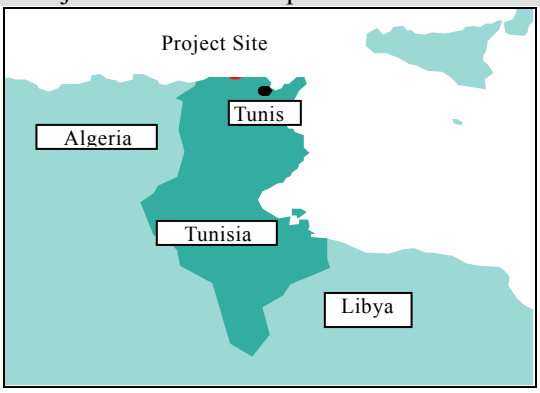
Tunisia

Water Pipeline Construction and Irrigation Project in North Tunisia

External Evaluator: Koichiro Ishimori
(Value Frontier Co., Ltd.)

Field Survey: November 2006 and January 2007

1. Project Profile and Japanese ODA Loan



Map of project area

Aqueduct

1.1 Background

In the capital city of Tunis, which is the center of political and economic activity in Tunisia, an increasing amount of water was being used, and the demand for tap water, including drinking water, was rising due to the fact that the population was growing at an annual average of 2% and the living environment was also improving as the country developed economically.[1]

Moreover, 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 northern 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 a stable supply of tap water and improvement of water quality in Tunis, etc., by adding an expansion to approximately 80 km (the Sejnane Dam - Medjerdah Canal section) of the aqueduct which was installed from the Sidi el Barrak Dam (effective storage, 1.9 million m³, approximately 1.2 times the Kurobe Dam in Toyama Prefecture, Japan) in Béja Governorate (population approximately 300,000) northwest of the capital city of Tunis to Medjerdah Canal on the outskirts of Tunis,

[1] The annual average GDP growth rate during the 1990s was approximately 4%.

thereby contributing to the improvement of public welfare. Moreover, the project will promote increased production, including improvement of agricultural productivity, by irrigating 4,420 ha of farmland (cf. about two-thirds of the area inside Tokyo's Yamanote loop line (approximately 6,300 ha)) in Nefza, Béja Governorate, and in Sejnane, Bizerte Governorate, the main water source of which is the above-mentioned Sidi el Barrak Dam, thereby contributing to improvement of 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	14,130 million yen/ 10,711 million yen
Exchange of Notes/Loan Agreement	January 1996/February 1996
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 2.7%(Consulting Service: 2.3%) 25 years (7 years) General Untied
Final Disbursement Date	December 2004
Main Contractors	EL KANAOUET (Tunisia) SOMATRA・GET (Tunisia), BONNA (Tunisia)
Consultant Services	SELKHOZPROMEXPORT (Russia)
Feasibility Study (F/S), etc.	**Aqueduct Facilities Construction** F/S: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1982） D/D: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1993） **Irrigation Facilities** F/S: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1995） D/D: Ministère de l' Agriculture et des Ressourrces Hydrauliques（1997）

2. Evaluation Result (Rating: B)

2.1 Relevance (Rating: a)

The relevance of the aqueduct facilities construction and 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 loan agreement (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), "supply of tap water to urban areas" and "increased production of agricultural crops in the northern region" are stated as priority policies. These policies are maintained in the 9th National 5-year Development Plan (1997-2001). In the 10th National 5-year Development Plan (2002-2006), "efficient supply and improvement in quality of tap water" as well as "increased productivity and profitability of agricultural crops in the northern region" are stated as priority policies. Given this, "supply of tap water" and "increased production of agricultural crops" are recognized as possessing consistently high priority in the National 5-year Development Plans.

2.1.2 Water Resource Development Plan

Because there is heavy rainfall during the wintertime in northern Tunisia and high-quality surface water is available, in the Water Resource Development Plan (prepared in 1992) as of 1996, "supply of tap water to Tunis, etc. by developing water resources in the north" and "implementation of irrigation in the north" were mentioned as priority issues. In the current Water Resource Development Plan (revised in 2000), "supply of tap water to Tunis, etc. by developing water resources in the north" and "implementation of irrigation in the north" as well as "efficient usage of water for agriculture" continue to be mentioned as priority issues. Given this, "supply of tap water to Tunis, etc. by developing water resources in the north" and "implementation of irrigation in the north" are 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 install irrigation facilities in Nefza and Sejnane in the north, together with ensuring the tap water supply in Tunis, etc., by expanding the aqueduct that runs from the north to the outskirts of Tunis, is responsive to the demand for tap water and 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.

2.2 Efficiency (Rating: b)

2.2.1 Output

The project's installation of aqueduct and irrigation facilities was implemented basically according to plan. Tables 1 and 2 below show the details of the plan at the time of appraisal and the actual output at the time of the ex-post evaluation.

Table 1: Aqueduct Facilities

Plan (appraisal)	Actual (ex-post evaluation)	Alterations
(1) Sejnane - Joumine Aqueduct 35.8km Pump station, 1 site (7 pumps)	(1) Sejnane - Joumine Aqueduct 37.0km Pump station, same as left	Basically as planned
(2) Joumine - Medjerdah Aqueduct 45.0km Pump station, 1 site (4 pumps)	(2) Joumine - Medjerdah Aqueduct 47.2km Pump stations, same as left	Basically as planned
(3) Consulting services 433MM	(3) Consulting services 746MM	Expanded due to extension of project period, etc.

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Table 2: Irrigation Facilities

Plan (appraisal)	Actual (ex-post evaluation)	Alterations
Nefza Irrigation		
(1) Pump station, 1 site (5 pumps)	(1) Pump station, same as left	As planned
(2) Reservoirs, 2 sites (500 m^3、33,000 m^3)	(2) Reservoirs, same as left	As planned
(3)Primary and secondary canals (5.1km)	(3)Primary and secondary canals (30km)	Extended due to expansion of irrigated area
(4) Tertiary canals (107km)	(4) Tertiary canals (116km)	
(5) Drainage canal (18km)	(5) Drainage canal, same as left	As planned
(6) Farm roads (63km)	(6) Farm roads (70km)	Extended due to expansion of irrigated area
Sejnane Irrigation		
(1) Pump stations, 4 sites (9 pumps)	(1) Pump stations, 4 sites (8 pumps)	The number of pumps was reduced by 1 due to a partial change in the area to be irrigated, and this caused no problem in irrigation.
(2) Reservoirs, 4 sites (1 site, 2,500 m^3; 2 sites, 3,000 m^3; 1 site, 7,000 m^3)	(2) Reservoirs, 8 sites (1 site 30 m^3; 7 sites 300 m^3)	To respond more effectively to demand, 4 medium-size reservoirs were altered to 8 small-size reservoirs.

(3)Primary and secondary canals (31km)	(3)Primary and secondary canals (28km)	Basically as planned
(4) Tertiary canals (129km)	(4) Tertiary canals (143km)	Extended due to expansion of irrigated area
(5) Drainage canals (12km)	(5) Drainage canals (93km)	Drainage canals were expanded to avoid accumulation of silt during the rainy season, out of consideration for the soil environment in the expanded irrigation area.
(6) Farm roads (100km)	(6) Farm roads (52km)	This project constructed only 52 km due to the delay in building branch roads because of the delay in dividing farm fields by the AFA (Agence Foncière Agricole) during the project period. However, the remaining portion is scheduled to be built by the Commissariat Régional au Développement Agricole (CRDA) in the Bizerte Governorate, which exercises jurisdiction over the Sejnane irrigation.
Nefza Irrigation, Sejnane Irrigation		
(1) Consulting services 235MM	(1) Consulting services 308MM	Expanded due to extension of project period, etc.

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

2.2.2 Project Period

The project period planned at the time of appraisal was February 1996 to December 1999, or 47 months, but due to delays in both the aqueduct facility construction and the irrigation facility construction, the actual project period was February 1996 to December 2004, or 107 months. The main reasons for the delay were the time required to prepare for the bidding, etc., (extended from 10 months to 16 months), and moreover, the delay in the civil engineering work overall (extended from 36 months to 85 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 Tunisia's Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE) and Office National de l'Assainissement (ONAS), together with delays in dividing the farm fields 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 18,840 million yen (Japanese ODA loan portion: 14,130 million yen). The actual cost, at 13,089 million yen (Japanese ODA loan portion: 10,711 million yen) was less than the planned cost. The reasons for the reduction in cost were the efficient awarding of contracts through competitive bidding and reduction of reservoir construction cost.

2.3 Effectiveness (Rating: b)

-Aqueduct Facilities

2.3.1 Aqueduct Water Volume

Because one objective of the construction of aqueduct facilities by this project was to expand the aqueduct between the Sejnane Dam and the Medjerdah Canal on the outskirts of Tunis so as to increase the aqueduct's water volume in order to increase the supply of tap water in Tunis, etc., the water volume of the aqueduct in the project site between Sejnane - Joumine and between Joumine - Medjerdah was verified. The actual daily average aqueduct water volume for the Sejnane - Joumine section was 63% of the 2010 target level and for the Joumine - Medjerdah section was 65% of the 2010 target level. The Tunisian government reviewed the aqueduct plan in order to respond to the future demand for tap water in Tunis, etc., and in March 2004 signed a new Japanese ODA loan agreement for the Water Pipeline Construction Project in North Tunisia which promotes further expansion of the aqueduct in the same area as this project. Thus, it appears that flexible operation will be promoted, including for the aqueduct built by this project, so that a stable water supply is ensured in the future.

Table 3: Daily Average Aqueduct Water Volume

Daily average aqueduct water volume	Plan (2010)	Actual (January – September 2006)
Sejnane-Joumine Section	Average 291,370 m³	Average 185,567 m³
Joumine-Medjerdah Section	Average 291,370 m³	Average 190,418 m³

source: SECADENORD

A trial calculation of the number of persons who may be thought to have benefited from this project's construction of aqueduct facilities indicates that there are approximately 1.6 million beneficiaries.[2]

[2] In the case where the daily average aqueduct water volume in the Joumine-Medjerdah section which feeds the Medjerdah Canal, the source of drinking water for Tunis, is divided by daily average water usage volume

2.3.2 Saline Concentration of Drinking Water Source

Because this project's construction of aqueduct facilities also has the objective of reducing the saline concentration in the drinking water source in Tunis, etc., the saline concentration in the Medjerdah Canal, which is the drinking water source for Tunis, was verified. The saline concentration was reduced from 1.11 g/ℓ in 1996 (prior to project implementation) to 0.75 g/ℓ in 2005 (after project implementation). This is an improvement that not only meets the Tunisian standard for saline concentration of drinking water (2.5 g/ℓ or less), but also meets the standards of the World Health Organization (WHO) (1.0 g/ℓ or less)

-Irrigation Facilities

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

This project installed irrigation facilities in Nefza and Sejnane. The total area which benefited by irrigation, at 5,378 ha, exceeded the planned area of 4,420 ha.[3] In addition to expanding the area benefited by irrigation, new beneficiaries were created through the redivision of farm fields, and so a rough estimate of the total number of irrigation beneficiaries indicates 3,400 farm households (15,784 persons), exceeding the planned figure of 1,850 farm households (12,350 persons).

However as of 2006, usage of irrigation was behind schedule because most of the farm households in Nefza and Sejnane lack knowledge and technology needed for planting each type of crop. They also need financing to introduce irrigation equipment in their fields but are concerned about repaying the loans, and so they are taking a wait-and-see attitude toward the activities of the few farm households that are introducing the equipment at this time. Moreover in Sejnane, a misfortune occurred in which the pump station for the main water source, which was built by multinational aid organizations, malfunctioned, and so water could not be pumped there until the summer of 2005. (Tables 4 and 5)

(119ℓ) per person in Tunis in 2006.

[3] As a result of careful examination of the effective storage of the dam and the irrigation plan, it was determined that an increase in irrigation usage could be handled.

Table 4: Area Benefited by Irrigation

	Area Benefited by Irrigation		
	Plan	Actual	Current (of the "Actual," farmland currently actually irrigated)
Nefza Irrigation	1,585 ha	2,223 ha	901 ha
Sejnane Irrigation	2,835 ha	3,155 ha	7 ha
Total	4,420 ha	5,378 ha	908 ha

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Table 5: Number of Persons Benefited by Irrigation

	Number of Persons Benefited by Irrigation		
	Plan	Actual	Current (of the "Actual," farm households currently actually irrigating)
Nefza Irrigation	1,585 ha containing 1,000 farm households (8,100 persons)	2,223 ha containing 980 farm households (4,410 persons)	901 ha containing 398 farm households (1,791 persons)
Sejnane Irrigation	2,835 ha containing 850 farm households (4,250 persons)	3,155 ha containing 2,420 farm households (11,374 persons)	7 ha containing 5 farm households (24 persons)
Total	4,420 ha containing 1,850 farm households (12,350 persons)	5,378 ha containing 3,400 farm households (15,784 persons)	908 ha containing 403 farm households (1,815 persons)

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

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

Below (on Table 6) is a comparison of the planned and actual figures (total) for the cultivated area, by major crops, in Nefza and Sejnane. Because of their low profitability, corn and oats for animal feed were hardly cultivated at all using irrigation, but approximately 2,055 ha of these crops were cultivated using rain-fed agriculture. On the other hand, because of their high profitability, irrigated cultivation was started for watermelon, tobacco, pears, and spring onions; however, due to the reasons stated in 2.3.3 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 6: Cultivated Area Using Irrigation, by Major Crops

	Plan	Actual (2006)
Corn for animal feed	1,326 ha	1 ha
Oats for animal feed	1,147 ha	0 ha
Watermelon	573 ha	311 ha
Tobacco	512 ha	164 ha
Pears	430 ha	58 ha
Spring onions	385 ha	80 ha
Other	47 ha	294 ha

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Meanwhile, the yield per unit area of irrigated crops was below the planned level as well as the average level in Tunisia for most of the crops. (Table 7).

Table 7: Yield per Unit Area Using Irrigation, by Major Crops (t/ha)

	Plan	Actual (2006)	Average in Tunisia
Corn for animal feed	35	30	40
Oats for animal feed	6	0	NA
Watermelon	30	12	17
Tobacco	2	2	2
Pears	5	6	17
Spring onions	20	7	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 Nefza, including instruction on planting, and in Sejnane the Tunisian government has started a pilot program (the contents of which are unique to Sejnane, with gratis provision of seeds and irrigation water, funding of 60% of the initial investment cost of introducing irrigation facilities, and assistance in filling out loan application forms at banks), and 2) since the effects of irrigation are progressively becoming visible during the build-up period, it is likely that the negative stance of farm households toward irrigation will improve and that usage of irrigation by farm households will proceed.

2.3.5 Irrigation Fee Collection Rate

Table 8: Irrigation Fee Collection Rate

	Irrigation Fee Collection Rate	
	Plan	Actual (2006)
Nefza Irrigation	100%	58%
Sejnane Irrigation	100%	Uncollected

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

It was planned to collect 100% of the irrigation fee in both Nefza and Sejnane. However, in Nefza the actual collection rate, at 58%, was lower than planned. This was because, in Nefza, many farmers have not yet harvested their first year's crops (i.e., have not yet received cash for their crops) and so are unable to pay the irrigation fee to the farmers' association (GDA). In Sejnane, the irrigation fee remains uncollected because, as of 2006, only a pilot program had been started on 7 ha of farmland, irrigation water was provided at no charge, and irrigation facilities had not yet been in-service.

2.3.6 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 4,956,000 dinars (approximately 446 million yen) in the second year following completion. However, the actual increase was around 2,174,000 dinars (approximately 196 million yen).

2.3.7 Economic Internal Rate of Return（EIRR）

The project's economic internal rate of return (EIRR) planned at the time of appraisal was 12.5% (aqueduct facilities: 13.0%; irrigation facilities: 8.7%), and when the EIRR was recalculated under the same conditions[4], it was 9.3% (aqueduct facilities: 12.3%; irrigation facilities: 7.1%)

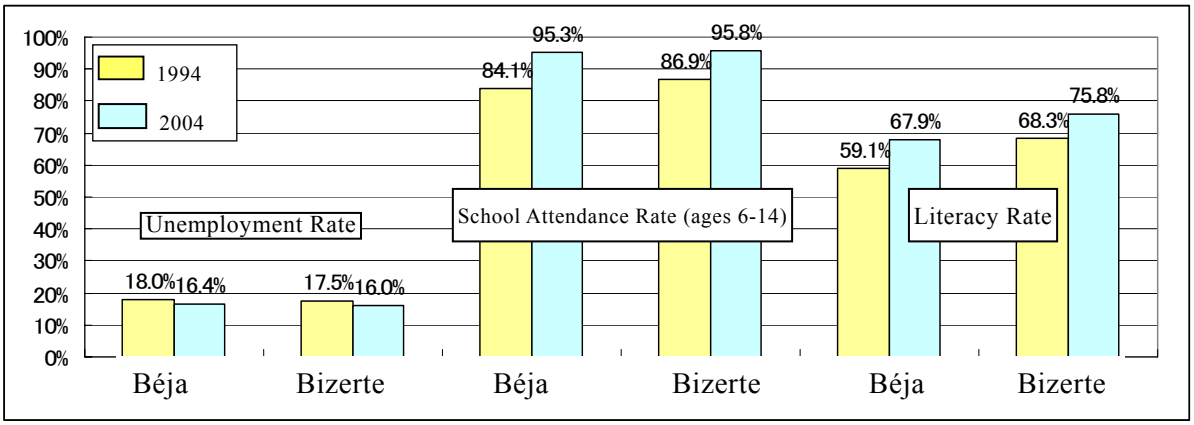
2.4 Impact

2.4.1 Improvement of Social Environment

In Béja Governorate and Bizerte Governorate where the Nefza irrigation and Sejnane irrigation 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.

[4] The benefits are assumed to be、for the aqueduct component, an increase in tap water supply and increased irrigation water as well as the accompanying increased agricultural productivity, and for the irrigation component, an increase in agricultural production and creation of new employment. The costs are assumed to be the project cost and operation and maintenance expense for each component.

Figure 1: Social Indicators in Béja Governorate and Bizerte Governorate



source: National Statistics Institute

2.4.2 Results of Irrigation Beneficiary Survey

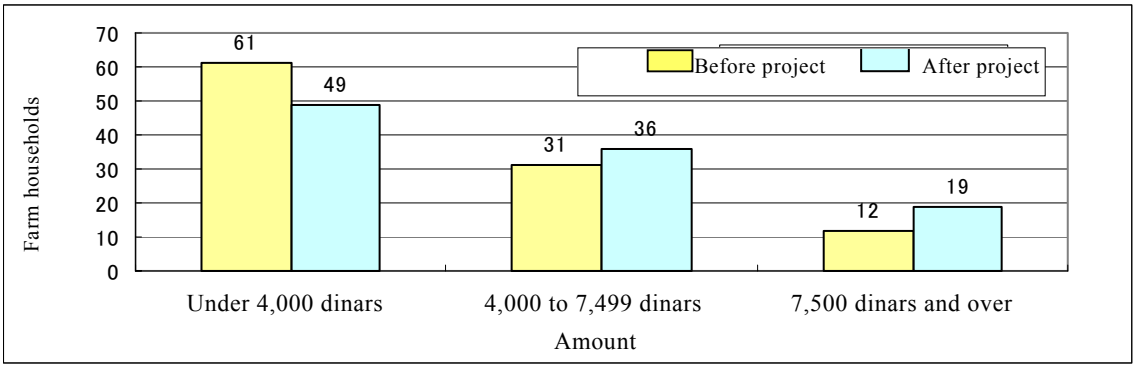
The below-mentioned (1) through (3) were ascertained when a beneficiary survey was conducted on 104 farm households (99 farm households in the Nefza irrigation area and 5 farm households in the Sejnane irrigation area) out of the 403 farm households (398 farm households in Nefza and 5 farm households in Sejnane) which benefited from the project and which are currently irrigating.

(1) Employment creation: Through this project, a total of 20,202 days of employment (men, 8,562 days; women, 11,640 days) were created involving work related to irrigation and farming. Moreover, it is likely that the 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 average farm income per farm household increased following the project in comparison to before the project, from 4,019 dinars (about 360,000 yen) to 7,916 dinars (about 710,000 yen).[5] The income of 7,916 dinars is slightly higher than the annual average farm income per farm household in Tunisia (7,875 dinars) at the time of this ex-post evaluation. Moreover, through analysis that divided 104 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 19 households in Group 3 had strong uplifting effect on this near doubling of income, it was also ascertained that there was a bottom-raising effect seen in improvements in Groups 1 and 2 (Figure 2).

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

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



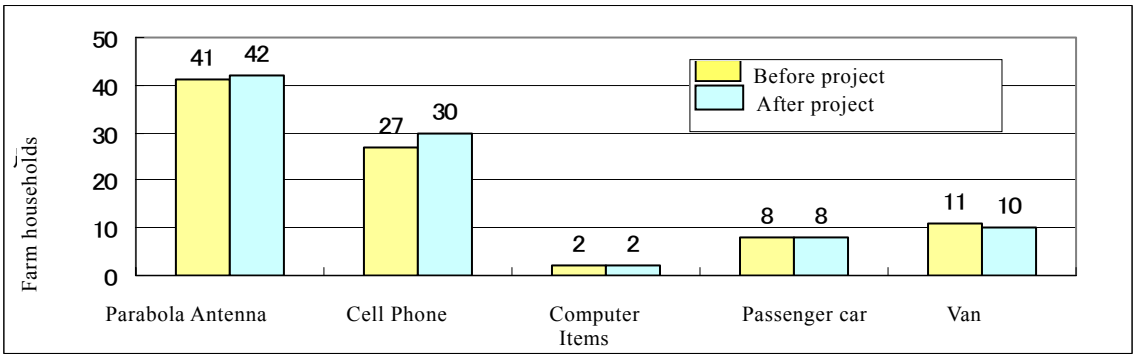
source: Beneficiary Survey

Green peppers harvested in Nefza

Tomatoes harvested in Sejnane

(3) Farm households' asset ownership: Comparing before and after the project, no large difference is visible (Figure 3).

Figure 3: Farm Households' Asset Ownership



source: Beneficiary Survey

2.4.3 Environmental Impact

In Ichkeul Lake on the outskirts of Tunis, destruction of the environment and ecosystem was progressing due to inflow of seawater from the Mediterranean Sea. Ichkeul National Park, which surrounds the lake, was registered by UNESCO in 1996 as a "World Heritage Site in danger." However, owing to the fact that the aqueduct was expanded by this project, enabling more a stable supply of tap water for Tunis, etc., the water formerly stored as an emergency supply for Tunis in the Sejnane Dam, the Joumine Dam, and the Ghezala Dam can now be released as environmental water in an amount triple that prior to the project (Table 9). Also, due to initiatives of the Tunisian government including the construction of a sluice gate between the Mediterranean Sea and the lake, the environment(saline concentration) in the lake (Figure 4) and the ecosystem(number of water fowl) (Figure 5) began to recover during 2005 and 2006. These changes led to the removal of the Ichkeul National Park from the list of World Heritage Sites in danger in July 2006.

Table 9: Volume of Environmental Water Released in Lake Ichkeul

(unit: 1 million m^3)

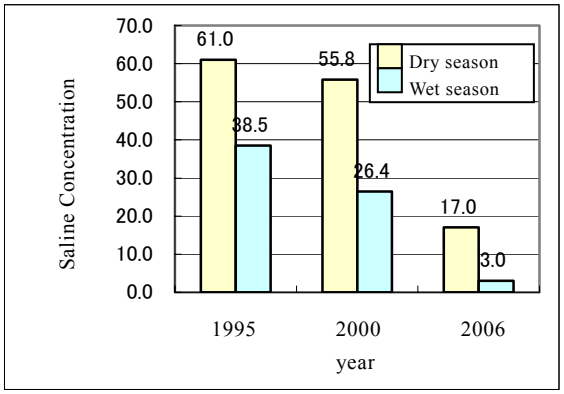
1996	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Sejnane	0.77	1.09	6.46	6.32	1.91	5.38	6.34	5.01	0.04	0.05	0.05	0.05	33.47
Joumine	0.2	0.45	0.46	0.35	0.36	0.36	0.37	0.37	0.36	0.37	0.33	0.33	4.31
Ghezala	0	0	0	1.12	0.96	0	0	0	0	0	0	0	2.08
													39.86

source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

2006	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Sejnane	19.97	30.56	14.05	0.05	0.04	0.34	0.03	0.03	0.03	0.02	0.02	0.13	65.27
Joumine	3.52	15.01	20.26	0.33	0.34	0.34	0.32	0.32	0.28	0.29	0.28	0.47	41.76
Ghezala	0.27	6.32	2.6	0.08	0	0	0	0	0	0	0	0.13	9.4
													116.43

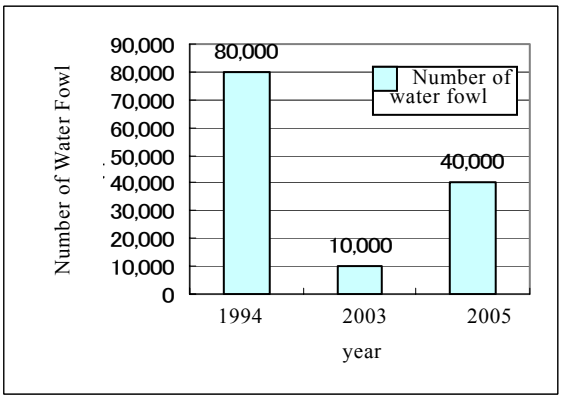
source: Ministère de l' Agriculture et des Ressourrces Hydrauliques

Figure 4: Saline Concentration in Ichkeul Lake (unit: g/l)



source: Environmental Agency

Figure 5: Number of Water Fowl (estimate) (unit: birds)



source: Environmental Agency

2.4.4 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: a)

2.5.1 Operation and Maintenance Agency

Aqueduct Facilities: Société d'Exploitation du Canal et des Adductions des Eaux du Nord (SECADENORD)

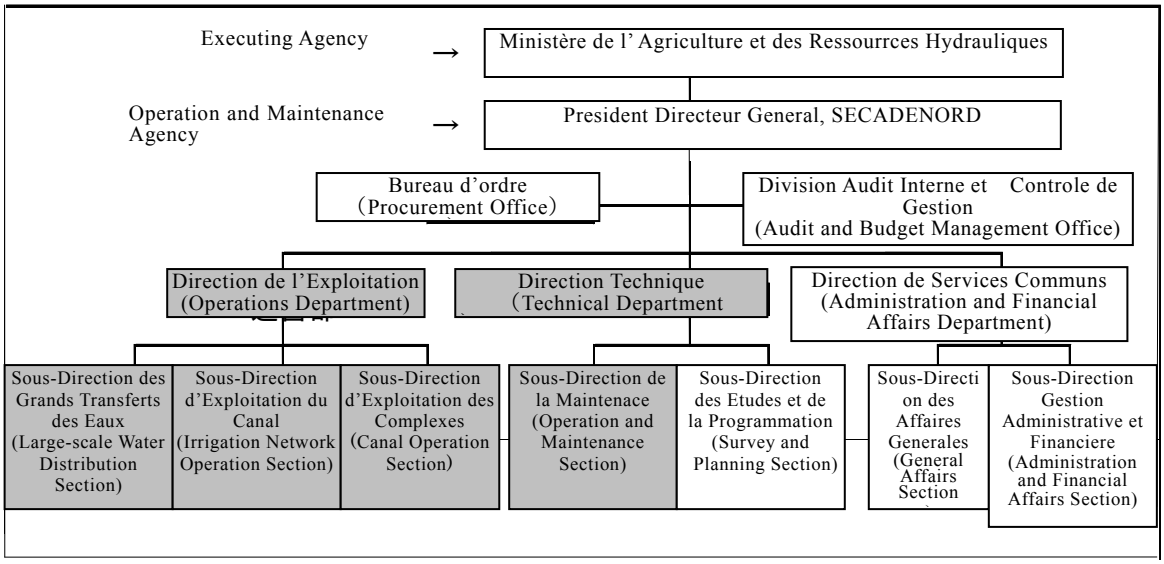
2.5.1.1 Technical Capacity

Having conducted operation and maintenance of the aqueduct facilities since before the implementation of this project, SECADENORD holds many types of training each year for engineers and technicians, including aqueduct defect diagnostic training, pump station operation and maintenance training, and operation and maintenance work plan training. No problems are found in technical capacity.

2.5.1.2 Operation and Maintenance System

SECADENORD is a public corporation under the jurisdiction of the Ministère de l' Agriculture et des Ressourrces Hydrauliques. The operation and management of the aqueduct facilities laid by this project are carried out by 99 staff members employed in various sections affiliated with the Operations Department (Direction de l'Exploitation) and the Technical Department (Direction Technique).

Figure 6: Organization of Société d'Exploitation du Canal et des Adductions des Eaux du Nord（SECADENORD）



source: SECADENORD

2.5.1.3 Financial Status

SECADENORD is a public corporation under the Ministère de l' Agriculture et des Ressourrces Hydrauliques, but it receives no financial subsidies from the ministry. Instead, it earns income from sales of water to Tunisia's Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE) and Commissariat Régional au Développement Agricole (CRDA). Since 1984, its income and expenditures have been in balance, and net profit during the past three years increased from approximately 222 million dinars (2003) to approximately 896 million dinars (2005). Given the above, no problems are found in the financial status of SECADENORD.

2.5.2 Operation and Maintenance Agency

Main Irrigation Facilities

Nefza Irrigation: Commissariat Régional au Développement Agricole (CRDA), Béja Governorate

Sejnane Irrigation: Commissariat Régional au Développement Agricole (CRDA), Bizerte Governorate

2.5.2.1 Technical Capacity

The CRDAs in Béja Governorate and Bizerte Governorate are holding regular workshops on planting irrigated crops for Groupement de Développement Agricole

(GDAs); however, the CRDAs' knowledge and technology are limited with regard to cultivation techniques for irrigated crops and water management, and so the workshops are not at a level that responds adequately to the GDAs expectations. Moreover in both governorates, there are no problems in the operation and maintenance of the pump stations, reservoirs, and primary and secondary canals, a task which is the responsibility of the CRDAs. Yet, when it comes to the guidance on operation and maintenance provided by the CRDAs to the GDAs concerning tertiary canals and lower-ranked facilities for which the GDAs are responsible, the CRDAs' main focus is on how to repair malfunctions rather than on how to conduct daily maintenance inspections, and this is not of a level that responds adequately to the GDAs' expectations. However, JBIC launched technical assistance at the CRDA in Béja 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.),[6] and so the sustainability of technical capacity is likely to increase. In the CRDA in Bizerte Governorate, the above-mentioned technical assistance is not being provided due to JBIC budget considerations. However, it is planned to establish a council of the parties concerned, with the objective of promoting information sharing among the Sejnane irrigation area under the CRDA of Bizerte Governorate, the Nefza irrigation area under the CRDA of Béja Governorate, and the Fernana irrigation area and the Haman Bourguiba irrigation area under the CRDA of Jendouba Governorate. Thus, the improvement in the Nefza irrigation, which is receiving JBIC's assistance, may be expected to have a ripple effect on the Sejnane irrigation.

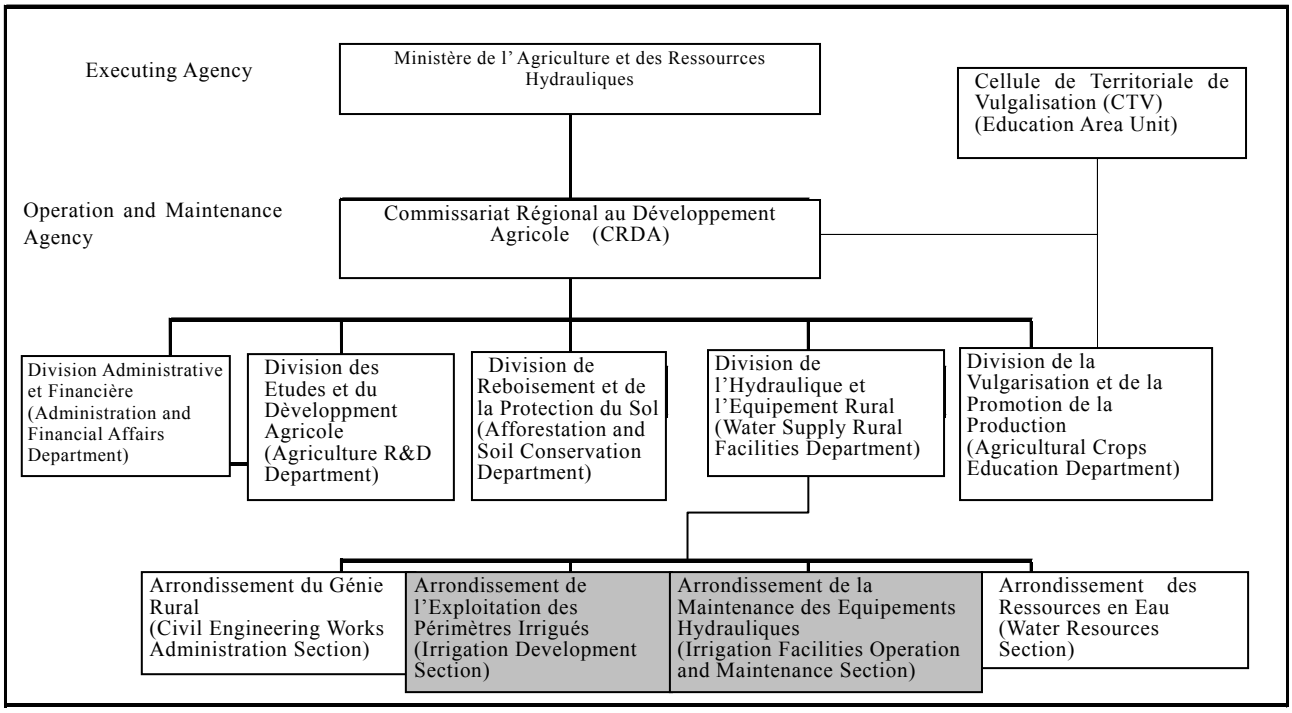
2.5.2.2 Operation and Maintenance System

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 Béja Governorate consists of 12 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

6 The same support was launched at the CRDA in Jendouba Governorate for another Japanese ODA loan in Tunisia, the Barbara Irrigation Project.

addition to 4 irrigation support staff in the Cellule de Territoriale de Vulgalisation (CTV) who educate concerning irrigation and provide guidance concerning planting. At the CRDA in Bizerte Governorate, there are 9 operation and maintenance staff members assigned in the same manner, and in addition, there are 13 irrigation support staff in the CTV. By and large, there are no problems in the operation and maintenance systems in the CRDAs of Béja Governorate and Bizerte Governorate.

Figure 7: Organization of
Commissariat Régional au Développement Agricole (CRDA)



source: CRDA, Béja Governorate

2.5.2.3 Financial Status

In both Bizerte Governorate and Béja Governorate, the CRDAs have maintained a surplus since 2003. Annual income in each CRDA is approximately 1.8 million dinars (about 160 million yen), and their 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 Nefza and Sejnane. 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.

2.5.3. Operation and Maintenance Agency

Part of the Irrigation Equipment:

Nefza irrigation, Groupement de Développement Agricole (GDA)

Sejnane irrigation, Groupement de Développement Agricole（GDA）

2.5.3.1 Technical Capacity

Neither the Nefza GDA nor the Sejnane 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 Nefza 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 maintenance (through preparation of an operation and maintenance manual for sprinklers and drip irrigation equipment in addition to tertiary canals and drainage canals),[7] and so the sustainability of technical capacity is considered likely to increase. The above-mentioned technical assistance is not being provided for the Sejnane GDA due to JBIC budget considerations. However, as stated above, it is planned to establish a council of the parties concerned, with the objective of promoting information sharing among the Nefza, Sejnane, Fernana and Haman Bourguiba irrigation areas. Thus, the improvement in the Nefza irrigation, which is receiving JBIC's assistance, may be expected to have a ripple effect on the Sejnane irrigation.

2.5.3.2 Operation and Maintenance System

In Nefza, seven Groupement d'Intérêt Collectifs (GICs) that have carried out operation and maintenance of tertiary and lower-ranked canals heretofore are merging and reorganizing as three GDAs so as to improve their ability to function and their financial status as well as their efficiency. Five of the seven GICs have already merged to form two GDAs, and the remaining two GICs plan to merge into one GDA in the near future. The GDAs each consist of an association head, a treasurer, four office staff, one technician, and two supervisors. Overall, there are no problems in their operation and maintenance systems.

In Sejnane, four Groupement d'Intérêt Collectifs (GICs) will merge and reorganize as one GDA so as to improve their ability to function and their financial status as well

7 The same support was launched at the Fernana GDA for another Japanese ODA loan project in Tunisia, the Barbara Irrigation Project.

as their efficiency. The Sejnane GDA plans to adopt the same structure as the Nefza GDA. Currently, the system is not fully in place because irrigation fees, which fund the GDAs' operation, are not being collected. However, the GDA is on course to strengthen its system, with plans to promote information sharing with related bodies in other governorates (i.e., CRDAs and GDAs, etc.) and also with plans to increase collection of irrigation fees by encouraging farmers to participate in the GDA through strengthening the GDA's technical capacity and through offering educational activities. Sustainability of the operation and maintenance system is considered likely to increase henceforth.

2.5.3.3 Financial Status

Nefza has maintained a surplus since 2005. The system was strengthened with the objective of strengthening the financial status, and further increases in sales of irrigation water are considered likely as usage of irrigation expands in the future. So, there are no problems in the financial status overall.

In Sejnane, because only five farm households have started irrigation in the pilot project area which is exempted from payment of irrigation fees, no irrigation fees are currently being collected. However as stated above, farmers' participation in the GDA is being promoted by strengthening the GDA's technology and system, and so the GDA is on course for increasing collection of the irrigation fee. Therefore, the sustainability of the financial status is considered likely to increase henceforth.

2.5.4 Operation and Maintenance Status

2.5.4.1 Operation and Maintenance Status of Aqueduct Facilities

No problems.

2.5.4.2 Operation and Maintenance Status of Irrigation Facilities

There are no problems overall. However, following the completion of this project, in Nefza part of a primary canal and its groundwork were damaged by a landslide due to heavy rains. The damaged primary canal was replaced with a new polyethylene pipe by the CRDA in Béja Governorate, but repair of the groundwork has not been undertaken due to the high cost involved.

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

3.2 Recommendations

Because the irrigation in Nefza and Sejnane 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.

Comparison of Original and Actual Scope

Item	Plan	Actual
1.Output	**Aqueduct Facilities** (1) Sejnane-Joumine section Aqueduct 35.8km, Pump station, 1 site (7 pumps) (2) Joumine-Medjerdah section Aqueduct 45.0km, Pump station, 1 site (4 pumps) (3) Consulting services 433MM **Irrigation Facilities** Nefza Irrigation (1) Pump station, 1 site (5 sets) (2) Reservoirs, 2 sites（500m³, 33,000 m³） (3) Primary and secondary canals（5.1km） (4) Tertiary canals（107km） (5) Drainage canals（18km） (6) Farm Roads（63km） Sejnane Irrigation (1) Pump stations, 4 sites(9 sets) (2)Reservoirs, 4 sites (1 site: 2,500 m³; 2 sites: 3,000 m³; 1 site: 7,000 m³) (3)Primary and secondary canals（31km） (4) Tertiary canals（129km） (5) Drainage canals（12km） (6) Farm Roads（100km） Nefza Irrigation/ Sejnane Irrigation (1) Consulting services 235MM	**Aqueduct Facilities** (1) Sejnane-Joumine section Aqueduct 37.0km, Pump station, same as left (2) Joumine-Medjerdah section Aqueduct 47.2km, Pump station, same as left (3) Consulting services 746MM **Irrigation Facilities** Nefza Irrigation (1) Pump station, same as left (2) Reservoirs, same as left (3) Primary and secondary canals（30km） (4) Tertiary canals（116km） (5) Drainage canals, same as left (6) Farm Roads（70km） Sejnane Irrigation (1) Pump stations, same as left (8 sets) (2) Reservoirs, 8 sites (7 sites: 300 m³; 1 site: 30 m³) (3)Primary and secondary canals（28km） (4) Tertiary canals（143km） (5) Drainage canals（93km） (6) Farm Roads（52km） Nefza Irrigation/ Sejnane Irrigation (1)Consulting services 308MM
2.Project Period	February 1996 - December 1999 (47 months)	February 1996 – December 2004 (107 months)
3.Project Cost Total ODA Loan Portion Exchange Rate	18,840 million yen 14,130 million yen 1 dinar ＝85.8 yen (as of June 1995)	13,089 million yen 10,711 million yen 1 dinar ＝87.7 yen (weighted average during project period)