Tunisia

Barbara Irrigation Project

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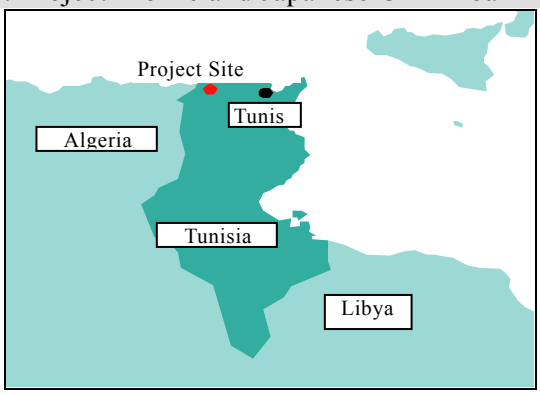
Field Survey: November 2006 and January 2007

1. Project Profile and Japanese ODA Loan



Map of project area

Farmer at Fernana Irrigation

1.1 Background

Tunisia's agricultural sector employs approximately 33% of the working population and produces approximately 14% of the GDP, making it an important sector for the country. Because the northwestern region of the country, which is the center of agricultural activity, primarily conducted rain-fed agriculture that depended on wintertime rainfall, agricultural productivity was unstable since it was affected by the weather.

1.2 Objective

The project's objective is to promote improvement in agricultural productivity and increase of agricultural production by irrigating 2,070 ha of farmland (cf. about one-third of the area inside Tokyo's Yamanote loop line (approx. 6,300 ha)) in Fernana and Haman Bourguiba which are located in Barbara, Jendouba Governorate (population approx. 410,000), northwest of the capital city of Tunis, and thereby contribute to improvement of the farmers' livelihoods and standard of living.

1.3 Borrower/Executing Agency

Government of the Tunisian Republic/ Ministère de l' Agriculture et des Ressourrces Hydrauliques

1.4 Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	1,913 million yen/1,518 million yen
Exchange of Notes / Loan Agreement	March 1998/March 1998
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 2.7%(Consulting Service: 0.75%) 25 years (7 years) (Consulting Service: 40 years (10 years)) General Untied (Consulting Service: Partially Untied)
Final Disbursement Date	October 2004
Main Contractors	—
Consultant Services	—
Feasibility Study (F/S), etc.	F/S: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1996） D/D: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1997）

2. Evaluation Result (Rating: D)

2.1 Relevance (Rating: a)

The relevance of the irrigation construction implemented by the project is analyzed from three perspectives, (1) the National 5-year Development Plan, (2) Water Resource Development Plan, and (3) the necessity of project implementation, considering each at the time of the appraisal (1996) and at the time of the ex-post evaluation (2006).

2.1.1 National 5-year Development Plan

In the 8th National 5-year Development Plan (1992-1996), "increased production of agricultural crops in the northwestern region" including Barbara is stated as a priority policy. Moreover in the 10th National 5-year Development Plan (2002-2006), "increased productivity and profitability of agricultural crops in the northwestern region" including Barbara is stated as a priority policy. Given this, "increased production of agricultural crops" is recognized as possessing consistently high priority in the National 5-year Development Plans.

2.1.2 Water Resource Development Plan

In the Water Resource Development Plan (prepared in 1992) as of 1996, "implementation of irrigation in Barbara" was mentioned as a priority issue. In the current Water Resource Development Plan (revised in 2000), "efficient usage of water for irrigation and agriculture in Barbara" continues to be mentioned as a priority issue. Given this, "implementation of irrigation in Barbara" is recognized as possessing consistently

high priority in Tunisia's Water Resource Development Plan.

2.1.3 Necessity of Project Implementation

This project, which aims to expand productivity including agricultural productivity by installing irrigation facilities in Barbara, is responsive to the demand for agricultural production, not only at the time of the project appraisal but also currently, and the necessity of implementing this project, both at the time of appraisal and currently, is recognized.

As seen above, the relevance of implementing this project is consistently recognized from the beginning to end.

2.2 Efficiency (Rating: b)

2.2.1 Output

The project's installation of irrigation facilities was implemented basically according to plan. Table 1 below shows the details of the plan at the time of appraisal and the actual output at the time of the ex-post evaluation.

Table 1: Irrigation Facilities

Plan (appraisal)	Actual (ex-post evaluation)	Alterations
(1) Regulating reservoir, 1 site (Haman Bourguiba: 150 m³)	(1) Regulating reservoir, same as left	As planned
(2) Pump stations, 5 sites (3 pumps each at 3 sites in Fernana; 6 pumps and 3 pumps, respectively, at 2 sites in Haman Bourguiba	(2) Pump stations, same as left (4 to 5 pumps each at 3 sites in Fernana; Haman Bourguiba, same as left)	Increased in Fernana for efficient facility operation to meet demand
(3) Reservoir, 3 sites (2 sites of 7,000 m³ and 4,000 m³ in Fernana; 1 site of 6,000 m³ in Haman Bourguiba)	(3) Reservoir, same as left	As planned
(4) Water pipes（5.9km）	(4) Water pipes（6.6km）	Basically as planned
(5) Tertiary canals (80.4km)	(5) Tertiary canals (78.0km)	Basically as planned
(6) Consulting services 14MM	(6) Consulting services, same as left	As Planned

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

2.2.2 Project Period

The project period planned at the time of appraisal was March 1998 to December 2001, or 46 months, but the actual project period was March 1998 to August 2004, or 78 months, representing a delay of 32 months (170% of the planned period). The main reasons for the delay were the time required to prepare for the bidding, etc., (extended from 7 months to

18 months). Moreover, there was a delay in the civil engineering work overall (extended from 35 months to 48 months) because of delayed delivery of concrete pipes due to inadequate manufacturing capacity of the contractor who was awarded the contract, following an increase in domestic demand for concrete pipes mainly from Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE) and Office National de l'Assainissement (ONAS), together with the delays in land reallocation and the delays caused by interruptions in construction due to heavy rains and flooding in the winter of 2002.

2.2.3 Project Cost

The total project cost planned at the time of the appraisal was 2,823 million yen (Japanese ODA loan portion: 1,913 million yen). The actual cost, at 1,750 million yen (Japanese ODA loan portion: 1,518 million yen) was less than the planned cost. The reasons for the reduction in cost were depreciation of the local currency and the efficient awarding of contracts through competitive bidding.

2.3 Effectiveness (Rating: c)

2.3.1 Area Benefited by Irrigation and Number of Persons Benefited by Irrigation

This project installed irrigation facilities in Fernana and Haman Bourguiba. The area which benefited by irrigation was 1,874 ha, slightly above the planned area of 1,863 ha. Through this, the number of farm households benefited by irrigation was 555 farm households, which exceeded the planned number of 539 farm households. On the other hand, because the number of family members per farm household decreased, the number of persons benefited was slightly lower than assumed at the time of appraisal.[1]

However as of 2006, usage of irrigation was not progressing because most of the farm households in Fernana and Haman Bourguiba need financing to introduce terminal irrigation equipment such as sprinklers, and since they are concerned about repaying the loans, they are taking a wait-and-see attitude toward the activities of the few farm households that are introducing the equipment at this time. In addition, the farmers do not possess adequate knowledge of techniques for irrigation farming and of planting various types of crops. Another reason why usage of irrigation is not progressing in Haman Bourguiba is the fact that introduction of irrigation facilities is behind schedule due to delays in dividing the farm fields (Table 2 and Table 3).

[1] The number of persons per farm household in 1997 was about 5.1 persons in Fernana and about 6.4 persons in Haman Bourguiba. However, the number of persons per farm household at the time of the ex-post evaluation in 2006 was about 4.6 persons in Fernana and 4.5 persons in Haman Bourguiba.

Table 2: Area Benefited by Irrigation

	Area Benefited by Irrigation		
	Plan	Actual	Current (of the "Actual," farmland currently actually irrigated)
Fernana Irrigation	1,170 ha	1,094 ha	147 ha
Haman Bourguiba Irrigation	693 ha	780 ha	44 ha
Total	1,863 ha	1,874 ha	191 ha

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Table 3: Number of Persons Benefited by Irrigation

	Number of Persons Benefited by Irrigation		
	Plan	Actual	Current (of the "Actual," farm households currently actually irrigating)
Fernana Irrigation	1,170 ha containing 320 farm households (1,632 persons)	1,094 ha containing 327 farm households (1,504 persons)	147 ha containing 72 farm households (331 persons)
Haman Bourguiba Irrigation	693 ha containing 219 farm households (1,402 persons)	780 ha containing 228 farm households (1,026 persons)	44 ha containing 25 farm households (112 persons)
Total	1,863 ha containing 539 farm households (3,034 persons)	1,874 ha containing 555 farm households (2,530 persons)	191 ha containing 97 farm households (443 persons)

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

2.3.2 Cultivated Area and Yield per Unit Area, by Major Crops

Below (on Table 4) is a comparison of the planned and actual figures (total) for the cultivated area, by major crops, in Fernana and Haman Bourguiba. Because of their low profitability, wheat, oats for animal feed, barley, and sugar beets were hardly cultivated at all using irrigation, but approximately 1,213 ha of these crops were cultivated using rain-fed agriculture. On the other hand, because of their high profitability, irrigated cultivation was started for tobacco, potatoes, and watermelon; however, due to the reasons stated in 2.3.1 and because this was the build-up period to accustom the fields to cultivation (a period for new fields that are put into cultivation that ordinarily lasts 5 years from the completion of regular irrigation projects like this one), irrigation is

currently not yet progressing as planned.

Table 4: Cultivated Area Using Irrigation, by Major Crops

	Plan	Actual (2006)
Wheat	545 ha	0 ha
Oats for animal feed	501 ha	0 ha
Barley	118 ha	0 ha
Sugar beet	115 ha	0 ha
Tobacco	104 ha	47 ha
Potatoes	100 ha	23 ha
Watermelon	85 ha	32 ha
Other	295 ha	89 ha

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Meanwhile, the yield per unit area of irrigated crops basically met the planned level as well as the average in Tunisia, except for watermelon (Table 5).

Table 5: Yield per Unit Area Using Irrigation, by Major Crops (t/ha)

	Plan	Actual (2006)	Average in Tunisia
Tobacco	2	2	2
Potato	15	13	14
Watermelon	27	9	17

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

However, it is expected that the above-mentioned issues will be alleviated in the future due to the reasons below and that improvements will progress in the cultivated area and the yield per unit area. Usage of irrigation is deemed likely to progress because 1) JBIC is launching activities in Fernana, including instruction on planting, and 2) since the effects of irrigation are progressively becoming visible during the build-up period, the stance of farm households towards irrigation is improving.

2.3.3 Irrigation Fee Collection Rate

Table 6: Irrigation Fee Collection Rate

	Irrigation Fee Collection Rate	
	Plan	Actual (2006)
Fernana Irrigation	100%	100%
Haman Bourguiba Irrigation	100%	0%

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

It was planned to collect 100% of the irrigation fee in both Fernana and Haman Bourguiba in this project. In Fernana, 100% collection was achieved as planned, but in Haman Bourguiba, the collection rate was 0% because nearly all of the farmers have not yet harvested their first year's crops (i.e., had not yet received cash for their crops) and so are unable to pay the irrigation fee to the farmers' association (GDA).

2.3.4 Profit Increase due to Increased Production of Agricultural Crops

This project planned to increase profit by increasing production of agricultural crops in the amount of 2,379,000 dinars (approximately 214 million yen) in the second year following completion. However, the actual increase was around 683,000 dinars (approximately 61 million yen).

2.3.5 Economic Internal Rate of Return（EIRR）

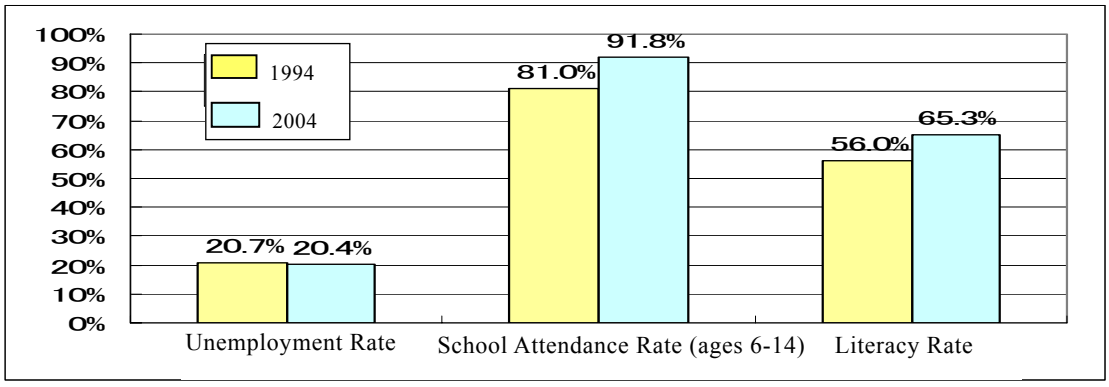
The project's economic internal rate of return (EIRR) planned at the time of appraisal was 10.1%, and when the EIRR was recalculated under the same conditions[2], it was 7.0%.

2.4 Impact

2.4.1 Improvement of Social Environment

In the Jendouba Governorate where Fernana and Haman Bourguiba are located, improvements in the following social indicators (Figure 1) were visible between 1994 prior to the project and 2004, the year of project completion. However, a direct correlation with this project has not been confirmed.

Figure 1: Social Indicators in Jendouba Governorate



source: National Statistics Institute

[2] The benefits are assumed to be an increase in agricultural production and creation of new employment, and the costs are assumed to be the project cost and operation and maintenance expense.

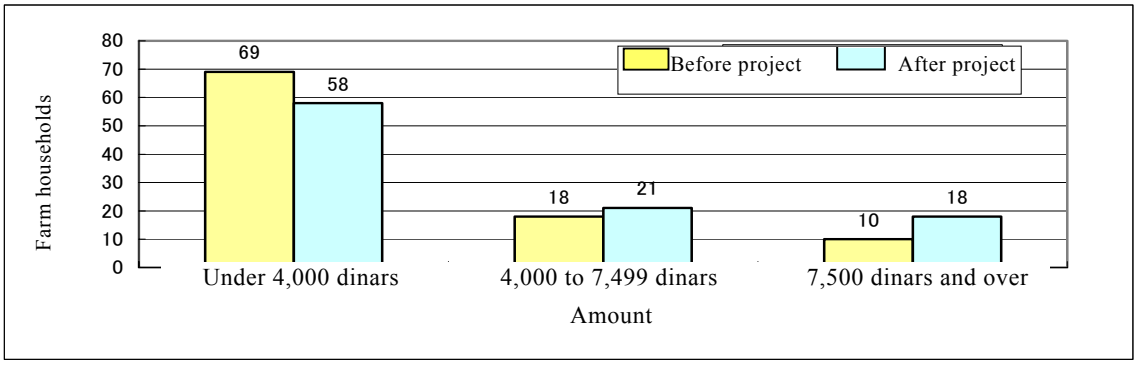
2.4.2 Results of Irrigation Beneficiary Survey

The below-mentioned (1) through (3) were ascertained when a beneficiary survey was conducted on all 97 farm households which benefited from the project and which are currently irrigating (72 farm households in the Fernana irrigation project and 25 farm households in the Haman Bourguiba irrigation project).

(1) Employment creation: Through this project, a total of 5,607 days of employment (men, 45 days; women, 5,562 days) were created involving work related to irrigation and farming. Moreover, it is likely that the striking increase in the employment of women had a positive impact on the social advancement of women.

(2) Annual farm income: It was ascertained that annual farm income per farm household increased following the project in comparison to before the project, from 4,414 dinars (about 400,000 yen) to 6,283 dinars (about 570,000 yen).[3] The income of 6,283 dinars is 80% of the annual average farm income per farm household in Tunisia (7,875 dinars) at the time of the ex-post evaluation. Moreover, through analysis that divided 97 farm households into three groups (income less than 4,000 dinars, income from 4,000 to 7,499 dinars, and income 7,500 dinars and over), it was ascertained that approximately 19% of the total were farm households in which the annual average farm income per farm household was near the Tunisian average or above average (i.e., at or above the 7,500 dinars of Group 3); furthermore, although the increase of 142% was largely due to the uplifting effects of 18 farm households in Group 3, it was also ascertained that there was a bottom-raising effect seen in improvements in Groups 1 and 2 (Figure 2).

Figure 2: Farm Households according to Annual Average Farm Income per Farm Household



source: Beneficiary Survey

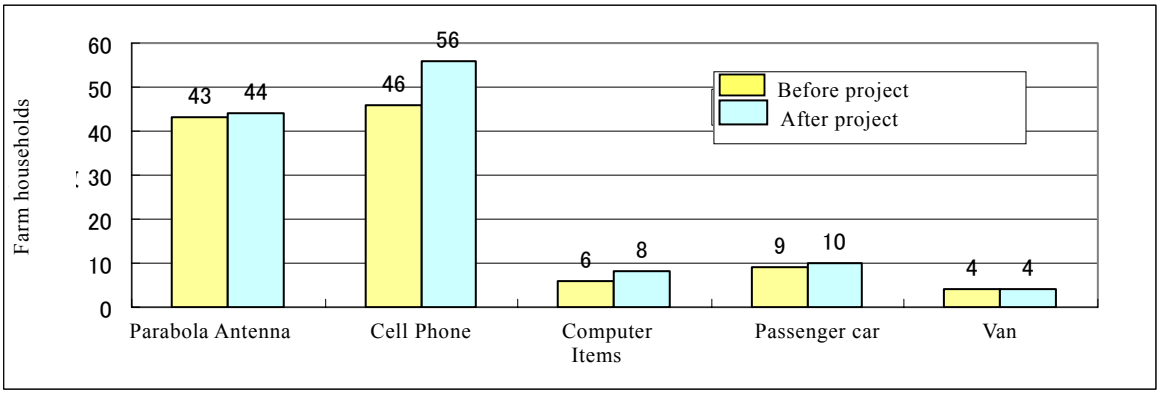
[3] There was an increase even if the average price increase (approximately 3%) during the project period is taken into account.

Potato cultivation in Fernana

Tobacco cultivation in Haman Bourguiba

(3) Farm households' asset ownership: There is a slight uptrend in asset ownership before and after project implementation, which suggests an improvement in farmers' standard of living (e.g., access to information seems to have become easier than prior to the project for 10 farm households that newly purchased cell phones) (Figure 3).

Figure 3: Farm Households' Asset Ownership



source: Beneficiary Survey

2.4.3 Other Impact

There was no land acquisition or resident relocation involved in the implementation of this project. Moreover, no problems due to salt damage have occurred on the irrigated land following project completion.

2.5 Sustainability (Rating: b)

2.5.1 Operation and Maintenance Agency

Main Irrigation Facilities: Commissariat Régional au Développement Agricole (CRDA), Jendouba Governorate

2.5.1.1 Technical Capacity

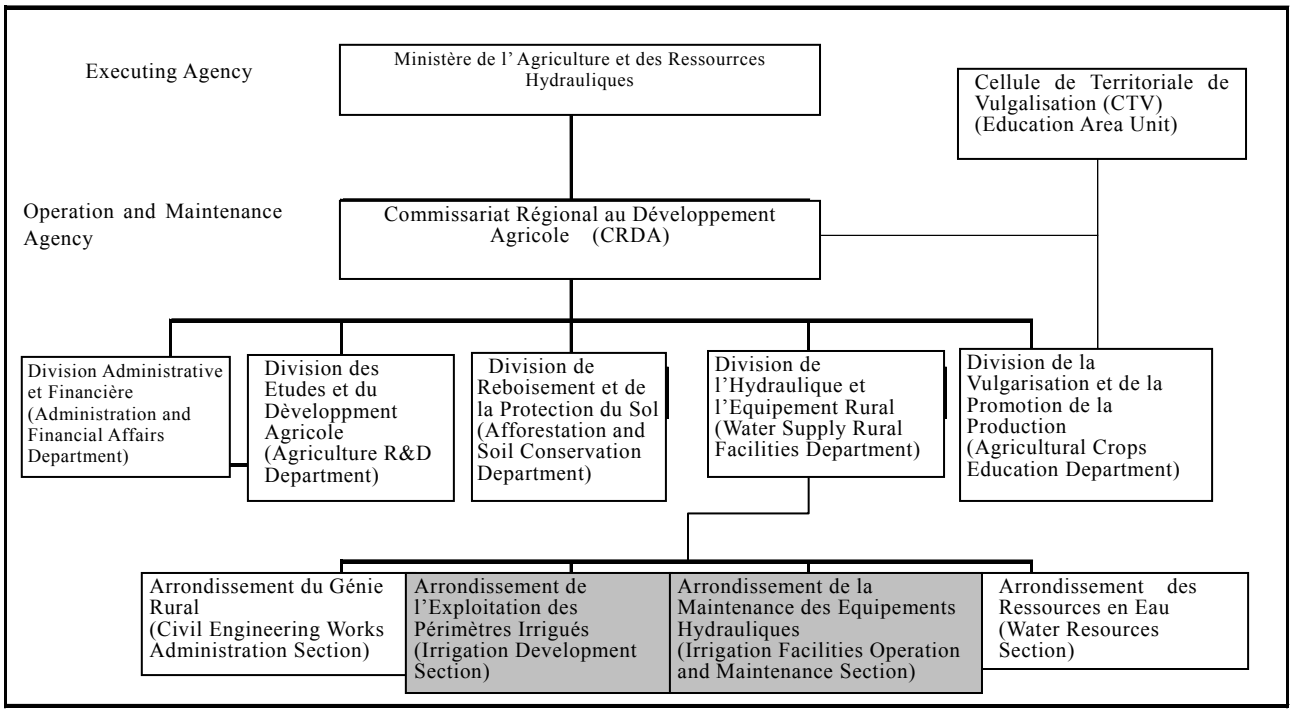
The CRDA does not provide adequate planting guidance to the GDA (the farmers' association). Also, there are no problems in CRDA's operation and maintenance of the regulating reservoir, pump stations, or other reservoirs, etc., for which it is responsible, but CRDA provides inadequate guidance to GDA concerning operation and maintenance of equipment for tertiary and lower-ranked canals for which the GDA is responsible. However, JBIC launched technical assistance at CRDA in the Jendouba Governorate prior to this ex-post evaluation with the cooperation of a consultant in Tunisia. Through this, the GDA is receiving planting guidance (instruction in rotation irrigation and the suitable amount of irrigation as well as adjustment of irrigation hours, etc.) and guidance in operation and management (suggestions on suitable flow amount for each water tap, etc.),[4] and so the sustainability of technical capacity is likely to increase.

2.5.1.2 Operation and Maintenance System

The CRDA has one office in each governorate, located in the regional offices of the Ministère de l' Agriculture et des Ressourrces Hydrauliques. The operation and maintenance staff at the CRDA office in Jendouba Governorate consists of 8 persons assigned to the Irrigation Development Section (Arrondissement de l'Exploitation des Périmètres Irrigués) and the Irrigation Facilities Operation and Maintenance Section (Arrondissement de la Maintenance des Equipements Hydrauliques) of the Water Supply Rural Facilities Department (Division de l'Hydraulique et l'Equipement Rural), in addition to 4 irrigation support staff in the Cellule de Territoriale de Vulgalisation (CTV) who educate concerning irrigation and provide guidance concerning planting. By and large, there are no problems in the operation and maintenance system.

[4] The same support was launched at the CRDA in Béja Governorate for another ODA loan in Tunisia, the Water Pipeline Construction and Irrigation Project in North Tunisia.

Figure 4: Commissariat Régional au Développement Agricole (CRDA)



source: CRDA, Jendouba Governorate

2.5.1.3 Financial Status

CRDA has maintained a surplus since 2003. Its annual income increased during 2003 through 2005 from 3.5 million dinars (approximately 310 million yen) to 5.13 million dinars (approximately 460 million yen). The main sources of income are the cost allocation budget from the Ministère de l' Agriculture et des Ressourrces Hydrauliques and sales of water for irrigation. The budget is adequate for the operation and maintenance of irrigation facilities in Fernana and Haman Bourguiba. Given that sales of water for irrigation are likely to further increase as usage of irrigation expands in the future, there are no problems in the financial status overall.

2.5.2 Operation and Maintenance Agency

Part of the Irrigation Equipment:

Fernana Irrigation; Groupement de Développement Agricole（GDA）

Haman Bourguiba Irrigation: Groupement de Développement Agricole（GDA）

2.5.2.1 Technical Capacity

Neither the Fernana GDA nor the Haman Bourguiba GDA has sufficient knowledge or technology for planting. Also, their knowledge and technology is insufficient for operation and maintenance of equipment for tertiary canals, lower-ranked canals, and

drainage canals. However, JBIC launched technical assistance for the Fernana GDA prior to this ex-post evaluation with the cooperation of a consultant in Tunisia. Through this, the GDA is receiving planting guidance (concerning adjustment of amount of irrigation depending on soil quality and crop, etc.) and guidance in operation and management (through preparation of an operation and maintenance manual for sprinklers and drip irrigation equipment in addition to tertiary canals and drainage canals),[5] and so the sustainability of technical capacity is likely to increase. The above-mentioned technical assistance is not being provided for the Haman Bourguiba GDA due to JBIC budget considerations, but improvements due to JBIC assistance in the Fernana irrigation may be expected to have a ripple effect on the Haman Bourguiba irrigation through exchange of information between the GDAs and the farmers because of their geographical proximity.

2.5.2.2 Operation and Maintenance System

The Fernana GDA consists of an association head, a treasurer, four office staff, one technician, and two supervisors. Overall there are no problems in the operation and maintenance system. The Haman Bourguiba GDA plans to adopt the same staff structure as the Fernana GDA, but as it still lack a treasurer, office staff, and a technician, concerns remain regarding its operation and maintenance system.

2.5.2.3 Financial Status

The Fernana GDA collected 100% of its irrigation fees, which are the main funding for its activities, and there are no problems in its financial status. However, the Haman Bourguiba GDA, as explained above, has not begun collection of irrigation fees (the plan is to begin collection in 2007), and so concerns remain regarding its financial sustainability.

2.5.3 Operation and Maintenance Status

At the current point in time, there are no problems in the operation and maintenance condition of the two irrigation facilities.

3. Feedback

3.1 Lessons Learned

When implementing a new irrigation project in a region unaccustomed to irrigation, while installing infrastructure, it is also important to provide education concerning

[5] The same support was launched at the Nefza GDA for another Japanese ODA loan project in Tunisia, the Water Pipeline Construction and Irrigation Project in North Tunisia.

irrigation and to provide technical and financial assistance to stimulate actual implementation of irrigation.

3.2 Recommendations

1. In Fernana or in Haman Bourguiba, or in both, it is important to stimulate independent efforts by the Tunisian government itself (i.e., gratis provision of seeds and irrigation water, provision of subsidies for introduction of irrigation equipment, and assistance with loan applications at banks), such as those being undertaken in Sejunane, the project site of another Japanese ODA loan project in Tunisia, the Water Pipeline Construction and Irrigation Project in North Tunisia.

2. Because the irrigation in Fernana and Haman Bourguiba is still in the build-up period, it is important to utilize JBIC's ex-post monitoring scheme and to measure once again the effects, impact, and sustainability at the point 7 years after completion. Moreover, considering the need for a build-up period, it would be desirable to consider the timing of implementation of future ex-post evaluations of irrigation projects, taking the build-up period into consideration.

Comparison of Original and Actual Scope

Item	Plan	Actual
1. Output	(1) Regulating reservoir, 1 site (Haman Bourguiba: 150 m³) (2) Pump stations, 5 sites (3 pumps each at 3 sites in Fernana; 6 pumps and 3 pumps, respectively, at 2 sites in Haman Bourguiba) (3) Reservoir, 3 sites (2 sites of 7,000 m³ and 4,000 m³in Fernana; 1 site of 6,000 m³ in Haman Bourguiba) (4) Water pipes（5.9km） (5) Tertiary canals (80.4km) (6) Consulting services 14MM	(1) Regulating reservoir, same as left (2) Pump stations, same as left(4 to 5 pumps each at 3 sites in Fernana; Haman Bourguiba, same as left) (3) Reservoir, same as left (4) Water pipes（6.6km） (5) Tertiary canals (78.0km) (6) Consulting services, same as left
2. Project Period	March 1998–December 2001 (46 months)	March 1998-August 2004 (78 months)
3. Project Cost Total ODA Loan Portion Exchange Rate	2,823 million yen 1,913 million yen 1 dinar =110 yen (as of July 1997)	1,750 million yen 1,518 million yen 1 dinar = 85.96 yen (weighted average during project period)