whereas AWUA, a farmers’ association, despite being an essential user/beneficiary organization in terms of the distribution of irrigation water, is not yet legally entitled to be publicly funded for the promotion of the drip irrigation system. Thus, related activities have remained stalled in the AWUA.

#### <Evaluation Result>

In light of the above, Slight problems have been observed in terms of institutional, and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

### 5 Summary of the Evaluation

The project has partially achieved the Project Purpose and the Overall Goal. As for sustainability, the necessary budget has not been provided to the farmers’ association for achieving the intended effect of bottom-up promotion. As for efficiency, the project cost and period slightly exceeded the plan.

Considering all of the above points, this project is evaluated to be partially satisfactory.

### III. Recommendations & Lessons Learned

#### Recommendations for Implementing Agency:

Due to unexpectedly severe water scarcity and entailed tight restrictions on water use, farmers have been facing a vicious circle of multiple difficulties. In using the water pump for drip irrigation, they are particularly burdened with the payment for higher electricity charges. Hence, many of them are no longer able to afford association membership fees or equipment maintenance costs to collectively promote drip irrigation. Farmers have no choice but to put off disseminating the new agricultural techniques and drip irrigation that they acquired in the project. Nonetheless, food security through the promotion of water-saving agriculture is a national priority to serve its basic needs, ORMVAD may need to negotiate with the National Office of Water and Electricity (ONEE) to solve the issue of disproportionate cost in electricity in drip irrigation as a common interest by proposing to install a solar-powered system which is expected to help farmers cope with water scarcity and decrease water demand (as soon as completion of the ongoing feasibility study by ORMVAD). Furthermore, in a larger picture of sustainable development in the region, ORMVAD should strategically coordinate with high officials of the central government and partners to mutually synergize the other projects. To initiate to establish an allied network with like-minded non-governmental institutions and international organizations is also recommended to support farmers dedicated to water-saving agriculture with technical assistance and extension activities in a timely manner.

#### Lessons Learned for JICA:

##### 1) Necessity to support the end-user association in a long-term perspective

Considering water availability as one of the decisive factors in the formulation of irrigation projects, it is proposed that the project should support AWUA through detailed planning focusing on their readiness for drought and establish an irrigation system to maintain a certain level of water productivity even during periods of drought. Besides, as one of the solutions to secure sustainability in anticipation of the system utilization after project completion, prior to project implementation, it is recommended that JICA should hold in-depth discussions regarding the financial aspect of the planned system, then seek a possibility of financial support of the state government to fund users of the system (e.g. AWUA) in order to facilitate effective management of drip irrigation in a self-sustaining way.

##### 2) In-depth study on climate variability and predictability for vulnerable partner countries

It is recommended to conduct an in-depth study on climate change and long-term projection which could help identify potential risks involved in the geographical and environmental situation in the target region. It would also serve to adopt appropriate technology to secure the resilience against natural conditions such as drought, weighing the pros and cons of them thoroughly given the changing circumstances within the foreseeable timeframe. It would have contributed to the readiness for the ramifications of climate change if experts had studied in this regard concerning the Doukkala region and provided them an assessment of water resources availability/vulnerability including options for adaptation and mitigation for sustainable management of water resources.



Transfer of Japanese know-how to Moroccan counterpart on drip irrigation techniques



Introduction of new crops by JICA drip irrigation project



Irrigation water storage basin during the project (2001-2016)



Irrigation water storage basin of today (2021)