

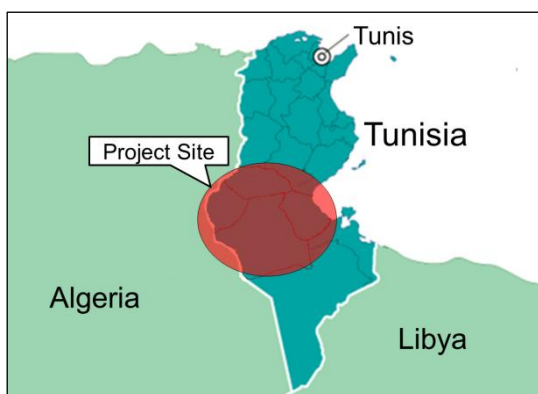
## Ex-Post Monitoring of Japanese ODA Loan Project

Tunisia

### Irrigation Perimeters Improvement Project in Oasis

External Monitoring Consultants: Eiko Nakamoto / Toyo Tanaka, Nakamoto&Associates Co., Ltd.

#### 1. Project Description



Project Location



Concrete canal and old canal (Gabs)

#### 1.1 Project Objective

The objective of this project is to provide stable supply of irrigation water and conserve groundwater through the renovation of terminal earth canals and development of drainage systems in the oases of Tunisia's four southern governorates – Gabs, Gafsa, Kebili and Tozeur – thereby contributing to the stability of agricultural productivity and development of the local economy.

#### 1.2 Outline of the Loan Agreement

Approved Amount / Disbursed Amount	8,106 million yen / 6,417million yen
Loan Agreement Signing Date / Final Disbursement Date	December 1996 / December 2005
Ex-post Evaluation	2007-2008
Executing Agency	Ministry of Agriculture (MOA)
Main Contractor	-
Main Consultant	-

### 1.3 Background of Ex-Post Monitoring

In Tunisia, the agricultural sector is extremely important, as 35% of the population live in rural areas; agriculture accounts for 11% of its GDP; and agricultural products comprise 9.3% of all exports. Date palms, an important export product, are a major agricultural product in the southern oases. The southern oases are, however, in an arid region that receives only 100–200 mm of rainfall per year; consequently, groundwater has been used to irrigate the land in this area since ancient times. However, in the oases, due to a lack of adequate terminal channels, the irrigation systems are often beset with water leakage, resulting in a low usability level. From the fact of lowering of the groundwater level, and since the development of new water resources is not dependable, improvement in the effective use of irrigation systems through water conservation was urgently needed. In order to address this situation, this project has implemented the renovation of terminal earth canals and development of drainage systems in the oases of Tunisia's four southern governorates – Gabes, Gafsa, Kebili and Tozeur.

At the time of ex-post evaluation report (2007), the number of beneficiary rural households of this project were 18% less compared to the initial plan due to insufficient funds. In addition, the areas under cultivation in three regions covered by the project were 40% to 60% less than the areas that were originally planned in the project. From the financial aspect, some Agricultural Development Groups (GDA) in Tozeur and Kebili were in deficit in 2006. Due to the government proposal to reduce the budget, the ratio of maintenance cost (CRDA3:GDA7) borne by the GDA was rising. Since 2005, the ratio of GDA's funds to the operation and maintenance cost was exceeding 100%. Also, in the ex-post evaluation report, deterioration of concrete canals was indicated. The cause for the deterioration was under research at the time. From these situations, concern was shown over the sustainability of the project.

Therefore, this project was selected for ex-post monitoring and reviewed under each criterion with the findings from the field survey and other research activities with a final conclusion being drawn.

## 2. Outline of the Monitoring Study

### 2.1 External Monitoring Consultants

Eiko Nakamoto (Nakamoto & Associates Co., Ltd.)

Toyoo Tanaka (Nakamoto & Associates Co., Ltd.)

### 2.2 Duration of Monitoring Study

Duration of the Study: September 2012 – June 2013

Duration of the Field Study: November 26, 2012 – December 14, 2012

## 2.3 Constraints of the Monitoring Study

Obtaining all of the detailed data for each region was impossible due to the limitation of the survey period. The missing data were supplemented by national statistical data and by interviews to relevant authorities.

## 3. Monitoring Results

### 3.1 Effectiveness

#### 3.1.1 Quantitative Effects

##### 3.1.1.1 Results from Operation and Effect Indicators

###### 3.1.1.1.1 Beneficiary Rural Households

Compared to the time of ex-post evaluation, the number of beneficiary rural households has leveled after a slight increase; the efficacy of the project continues to take effect (Table 1). Numbers in Tozeur and Gabes are lower than the planned value; however, this is due to the fact that the planned value includes the regions excluded from this project. The increase in the number of beneficiary rural households in 2008 is from the homecoming of rural households, and not from new entry of outside farmers. Because of the cultural background of the Southern Oasis Region to think it is a shame to sell the land inherited from ancestors, sale of agricultural land is uncommon, resulting in limited new entrants. Land within the oasis is inherited from generation to generation, and therefore, acceptance of new entrants from outside farmers is rare.

At the time of ex-post evaluation, due to the increase in the number of land-owners interested in participating in the project, the CRDA had partially expanded the project components. However, the fact that the CRDA expanded the project's concrete canals could not be verified in this study.

Table 1: Number of Beneficiary Rural Households

(Unit: households)

	Planned	2006*	2007	2008	2009	2010	2011
Gafsa	5,620	6,212	7,055	7,055	7,070	7,070	7,080
Tozeur	7,060	5,855	4,652	4,652	4,652	4,652	4,652
Kebili	9,020	10,122	10,886	10,886	10,886	10,886	10,886
Gabes	17,900	10,171	10,171	10,618	10,626	10,626	10,676
Total	39,600	32,360	32,764	33,211	33,234	33,234	33,294

Source: CRDA \*value from ex-post evaluation report

###### 3.1.1.1.2 Beneficiary Area

In comparison to the time of ex-post evaluation, beneficiary area by this project shows a slight increase in all regions (Table 2). In regards to the beneficiary area of the oases in which the project was implemented, Gafsa exceeds the initial plan; beneficiary areas of Gabes and Kebili are below the planned area, but have stabilized. The project continues to produce positive effects.

Table 2 Beneficiary Area

(Unit: ha)

		Planned	2006*	2007	2008	2009	2010	2011
Gafsa	Number of Oases	8	8	9	9	9	9	9
	Benefitted Area	3,467	3,467	3,584	3,584	3,584	3,584	3,584
Tozeur	Number of Oases	30	20	18	18	18	18	18
	Benefitted Area	5,622	3,143	3,285	3,285	3,285	3,285	3,285
Kebili	Number of Oases	67	30	30	30	30	30	30
	Benefitted Area	7,213	3,700	3,735	3,735	3,735	3,735	3,735
Gabes	Number of Oases	48	30	30	34	34	34	34
	Benefitted Area	7,133	4,115	4,424	4,435	4,443	4,443	4,443
Total	Number of Oases	153	88	87	91	91	91	91
	Benefitted Area	23,435	14,425	15,028	15,039	15,047	15,047	15,047

Source: CRDA \*value from ex-post evaluation

According to the interview with the CRDA of Gabes, 4 oases in Gabes were divided because of inheritance and, as a result, the number of oases increased. The increase in area is due to the change in the calculation method; there was no substantial increase. In Tozeur, number of oases decreased by two. However, according to the Ministry of Agriculture, this decrease can be explained by the possibility that several oases or GDAs were merged.

Furthermore, with the following ODA loan project, “Water Saving Agriculture Project in Southern Oasis Area”, irrigation facilities will be installed in the 19 oasis which were excluded from this project. The new project had not initiated its implementation at the time of this study.

#### 3.1.1.1.3 Cultivated Area and Cropping Ratio

Cultivated areas in Gafsa, Kebili and Gabes have increased compared to the time of ex-post evaluation (Table 3). According to the interview with Ministry of Agriculture, this is due to the increased efficiency of land usage resulting from three-layer polyculture. The farmers generally plant palm trees on the upper level, olive trees on the lower level and cultivate vegetables on the ground level in order to optimize land usage. Increased volume of distributed water from the rise in water efficiency by this project has enabled the farmers to actively engage in three-layer polyculture. The CRDA calculates cultivated area by multiplying benefitted area with cropping ratio resulting in cropping ratio exceeding 100%.

Table 3 Cultivated Area and Cropping Ratio

(Unit: ha)

		Planned	2007*	2008	2009	2010	2011
Gafsa	Cultivated Area	5,359	3,046	3,154	3,226	3,226	3,226
	Cropping Ratio	155%	85%	88%	90%	90%	90%
Tozeur	Cultivated Area	6,501	3,700	3,722	3,708	3,580	3,548
	Cropping Ratio	116%	113%	113%	113%	109%	108%
Kebili	Cultivated Area	12,130	5,528	5,602	5,789	5,976	6,125
	Cropping Ratio	168%	148%	150%	155%	160%	164%
Gabes	Cultivated Area	10,690	6,575	7,220	7,238	7,323	7,330
	Cropping Ratio	150%	149%	163%	163%	165%	165%
Total	Cultivated Area	34,680	10,275	10,942	10,946	10,903	10,878

Source: CRDA \*value from ex-post evaluation

On the other hand, abandoned plots of farmland also exist within the oasis. Ex-post evaluation reported the problem of abandoned farmlands due to property rights disputes resulting from inheritance. This problem is caused by a tradition to divide the land into the number of male heirs upon inheritance. This leads to fragmentation of land after a few generations and complication of land boundary and property rights, and ultimately, dispute over land ownership. At present, more than 60% of farmland in Gabés is fragmented land, under 0.5 hectare. Concerning this problem, the Ministry of Agriculture issued a law in 2011 (decree No.4115.5) which prohibits land division and endowment. As a result, land fragmentation deterred and cases of dispute over land ownership have tranquilized. During the field study in Gabés, abandoned lots of farmland were identified; however, according to the CRDA, the situation is improving.

#### 3.1.1.1.4 Crop Yields

Data for 2007 obtained during this study and those reported in the ex-post evaluation (2007) differ significantly. In the inquiry made to the CRDA of Gabes, the source of the data in the ex-post evaluation report could not be verified. Therefore, this analysis was done with the available annual data since 2007, which were newly obtained by this study. Based upon these premises, crop yield has shown a steady increase since 2007. For example, crop yields of summer and winter vegetables of Gafsa have continually risen, as seen in Table 4. In addition, crop yield of fodder has shown substantial increase since 2007. This is due to the government's policy to raise the self-sufficiency of milk to 100%, which led to the increased demand and rise in price of dairy cows, resulting in enhancement of breeding of dairy cows. Consequently, the rising demand for fodder led to the increase in price; fodder has become a highly attractive crop to the farmers.

Table 4 Crop Yield

(Unit: tons/ha)

		Planned	2007	2008	2009	2010	2011
Gafsa	Fruit Trees	11.7	10.6	10.6	10.7	10.6	10.7
	Summer Vegetables	18	4.3	4.4	4.5	4.6	4.6
	Winter Vegetables	23.6	6.5	6.6	6.8	6.8	6.8
	Fodder	59.3	65.8	65.7	65.9	66.0	66.1
Tozeur	Fruit Trees	2.5	525.0	533.0	582.0	582.0	611.0
	Summer Vegetables	9.6	1,350.0	1,724.0	1,596.0	1,336.0	1,269.0
	Winter Vegetables	12.5					
	Fodder	79.9	5,612.0	6,543.0	7,764.0	11,832.0	10,420.0
Kebili	Fruit Trees	2.8	539.6	541.0	566.0	576.0	576.0
	Summer Vegetables	10.1	50.0	58.0	59.0	48.0	6.0
	Winter Vegetables	12.8	165.0	240.0	230.0	253.0	157.0
	Fodder	20.1	1353.0	1443.0	1402.0	1370.0	1085.0
Gabes	Fruit Trees	11.8	32.3	34.6	34.6	31.6	35.1
	Summer Vegetables	15.2	11.1	11.7	12.3	13.4	13.4
	Winter Vegetables	28.1	27.0	27.3	27.3	28.7	28.7
	Fodder	59.4	59.0	71.3	75.4	77.6	81.7

Source: CRDA

According to the CRDA of Gabés, as described above, stable production as a result of increased irrigation water supply has enabled the farmers to engage in three-layer polyculture. In addition, irrigation water enabled the farmers to cultivate in the dry season, and the resulting increase in the cultivation period has led to the rise in the crop yield. Crop yields of olives and pomegranates have particularly increased. In addition, the drop in crop yields of fruit trees seen in 2010 is due to heavy rainfall.

### 3.1.1.2 Results of Calculations of Internal Rates of Return (IRR)

In the ex-post evaluation report, Internal Rate of Return (IRR) was calculated to be 9.0%. However, since the basis of this calculation used in the ex-post evaluation report could not be obtained, IRR will not be calculated in this report.

### 3.1.2 Qualitative Effects

From the interview with the CRDA of Gabés, and from the responses to the questionnaires sent to the CRDAs, positive quantitative effects of the project reported in the ex-post evaluation report were

confirmed. The installation of concrete irrigation canals has reduced water leakages and increased water efficiency. The effects produced from this effect are as follows: First, salt damage has decreased. Since irrigation water is periodically drawn into the farmland, salinity in the soil is washed away, and salt damage was decreased from depressed salt concentration in the soil. However, scientific research has not been performed on the salinity or the conservation of ground water resources. Second, since the irrigation canals used before the projects were simple ditches dug in the ground, there was substantial water loss. Concrete canals enabled efficient water use, and water distribution to farmers farther downstream became possible. Third, with the stable volume of water supply, accurate calculation of water distribution became possible, and as a result, water outages decreased and led to the increase in crop yields. The distribution of water to farmers is done according to a rotation system between users. The rotation system consists of deciding on the order in which irrigation water is used by each farmer as well as the allocated time which is counted by hours per user, in order to optimize the efficient use of irrigation water. The installation of concrete water pipes has allowed for improved precision in terms of time and volume of water distributed to each parcel. This has helped reduce water outages and led to increased production. Furthermore, the improvement in water efficiency increased the volume of water distributed per hour, and reduced the time for water distribution to each parcel. Fourth, diversification of crops resulting from more farmers engaging in three-layer polyculture has led to a reduction in the fallow periods. The fallow periods, in which the farmlands were unused, were between 20 to 50 days before the implementation of the project. After the project, periods were reduced to 17 to 35 days. In addition, the qualities of harvested products have improved compared to those before the project.

The above mentioned items confirm that the positive effects at the time of ex-post evaluation continue to be produced. Although the problem of aforementioned abandoned farmlands resulting from dispute over land ownership has not been solved, the problem is showing signs of steady improvement from the efforts made by the Ministry of Agriculture.

## 3.2 Impact

### 3.2.1 Intended Impacts

Ex-post evaluation report indicated this project's impact of younger generations' return to agriculture. According to the interview to the CRDA, the recent years have witnessed a growing tendency for younger generation, between 39 and 50 years old, to return to agricultural activities. This is due to the fact that increased irrigation efficiency has made irrigated agriculture more accessible than before, and part-time agriculture, undertaking agricultural tasks as secondary activities, became possible. There are also an increasing number of people returning to farming after early retirement. It can be assured that the contribution of this project to the returning of those

aforementioned to agricultural activities is continually significant, since the ex-post evaluation.

Ex-post evaluation reported the increase in employment opportunities of seasonal workers during harvesting season, resulting from the increase in agricultural production brought about by this project. Currently, the increase in agricultural production continues to produce employment opportunities for seasonal workers during the harvest season. However, the increase of agricultural production in the oasis gave a rise to a new problem of insufficient seasonal labor. The olive harvest season in the southern region requires a seasonal workforce of 120,000 workers, while in reality, there only 20,000 workers are available. Seasonal workers receive low wages and do not have any social insurance; such conditions are not attractive to young people. The majority of seasonal workers (more than 80%) are women. In recent years, women's advance into society have accelerated in Tunisia, and women have better chances of finding work that offer better working conditions compared to seasonal workers. This is also a factor in the shortage of seasonal workers. In addition, political instability in neighboring country of Libya resulted in refugees flowing into Tunisia. This has created a demand for vast quantities of food. While the farmers are increasing their productions, the seasonal workers immigrate to countries paying higher wages such as the Gulf and Libya creating a shortage of seasonal workers in Tunisia. In case of serious shortage, the government assists the harvest of olives by sending military troops to the region. This problem has not yet been solved. The problem not only concerns the targeted area covered by this project, but is in fact a common issue for the entire southern region.

The project's impact of improvement in salt damage from saline soil, decrease in water outage, and increase in the diversity of crops continues to take effect. Decrease in the salt damage and increase in the volume of distributed water have raised the precision of calculation for water distribution, which led to diversification of crops and decreased water outage. Agricultural production and household income increased as a result. This project's positive impact on the improvement of living standards of farmers in the target area continues to take effect. There are a growing number of farmers that have purchased new cars or have built house extensions. In addition, owing to the positive effects observed in terms of water efficiency through the concrete canals installed by this project, some farmers have installed in their own parcel, concrete canals similar to the ones used in the project at their own cost. This is also another positive effect of the project.

### 3.2.2 Other Impacts

#### 3.2.2.1 Environmental Impact

The negative impact of the project that was mentioned in the ex-post evaluation concerning the decrease in the number of birds as well as the decrease of cooling effect inside the oasis was not based on empirical and scientific data, but rather on the personal opinion of the interviewed persons. According to the Ministry of Environment, there has been no scientific study conducted concerning



the decrease in the number of birds or on the decrease in the cooling effect inside the oasis. The Ministry of Agriculture, in collaboration with the Ministry of Environment and UNESCO, has jointly proceeded to the starting of a project on the protection of the oasis, and the results of the study are expected from this project. As for the decrease of cooling effects of the oasis, the CRDA of Gabes is not aware of such impact.

The Ministry of Environment has stated that this project had a positive impact on the protection of oases, protection of nonrenewable resources such as fossil water, protection of soil, and prevention of desertification. Continual effects of these impacts reported in the ex-post evaluation were confirmed.

According to the interview with the CRDA of Gabés, “water is rare in this region; carefully attention is paid to maintain the balance between the production and the preservation of water resources when using water for agriculture. Therefore, there are no negative changes concerning water”.

#### 3.2.2.2 Impact to Surrounding Regions

At the time of ex-post evaluation, it was confirmed that this project was contributing to the improvement of economic and social life of the surrounding regions by reclamation of farmland in the outer regions of the oasis using surplus water. According to the CRDA of Gabes, efficient water distribution continues to be possible since the time of ex-post evaluation, and reclamation of oases' outer region is also continually pursued; these impacts are continues to take effect. On the other hand, the Ministry of Agriculture states that it is necessary to reinforce and enforce the law, since the public order has become unstable after the revolution and more people are using the water illegally. This issue is not peculiar only to the oases targeted by this project, but a common problem in all of the oases. Since the illegal users do not pay the water fee, it is possible that there could be negative effects on the sustainable management of the oasis. However, the Ministry of Agriculture considers the current condition of Tunisia to be temporary, and expects this situation of the illegal usage of water to improve in the future.

#### 3.2.2.3 Land Acquisition, Relocation

There have been no land acquisitions or relocation since the time of ex-post evaluation.



Concrete canals



Copied concrete canal

Delamination from salt damage can be seen  
(See 3.3.3.1 and 3.3.4)

The continued consistency of the impact of this project was confirmed. However, there were no scientific studies on the impact of the environment; the scientific results are expected from the UNESCO project on oasis preservation.

### 3.3 Sustainability

#### 3.3.1 Structural Aspects of Operation and Maintenance

##### 3.3.1.1 CRDA

According to the Ministry of Agriculture, there were no notable changes in the maintenance and operation system since the ex-post evaluation. The activities related to operation and maintenance of the facilities and the equipment is shared between the CRDA and the GDA. However, the shared roles differ by region. Relations between the CRDA and the GDA are good.<sup>1</sup> The system of task sharing between the CRDA and the GDA in the region of Gabes, based on the interviews and the site visit, will be presented below.

The organization of the CRDA has been enhanced by the increase in the number of staff compared to the time of ex-post evaluation. According to the answers to the questionnaire sent to the CRDA, the CRDA is responsible for repairs of large-scale facilities (irrigation facilities, main irrigation channels, secondary irrigation channels) and maintenance requiring certain expertise. This has not changed since the ex-post evaluation. The CRDA also provides for the GDA the necessary

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<sup>1</sup> Cultural background of the oasis: Since water is scarce in the southern oases region, management of oases water has been carried out by communities since ancient times. Irrigation techniques were developed. Irrigational rotation system and the volume of water according to the area and types of crop were calculated by engineers. In the 16th century, an agricultural organization, a predecessor of the GDA, was established. This organization was carried over to the GDA, making a solid foundation. Therefore, after the revolution of 2011, while the GDAs in other regions were dissolved, those in the southern regions remained intact and have built a firm relationship with the CRDA.

calculations for water rotation system.<sup>2</sup> In the CRDA of Gabes, the Maintenance Unit and the Department of Operations of Irrigated Perimeters (DOIP) perform the operation and maintenance of the facilities. The Maintenance Unit and the DOIP, which is under the Division of Hydraulics and Rural Equipment, conducts the maintenance of pumping stations and cooling facilities upon the request from the GDA.

At the time of ex-post evaluation, there were 1 to 2 engineers, several technicians, and 10 to 20 skilled workers at each CRDA. Currently, each CRDA hires, as full-time employees, 1 to 24 engineers, 7 to 40 technicians, and 10 to 33 skilled workers.

The ex-post evaluation report mentioned that there was a growing tendency for the CRDA to outsource its activities. This tendency continues to be present within the CRDA. However, the reason for outsourcing is not only the shortage of staff, but upon the expectation to stimulate the local economy through promotion of sound competition.

#### 3.3.1.2 GDA

Since the last assessment, there have been no significant changes regarding the organizational system of the GDA. The GDA is in charge of small-scale repairs and daily maintenance of irrigation facilities. However, there are regions such as Gabes, where most of the maintenance activities are entrusted to the GDA by the CRDA. In Gabes, all the maintenance activities of the facilities and equipment are performed by the GDA. The cost of the maintenance is borne by the GDA, and collected from each rural household. Henceforth, the CRDA of Gabes is urging the GDA to directly hire external subcontractors themselves for the repairs of the facilities and without the involvement of the CRDA. According to the interviewed with the CRDA of Gabes, the GDA is increasingly resorting to outsourcing to external subcontractors. However, the GDA desires to return to the traditional system of the CRDA managing the large-scale repairs, and the GDA managing the small-scale repairs. The cost of repair by the CRDA is considerably lower. On the other hand, the CRDA claims that the GDA has sufficient financial capacity to manage the operation and maintenance of the facilities as the policy of the State also promotes the GDA participation in covering the operation and maintenance cost of water systems.

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<sup>2</sup> The frequency and duration of water distribution is determined by the area and the types of crop. Based on these factors, "calculation for rotation system" is the process of calculating frequency and time of irrigation usage.

Table 5 Operation and Maintenance Structure of the GDA

		2007	2008	2009	2010	2011
Gafsa	Irrigated Area (ha)	3,584	3,584	3,584	3,584	3,584
	Number of GDA	9	9	9	9	9
	GDA Membership	7,055	7,055	7,070	7,070	7,080
	GDA Representatives	54	54	54	54	54
Tozeur	Irrigated Area (ha)	3,285	3,285	3,285	3,285	3,285
	Number of GDA	31	31	31	31	31
	GDA Membership	186	186	186	186	186
	GDA Representatives	31	31	31	31	31
Kebili	Irrigated Area (ha)	3,735	3,735	3,735	3,735	3,735
	Number of GDA	30	30	30	30	30
	GDA Membership	180	180	180	180	180
	GDA Representatives	0	0	0	0	0
Gabes	Irrigated Area (ha)	4,424	4,435	4,443	4,443	4,443
	Number of GDA	30	34	34	34	34
	GDA Membership	168	168	168	168	168
	GDA Representatives	127	140	140	140	140

Source: CRDA

In the southern region, one or more GDA is established for each oasis. The numbers of GDAs presented in the ex-post evaluation differ significantly from the numbers obtained by this study. Therefore, comparison analysis is performed using the data for 2007 obtained by this study. Based on these premises, the numbers of GDAs have not changed, other than the increase due to the aforementioned division of the GDA in Gabes in 2008 (Table 5). Moreover, in each CRDA there are two workers in charge of each GDA and, concerning this point, there are no changes compared to the ex-post evaluation.

### 3.3.2 Technical Aspects of Operation and Maintenance

#### 3.3.2.1 CRDA

The CRDA is continually providing technical assistance to the GDA since the ex-post evaluation. According to the CRDA, it is providing training seminars and workshops upon request from the GDA. Workshop is held at the training center. In addition, outsourced training is held upon request from farmers who wish to receive training on a specialized subject, and on-site trainings on the farmland are also held. Regular topics of the workshops relate to water saving techniques, such as, the methods of drip irrigation (method of irrigation by drips of water through emitters), and methods for increasing the efficiency of gravity irrigation (irrigation method using the natural gravity of the grounds); pomegranate cultivation; beekeeping; labeling management for exporting crops; and organizational management such as, expense management and meeting facilitation. Data regarding the number of trainees by age group could not be obtained.

In Gabes, the CRDA offers outsourced training sessions in order to provide farmers with a wide

variety of expertise, in addition to the seminars given by its own engineers. Also, the CRDA holds meetings semi-annually with representatives from each GDA to share the knowledge concerning irrigation and water efficiency.

#### 3.3.2.2 GDA

Technical assistance by the CRDA is continually being provided since the ex-post evaluation. Through CRDA's technical assistance, the GDA has become able to carry out the maintenance operations by themselves. The training sessions offered by the CRDA are basically free of charge. The GDA actively attend these training courses and apply the knowledge such as new irrigational techniques and cultivation of various crops them in the agricultural lands they are managing, to their agricultural activities.

According to the interview with the GDA, apart from the various free training courses offered by the CRDA, they attend the CRDA's outsourced training sessions such as pomegranate cultivation and labeling management for exporting pomegranates. The CRDA bears the cost of the training; however, if the training topic benefits only some of the farmers, then the beneficiaries share the cost. At the time of ex-post evaluation, GDAs were hiring technical experts, such as engineers. However, the number of technical experts could not be obtained. Currently, most GDAs hire a technical director who manages the technical and financial affairs of the GDA.

#### 3.3.2.3 Ministry of Agriculture

In the ex-post assessment of the project, it was mentioned that the Ministry of Agriculture organizes orientation meetings for the farmers. Currently, these meetings are held by the CRDA and not the Ministry of Agriculture as the CRDA is the regional office of the Ministry of Agriculture. Actual implementation such as technical assistance to the GDA is done by the CRDA, and the Ministry of Agriculture is responsible for general affairs and overall management. Ministry of Agriculture holds irregular sensitization sessions and training sessions for water-saving and irrigation techniques for the GDAs and the farmers. In addition, the Ministry of Agriculture holds a meeting once a month with the representatives of all CRDAs to provide the necessary information.

According to the Ministry of Agriculture, the water efficiency is one of the national agenda. It is cooperating with the Ministry of Environment to carry out water saving campaigns through television commercials and regional television programs. Annual "Water Day" was established to send a variety of messages for the importance of water resource.

### 3.3.3 Financial Aspects of Operation and Maintenance

#### 3.3.3.1 CRDA

Water fee collection rate from the GDA continues to be close to 100% since the ex-post evaluation.

According to the questionnaire to the CRDA, Gafsa, whose decline in the collection rate was indicated in the ex-post evaluation report, has raised its collection rate to 100% since 2007. Regarding the ratio of operation and maintenance cost borne by the CRDA and the GDA, the ratio is CRDA 30% and GDA 70%. However in Gabes, almost all of the operation and maintenance cost is borne by the GDA.

Cost of daily operation and maintenance is borne by the GDA. Although the CRDA in Gabes is lacking funds for a large-scale repair of pumping stations and cooling towers, there are no problems concerning the current status of the maintenance of the facilities of this project.

In Gabes, there is no financial assistance given from the CRDA to the GDA. According to the interview to the CRDA of Gabes, the deterioration of concrete indicated in the ex-post evaluation report is only at the surface and there is no effect on the irrigation. On the other hand the GDA, which is responsible for the maintenance, desires a large-scale repair of the deteriorated concrete canals, and is negotiating with the CRDA to provide financial assistance for the repair of the canals. According to the interview to the Ministry of Agriculture and the answers from the questionnaire to the CRDA, ratio of concrete canals with surface damage is limited. CRDA of each region lacks the funds to implement a large-scale repair of the irrigation facilities. Each CRDA has an annual budget for maintenance of irrigation and drainage networks, and are implementing the necessary repairs based on schedule of annual priority. However, financial statements to confirm the balance of revenue and costs of maintenance were not available.

### 3.3.3.2 GDA

The GDA collects the irrigation water fees directly from the users and, the necessary maintenance costs are collected from each farmer according to the volume of utilized water. Farmers' incomes have increased overall; there are no problems regarding the finance of maintenance costs (Table 6).

Table 6 Balance of the GDA

(Unit: TND)

		2006****	2007	2008	2009	2010	2011
Gafsa	Revenue	620,060	734,634	761,658	753,979	669,187	702,647
	Expense	424,226	680,560	709,823	760,440	836,484	1,003,781
Tozeur	Revenue	2,601,124	112,000	111,000	112,200	125,600	125,600
	Expense	2,686,805	87,000	68,000	94,000	113,000	113,000
Kebili	Revenue	2,563,425	1,813,897	1,581,279	1,972,982	2,184,765	1,771,088
	Expense	2,626,415	181,054	125,085	225,244	289,854	114,874
Gabes	Revenue	N/A	708,546	1,065,917**	1,433,691***	1,540,239***	1,471,791
	Expense	N/A	663,683*	1,039,623**	1,349,252***	1,480,346***	1,402,124

Source: CRDA, GDA \*data missing from 11GDAs \*\*data missing from 5 GDAs \*\*\*data missing from 1 GDA  
\*\*\*\*value from ex-post evaluation

Ratio of funds to the cost of operation and maintenance has not changed, with the exception of Kebili, compared to the ex-post evaluation, and generally speaking, collected water fee and costs borne by the farmers cover the maintenance costs (Table 7). The reason for the low ratio in Kebili could not be investigated due to the limited timeframe of the study.

Table 7 Ratio of the GDA funds to Cost of Operation and Maintenance

	(Unit: %)					
	2006*	2007	2008	2009	2010	2011
All Oases (excluding Kebili)	-	92	94	96	104	110
Kebili	-	10	8	11	13	6
Total	118	48	55	57	60	65

Source: CRDA, GDA \*value from ex-post evaluation

In Gabes, the neighboring markets have vitalized, and price of agricultural products have risen. In addition, since increase in production was made possible by this project, farmers' incomes are rising. According to the CRDA of Gabes, because the financial capacity of the farmers increased, the costs associated with maintenance of facilities are almost entirely born by the GDA. Although the GDA cannot afford the aforementioned large-scale concrete canal repair, it is currently carrying out the maintenance of pumping station to tertiary canals. The collected fees of water utilization from the farmers are maintained at affordable prices, and the remainder of the amount required for the cost of maintenance is borne by the farmers based on the volume of used irrigation water. There is no problem with the financial capacity of the farmers, since their income is increasing. Collection rate of the water fees is 75% to 100% in all GDAs, except Tozeur, and has continually maintained a high level since the ex-post evaluation (Table 8). The reason for the low collection rate in Tozeur could not be ascertained due to the limited timeframe of the study.

According to the Ministry of Agriculture, the parity in terms of operation and maintenance costs between the CRDA and the GDA is respectively of 30% and 70%. However, the reduction of state budget and the rising incomes of the GDAs have created the tendency for the increase in the GDA's ratio of bearing the maintenance cost.

Table 8 Water Fee Collection Rate

	(Unit: %)				
	2007	2008	2009	2010	2011
Gafsa	100	100	100	100	100
Tozeur	30	35	24	25	14
Kebili	80	82	79	75	75
Gabes	93	101	89	91	80

Source: CRDA, GDA

### 3.3.3.3 Ministry of Agriculture

Ex-post evaluation reported that the Ministry of Agriculture was granting subsidy to the GDA. However, the subsidy is currently not being given. The Ministry of Agriculture undertakes measures through the CRDA, and no direct subsidy towards the GDA is being implemented. According to the interview, large-scale repair is being undertaken by cooperation of the CRDA and the GDA, and small-scale repair and daily maintenance is undertaken by the GDA; granting subsidy is not necessary.

Moreover, as additional information, from an interview with the Ministry of Agriculture, and information on the website of the Ministry of Planning and Regional Development, there is a fund called FOSDAP (Special Fund for Agriculture and Fisheries Development), intended for small-scale farmers. The fund is managed by the BNA (National Agriculture Bank) and allocated indirectly to small farmers through the CRDAs in order to assist in financing of the costs associated with irrigation activities. The fund also assists the GDAs through financing the costs for the renovation and maintenance of the irrigational network. The allocated amounts are limited to 60% of the cost, and in 2012, 23.5million Dinars have been disbursed to the 24 CRDAs.

### 3.3.4 Current Status of Operation and Maintenance

The deterioration of the concrete irrigation channels, mentioned in the ex-post evaluation, was seen in certain facilities during the field survey at the CRDA of Gabes. According to the Ministry of Agriculture, delamination of concrete is due to salt damage from the salinity of soil and salt contained in the moisture. According to the CRDA of Gabes, it is due to salinity and sulfurization from the soil, and also, the effect of the quality of concrete used for the project. At the time of construction, the concrete with “high resistance to salinity” was selected. However, since the selection was made considering the balance between cost and quality, the selected concrete was not of highest quality, but one that can withstand the use for irrigation. Therefore, the concrete has deteriorated with time. However, the deterioration is only on the surface, and there is no influence on the capacity of irrigation. During the site visit, new concrete canals could not be seen, but the surface of the canals was repaired with additional layer of concrete. According to the answers to the questionnaires, in Kebili and Tozeur, repair has not been undertaken since the deterioration is only on the surface of the concrete, and is evident in only 3% of all canals. The repair of the concrete surface is being undertaken by the CRDA, but due to budget constraints, the repair work is undertaken according to priority. At the CRDA of Kebili, maintenance is thoroughly conducted whereas all water pipes in the cooling facilities, descaling of the cooling tower, replacing of pipes and wooden grids are done once every two years. In Tozeur, maintenance of cooling facilities maintenance is jointly executed by the CRDA and the GDA. During the site visit in Gabes, the



facilities were in order, and no problems could be detected.

Thus, the operation and maintenance has been properly carried out by the cooperation of the CRDA and the GDA. The study confirmed that there is no problem from the time of ex-post evaluation.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

The number of beneficiary rural households as well as that of the cultivated areas is increasing. On the other hand, qualitative effects reported in the ex-post evaluation such as the increase in the number of the returned farmers, the reduction of soil salinity, the rise in the standard of living, have once again been confirmed. Deteriorations of concrete canals, indicated in the ex-post evaluation, were also confirmed. However, the authorities noted that this deterioration was only on the surface of the concrete. Also, from the fact that the CRDA judged that there were no problems with the function of the canal, and although elementary efforts to repair the deteriorating surface were seen, it can be concluded that there is no problem with the sustainability of the project. Taking into consideration the above-mentioned findings, it is concluded that the positive effects of the project continue to be seen after the ex-post evaluation.

### 4.2 Recommendations

None.

### 4.3 Lessons Learned

From ancient times, certain distinctive culture exists in the southern region of Tunisia which stipulates that selling oasis lands inherited from the ancestors is perceived as a shame. This is the cause for limited sales of land, and few new entrants. Therefore, utilizing “the number of beneficiary rural households” as an indicator to assess the effect of project is inappropriate. Rather, indicators such as “irrigation usage rate”, “change in agricultural production” should have been analyzed. Based on this, when selecting operation and effect indicators for this type of project, it is necessary to take into account the regional cultural background and characteristics of the targeted region.

Comparison of the Original and Actual Scope of the Project

Item	Breakdown	Original	Actual
Output	Number of oases		
	Gafsa	8	As planned
	Tozeur	30	20
	Kebili	67	30
	Gabes	48	30
	Area of target sites (ha)		
	Gafsa	3467	As planned
	Tozeur	5622	3,143
	Kebili	7213	3,700
	Gabes	7133	4,115
	Construction of terminal earth canals (meter)		
	Gafsa	483,242	325,124
	Tozeur	494,454	157,971
	Kebili	1,080,683	870,240
	Gabes	1,033,188	370,791
	Construction of drainage canals (meter)		
Gafsa	37,465	31,888	
Tozeur	352,500	353,614	
Kebili	573,782	347,095	
Gabes	649,681	193,730	
Consulting Services		78 MM	87 MM
Period	Dec. 1996 – Jun. 2003 (6 years and 7 months) 79 months	Dec. 1996 – Dec. 2005 (9 years and 1 month) 109 months	
Project Cost	5,847 million yen		*15
Foreign Currency	4,961 million yen		
Local Currency	(Local currency: 45,106,000 TD)		
Total	10,808 million yen		8,102 million yen
ODA Loan	8,106 million yen		6,417 million yen
Portion	1TND = 110 yen		1TND = 95.45yen
Exchange Rate	(As of Dec. 1996)		(Average Dec. 1996 – Dec. 2005)

15 There are no data on the breakdown.