SUMMARY

LIST OF MAPS

II - Mid-term evaluation of the three Projects

The objective of a mid-term evaluation project is to identify:

- First, its progression regarding irrigation wo rks construction;
- Second, the extensions of the installations of the irrigated perimeters;
- Third, the the drinking water supply for the urban and coastal areas of the north and the centre of the country;
- Finally, the capacities of irrigation water supply of the projected zones (quantity and quality).

As required in the reference terms, the mid-course evaluation of the three JBIC projects will be based on five criteria relative to the evaluation of the progression execution of irrigation works (pipes, pumping station , irrigation and drainage network : relevance, effectiveness, efficiency, impact and sustainability.

Due to a lack of setting in water, the concerned administrative services have to clarify the envisaged operation and exploitation of the pumping out and supplying works. They have also to clarify the irrigation practices which they propose to be adopted by the irrigators, as well as pipes and irrigation and drainage works maintenance actions that all propose to follow. These explanations will then lead to propose the most relevant operational indicators. These indicators will allow the measurement of effective effects and impacts of the project on the agricultural productions, the farmer incomes, and the living conditions of the population: employment, sanitary arrangements and household living standards. So we will be able to compare them with the effects and impacts envisaged by the the JBIC evaluation mission.

II.1 - Mid-term evaluation of TS-P7 Project : Water pipeline construction and irrigation Project in North Tunisia

II.1.1 - Objectives of TS-P7 Project

This project was conceived for two objectives, the second coming as completing the first : transfer of 89% of fresh waters from Sidi El Barrak dam located in Beja division to SONEDE network of the Eastern coast of the country, and enhancement of 11% of these waters by the irrigation of 2 new irrigated perimeters.

a) **The objective of a stable supply fresh water**

Project TS-P7 envisaged a water-conducting double pipe from Sejnane dam in Bizerte division to Mejerdah valley near Tunis, aiming to provide the coastal cities of Tunisia with a fresh water supply of 4 m^3 /S, that is to say 126 M.m^3 /year.

The project contributes to the general improvement of the living conditions by ensuring the 345,600 m^3 /day supply, that is to say 50 L / day to 6,9 millions of Tunisians.

b) **Objective of agricultural productions securing in Nefza and Sejnane plains**

Project TS-P7 envisaged the increase in the agricultural productions by the irrigation of 4,420 ha with 16 M.m^3 coming from Sidi El Barrak dam, among them:

- 1,855 ha equipped around Nefza to use there 7 M.m^3 in compensation of the setting in water of this pond, and
- 2,365 ha equipped on both sides of Sejnane river to use there 9 M.m^3 of the 135 M.m^3 transferred from Sidi El Barrak dam to Sejnane dam.

The Project contributes to the increase of 6,8 M.TD of the income of the 3,000 profit exploiters, i.e. an average increase of 2,230 TD by beneficiary.

II.1.2 - Analysis of TS-P7 Project relevance

The general analysis of the national and regional policies in matter of agricultural development and water management has as a principal objective to guarantee the execution of the projects in accordance with the strategies of the agricultural sector, on the national and regional level.

a) **Coherence of the Project with the national Development policy**

a.1) Coherence of the Project with the priorities of the national Development policy

The choice of two zones qualitatively and quantitatively deprived of irrigation water resources allows the promotion of their development by diversifying their common practised agricultural crops. For the first, (3,000 ha arranged grounds), waters were pumped directly from Sidi El Barrak dam. For the second, (arranged 3,850 ha), waters were transited through a pipe coming from water releases of Sidi El Barrak dam and intended to feed Sejnane dam.

The formerly considered approach for the development of Sejnane plain within the framework of a pilot scheme of the German cooperation, by the reasoned management of pluvial pastures, failed however at the beginning of the assistance Project. In the case of Nefza plain, the setting up in water of Sidi El Barrak dam has recovered alluvial lands formerly productive, and the perimeter becomes a mitigation measure to the negative impacts of the dam, considered like a national interest strategic project.

a.2) Coherence with the national integrated water resources management policy

Northern water development Master Plan envisage to supply drinking water from north west fresh waters to urban centres of Tunis, Sahel, Sfax and Sidi Bouzid and irrigation water to northern agricultural land and to Cap Bon perimeters.

The main water resources are located in the North west and need to be transferred to the consuming areas. The second pipe project is then designed to transfer water from Sidi El Barrak Dam to Tunis and provide irrigation water for Sejnane and Nefza perimeters. The project is responding to one of the main objectives of the National Master Plan.

National integrated water resources management policy's main directions are:

- providing drinking water from northern water for large urban poles and developing agricultural production in Nefza, Sejnane and the Cap Bon areas;

- improving water quality of Mejerdah River characterised by a relatively significant salinity level, by its mixture with Sidi El Barrak dam's waters;
- promoting the regional economic growth and the increase of the population incomes through the development of the agricultural production of Sejnane and Nefza plains.

The project design considers also the national priorities of water saving by introducing sprinkling and drop irrigation systems and the limitation of the water volumes to be used.
The project is also in coherence with the integrated and rational water management approach and this through the introduction of flow control valves in the terminals and by a water pricing.

Participatory water management approach is one of the most important directions of the National Water policy. This is why 4 GIC have been created in Sejnane perimeter and 4 others in Nefza perimeter. These water users associations are funded in order to release the State of the functioning and maintenance actions of these perimeters. By the same way, they allow a more effective management by the owners themselves.

a.3) Coherence with the national agricultural policy

The problems encountered in the citrus fruit fields of Cap-Bon led the M/ARH to explore new surfaces where to develop citrus fruit cultivation in the zones of soft or moderated winter of the divisions of Kairouan, Bizerte, Beja and Jendouba.

Moreover, as recommended in Beja and Bizerte Regional Agricultural Maps, it's clear that seeking for competitiveness will lead the beneficiaries to specialize in milk and cereals production.

a.4) Coherence with the Tobaccos Control policy

The Project will allow Nefza and Sejnane plains to meet perfectly the pressing needs of the Tobaccos Control for irrigated grounds by fresh waters in order to extend the culture of the new Tobacco varieties which can be a substitute to the imports of Virginia Tobacco cigarettes for the industry of light cigarettes.

b) Coherence of the Project with the regional integrated water resources management policy

At the regional level, within the framework of the extreme Northern Tunisia hydraulic resources exploitation, approximately 10 M.m^3 for Nefza perimeter and 13 M.m^3 for Sejnane perimeter of water quantities are coming from Sidi El Barrak dam. They have been allocated for the irrigation of 1,755 ha net in Nefza plain and of 3,155 ha net in Sejnane plain.

The arranged perimeters surfaces extension compared to those planned at the beginning resulted, however, in having 2,700 ha net in the case of Nefza and 3,400 ha net in the case of Sejnane. Under these conditions, the used water volume would be 29 M.m^3 instead of the initially planned 23 M.m^3. Consequently, it is necessary to see the incidence of this increase on the water stock management, within the regional framework.

Moreover, the regional concern is to make profitable the perimeters water use without touching to the integrity of the downstream resource, and in particular Sejnane and Sidi El Barrak dams, whose water is intended mainly to feed drinking water national needs. The irrigation impacts must also be considered in total installation.

II.1.3 - Analysis of TS-P7 project efficiency

a) **Variations between the estimated and observed outputs**

a.1) Technical variations between estimated and carried out installations in Nefza perimeter

Table n°II-1 of page II-5 presents the variations between the achievements made by Nefza Project Unit and the estimations of the Detailed study of the perimeter.

As it was carried out, Nefza perimeter has 6 hydraulic sectors: Bouzenna 1, Bouzenna 2, Bouzenna 3, Jmila, Touila and Ouechtata. The total surface of the equipped zones is 2,930 ha (that is to say an increase of 670 ha compared to the study carried out by STUDI and 1,345 ha compared to the evaluation report.)

The justification of the increase in the equipped surface is explained by the requests of the bordering population of the initial installation, which had been conceived like compensation to the expropriated farmers during the setting in water of Sidi El Barrak Dam. This bordering population was, however, often expropriated during the pond setting in water.

The majority of the modifications result from this surface increase. Moreover, the capacity of the tank that feeds Touila and Ouechtata sectors was reduced from 33,350 m^3 to 500 m^3, by modifying its compensation pond role to a pump regulation tank.

Lastly, the tracks network was reduced because bad climatic conditions, geo-technical conditions as well as the social opposition that prevented their realization.

a.2) Technical variations between estimated and carried out installations in Sejnane perimeter

Table n°II-2 of page II-6 compares in its turn the differences between the Project Unit achievements and the estimations of the Detailed study of the perimeter carried by STUDI in 1998.

As it was carried out, Sejnane perimeter has 8 hydraulic sectors, fed by 4 pumping complexes.

The net surface of the equipped zones is 4,036 ha, that is to say an increase of 734 ha compared to the study carried out by STUDI and 1,201 ha compared to the evaluation report. This increase in the surface is explained by:

- The OEP will is to lower the staff number of its farm by setting up a kind of « technicians batches » for its managerial staff and a kind of « young farmers » batches for its workers ;
- the repeated requests of the bordering population of the initial sectors, further to the necessity to replace two areas initially excepted in the ” garaa “ of Sejnane and downstream along the oued of Sejnane.

Table n°II-1 : Comparison estimation-achievements of hydraulic installations in Nefza perimeter

Request	Estimations(Detailed study STUDI 1997)	Achievements	Comments
equipped Surface (ha)	total Surface: 2,260 ha net surface: 1,730 ha (Bouzenna : 742 ha – Jmila : 244 ha – Touila : 308 ha – Ouechtata : 436 ha)	Total Surface: 2,930 ha (Bouzenna : 1,550 ha – Jmila : 375 ha – Touila : 470 ha – Ouechtata : 530 ha) Clear surface : 2,640 ha (Bouzenna : 1,400 ha – Jmila : 340 ha – Touila : 420 ha –Ouechtata : 480 ha)	Surfaces extension after the bordering population request.
Irrigation basic parameters (equipment flow, needs, rotation...)	Bouzenna (average net surface : 2.1 ha; Gross requirements: 1,400 m^3 /ha, equip flow : 1,7 l /s) Jmila (average net surface : 2.0 ha ; Gross requirements : 1,250 m^3 /ha, equip flow : 1.5 l /s) Touila (average net surface : 1.7 ha; Gross requirements: 1,150 m^3 /ha, equip flow : 1.1 l /s) Ouechtata (average net surface : 0.85 ha; Gross requirements: 2,000 m^3 /ha, equip flow : 0.8 l /s)	Respected APD diagram, with for Ouechtata 2 l /s by terminal	
Type of intake	Bouzenna and Jmila sectors : pricking on Sidi Barrak pipe – Sejnane. Touila and Ouechtata sectors : direct intake on Sidi Barrak dam.	In addition to the envisaged pricking, two other pricking were carried out to feed the extension zone (Cape Negro)	The 2 prickings connect the extension zone to the network
pumping out station	Touila and Ouechtata sectors : a station with floating pontoon (3 stations with 11 pumping installations and one of safety, Qu=56 l /s and TMH= 41 m.	12 pumping group among them a safety one (Qu=66l/s – HMT:32 m)	A difference due to the arranged surfaces increase
pumping station	Touila and Ouechtata sectors : a recovery station (6 pumps including 1 of safety with qu = 124 l /s and TMH = 66 m)	6 pumping group among them a safety one (Qu=145 l/s – HMT = 63 m)	A difference due to the arranged surfaces increase
Discharge pipe	Bouzenna and Jmila sectors : a transfer pipe to the tank of 4,020 lm overall length in DN 800 (Q=575 l /s). Touila and Ouechtata sectors : a discharge pipe of 1,100 lm overall length in DN 800 (Q=620 l /s).	Bouzenna and Jmila discharge pipe: 4,0 km Touila and Ouechtata: 1,4km	
Tank	Bouzenna and Jmila sectors : Half-sunken AB tank of 31,300 m^3 capacity. Touila and Ouechtata sectors : Half-sunken AB tank of 33,350 m^3 capacity.	Bouzenna and Jmila: a 33.000 m^3 regulation tank Touila and Ouechtata: a 500 m^3 regulation tank	Touila Ouechtata 's tank is no longer a compensation tank (storage) but plays the role of pumps regulation and network functioning.
distribution network	Bouzenna and Jmila sectors : a distribution network of 57.2 km length. Touila and Ouechtata sectors : a distribution network of 49.8 km length is.	119 km of Pehd network 24,6 km of reinfored concrete	A difference due to the arranged surfaces increase
terminals number		1300 terminal	The design modification (from terminals having several intakes to an almost individual terminals)
cleansing network	A recallipering of the existing natural network	18 km on the natural existent network	
tracks network	Bouzenna and Jmila sectors : total length of the tracks network is 58.5 km. Touila and Ouechtata sectors : total length of the tracks network is 19.0 km.	70 km of tracks	Realization socio technical problems
windbreaks network	Not envisaged	60 km of windbreak	Financing on national budget

Table n°II-2 : Comparison estimation-achievements of hydraulic installations in Sejnane perimeter

Request	Estimations (Detailed study STUDI 1998)	Achievements	Comments
Net surface (ha)	Total surface : 3,302 ha): C1 (794 ha), C2 (1,180 ha), C3 (759 ha), C4 (570 ha)	Total surface (3,990 ha): C1 (900 ha), C2 (1,122 ha), C3 (1,390 ha), C4 (580 ha)	the rough surface envisaged is 2,835 ha (source " Apraisal document")
irrigation basic parameters (equipment flow, needs, rotation...)	785 m^3 /ha (plain rotation) and 1,455 m^3 /ha (slopes rotation) – 16 hours of irrigation	Approximately 0,65 l /s /ha, and 1,100 m^3 /ha in rush month	Maintained Assumptions of the detailed study
Type of intake	CP1 and CP2 (taken by canal with raising threshold) CP3 and CP4 (taken by canal without raising threshold)	Idem	Maintained Diagram
pumping out station	**CP1 :** S1: 2 + 1 – HMT = 6.6 m, Q = 74 l /s, S2 : 3 + 1 – HMT = 5.4 m, Q = 324 l /s) **CP2** : S3 : 3 + 1 – HMT = 5.4 m, Q = 104 l /s, S4 : 3 + 1 – HMT = 5.7 m, Q = 240 l /s, S8 : 3 + 1 – HMT = 5.2 m, Q = 157 l /s) **CP3** : S5 : 3 + 1 – HMT = 6.5 m, Q = 129 l /s, S9 : 3 + 1 – HMT = 6.7 m, Q = 149 l /s) **CP4** : S6 : 3 + 1 – HMT = 5.2 m, Q = 148 l /s, S2 : 3 + 1 – HMT = 5.3 m, Q = 165 l /s)	**CP1** : S1 : 2 + 1 – HMT : 4.6 m, Qu = 40 l /s, S2 : 3 + 1 – HMT = 4.8 m, Qu = 128 l /s) **CP2** : S3 : 3 + 1 – HMT = 7.5 m, Qu = 38 l /s, S4 : 3 + 1 – HMT = 7.5 m, Qu = 120 l /s, S8 : 3 + 1 – HMT = 8.7 m, Qu = 55 l /s) **CP3** : S5 : 3 + 1 – HMT = 5.0 m, Qu = 52 l /s, S7 : 3 + 1 – HMT = 4.9 m, Qu = 48 l /s) **CP4** : S6 : 3 + 1 – HMT = 3.8 m, Qu = 102 l /s)	Increase of the arranged surface
pumping station	**CP1** : S1: 2 + 1 – HMT = 65.3 m, Qu = 37 l /s, S2 : 3 + 1 – HMT = 59.3 m, Qu = 108 l /s) **CP2** : S3 : 3 + 1 – HMT = 73.0 m, Qu = 35 l /s, S4 : 3 + 1 – HMT = 91.0 m, Q = 80 l /s, S8: 3 + 1 – HMT = 129.0 m, qu = 52 l /s) **CP3** : S5 : 3 + 1 – HMT = 88.4 m, qu = 43 l /s, S9 : 3 + 1 – HMT = 105.4 m, Qu = 50 l /s) **CP4** : S6 : 3 + 1 – HMT = 88.8 m, qu = 50 l /s, S2 : 3 + 1 – HMT = 88.4 m, Qu = 55 l /s)	**CP1** : S1 : 2 + 1 – HMT : 68 m, Qu = 36.0 l /s , S2 : 3 + 1 – HMT = 59 m, Qu = 116.0 l /s) **CP2** : S3 : 3 + 1 – HMT : 69 m, Qu = 34.5 l /s , S4 : 3 + 1 – HMT = 74 m, Q = 71.0 /s, S8 : 3 + 1 – HMT = 116 m, Qu = 45.0 l /s) **CP3** : S5 : 3 + 1 – HMT : 83 m, Qu = 50.0 l /s , S7 : 3 + 1 – HMT = 85 m, Qu = 43.5 l /s) **CP4** : S6 : 3 + 1 – HMT : 86 m, Qu = 97.0 l /s)	Increase of the arranged surface
Discharge pipe	-	Pipe of rejection-distribution Φ 600	
Tank	**CP1** (R1: 7500 m^3, R2: 26500 m^3) **CP2** (R3: 8,500 m^3, R4: 21,000 m^3, R8: 11,500 m^3) **CP3** (R5: 11000 m^3, R9: 9,500 m^3) **CP4** (R6: 12,500 m^3, R7: 10,500 m^3)	All brought back to 300 m^3 except R4 brought back to 100 m^3	Pumps regulation tank and no longer compensation (storage)tank
Distribution network	128.775 km of Φ 90 to Φ 315) 31.120 km of Φ 400 to Φ 600)	171.000 km	Arranged surface increase
terminals number	CP1 : 128 terminal CP2 : 137 terminal CP3 : 88 terminal CP4 : 70 terminal	1,128 terminals	Design modification
cleansing Network	11.810 km	93..100 km	Underestimated network during the study
tracks Network	20 km of primary track and 80 km of secondary track	52..4 km	Realization problem
windscreens Network	-	None	Need for a special financing

The majority of the modifications result from this surface increase. The capacities of the tanks feeding the various sectors were however reduced following the modification of their role from a compensation tank to a simple pump regulation tank.

The design was modified with the division of the perimeter in only 8 sectors, instead of the 9 initially envisaged. The increasing of the terminals network is related to a modification of the irrigation type: from a "water turn" irrigation to an "at request" irrigation.

The sanitation network was extended because the studies had underestimated the extent of the hydromorphy phenomenon in Sejnane perimeter.

The tracks network was reduced for the secondary tracks, because their realization encountered problems : bad climatic and inadequate geo technical conditions

Lastly, it's worth notice that a 45.6 ha area called to an urban extension has been included in the sector 5 and fit out with markers. In order to be able to shut up the future urban development in it, we advise its exclusion.

a.3) Variations between estimated and realized irrigated production in Nefza and Sejnane perimeters

For lack of effective setting in water, it was not possible to carry out an analysis of the differences between estimated and carried out irrigated productions in Nefza and Sejnane perimeters

Only 100 ha were set in water in Nefza perimeter thanks to the network test of Bouzenna sector during 2004 summer, and they were completely devoted to the speculative production of water melon, in the absence of any attempt of rotation.

a.4) Technical variations between estimated and carried out installations on the level of the double pipe

The second pipeline project consists in the construction of two second pipeline sections: Sejnane Joumine section and Joumine –Mejerdah section, and in the realization of 2 pumping station on each part. The **Table n°II-3** and **Table n°II-4** of page II-8 present the various components of the pipeline doubling project as they were estimated then as they were carried out, respectively for the first section beetween Sejnane and Joumine and for the second section beetween Joumine and Mejerdah river.

Table n°II-3 : Variations between planned and actual components between Sejnane and Joumine

Component	estimations	Achievements	Cause of the noticed differences
Sejnane-Joumine section	- Building materials: reinforced concrete	No difference	
	- Internal diameter: 1800mm	No difference	
	- Length : 35,8 km (10,44 km with a cement coating resistant to the surfaces + 4,99 km of cathodic protection)	Length : 37,063 km	- To take advantage from the 2nd file works to lay some of the 3rd file (obstruction reason)
	- Nominal capacity of the pumping station: 5,82 m^3 /s	No difference	-local and meticulous revisions regarding the design
	- Flow starting from the regulation pond: 4 m3/s	No difference	
	- Maximum service pressure: 11 bars	No difference	
	- Flow meter on Sejnane - Sidi M'Barek section	No difference	
Sejnane pumping station	- Number of pumps: 6+1	No difference	
	- Nominal capacity: 11,64 m^3 /s	No difference	
	- TMH : 66 m	No difference	
	- Unit power : 2,000 kw	No difference	
	- Suction cups, air valves and drainers rooms: 23 site	No difference	
	- counting Rooms: 2 site	No difference	
	- cutting Rooms: 2 site	No difference	
	- drainage c.e works rooms: 22 site	No difference	
Crossing Works	- Crossing under the railway : 2	No difference	
	- Crossing on river or brooks : 14 sites	No difference	
	- Crossings on principal roads : 60 sites	No difference	
Civil engineering works	- Excavations : 695,7 10^3 m^3	No difference	
	- Fill : 414,6 10^3 m^3	No difference	
	- Concrete for works : 29 10^3 m^3	No difference	
	- Reinforcing steel : 913 tons	No difference	

Table n°II-4 : Variations between planned and actual components between Joumine and Mejerdah river

Component	Estimations	Achievements
Joumine – Mejerdah river section	Building materials: reinforced Concrete	No difference
	Internal Diameter: 1,800 mm	No difference
	Length: 45,02 km (27,5 km with a concrete coating resistant to sulphates + 17,92 km of cathodic protection)	Length : 47,189 km
	Flow starting from the regulation tank: 4 m^3 /s	No difference
	service maximum pressure: 10 bars	No difference
	2 Flow meters on Joumine - Sidi M'Barek and Sidi M'Barek – wadi Mejerdah sections	No difference
Joumine pumping station	Number of pumps : 3+1	No difference
	Nominal capacity : 4 m^3 /s	No difference
	HMT : 66 m	No difference
	Unit power: 1,100 kW	No difference
	Suction cups, air valves and drainers rooms : 19 sites	No difference
	Room of counting : 2 sites	No difference
	Room of cutting : 2 sites	No difference
	Rooms for works of draining : 19 sites	No difference
Crossing works	Crossing under the railway: 2	No difference
	Crossing on river or brooks:7 sites	No difference
	Crossings on principal roads: 13 sites	No difference
Civil engineering works	Excavations: 623 10^3 m^3	No difference
	Fills : 456 10^3 m^3	No difference
	Concrete for works : 14,4 10^3 m^3	No difference
	Reinforcing steel : 736.5 tons	No difference

b) Variations between planned and observed deadlines

b.1) Variations between planned and observed schedule for the setting in water of the perimeters

b.1.1) Variations between planned and observed achievement deadline for irrigated perimeters arrangement

The projected planning of Nefza perimeter achievements estimated an equipped surface of 1,585 ha between February 1996 and December 1999. The real achievements planning (see appendix) indicates that the realization proceeded from April 2000 to December 2004, for a finally equipped surface of 2,930 ha.

This surface increase, which is the cause of delays in Nefza, is due to the request of expropriated farmers at the time of the setting in water of Sidi El Barrak dam's pond and resettled in the zone skirting the of Sidi El Barrak –Sejnane pipeline or around the initial perimeters .Those farmers want also to use irrigation water to intensify their production system.

The projected planning of the achievements for Sejnane perimeter estimated an equipped surface of 2,835 ha From February 1996 to December 1999. The real achievements planning (see appendix) indicates that the realization proceeded from June 2000 to November 2004, for a finally equipped surface of 3,800 ha.

First of all, the works starting up has recorded a shift compared to the initial program because of administrative concerns : a series of recommendations, prior agreements, procedures and visas which take time to be carried out and which should be obtained beforehand.

Lastly, the rains and the floods have affected works :

- in Nefza perimeter, where building sites remained impracticable from November 12 2002 till the end of March 2003.

- in Sejnane perimeter, where intermittent stops followed one another between November and December 2002, before a general stop of all building sites from January 2003 until April 14 2003. The presence of a low depth groundwater also limits the progress of foundation and track works, as well as the execution of drainage and agricultural sanitation ditches.

After deduction of the delay explained by the bad weather, the other months of delays (2 to 3 months) are explained, in addition to the arranged surfaces increase, by the problems which have occurred on the level of the following markets:

- a problem of limit in the output has affected the manufacture of concrete pipes necessary to the irrigated perimeters, and one was brought to substitute concrete by Pehd, as material constituting the pipes of diameters lower than 600 mm ;

- a problem of execution on the markets of the agricultural tracks and sanitation-drainage work, because of bad geo technical conditions and of the opposition expressed by some owners.

- a problem of pumping station retiming on the level of Sejnane perimeter, because of the works flooding in their initial position.

b.1.2) Variations between planned and observed completion dates for the land reform work

The action of regrouping is not completed in March 2005 in sectors 2 and 6, whereas it should had been completed in 2003. Persistent dissensions on the relative grounds valorisation, and thus the validity of some proposed plots exchanges, prevent the concluding of a final agreement.

b.1.3) Variations between planned and observed completion dates for GIC effective constitution

Though there is no delay concerning the GIC constitution, it is necessary to note that the constitution is not completely effective (no held general meetings to elect Board of Directors) since the 11 GICs of the two perimeters are still functioning with temporary committees recognized by the Authorities.

b.2) Variations between planned and observed schedule for the double pipeline water setting

Works of the second pipeline project for the two sections Sejnane – Joumine and Joumine – Mejerdah would have been started at the beginning of 1997, and completed at the end of 1999. In fact, these works started with a delay of 5 months towards the 13/03/1997 and they were completed towards the 30/07/2004[1].

The shift between the planned works deadline and actual ones is due primarily to :

- the performance insufficiencies of concrete pipes local supplier due to insufficiencies in the factory's output;
- the exceptional climatic phenomena which slowed down the progress of the work : strong rainfall from November 2002 to March 2003;
- the administrative problems, such as obtaining prior agreement and the series of recommendations, the slowness of the administrative procedures

c) **Variations between estimated and real investment costs (APD)**

c.1) Variation between planned and observed investment costs for Nefza perimeter

The estimated amount in the initial contract was 1,728 M.JP¥ which corresponded to 20.8 M.TD on the basis of conversion rate of 1,000 JP¥ for 12,0339 TD and was distributed as indicated in **Table n°II-5** below, which compares it to the approved amounts of the 17 actually concluded markets.

Table n°II-5 : Real realization cost of Nefza perimeter

Batch N°	Item	Estimations TTC	Contractor	JBIC	Budget	**Total**
2.2.1.1	Bouzenna tank's Civil engineering	1 394 610.140		1 062 007.728	330 402.404	**1 392 410.132**
2.2.1.2	Civil engineering Touila pumping station and tank	722 755.900	Lotfi Ali	693 862.061	215 868.196	**909 730.257**
2.2.2	pumping station and tank equipment	1 995 037.107	Lotfi Ali	1 275 062.284	514 793.508	**1 789 855.792**
2.2.3	Reinforced Concrete special parts and pipes supply	4 672 978.617	ERHMA-ing A.CACCAVALE	2 685 558.951	853 112.560	**3 538 671.511**
	endorsement 1		EL Kanaouet	901 827.072	291 363.300	**1 193 190.372**
2.2.4	Reinforced Concrete special parts and pipes installation	2 262 000.000	El Kanaouet under treating El Mawassir	1 725 145.063	536 711.797	**2 261 856.860**
2.2.5	PEHD pipes and special parts supply	2 057 537.097	MAGISA - STIT	1 607 462.760	513 517.203	**2 120 979.963**
2.2.6	Install PEHD pipes	2 135 419.500	SICOAC	1 329 187.673	413 525.054	**1 742 712.727**
2.2.7	Supply cast iron special parts	171 759.833	WP SOGIT Inter Abdelaziz Said	113 445.522	36 659.513	**150 105.035**
2.2.8	Supply tap – valves	266 116.983	SOFOMECA	162 747.172	76 758.113	**239 505.285**
2.2.9	equipment supply, watermeters for terminals	486 414.000	SERIN	370 993.729	115 420.271	**486 414.000**
2.2.9	Network Protection	157 192.808	Moncer Mohamed	119 892.820	37 299.988	**157 192.808**
2.2.10	Sanitation drainage	1 560 772.000	SERIN	1 343 335.004	417 926.446	**1 761 261.460**
2.2.11	Agricultural tracks batch 1	2 719 150.000	GTS	951 093.686	295 895.814	**1 246 989.500**
	Agricultural tracks batch 2		SOTUBISE	1 245 334.386	387 437.364	**1 632 771.750**
2.2.12	pumping stations and tanks electrification	160 000.000	SOTUBISE	122 033.896	37 966.101	**159 999.997**
2.2.13	Vehicles acquisition	42 417.500	STEG	12 926.822	4 021.678	**16 948.500**
			Renault	22 366.526	7 233.474	**29 600.000**
			Economic Auto	16 093.220	5 237.780	**21 331.000**
TOTAL		**20 804 161,485**		**15 760 376.375**	**5 091 150.564**	**20 851 526.939**

From the two preceding tables data, **Table n°II-6** below displays the indeed committed amounts.

[1] *The real date of work completion corresponds to the temporary acceptance date of the last batch.*

Table n°II-6 : really carried out expenditures in Nefza

Scheduling Amount Payment ordering	Markets	Work	Lapse	Variations
JBIC	15 606 238.442	15 760 376.375	154 137.933	+ 1.0%
Local	5 097 923.043	5 091 150.564	-6 772.479	- 0.1%
Total	**20 704 161.485**	**20 851 526.939**	**147 365.454**	**+ 0.7%**

Despite the increase of 60% of arranged surfaces, the weak variation of the installation cost of Nefza perimeter is explained by:

- the permanent rise of the conversion rate JP¥ /TD during all the considered period ;
- a strong competition on all the work and supply contracts in the national as well as international invitations to tender. The tenders number is often higher than 10 ;
- the refusal expressed by some owners about drainage or distribution pipelines crossings, which makes the installed lengths slightly higher than the initially estimated.

c.1) Variations between planned and observed investment costs for Sejnane perimeter

Facing an estimated amount in the initial contract of 1,928 M.JP¥, which corresponded to 23.2 M.TD on the basis of conversion rate of 1,000 JP¥ for 12.0339 TD, **Table n°II-7** below shows the distribution of the various real expenditures after work completion, which rise on the whole to 22,058,000 TD distributed out of 15 actually concluded markets, for which 23,214,321 TD were really consumed.

Table n°II-7 : Real realization costs of Sejnane perimeter

Batch N°	Item	Contractor	Jbic	Budget	**Total**
2.2.1.1	Civil engineering, stations, tanks, buildings	Lotfi Ali	2 986 603.064	930 297.670	**3 916 900,734**
2.2.1.2	Equipment pumping stations and tanks	Ansaldo Meregalli	1 949 171.210	650 185.204	**2 599 356,414**
2.1.3	Reinforced Concrete pipes and special parts supply	El Kanaouet	488 092.324	158 250.378	**646 342,702**
	Endorsement 1	El Kanaouet (under treating Bestoplast)	2 196 674.998	789 094.742	**2 985 769,740**
Batch 2.1.4	Installation of pipes and special parts FB	Chaabane and Co	1 214 744.097	377 625.280	**1 592 369,377**
Batch 2.1.5	PEHD pipes supply	BESTOPLAST	1 898 701.343	605 350.920	**2 504 052,263**
Batch 2.1.6	PEHD pipes installation	Chaabane and Co	1 671 204.777	519 872.823	**2 191 077,600**
Batch 2.1.7	Cast iron special parts	SOFOMECA	221 565.696	71 500.869	**293 066,565**
Batch 2.1.8	Taps and valves supply	SIPAH	171 834.689	94 674.521	**266 509,210**
Batch 2.1.9	Terminals equipment supply	SIPAH	260 601.490	142 112.811	**402 714,301**
Batch 2.1.9 (a)	Network protection	NESRIN	118 816.200	36 069.140	**154 885,340**
Batch 2.1.10	Sanitation drainage	ETRAHI	1 719 489.476	534 922.392	**2 254 411,868**
Batch 2.1.11	Agricultural tracks	EL Amri Youssef	1 809 101.009	562 664.023	**2 371 765,032**
Batch 2.1.12	Pumping stations electrification	STEG	689 274.916	230 725.084	**920 000,000**
Batch 2.1.13	Vehicles acquisition	Economic Car / Citroen	86 234.286	28 865.713	**1 592 369,377**
Batch 2.1.4	FB pipes and special parts installation	Chaabane and Co	1 214 744.097	377 625.280	**115 099,999**
Batch 2.1.5	PEHD pipes supply	BESTOPLAST	1 898 701.343	605 350.920	**2 504 052,263**
Batch 2.1.6	PEHD pipes installation	Chaabane and Co	1 671 204.777	519 872.823	**2 191 077,600**
TOTAL			**17 482 109.575**	**5 732 211.570**	**23 214 321.145**

Despite the increase of 10% of arranged surfaces, this stagnation of the installation cost of Sejnane perimeter is explained by :

- the permanent rise of the conversion rate JP¥ / TD during all the considered period ;

- a strong competition on all the work and Supply contracts in the national as well as international Invitations to tenders The tenders number is often higher than 10.

c.2) Observed variations between estimated and real investment costs for the pipeline doubling

Table n°II-8 below presents the distribution of the pipeline doubling amount estimated in the initial contract , which represents a total of 13,416 M.JP¥ corresponding to 161.4 M.TD on the basis of conversion rate of 1,000 JP¥ for 12,0339 TD.

Table n°II-8 : Estimated cost of the pipeline doubling

Amounts / Component	Loan in Million ¥	National Budget in Million TD	Total Amounts in Million ¥	Total Amounts in Million TD
Section of Sejnane – Joumine	3 449	22.64	5 660.35	68.12
Section of Joumine – Medjerda	3 344	22.79	5 237.82	63.03
Physical unexpected incidents S / J	189	1.13	282.90	3.40
Physical unexpected incidents J /M	167	1.14	261.73	3.15
Taxes		23.74	1 972.76	23.74
Total	**7 479**	**71.44**	**13 415.56**	**161.44**

Source: the double pipe completion project report

Facing this initially estimated cost of 161,440 M.TD, **Table n°II-9** below shows the distribution of the various real expenditures after completion of work, which rose on the whole only to 99,789 M.TD.

Table n°II-9 : Real cost of the pipeline doubling

N°	Item	Contractor	Jbic	Budget	**Total**
batch 1.1	Supply of the conducts and special parts S / J	El Kanaouet	16 795 943.831	5 120 442,027	**21 916 385,858**
Batch 1.2	Supply of the conducts and special parts J / M	El Kanaouet	18 102 111.952	5 796 930,825	**23 899 042,777**
Batch 2.1	Installation of pipes and special parts S / J	SOMATRA GET	9 590 561.451	2 914 867,683	**12 505 429,134**
Batch 2.2	Installation of pipes and special parts J / M	BONNA Tunisia	10 408 498.701	3 102 514,324	**13 511 013,025**
Batch 3	Supply of equipment for pipes protection	OTC	1 863 913.262	879 675,584	**2 743 588,846**
Batch 2.A 1	Sejnane pumping station– civil Engineering	CWE	1 674 847.203	395 533,615	**2 070 380,818**
Batch 2 A 2	Joumine 2 pumping Station–civil Engineering	CWE	1 225 051.658	375 917,505	**1 600 969,163**
Batch 4-.3 (*)	hydro-mechanical and electric Equipment. Sejnane and Joumine pumping stations	Ansaldo Meregali	7 485 767.467	2 626 865,698	**10 112 633,165**
Batch 4.4	Electrification of Sejnane pumping station	STEG	8 361 387.571	2 848 612,429	**11 210 000,000**
Batch 5	Travelling material	Economic Car	167 186.730	52 013,270	**219 200,000**
		TOTAL	**75 675 269,826**	**24 113 372,960**	**99 788 642.786**

(*) This batch 4-3 was the subject of a payment in euros of an amount of 4,838,728 Euros converted into Dinars at the rate of 1.00 € for 1.295 TD included in JBIC share.

This significant diminution of 38% of the amount of this market price expressed in TD is explained by :

- continuous variation of the exchange rate between JP¥ and TD, in favour of the JP¥ ;
- strong competition on all the work and Supply contracts in the national as well as international Invitations to tenders, where Tunisian companies won the majority of the markets, except for the electromechanical equipment and the pumping stations civil Engineering .
- the realization of this second pipe project was made in the continuity of the first pipe project, which minimized the technical risks on the adopted solutions.

II.1.4 - Analysis of TS-P7 project effectiveness

a) **Presentation of the TS-P7 Project supervision major indicators**

At the end of this mid-term evaluation of TS-P7 Project achievements which were carried out in February-March 2005, before the setting in water of the irrigated perimeters and the connection to the network of the double pipeline between Sejnane dam and Mejerdah River, only some supervision indicators of the Project really observed can be compared with those planned at the time of the loan agreement conclusion between JBIC and Tunisian State.

The second pipeline has not yet been functioning, **Table n°II-10** below presents only the planned values of the major operation and effectiveness (supervision) indicators of this part of TS-P7 Project.

Table n°II-10 : Values of the major operation and effectiveness indicators for the second pipeline of TS-P7 Project

Effectiveness indicators	Planned	Actual (in march 2005)
Operation indicators		
Amount of water supply for drinking purposes for 2010	4 m^3 /second = 345,600 m^3 /day = 78 M. m^3 /year	
Served population	5 million inhabitant /day	
Water salinity	- By the year 2010 water salinity for Large Tunis will be about 0.82 g/l ; for the Cap Bon and Sfax it is estimated to reach 1.02 g/l.	
Effect indicators		
Percentage of served population (%)	In urban areas, 100 % of population is served by drinking water.	
Water supply per capita (l/person/day)	Projected water supply per capita for the year 2010: - LargeTunis : 114 - Cap Bon : 86 - Sfax : 90 - Sidi Bouzid : 43 - Sousse : 106 - Kairouan : 59	
water supply income	40 835 340 TD	

Table n°II-11 of page II-14 also presents the planned values of the major operation and effectiveness (supervision) indicators of the perimeters part of TS-P7 Project, and compares some of them with the values really observed in February-March 2005.

Table n°II-11 : Values of the major operation and effectiveness indicators of the two perimeters of TS-P7 Project

Indicators	Planned			Actual (in March 2005)	
Arranged area	Total : 5,176 ha	in Nefza : 1,851 ha in Sejnane : 3,325 ha		Total : 6,960 ha	in Nefza : 2,930 ha in Sejnane : 4,030 ha
Useful agricultural area	Total : 4,910 ha	in Nefza : 1,755 ha in Sejnane : 3,155 ha		Total : 6,240 ha	in Nefza : 2,640 ha in Sejnane : 3,600 ha
Beneficiaries Number	Total : 1,900 households	in Nefza : > 1,000 households in Sejnane : > 850 households		Total : 3,400 households	in Nefza : 980 households in Sejnane : 2.420 households
	Cultivations	Occupation	Output	N.A.	
	Pear tree	216 ha	25.0 T /ha	N.A.	
	Apple tree	215 ha	25.0 T /ha		
	Citrus fruits	119 ha	18.0 T /ha		
	Wheats	204 ha	5.5 T /ha		
	Leguminous plants	27 ha			
	Tobacco	512 ha	2.0 T /ha		
	Barley in green	406 ha	45.0 T /ha		
	Bersim	1,461 ha	50.0 T /ha		
	Tare-Oats hay	1,147 ha	6.0 T /ha		
	Fodder corn	1,336 ha	40.0 T /ha		
	Potato of off-season	234 ha	14.0 T /ha		
	Green onion	385 ha	30.0 T /ha		
	Tomato	107 ha	50.0 T /ha		
	Melon	232 ha	20.0 T /ha		
	Water melon	512 ha	30.0 T /ha		
Collection rate of irrigation fees	100 %			N.A.	
Increase of agricultural income	year 2010	+ 6,747,000 TD		N.A.	

b) **Water supply of the country's urban centres**

The project of doubling the Northern Water pipe has for main goals the drinking water supply in the areas of Large Tunis, Cap-Bon, Sousse and Sfax coasts, Kairouan and Sidi Bou Zid, the development of the irrigation in the new perimeters of Nefza and Sejnane and the safeguard of Cap-Bon existing perimeters. The purpose of this project is also the improvement of the quality of drinking water by mixture of Mejerdah river waters with those of Sidi El Barrak dam.

To analyse its effectiveness, several indicators can be used. The most significant among them are as follows: provided water quantities, the SONEDE sale income of this water and the provided water quality.

b.1) Evolution of the provided water quantities

Table n°II-12 below presents the water quantities provided to meet the population needs evolution.

Table n°II-12 : Quantities of water to be delivered for urban poles drinking water supply (in 10^6 m^3)

water quantities	coming from the double pipe		coming from Mejerdah	**Total**
Year	**Total**	Used for drinking water		
2000	**85.7**	52.4	54.3	**106.7**
2005	**114.5**	75.1	71.3	**146.4**
2010	**114.6**	78.0	86.8	**164.8**

Source : SAPROF Report

It is noted that the quantities of water delivered by this double pipeline should evolve from 86 M.m^3 in 2000 to reach 115 M.m^3 in 2010.

a.2) Evolution of water quality supplied by SONEDE

Waters of Mejerdah river are not often convenient for human consumption because of their strong salinity : 1,8 G /L on average, and to 2,4 G /L in low water level. On the contrary, water of Sidi El Barrak dam has a low salinity, about 0,6 G /L, from where the idea to mix them with Mejerdah waters to improve the quality of water to be delivered in the coastal urban centres.

Table n°II-13 below presents the evolution of the monthly water salinity in drinking water tank of Ghdir El Goulla feeding Large Tunis (through SONEDE) and Mejerdah Cap-Bon Canal (CMCB).

Table n°II-13 : Salinity level after mixture of Northern and Mejerdah waters

Month / Year	Jan	Feb	Mar	Apr	Mai	June	July	Aug	Sep	Oct	Nov	Dec
2000												
Ghdir El Goulla	0.69	0.69	0.69	0.69	0.75	0.74	0.66	0.72	0.78	0.77	0.73	0.72
Canal MCB	1.00	1.00	1.00	1.00	1.00	1.00	1.11	1.00	1.00	1.00	1.00	1.02
2005												
Ghdir El Goulla	0.73	0.73	0.73	0.73	0.77	0.71	0.72	0.69	0.75	0.79	0.76	0.74
Canal MCB	1.00	1.00	1.00	1.00	1.00	1.00	1.18	1.00	1.00	1.00	1.00	1.03
2010												
Ghdir El Goulla	0.76	0.76	0.76	0.76	0.80	0.68	0.78	0.74	0.72	0.82	0.79	0.76
Canal MCB	1.00	1.00	1.00	1.00	1.00	1.00	1.25	1.10	1.00	1.00	1.00	1.06

Source: SAPROF Report for the pipeline doubling

c) **Arranged surfaces**

c.1) Situation and delimitation of arranged surfaces

Map n° II-1 on page II-17 presents planned perimeters extensions in the initial feasibility study carried out by the CNEA in 1995 for Nefza and Sejnane perimeters. On the whole, arranged surface represented 5,176 ha, including 1,851 ha in Nefza and 3,325 ha in Sejnane.

The Detailed study carried out by STUDI in 1997 indicated an equipped surface of 5,920 ha, including 2,260 ha in Nefza by considering the first requests of this perimeter extension, and 3,660 ha in Sejnane because of a displacement of some sectors initially located in a garaâ zone.

Map n° II-2 on page II-18 presents also actual perimeters extensions object of the plots regrouping study carried out by the AFA from 2001 to 2005. Plotting of the finally equipped batches object of two land reform operations provides a total arranged surface of 6,850 ha, including 3,000 ha in Nefza and 3,850 ha in Sejnane.

b.2)Arranged SAU = indicator n°1

In the initial feasibility study, the arranged SAU represented 4,910 ha, including 1,755 ha in Nefza and 3,155 ha in Sejnane. Neither the detailed study nor the evaluation study mentioned any arranged SAU.

From a total arranged surface of 6,920 ha, the arranged SAU can be estimated as 6,240 ha (i.e. + 27%), including 2,940 ha in Nefza (i.e. an increase of 50%) and 3,600 ha in Sejnane (i.e. an increase of 14%). As shown by the Map n° II-2 of page II-17, this increasing in Sejnane is essentially linked to the integrations of parcels of the OEP farm, distributed to its staff within the framework of lowering the staff number of this public farms.

d) **Initially proposed grounds occupation in the two perimeters**

The initial estimations regarding the ground occupation of the feasibility study carried out by CNEA in 1996 are mentioned in **Table n°II-14** below

Table n°II-14 : Variation of the estimated ground occupation in Nefza perimeter

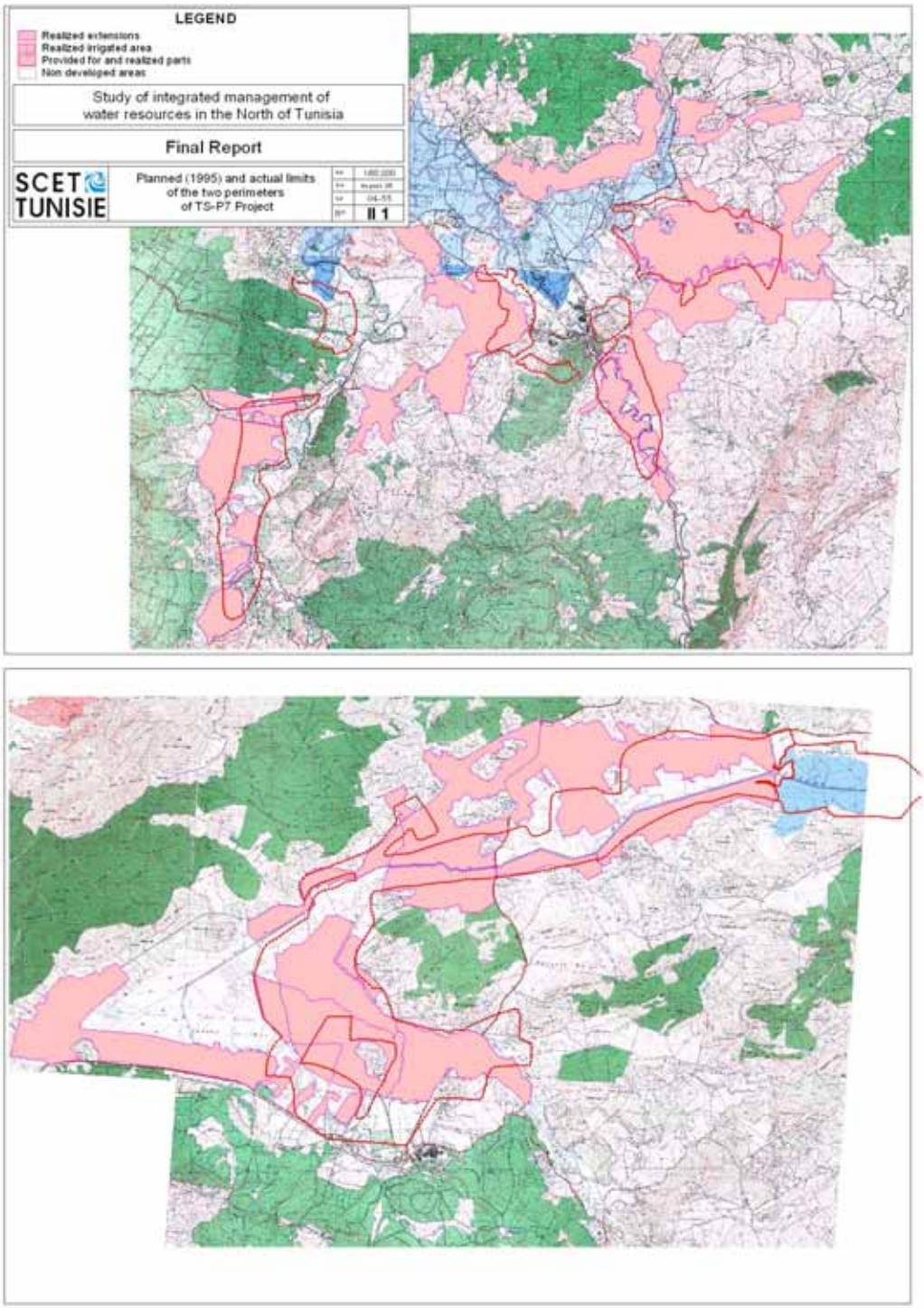
Cultivation	Area (ha)
Pear tree	114
Apple tree	114
Citrus fruits	119
Wheat	204
Leguminous plants	27
Tobacco	242
Bersim	396
Hay of tare-Oats	259
Fodder wheat	216
Off-season Potato	234
Green onion	107
Tomato	107
Melon	232
Water melon	164

Table n°II-15 below presents the enhancement outline provided by the Detailed study carried out by STUDI in 1998 for Nefza perimeter.

Table n°II-15 : Held rotations for Nefza perimeter by SERAH study (December 1993)

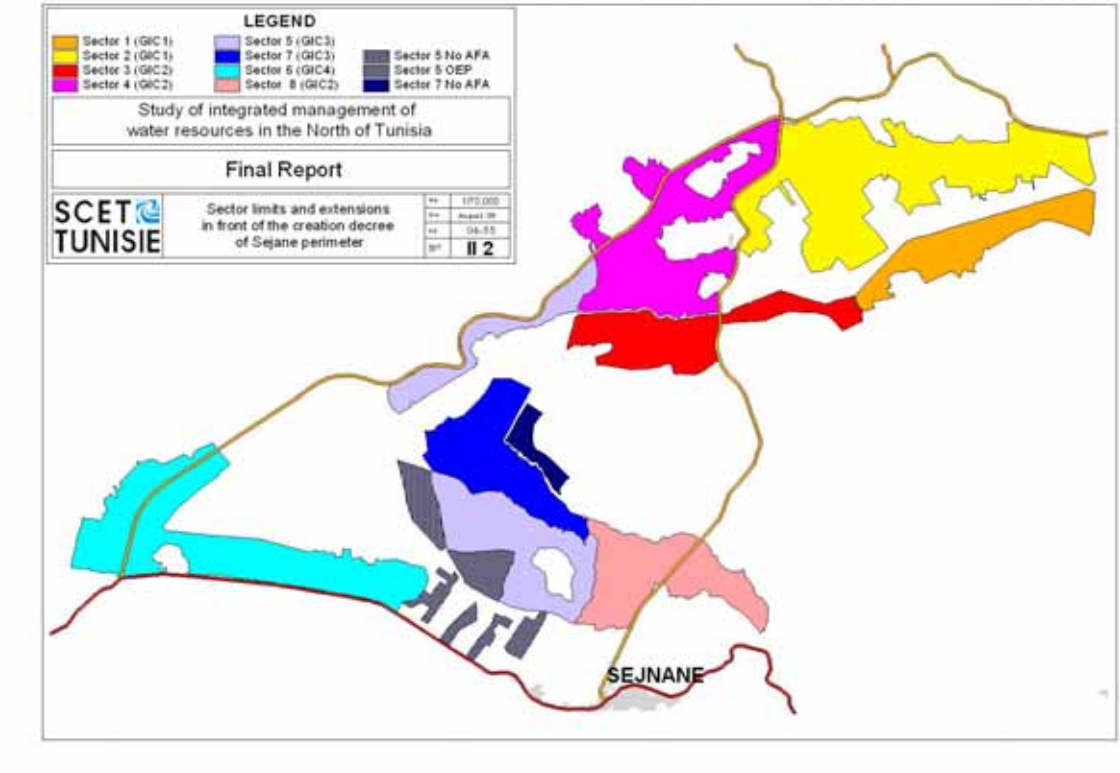
Irrigated sector / Occupation of the ground	Bouzenna	Jmila	Touila	Ouechtata
SAU exploitation-type	2.1	2.0	1.7	0.85
Fruit-bearing plantations (Citrus fruits-Apple tree-Pear tree-Olive tree)		0.75		0. 45
Cereals (Corn)	1.00		0.50	
winter fodder crops (barley bersim, GOES)	0.50	0.50	0.60	
summer fodder (fodder sorghum)	0.25		0.30	
winter truck farming (potato – green onion - broad bean)	0.60	0.75	0.60	0.40
summer truck farming (season-pepper-water melon-melon tomato)	0.60	0.50	0.70	0.30
Tobacco	0.25	0.10		0.10
Total	3.45	2.60	2.70	3.70
Intensification Rate of rotated surface	152%	140%	158%	135%

From these average ground occupations **Table n°II-17** on page II-19 presents the water requirements which were calculated in this same Detailed study.



Map n°

II-1:Planned (1995) and actual limits of the two perimeters of TS-P7 Project



Map n° II-2: Sector limits and extensions in front of the creation decree of Sejnane perimeter

Table n°II-16 : Water Requirements estimated for Nefza perimeter by STUDI study (November 1997)

Sector	Net surface (ha)	Net Surface by terminal (ha)	Gross requirements (m^3 / ha) in rush month	Flow (L / S)
Bouzenna	742	2.10	1 400	1.7
Jmila	244	2.00	1 250	1.5
Touila	308	1.70	1 150	1.1
Ouechtatia	436	0.85	2 000	1.0
Total	1 730	-		

The perimeter irrigation water rough annual requirement varied from 4,200 to 6,500 m^3 /ha /year. The total water requirements for rush month (June) were high on average with 1,485 m^3 /ha (0.85 L /S /ha).

The ground occupation initial estimations of the feasibility study made by CNEA in 1996 are indicated in **Table n°II-17** below.

Table n°II-17 : Estimated ground occupation in Sejnane

Cultivation	Area (ha)
Pear tree	102
Apple tree	101
Tobacco	270
Barley in green	406
Bersim	1 065
Tare-Oats hay	888
Fodder corn	1 120
Green onion	278
Water melon	348

In the same way, **Table n°II-18** below presents the enhancement outline provided by the Detailed study carried out by STUDI in 1997 for Sejnane perimeter.

Table n°II-18 : Held rotations for Sejnane perimeter by STUDI study (December 1997)

Ground occupation / Exploitation-type of 2.7 ha	In the plain	On the glacis
Fruit-bearing plantations (Apple tree-Pear tree)	-	0. 90
Cereals (Corn)	1.00	-
winter fodder crops (barley bersim, GOES)	1.00	0.75
summer fodder (fodder sorghum)	0.25	0.50
summer truck farming (tomato of season – water melon - melon)	0.50	0.25
winter truck farming (potato – green onion - broad bean)	0.70	1.05
Tobacco	0.25	0.25
Total	3.70	3.70
Intensification Rate	137%	155%

From these average ground occupations, water requirements were calculated in this same detailed study :

- for rotation 1, the rough annual irrigation water requirements were estimated at 3,333 m^3 /ha /year, and the rush month (June) water requirements at 785 m^3 /ha ;
- for rotation 2, the rough annual irrigation water requirements were estimated at 5,178 m^3 /ha /year, and the rush month (June) water requirements at 1,455 m^3 /ha.

On average, the rough annual irrigation water requirements were estimated at 4.120 m^3 /ha /year, and the rush month (June) water requirements at 1,100 m^3 /ha.

e) **Networks capacity**

e.1) Equipment flow on the level of the pumping out and conveying systems

Table n°II-19 below presents the hydraulic diagram as it was laid in the Detailed Study carried out by STUDIin 1998

Table n°II-19 : Water Requirements estimated by STUDI study (November 1998)

Sector	Net surface (ha)		Rough requirement in Rush month (m^3 /ha)	Flow (l/s)
	by sector	by terminal		
Bouzenna	742	2.1	1 400	1.7
Jmila	244	2.0	1 250	1.5
Touila	308	1.7	1 150	1.1
Ouechtatia	436	0.85	2 000	1. 0
Total	**1 730**			

The sizing of the pumping out systems was carried out on the basis of rough annual water requirements for irrigation varying between 4,200 and 6,500 m^3 /ha /year, and for water requirements during the rush month (June) of 1,485 m^3 /ha (0.85 L /S /ha).

In Sejnane, the pumping out network is carried out to feed a net surface of 3,400 ha, and the primary conveying is sized on the basis of need for 1.100 m^3 /ha in rush month (0.65 L /S /ha), which results in a rush-month flow of 3.74 M.m^3.

e.2) Equipment flow on the level of terminals

In Nefza, the network is carried out to feed a net surface of 2,700 ha, by providing the following flows :

- Bouzenna sector: a terminal every 2.5 ha on average with a flow of 1.7 L /S. That is to say an equipment flow of about 0.68 L /S /ha;
- Jmila sector: a terminal every 2.0 ha on average with a flow of 1.5 L /S. That is to say an equipment flow of about 0.75 L /S /ha;
- Touila sector: a terminal every 2.0 ha on average with a flow of 1.1 L /S. That is to say an equipment flow of about 0.55 L /S /ha;
- Ouechtata sector: a terminal by 1.0 ha on average with a flow of 2.0 L /S. That is to say an equipment flow of about 2.00 L /S /ha;

In Sejnane, each 3 ha - plot is supplied by a 2 l/s terminal, that is to say a 1,5 l/s of available flow.

e.3) Flow provided in rush month = indicator n°5

It is the smallest of these two equipment flows which corresponds to the available flow in rush month, i.e. the equipment flow on the level of :

- terminals in Touila (0,55 l /s /ha), Bouzenna (0,68 l /s /ha) and Jmila (0,75 l /s /ha) relative to Nefza perimeter;
- principal network in Ouechtata sector (0,85 l/s/ha) and Sejnane perimeter (0,65 l /s /ha).

Thus, the network appears largely sufficient to allow an intensive and profitable exploitation. Locally, the terminals will be able to distribute the rush-month water requirements for all the summery cultivations only on some SAU proportion to be irrigated, as **Table n°II-20** indicates below.

Table n°II-20 : Distribution capacity of the rush month needs in Nefza perimeter sectors (m^3 /ha)

Cultivation	Rush-month	Average value (m^3 /ha)	Maximum occupation rate			
			Bouzenna	Jmila	Touila	Ouechtata
Pear tree	July	1 400	83.9%	92.6%	67.9%	246.9%
Apple tree	June	1 080	108.8%	120.0%	88.0%	320.0%
Citrus fruits	July	1 020	115.2%	127.1%	93.2%	338.8%
Tobacco	July	1 200	97.9%	108.0%	79.2%	288.0%
Fodder sorghum	July	1 700	69.1%	76.2%	55.9%	203.3%
Tomato	July	1 810	64.9%	71.6%	52.5%	190.9%
Pepper	July	1 680	69.9%	77.1%	56.6%	205.7%
Melon	July	1 460	80.5%	88.8%	65.1%	236.7%
Water melon	July	1 260	93.3%	102.9%	75.4%	274.3%

In Sejnane also, the network appears largely sufficient to allow an intensive and profitable exploitation. Locally, the terminals will be able to distribute the rush-month water requirements for all the summery cultivations only on some SAU proportion to be irrigated, as **Table n°II-21** indicates below.

Table n°II-21 : Distribution capacity of the rush-month needs in Sejnane perimeter (m^3 /ha)

Cultivation	Rush-month	Average values (m3 / ha)	Max occupation rate
Pear tree	July	1 570	71.5%
Apple tree	June	1 080	104.0%
Citrus fruits	June	1 060	106.0%
Pomegranates	July	1 070	105.0%
Tobacco	July	1 400	80.2%
Fodder sorghum	July	1 630	68.9%
Tomato	July	1 710	65.7%
Pepper	July	1 610	69.8%
Melon	July	1 460	76.9%
Water melon	July	1 130	99.4%

The plot equipment should be well adapted to the exploitation (boundary marking, surface, water quality, ground type, cultivation type, plot configuration) by ensuring a minimum of investigation (ground infiltration factor, ground storing capacity, water quality on the level of the terminal).

f) Modification of the agro-economic context of the perimeters

f.1) Stratification of the beneficiary exploitations

f.1.1) Stratification of the beneficiary exploitations in Nefza perimeter

Table n°II-22 on page II-22 presents the stratification of the exploitations number in Nefza perimeter before starting land reform operation.

Table n°II-22 : Stratification of the exploitations in three sectors of Nefza perimeter

Sector	Bouzenna		Touila		Jmila		**Total**	
Field size (ha)	Number	*%*	Number	*%*	Number	*%*	Number	*%*
< 0,25	3	*1.0%*	2	*1.5%*	4	*2.3%*	**9**	*1.4%*
0,25 to 0,50	13	*4.2%*	9	*6.6%*	13	*7.3%*	**35**	*5.6%*
0,5 to 1,0	69	*22.2%*	22	*16.1%*	60	*33.9%*	**151**	*24.2%*
1 to 2	72	*23.2%*	49	*35.8%*	58	*32.8%*	**179**	*28.6%*
2 to 5	113	*36.3%*	36	*26.3%*	32	*18.1%*	**181**	*29.0%*
5 to 10	29	*9.3%*	12	*8.8%*	5	*2.8%*	**46**	*7.4%*
10 to 20	10	*3.2%*	6	*4.4%*	4	*2.3%*	**20**	*3.2%*
> 20 ha	2	*0.6%*	1	*0.7%*	1	*0.6%*	**4**	*0.6%*
TOTAL	**311**	***100.%***	**137**	***100.0%***	**177**	***100.0%***	**625**	***100.0%***

It is noted that the exploitations with a surface lower than 2 ha, which translates their future non-viability, represent at least the half of the exploitations in the three studied sectors.
In the same way, **Table n°II-23** below presents the stratification of the exploitations surface in Nefza perimeter before starting the land reform operation.

Table n°II-23 : Stratification of exploitation surfaces in three sectors of Nefza perimeter

Sector	Bouzenna		Touila		Jmila		**Total**	
Field size (ha)	ha	*%*	ha	*%*	ha	*%*	ha	*%*
< 0,25	0.4	*0.0%*	0.4	*0.1%*	0.6	*0.2%*	**1.4**	*0.1%*
0,25 to 0,50	5.5	*0.6%*	4.0	*0.9%*	5.3	*1.5%*	**14.8**	*0.8%*
0,5 to 1,0	47.9	*4.8%*	16.8	*3.9%*	42.6	*12.3%*	**107.3**	*6.1%*
1 to 2	107.3	*10.8%*	77.7	*17.8%*	81.3	*23.5%*	**266.3**	*15.0%*
2 to 5	355.7	*35.9%*	132.1	*30.3%*	97.0	*28.0%*	**584.8**	*33.0%*
5 to 10	183.6	*18.5%*	89.7	*20.6%*	28.7	*8.3%*	**302.0**	*17.0%*
10 to 20	135.6	*13.7%*	84.0	*19.3%*	66.4	*19.2%*	**285.9**	*16.1%*
> 20 ha	155.9	*15.7%*	31.0	*7.1%*	23.8	*6.9%*	**210.7**	*11.9%*
TOTAL	**991.7**	***100.0%***	**435.7**	***100.0%***	**345.8**	***100.0%***	**1 773.2**	***100.0%***

One notes that the non-viable exploitations of a size lower than 2 ha hold approximately 16% of the surface in Bouzenna sector, 22% in Touila sector and 37% in Jmila sector.

f.1.2) Stratification of the beneficiary exploitations in Sejnane perimeter

Table n°II-24 below presents the stratification of the exploitations in Sejnane perimeter before starting the land reform operation.

Table n°II-24 : Stratification of number and surfaces of the exploitations in Sejnane perimeter

	Exploitations		Surfaces	
Field size (ha)	Number	*%*	ha	*%*
< 0,25	541	*22.4%*	84.0	*2.5%*
0,25 to 0,5	576	*23.8%*	209.5	*6.2%*
0,5 to 1	561	*23.2%*	403.2	*11.9%*
1 to 2	382	*15.8%*	533.6	*15.7%*
2 to 5	255	*10.5%*	736.2	*21.6%*
5 to 10	69	*2.9%*	477.6	*14.0%*
10 to 30	23	*1.0%*	343.9	*10.1%*
> 30 ha	11	*0.5%*	613.7	*18.0%*
TOTAL	**2 418**	***100.0%***	**3 401.7**	***100.0%***

It is noted that more than 80% of these exploitations are located in the fields of a size lower than 2 ha, which shows their future non-viability. But these non-viable exploitations hold only 35% approximately of the total SAU of the future perimeter.

The presence of 38 batches stemmed from of the OEP farm and farmed by its ex-staff will allow to constitute for the neighbouring private farmers, a radiance center for the practice of dairy bovin breeding integrated to irrigated vegetable production.

f.1.3) Comparison between these two stratifications

Finally, **Diagram n°II-1** of page II-234 compares the two perimeters beneficiaries number distribution by plots size.

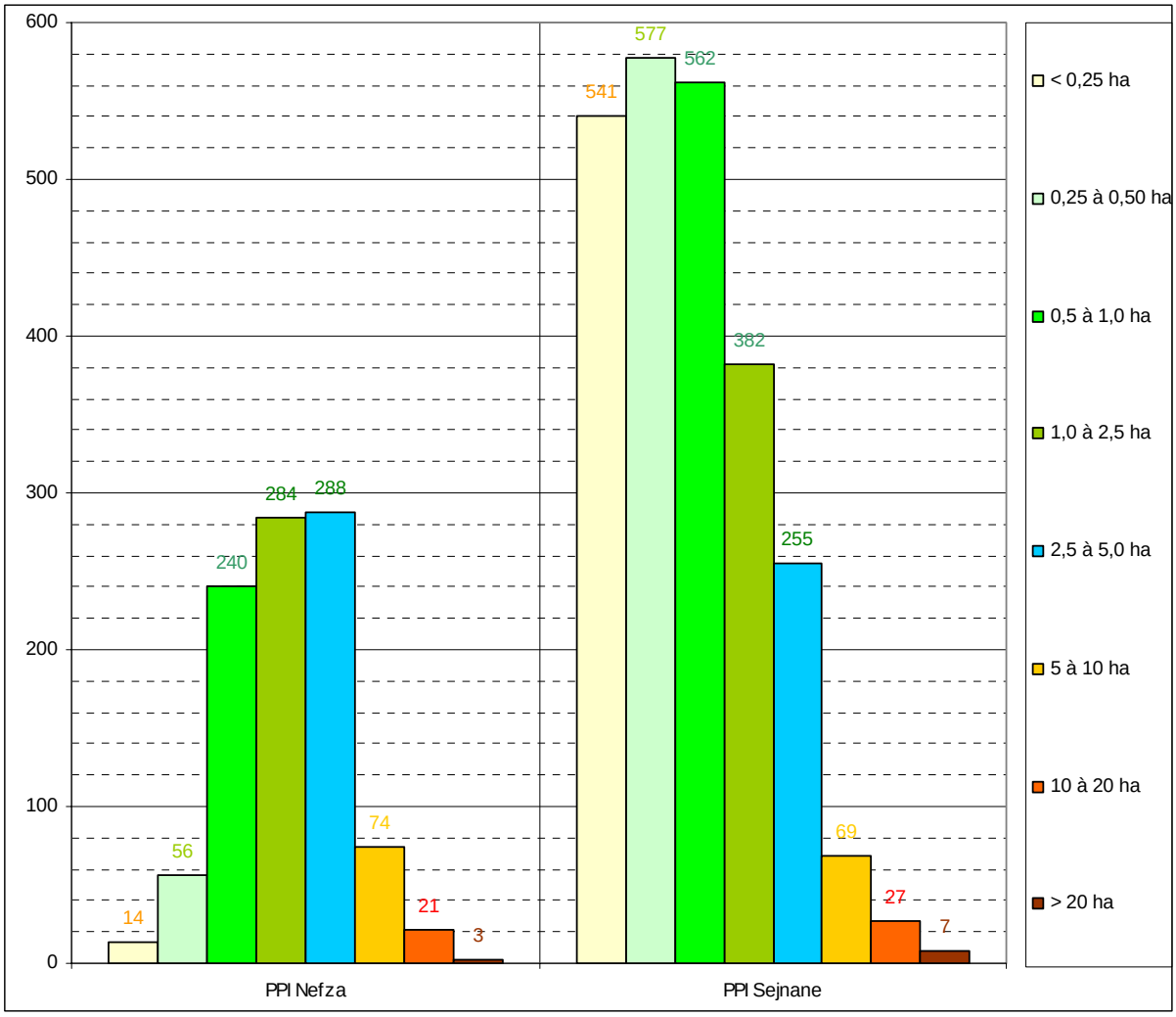


Diagram n°II-1 : Comparison between the beneficiaries stratification in the two perimeters arranged by TS-P7 Project

One can notice that the plot is more parcelled out on the level of Sejnane perimeter where predominate SAU 's three plots lower than 1 ha. In Nefza perimeter, the SAU's three plots range, however, between 0,5 and 5,0 ha.

This situation is found again on the level of the two perimeters beneficiaries SAU 's distribution by plots size. **Diagram n°II-3** of page II-245 presents it.

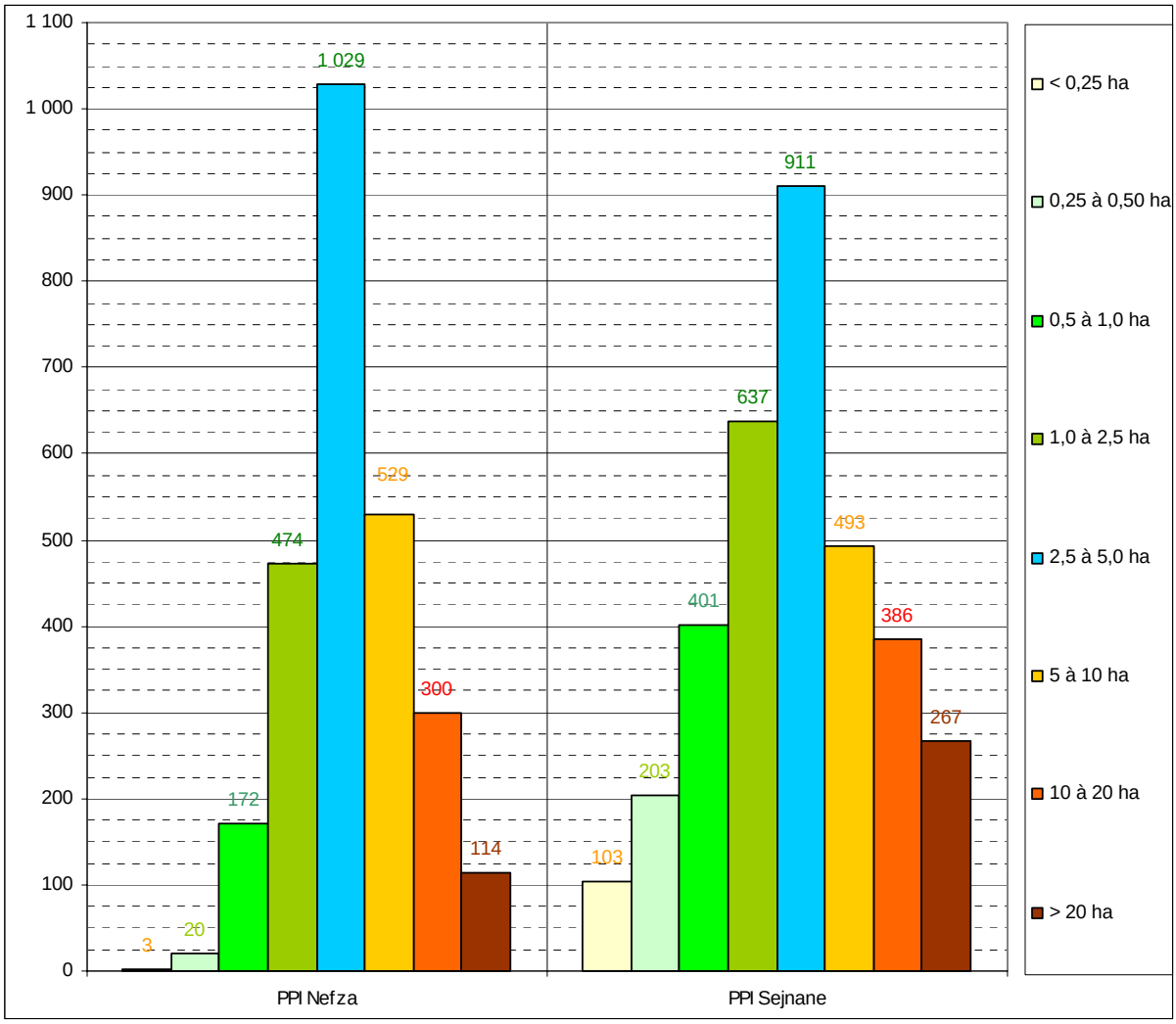


Diagram n°II-3 : Comparison between the SAU 's stratifictaion in the two perimeters arranged by TS – P7 Project

One can notice that the plot is more parcelled out on the level of Sejnane perimeter where predominate the SAU of the two SAU plots ranging between 1 and 5 ha. In Nefza perimeter, the SAU of the two SAU plots range, however, between 2,5 and 10,0 ha.

f.2) Evolution of land situations

f.2.1) Land situation in Nefza

Without considering the extension zone of Bouzenna, 86.6% of perimeter grounds belong to private farmers, among them only 23% are registered. The rest of the perimeter consists of state-owned grounds which are met in Bouzenna and Touila sectors. Nefza perimeter 's parcelling out was initially as follows : Exploitations number : 625 ;

- Recipients number : 1,153, corresponding to 1,8 recipient/exploitation ;

- Plots number : 3,709, corresponding to 5.9 parcel by exploitation.

The average parcels number/exploitation varies between 1.9 (in Jmila sector) and 3.2 (in Bouzenna and Touila sectors). The majority of exploitations are made up of two parcels and more.

Before the project, the average total exploitation surface vacillates between 4.3 and 8.9 ha according to sectors. This exploitation surface is between a minimum of 0.03 ha and a maximum of 130.58 ha. The held surface within the framework of the land reform is between 0.25 ha (in Jmila) and 0.50 ha for the other sectors. The maximum surface is 60 ha. **Table n°II-25** below presents the distribution of the number of the exploitations and parcels after the AFA intervention in Nefza.

Table n°II-25 : Exploitations parcelling state after regrouping in Nefza perimeter

	Exploitations		Plots	
Sector	Number	*%*	Ha	*%*
Bouzenna	381	*51,1%*	466	*40,7%*
Jmila	220	*29,5%*	334	*29,1%*
Touila	145	*19,4%*	346	*30,2%*
Total	**746**	***100,0%***	**1 146**	***100,0%***

This **Table n°II-25** allows to conclude that each perimeter exploitation will have 1.5 plot on average. The average exploitation surface varies from 1.5 (in Jmila) to 2.8 ha (in Touila).

f.2.2) Land situation in Sejnane

The perimeter is composed of 470 ha of registered private fields (11.6%), 3,441 ha of not registered private fields (85.3%) and 124 ha of registered state-owned fields (3.1%). The perimeter parcelling out was initially as follows:

- Exploitations number: 2,418;
- Parcels number : 4,860, corresponding to 2 parcel/exploitation.

Before the project, the average total exploitation surface is 1.67 ha. This exploitation surface is between a minimum of 0.01 ha and a maximum of 96.79 ha. The held surface within the framework of the land reform is 0.25 ha, and the maximum surface is 50 ha. Since the operation of regrouping is on the way of completion in Sejnane perimeter, **Table n°II-26** below presents the distribution of the exploitations depending on the actual parcelling out and joint possession state.

Table n°II-26 : Exploitations parcelling out and joint possession state in Sejnane perimeter

	Exploitations		SAU	
Field size (ha)	Number	%	ha	%
Exploitation having only one plot				
Single owner	911	37,7%	914,6	24,1%
in joint possession	451	18,7%	347,2	9,1%
Sub-total	**1 362**	**56,3%**	1 141,7	**30,0%**
Exploitation having two plots or more				
Single owner	820	33,9%	1 496,6	39,4%
in joint possession	236	9,8%	1 041,7	27,4%
Sub-total	**1 056**	**43,7%**	2 538,3	**66,8%**
TOTAL	**2 418**	**100,0%**	3 800,0	**100,0%**

This **Table n°II-26** allows to notice that 28.5% of the exploitations, representing 36.5% of total SAU, are in joint possession and that 43.7% of them, which occupe 66.8% of total SAU, consist of several plots.

f.3) Evolution of the level of populations organization = indicator n°6

The two perimeters populations are not homogeneous. The population organization starts to take form and to function only with the beginning of the distribution and the use of irrigation water, the holding of general meetings and the functioning of the GIC which are managed by an elected board of directors and assisted by an already available technical director.

II.1.5 - Analysis of TS-P7 project impact

a) **Determination of the major socio economic impacts**

a.1) Determination of the major direct socio economic impacts

Due to Nefza and Sejnane perimeters non-setting in water, it's difficult to study the real socio economic impact on the income of households whose exploitation is set in water. A theoretical analysis bringing out the positif socio economic impact on the beneficiaries agricultural income could be, however, carried out.

a.1.1) Distribution of the beneficiaries by sub-categories before setting in water

Actually, the ground occupation is indeed completely focused on large cultivations in pluvial mode with a large part of fallow rotation. In low humid bioclimatic stage, this situation is explained by an average income / ha of 350 DT for an owner and reduced of 150 DT /ha as rental expenses for a tenant. The correspondence between the sub categorization recommendations of small farmers category contained in PACFS study is therefore indicated in **Table n°II-27** below.

Table n°II-27 : Potential beneficiaries actual categorization in function of their SAU

Exploitant type SAU	Owner	Tenant
< 0,5 ha	A 4	A 4
0,5 à 1,0 ha	A 3	A 4
1 à 2 ha	A 3	A 3
2 à 4 ha	A 2	A 3
4 à 5 ha	A 2	A 2
5 à 9 ha	A 1	A 2
9 à 16 ha	A 0	A 1
16 à 30 ha	B	A 0
30 à 50 ha	B	B
50 à 90 ha	C	B
> 90 ha	C	C

a.1.2) Beneficiaries distribution by sub category after setting in water

Whatever the occupation of irrigated grounds is, an owner has 2.000 DT average income/ha, and reduced of 750 DT /ha as rental expenses for a tenant. The correspondence between the sub categorization recommendations of small farmers category contained in PACFS study is therefore indicated in **Table n°II-28** of page II-278.

Table n°II-28 : Potential beneficiaries actual categorization in function of their SAU

Exploitant type SAU	Owner	Tenant
< 0,5 ha	A 3	A 4
0,5 à 1,0 ha	A 2	A 3
1 à 2 ha	A 1	A 2
2 à 3 ha	A 0	A 1
3 à 4 ha	A 0	A 0
4 à 5 ha	B	A 0
5 à 9 ha	B	B
9 à 15 ha	C	B
> 15 ha	C	C

Consequently, the water setting will be showed automatically through the improvement on the level of the beneficiaries number distribution presented in **Diagram n°II-5** below.

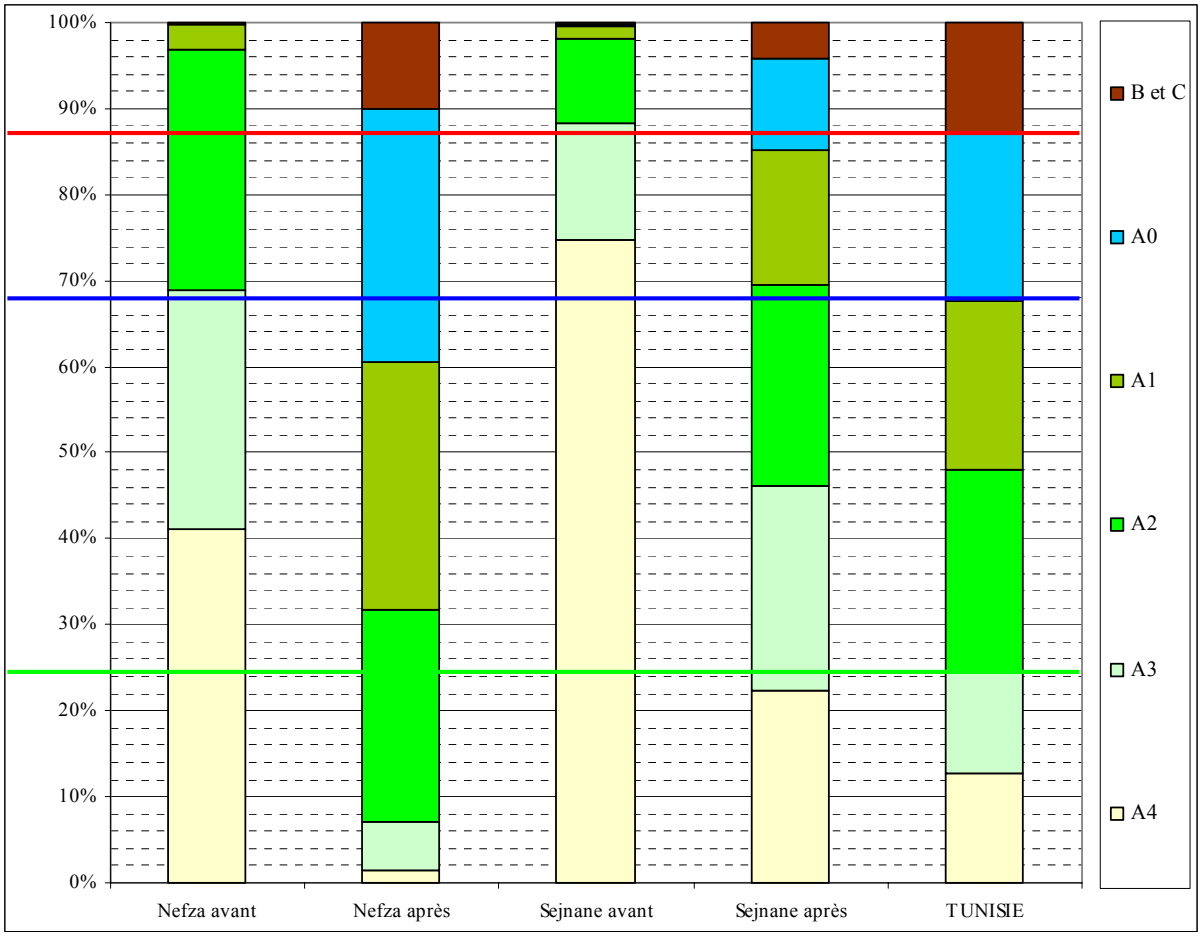


Diagram n°II-5 : TS – P7 Project beneficiaries distribution by sub category before and after water setting

One can notice indeed a connection between the two perimeters situation with the average situation on the national scale from :

- the viable(A0, B et C) and potentially viable(A1) sub categories number increase ;
- the fragile (A2), marginal (A3) and very marginal (A4) sub categories number decrease.

This improvement is also very clear when we observe the exploited SAU between the different beneficiaries sub categories presented in **Diagram n°II-6** below.

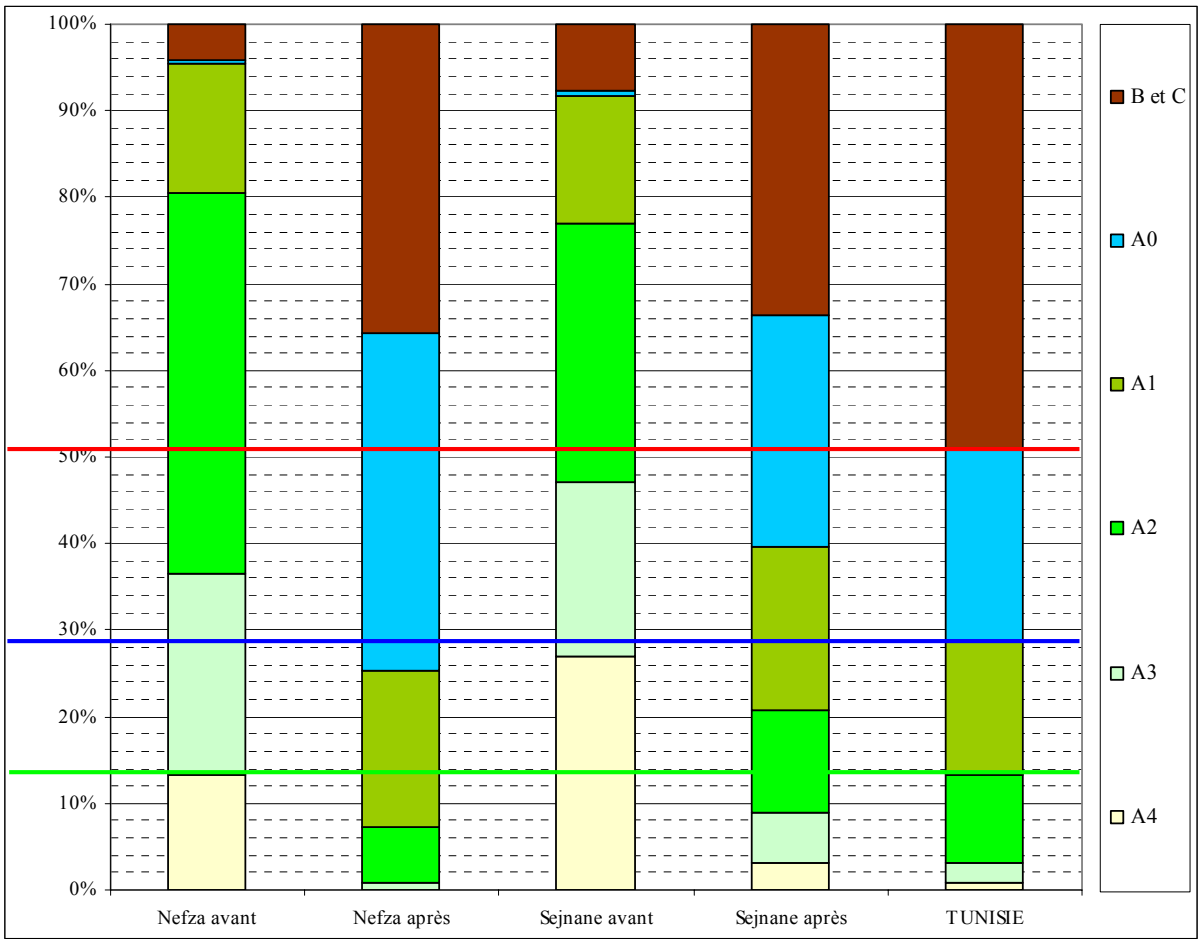


Diagram n°II-6 : SAU distribution by TS-P7 Project beneficiaries sub category before and after setting in water

a.2) Determination of the major indirect socio economic impacts

Due to Nefza and Sejnane non-setting in water it hasn't been possible yet to study the direct and indirect socio economic impacts generated by the TS – P7 Project.

b) Determination of the major environmental impacts

b.1) Determination of the major potential direct environmental impacts

b.1.1) Increase in the streaming towards the downstream after sanitation of the hydromorphic plains which were put to the irrigation

The sanitation of Bouzenna, Jmila and Cape Negro sectors of Nefza perimeter simply consisted of re-framing the natural rivers which pour directly in the pond of Sidi El Barrak dam. A sanitation network was only installed in Ouechtata and Touila sectors whose discharge system is the Mâadin River which pours directly in the pond of Sidi El Barrak dam.

Consequently, the stream increase will not have negative impact on Nefza plain.

Sejnane plain sanitation, in contrario, will generate an increase in the flow transited to the downstream by Sejnane River. It is a question of studying this increase impact on the flooding of Sejnane canal, then on the natural flow of water.

This question will have to be deepened in the next evaluation missions after the perimeter setting in water, in order to estimate the sanitation effect on the flows transited to the downstream and to see the clearing out need, and even for the canal and the river covering. This concern is reinforced by our observations on site, in particular during the complex PC1 visit where the water level overflowed the river and reached the level of the pumping stations of this complex.

b.1.2) Contributions of salts and toxinss in perimeters grounds

If the drainage network installed is sufficiently efficient, and because the irrigation water is only charged with 0,6 G /L, the problem of grounds salinity does not arise in the two perimeters, So, the 800 mm of the natural rain ensure alone the grounds washing.

b.1.3) Discharge of drainage water in ponds of dams located at the perimeters downstream

The conveyed water by the actual sanitation networks will be essentially the excess brought by the rain from the rivers basins slopes crossing the two perimeters. The parcels sanitation network is missing in the two perimeters, and must be established by the farmers to improve the exploitation state of their plots.

The drained irrigation water would be weak (efficient irrigation at 80%) and the greatest part to be drained would be the surplus water rain which will stagnate on the parcels. Thus, it is imperative to make sure of the quality of water to be drained in the two perimeters (in particular used fertilizers and pesticides) during the drainage network reinforcement in order to prevent any degradation of Sidi El Barrak and Sejnane dams water.

b.2) Determination of the major indirect environmental impacts

Due to the non-setting in water of Nefza and Sejnane perimeters, it is impossible to study the indirect environmental impacts generated by the TS-P7 Project.

c) **Proposal of socioeconomic indicators to evaluate the project TS-P7**

Thanks to data provided by several regional directions of Beja and Bizerte and by local services based in Nefza and Sejnane, several socioeconomic indicators concerning these two delegations have benn collected.

c.1) Proposal of socioeconomic indicators for the delegation of Nefza

The delegation of Nefza comprises 53,079 inhabitants in 2004, as against 55,924 in 1994. The annual population growth is thus equal to – 0.02%. As displayed by **Table n° II-30** on page II-3031, it's rather about an enclozed area in which it's diffcult to move or even to practice marketable activities.

Table n° II-30: Distances between some delegations of the gouvernorat of Beja (in Km)

Delegation	Beja	Mezj el Bab	Goubellat	Nefza
Beja		46	61	40
Mezj el Bab	46		15	86
Goubellat	61	15		101
Nefza	40	86	101	

c.1.1) Economic activities in the delegation of Nefza

The area forms part of field crops region, especially wheat and barey and where arboriculture remains marginal even the olive tree. Ovine and bovin breeding, considered as an integral part of agricultural activity, constitutes the principal source of incomes for the majority of households.

According to the population, agriculture is the principal activity, breeding beeing agriculture integrated activity. The majority of households chiefs is constituted by farmers-breeders, in practice of field crops (wheat and barley) that are weakly productive owing to the litte size of the estate. Tobacco cultivation constitutes an important activities axe for households, because it guarantees a part of the income. There is no paid jobs in the area.

The exodus of some household members toward big cities constitutes a source of revenue which helps absorb unemployment. Agriculture poverty and masculine emigration toward the large centers have heavily femaled the region.

As shown by the **Table n° II-32** below, unemployment represents a complex phenomenon which makes almost all housholds suffer in the gouvernorat of Beja.

Table n° II-32 : Jobless allocation (18-59 year ols) according to the sex and the environment

environment	**local**			**Non local**		
Gouvernorat	man	woman	total	man	woman	total
Beja	4,633	2,890	7,523	8,331	2,675	11,006

Source : Enquête nationale population et emploi 1999

c.1.2) Women work in the delegation of Nefza

Women do not have communal presence. In general, women do not exerce any activity out of home, only when they have to supply families of water.

Women and men manage the household needs and providing education for children. They have a very important role in the household survival in spite of the hidden nature of their productions (nonmarketable activities).

As part of the national policy of social help targeting the poorest population category, « Djel el Abyadh », a local development and microsociety financing ONG has been created to allow the supervision and the « empowerment » of these people so that they can better take part in their families wellbeing.

*c.1.3) **Drinking water supplying in the delegation of Nefza***

The general rate of drinking water service in the delegation of Nefza in 2004 is equal to 75.We find 32 GIC's of drinking water, and only 7 concern the project area.

c.1.4) The education in the delegation of Nefza

The delegation of Nefza has only 29 primary schools and 2 secondary schools at its disposal. The number of registered students is equivalent to 6,444 at the primary establishments, 2,757 at the preparatory classes and 2,420 at the high school.

The percentage of children (6-12 years old) in full-time education in the delegation of Nefza is equal to 94.3%. The **Table n° II-33** below compares the evolution of this percentage between 1984 and 1994 for the gouvernorat of Beja with the regional (North-west) and national percentages. Il also emphasizes the existing inequalities between the underpopulations according to the sex and the environment.

Table n° II-33: The percentage of children (6-12 years old) in full-time education evolution

Year	1984			1994		
Underpopulations	Beja	regional	national	Beja	regional	national
Boys	77.5	75.8	82.8	87.4	87.1	89.0
Girls	61.6	58.4	68.7	80.6	78.1	83.2
Urban environment	86.1	86.3	87.4	94.0	93.3	92.2
Rural environment	63.1	61.1	64.9	78.3	78.0	77.8
Total	**70.0**	**67.3**	**75.9**	**84.1**	**83.1**	**86.2**

Source : INS

In the same way, the **Table n° II-34** below compares the illiteracy rate evolution of people over 10 years old between 1984 and 1994 for the gouvernorat of Beja, with regional (North-west) and national rates, it emphasizes the existing inequalities between the underpopulations according to the sex and the environment.

Table n° II-34: the illiteracy rate evolution for peple over 10 years old

Année	1984			1994		
Underpopulations	Beja	regional	national	Beja	regional	national
Masculine	45.3	45.3	34.6	29.9	29.3	21.2
Feminine	67.5		58.1	51.9	53.4	46.3
Urban environment	40.1		33.2	28.3	28.2	22.8
Rural environment	64.0		61.9	48.9	48.7	46.2
Total	**56.2**	**56.7**	**46.2**	**40.9**	**41.5**	**31.7**

Source : INS

c.1.5) The sanitary infrastructure of the delegation of Nefza

The existing sanitation system of the delegation of Nefza is made up of one regional hospital, 14 free clinics, a mother and child center and of one laboratory.

The free clinics are located at each rural sector level. They are open every day from 8.30 a.m to 01.00 p.m and close the afternoons. They are endowed with a permanent health auxiliary and are visited by a general practitioner once to twice a week.

c.1.6) Infant and juvenile mortality in the delegation of Nefza

Infant mortality rate in the gouvernorat of Beja is equal to 24‰, for a national medium rate equal to 22‰. According to the Health Regional Direction responsibles, reliable and precise data about infant mortality and malnutrition is not available.

Nevertheless, they explain that infectious diseases are in the foreground for the child morbidness during the first year. In fact, they represent a third/two-thirds of hospitalizations and near half of deaths. These infections result from nonrecourse to cares linked to unfavourable socioeconomic conditions of the rural population. As for juvenile mortality, they explain that it essntially results from accidents in the home.

c.2) Socioeconomic indicators proposanl for the delegation of Sejnane

c.2.1) Households of the delegation of Sejnane

The average size of households is 6 persons. They seem to be essentially constituted by women, which reflects the men migration searching jobs in coastal cities of the country.

According to the population declaration, babies represent a little number, which reflects the recent decline of the tunisian women fertility, even in the rural environment. The combined effects of recourse to contraception, downturn of the marriage age, and of varied sociocultural factors (for example the girls scolarization) explain the fertility decline.

c.2.2) Economic activities in the delegation of Sejnane

In the project area, the economy is agrarian, weakly productive and essentially affect the population elementary needs satisfaction. It's a quite closed economy where money and goods circulation is lowered to the minimum living wage.

This weakly diversified economy, is essentially based on ovine breeding and cerealcultivation, women craft work and girls work who are forced to quit the school in order to do daily help in the big cities.

The exodus toward coastal cities and the capital of the households chiefs and young men capital, points to the lack of job opportunities in the delegation.

c.2.3) Revenue sources in the delegation of Sejnane

The population revenu sources are contituted by cereal cultivations that are weakly productive because of the little size of the estate and the climate nature. Ovine breeding if need be bovins, and the young girls work and women craft work (notably the pottery), constitute the other households revenu sources.

The recourse to complementary financing sources, as personal economies and loans from family and friends, constitute solutions to lessen the growing lack of money.

The exodus toward big cities and the capital represent a relatively important source of revenue that helps improve households incomes and resorb unemployment, notably the youth's one.

c.2.4) Unemployment rate in the delegation of Sejnane

Actually, unemployment rate in the gouvernorat of Bizerte is equal to17.7%. The Table n° II-35 of the page II-334 presents unemployed allocation between communal and noncommunal environment.

Table n° II-35*: unemployed allocation (18-59 years) according to the environment and the sex*

environments	communal			Noncommunal		
	Man	woman	total	man	wman	total
Numbre	11,406	4 ,26	16,132	20,781	6,326	27,107

Source : Enquête nationale population et emploi, 1999

c.2.5) Drinking water supplying in the delegation of Sejnane

The drinking water service rate in the delegation of Sejnane in 2004 is equal to 75.5%. The commune of Sejnane is 100% served by a network SONEDE. In an noncommunal environment, water systems are managed by collective interest groups (GIC's). Water sources of these systems are Rural engineering (GR) drealing and pitting.

This GIC's creation started in 1983. There are 11 drinking water GIC's in 2005 in the whole delegation, with 6 GIC's belonging to the project area. But these GIC's are generally non functional, because of the nonpayment of the water consumption fees, the frequent breaks in the pipe and the lack of experience of the GIC's membres concerning the water systems management.

In front of this situation, the population gets back to the existing natural sources.It's about private wells or not installed natural sources, with a mediocre quality and insufficient amounts, especially during the summer. The distances between these différent water points vary from 1.0 to 1.5 km. Water corves are made by women and children and the collection is made by not well maintained water cans.

c.2.6) Educational infrastructures of the delegation of Sejnane

The illiteracy rate in the area of Sejnane among the 10 years old population and above has been estimated to 36% for an regional average evaluated to 35.1% during the national survey of 2000, which had made an inventory of 114,086 illeterates, with 41,371 men and 72,715 women, that is a feminization rate of 63.7%.

The percentage of children in full-time education of the age group 6-14 years old is quite high in the gouvernorat of Bizerte in general and in the delegation of Sejnane in particular. The percentage could reach 90% in the delegation, for a regional average equal to 95.8% near the national average (95.1%).

The primary education is provided in the delegation in 28 primary schools frequented during the scolar year 2003-2004 by 5,806 students, 3,134 are boys and 2,672 girls, that is only a feminization rate equal to 46.0%. These 28 schools are equipped with electricity and with a nursery, but only 6 of them are equipped with drinking water and 5 with computer classroom.

The secondary education is provided in the delegation with one secondary school and 4 high schools. These five establishments are endowed with a nursery and a computer classroom and with drinking water and electricity.

c.2.7) The sanitary yinfrastructures of the delegation of Sejnane

The existing sanitation system of the delegation of Nefza is made up of one regional hospital, 14 free clinics, a mother and child center and of one laboratory.

The free clinics are located at each rural sector level. They are open every day from 8.30 a.m to 01.00 p.m and close the afternoons. They are endowed with a permanent health auxiliary and are visited by a general practitioner once or twice a week.

c.2.8) Infant and juvenile mortality delegation of Sejnane

The infant mortality decrease in Tunisia has been remarcable since the independance, thanks to continuous amelioration of sanitary services, hygienic conditions and life standard in general.

The local sanitary authorities esmitate that the infant rate mortality has been lowered to 22.0‰ in 2005 (as against 32.6‰ in 1994).

II.1.6 - Analysis of TS-P7 Project sustainability after JBIC withdrawal

a) **Technical abilities of the various institutional concerned concerned with the double pipeline**

The participants concerned with the double water pipe project after JBIC withdrawal:

- Ministry of Agriculture and Hydraulic Resources, represented by the General Directory of Dams and Great Hydraulic Work (contracting authority) ;
- SECADENORD, responsible for the exploitation and the maintenance of the 2 transfer lines and the pumping stations ;
- SONEDE, responsible for water supplying transferred by the double pipeline to urban centres of Large Tunis, Cap-Bon, the Sahels of Sousse and Sfax, Kairouan and Sidi Bou Zid.

a.1) Technical abilities of the M/AHR

The M/AHR is responsible for the water sector planning in Tunisia: installation of water resources development policy, execution of the great resources mobilization projects, water resource allocation to various economic sectors, ...

The exploitation and the maintenance of the water transfer and mobilization systems are carried out under the control of the Ministry (the contracting authority of hydraulic installations).

a.2) Technical ability of SECADENORD

After the double pipe and pumping station works realization, the M/AHR yields its exploitation and maintenance to the SECADUNORD. This company will undertake the exploitation and the maintenance of the equipment and the additional works on the pipe of transfer files I and II and on the pumping stations of Sejnane, Joumine I and Joumine II.

To exploit the transfer pipes and the pumping stations, the SECADUNORD has an exploitation department and a maintenance, studies and works department.

The exploitation department is subdivided in 2 sub-directions:

- S/D of MCB canal ;
- S/D of the adduction, which is responsible for the exploitation of the double pipeline.

The maintenance, studies and works department is also subdivided in 2 sub-directions:

- S/D maintenance which is responsible for operations of the mechanical and electric talks of the hydraulic works ;
- S/D studies and works which, in addition to studies, ensure clearing out, repairing and civil engineering works.

Table n°II-37 below presents the staff in charge of the pipes and stations keeping up and maintenance.

Table n°II-37 : Assigned staff to the pipe maintenance and control

Trade	Numbers
Principal technician: electrical engineer	1
Associated technical: electrical engineer	1
Electrician	2
Workman of maintenance	4
Help welder	1
Guard	10
Driver	1
Total	20

Source: Double control project completion report

The staff assignment at various jobs is in theory as follows :

- principal technician (electrical engineer) : person in charge of the exploitation and maintenance ;
- associated technical (electrical engineer) : head of the team, person in charge of the exploitation and maintenance.

Only one technical assistant is insufficient considering the diversity of the tasks for current or urgent interventions. In the same way, 2 electricians seems insufficient, considering the importance and the automation of the equipment on the level of the works and especially those of the pumping stations.

In addition, it is recommended to reinforce the maintenance teams' number and vary them from the qualification point of view, considering the diversity of the equipment and their geographical situation along the various pipes sections.

a.3) SONEDE technical abilities

SONEDE is a public establishment with industrial and commercial characters covering all the territory and placed under the supervision of the M/ARH. A contract program is drawn up between this public company and the State, where the performances to be reached are specifying all the operations to realize.

It envisaged to reinforce its supplying capacities, following the doubling of Sejnane-Mejerdah pipeline. These works comprise essentially a reinforcement of its pumping and treatment capacities.

b) Technical abilities of the various institutional participants concerned by the perimeters

b.1) Technical abilities of the two CRDA

b.1.1) Technical abilities of the operational departments

The operation department of the two perimeters will have the responsibility to follow the water invoicing to the GIC with the water counting in the station and in the antennas departures. Moreover, these services will assist, during the first years, their GIC technically in the network exploitation.

The assistance carried out by these services to the GIC will consist in the technical and financial management training. The two services, however, do not have actually enough material means to ensure the maintenance of the networks which are allotted to them.

b.1.2) Technical abilitiess of maintenance services

Part of Nefza perimeter's infrastructure will be the responsibility of the SECADENORD, in particular the primary infrastructure of Bouzenna and Jmila sectors (pricking on pipes, discharge pipe toward the tank and the tank). The maintenance service of Beja CRDA will be responsible for the maintenance of the whole primary infrastructure of the network of Ouechtata and Touila sectors, from water intake to departures of antennas of each GIC. So, the physical components under its responsibility consist of:

- pumping out station ;
- recovery station ;
- discharge pipe;
- regulation tank ;
- distribution pipes until antennas departures ;
- sanitation network ;
- tracks network.

The maintenance service of Sejnane perimeter, which is attached to the maintenance service based in Mateur, will be very probably responsible for the maintenance of the whole primary network infrastructure, from the intake to the antennas departures of each GIC , while the pumping out stations will be passed on the CECADUNORD. Thus, the physical components under its responsibility consist of:

- the pumping station ;
- discharge pipe ;
- regulation tank ;
- distribution pipes until antennas departures ;
- sanitation network ;
- tracks network.

b.1.3) Technical abilities of popularization coordination service

Beja and Bizerte CRDA have, like all Tunisian CRDA, a coordination service of its CTV, which annually schedule training and popularization operations and assist to organize demonstration days, farmers training courses in CFPA, ... according to this annual program.

b.2) The GICs technical abilities

7 GICs were made up in Nefza perimeter (Bouzenna 1, Bouzenna 2, Bouzenna 3, Touila, Jmila, Ouechtata and Cape Negro) and 4 GIC in Sejnane perimeter (sectors 1 and 2, sectors 3, 4 and 8, sectors 5 and 7 and finally sector 6).

b.2.1) Water management technical abilities

The GICs of the two perimeters have individual watermeters in each terminal, but there are terminals, which are divided between several exploiters, and they are terminals from which can emerge payment and water supply problems.

It is necessary for a durable water management to ensure the watermeters a long-term reliability (resistance against abrasion, but also problems of vandalism). If a problem would arise on this management mode, the GIC should have another alternatives.

For the water management, the GICs must have a staff to check watermeters and to record consumptions. This same staff should play the role of the network police force (functional check of the flow control valves and the watermeters).

The phenomenon of vandalism is real and is already observed:

- on the terminals, with removed locks and bolts and withdrawn blank flanges ;
- on the tanks, which must be obligatorily guarded or enclosed.

b.2.2) Networks maintenance technical abilitiess

At this level of analysis, it is very probable that the water cost alignment on the same level for all the GIC, while at the same time the number of the subscribers and the managed infrastructure are not the same, results in different situations:

- in Nefza perimeter, the GIC of Bouzenna sector is favoured and the GIC of Touila sector is underprivileged ;
- in Sejnane perimeter, the GIC of sector 2 is favoured and the GIC of sector 4 is underprivileged.

b.3) CTV technical abilities

Nefza and Sejnane CTVs' technical team exist relatively, but miss experiment concerning the irrigated cultivations and integrated farming, even if they can rely on milk cattle farming and fodder cultivations following the works carried out in Sejnane OEP farm.

c) Sustainability of the organizational aspects of TS-P7 Project

c.1) Determination of the population's organization degree

c.1.1) GICs preparation degree for water invoicing

Actually, 4 GIC in Nefza, namely Bouzenna1, Bouzenna2, Bouzenna3 and Touila, which all have a technical director, are completely ready and by means of recruiting their technical staff and the support of the technical director.

The 3 other GIC in Nefza, and the 4 GIC in Sejnane, are not completely ready for water invoicing. It is only after the setting in water and the official transfer of the perimeter management to these GIC with the help of a management agreement that these ones will put the human means necessary to carry out this task, i.e. technical staff and a technical director.

c.1.2) GICs preparation degree for networks maintenance

Actually, the irrigation staff of the 4 GICs of Bouzenna 1, Bouzenna 2, Bouzenna 3 and Touila are ready to maintain the distribution networks starting from the tank, with the help of the Technical Director's coordination role between the staff members.

c.1.3) Evaluation of the preparation degree to the constitution of GDA for the self-financing of the agricultural development and the management of the agricultural dies

Actually, the farmers and the 4 GICs already set up in Nefza have not managed yet to consider this evolution.

c.2) Determination of the coordination degree between staff members

The potential staff in Nefza and Sejnane delegations are :

- The CTV, in charge of coordination of the activities of Beja and Bizerte CRDA at the delegation level;
- Nefza and Sejnane ULAPs, as local sections of Beja and Bizerte URAP and of national UTAP ;
- The two BNA agencies.

It should be noted that the two CTVs do not have the sufficient human and material means for supervising the new irrigators on perimeters of such a surface. Being able to gather the various services of support and exploitation of water, the CTVs require a human and material reinforcement to ensure the adequate support to the private farmers (owners or users).

The activities of the two ULAPs sections are seasonal, because they do not have their own means for farmers supervising.

The two BNA agencies treat with the seasonal credits, the investment loans in medium and long term and are used as current accounts for other facilities, such as the subsidies granted by the APIA. With its database, the BNA has the means to treat with all the farmers.

d) Determination of the financial sustainability of TS-P7 Project partcipants

d.1) Determination of the beneficiaries financial abilities

d.1.1) Beneficiaries actual agricultural incomes

Actually, the ground occupation is completely directed towards the practice of the pluvial mode cultivations with an important fallow rotation. In humid low bioclimatic stage, we noted upper that this situation results in an average income released per hectare of about 350 TD for an owner, decreased of the rental expenses of about 150 TD /ha for a tenant.

In low humid bioclimatic stage, climatic risks are not disastrous. Even a weak rainfall deficit in winter can result in less ground clogging up and better rain quantities in the hydromorphic zones.

d.1.2) Improvement of the agricultural gross incomes following the setting in water

One of the objectives of the Projects is that the practice of irrigated agriculture should indistputably increase the profits for its beneficiaries. But it is clear that it will initially oblige them to invest, and then to engage more expenditure to cover higher production expenses.

If the financial conditions are met initially to allow the beneficiaries to borrow at will, subject to refunding carried out in convenient time, it is clear that the resources of the beneficiaries will be largely increased. In the long-term therefore, the GIC should not have any problem of financing the production expenses and the payment of the contributions and the invoices, after the initial period of refunding the contracted loans, as they have been used for the acquisition of the materials of irrigation, of the additional livestock and of the livestock buildings

d.2) Evaluation of the SECADUNORD financial abilities

d.2.1) Evolution of the sold water invoices

The water quantities supplied by the double pipeline during the 50 years of its lifetime were estimated in SAPROF study of the doubling of the northern water pipeline at 3,427.3 M.m^3. Table n°II-38 of page II-3940 presents the incomes calculation following the water sale by the SECADUNORD at various prices.

Table n°II-38 : Incomes estimate by water sale delivered by the double pipeline

Tariff SECADENORD (ml /m^3)	Income (M.TD)
17	58.3
40	137.1
50	171.4
66	226.1

Source: SAPROF Evaluation Report on double pipe, 1996

d.2.2) Evolution of the maintenance and operation fees

For the transfer pipes, the annual maintenance cost which will be necessary for year 2005 would raise to 467,000 TD distributed as follows :

- Maintenance of the hydro-electrical equipment ..... :27,000 TD
- Repair and maintenance work (to be made by thirds) ..... :200,000 TD
- Maintenance and repair of the civil engineering works and pumping stations ..... :35,000 TD
- Repair of the leakage on the level of the pipes..... :35,000 TD
- Expenses of the staff (contract and in control staff)..... :65,000 TD
- Expenses of electricity ..... 97,000 TD
- Any other business (telephone royalties, radios, office supplies and training courses) : ..... :8,000 TD

d.3) Evaluation of the GICs financial abilities for water invoicing

If, on a strictly economic level, it is justified to have a particular price fixing to each GIC, this principle is rejected on social aspects. Thus, the common water price fixation to all the GIC will back the situation of the largest farmers in the two perimeters.

- In Nefza perimeter, the water price *right now* fixed by the CRDA is 54 ml /m^3. Whereas the delivery price of the GIC is 68 ml /m^3. Economic calculation to carry out after the setting in water will have to

prove that the 14 ml of GICs' margin are sufficient to guarantee the financial balance of the 7 GIC, by taking account of the various risks: water consumption during the first years, maintenance requirements for the perimeters, water leakage (which can be real or fictitious by the the watermeters handling), ...

- In Sejnane perimeter, in contrary, no water price was still advanced to the exploiters, whereas the detailed study laid down a cost of 55 ml /m^3.

It is necessary however to keep present at the mind that, unlike the GIC in the centre and the south of Tunisia which feed their budget while selling annually from 3,500 to 5,500 m^3 /ha, the reviewed water requirements calculations in the Chapter III expressing constraints to the the good Project implementation show that the GIC's will sell only each year :

- 1.600 m^3 /ha on average in Nefza perimeter, and
- 2.400 m^3 /ha on average in Sejnane perimeter.

II.2 - Mid-term evaluation of TS-P11 Project : Goubellat Irrigation Perimeter construction Project

II.2.1 - Objectives of TS-P11 Project

The use of approximately 7 M.m^3 from Sidi Salem dam releases in Mejerdah River was considered in Goubellat plain which is located in average semi-arid Mediterranean bioclimatic stage. To this end, it was envisaged to arrange there 2.000 ha of state-owned grounds managed by 8 UCPA and 900 ha distributed between 7 large plots, to ensure there the development of the irrigated cultivation practice.

The Project should thus contribute to the increase of 11,7 M.TD 300 beneficiaries income, that is to say an average of approximately 0,9 M.TD by UCPA and 15,000 TD per private beneficiary.

It allows especially to prepare substitution by this new intensive agricultural zone near Large Tunis for the traditional near-urban agricultural zones which are corroded actually little by little by the urban growth : Sidi-Thabet, Borj Touil, Manouba, Mornaguia, Jdeïda, Es-Saïda, Mornag, ...

II.2.2 - Analysis of TS-P11 Project relevance

a) **Coherence of the Project with the national policy**

a.1) Coherence of the Project with the priorities of the national policy

The choice of a deprived zone qualitatively and quantitatively of irrigation water resources to transfer releases coming from Sidi Salem dam in the 2,950 ha arranged area allows the development promotion in a plain of the country's north-western area.

It is expected that the productions of this plain close to Large Tunis, gradually replaces those of the near-urban perimeters of the Low Valley of Mejerdah, which are more and more altered by the urban growth (Borj Touil, Manouba, Borj El Amri, Mornaguia).

For that, 2,045 ha of state-owned grounds were included in the perimeter, when the State entrusted the exploitation of these lands to 15 Companies for Agricultural Enhancement and Development, to 23 private farmers of the division, to 21 graduate technicians from Agriculture Tunisian Schools and to 158 " Young Farmers " (former cooperators, sons of the delegation farmers).

In order to increase the Project beneficiaries number, the entrusted to SMVDAs irrigated parcels reached a maximum of 80 ha of SAU. This resulted in modifications of contours of the zone to arrange, and in inclusions of 170 exploiting private farmers of the delegation, some with their own plots and the others with government plots

It is probable that the 15 SMVDAs are planned to invest in collection or storage structures of their productions, and that they will be able to make profitable these investments by ensuring the collection and the storage of the private beneficiaries belonging to the same GIC.

For these 351 other beneficiaries corresponding to private farmers originating from the division, the provision of water and collection and storage capacities undoubtedly will result in an obvious increase in their agricultural income sources. Finally, there are nearly 2.000 people who will profit in the long term from a very sensitive improvement of their living conditions.

a.2) Coherence with the national water resources integrated management policy

The project of the North water use in Goubellat plain allowed arranging 3,000 ha of irrigated cultivations. The used water was charged with dissolved salt at a rate of 1,0 to 1,5 g /L in winter, and 1,5 to 2,0 g /L in summer. This used water was in a plain located in a mid-arid climate whose deep water resources are quite limited and charged from 3 to 16 g /L according to the position in the plain.

The project design considers water saving national priorities by sprinkling and drop by drop irrigation system introduction and the used water volumes limitation. Moreover, the Project meets with the integrated and rational water use by the introduction of flow control valves on the terminals and by an adapted fixation of the water price for the infrastructure good financial management.

Lastly, the institutional aspect is reinforced by the creation of four GIC in the perimeter in order to release the State of the perimeter management and to allow a more effective management by the owners themselves.

a.3) Coherence with the agricultural national policy

With 36 plot entrusted to companies and technicians, it is a real pole of technical shining on the 351 other beneficiaries in order to ensure a sensible increase in the agricultural productions in the plain.

As recommended in the Regional Agricultural Chart of Beja Division, it is clear that seeking competitiveness will lead the VEADS, then by imitation, all the beneficiaries, to specialize in cereals and milk production. Moreover, the proximity of Large Tunis will facilitate the flow of the truck farming productions and the livestock animals, which will allow the practice of a relatively balanced rotation.

b) Coherence of the Project with the regional integrated water resources management policy

At the regional level, within the exploitation of the hydraulic resources of the North of Tunisia context, the allowance of Mejerdah water to this perimeter considers the regional context of the needed-resources. They are 13 M.m^3 of water released, indeed, on the level of Sidi Salem dam, which will be allocated

annually to the irrigation of 2,950 ha of SAU located in Goubellat plain. The regional concern is to make profitable the perimeter water use without touching to the integrity of the downstream resource.

The project which is integrated within the national plan of Northern water management context, is also a part of the watershed of Mejerdah river that is a very significant basin for the country water requirements satisfaction. Thus, the regional concern of safeguarding the quality of this river is very important.

II.2.3 - Analysis of TS-P11 Project effectiveness

a) **Variations between estimated and observed outputs**

a.1) Technical variations between estimated and carried out installations

The perimeter's design is as follows:

- A threshold pouring on the level of the river to ensure a sufficient draught in the intake ;
- A hydrant arranged out of right bank and communicating with the station ;
- A pumping out station raising water from the threshold level towards a right settling pond;
- a settling pond and a filtration civil engineering work eliminating almost the total solid charges transported by Mejerdah 's water ;
- a first pumping station SP1 established in the same site as the preceding civil engineering works ;
- a second pumping station SP2 known as for recovery located halfway between Mejerdah and the storage basin ;
- a storage, regulation and loading basin, located on a hill between Goubellat and Mjez El Bab ;
- a discharge pipe in Φ 1,000 transferring water from Mejerdah river to the storage basin.
- an adduction pipe in Φ 1,250 feeding the perimeter from the storage basin.

The analysis of the various documents shows that the choice of the perimeter site was modified during the realization of the TS – P11 project. So, the part located at the middle of the perimeter was abandoned for the profit of the zones located at the west. The abandoned zone belongs in one hand to some development companies and in the other hand, its shollows situation requiring costly sanitation and drainage installations, were several reasons to abandon that zone.

The site modification explains mainly the variations between estimations and achievements which are presented in **Table n°II-40** of page II-4547.

The estimated arranged surface in the studies and the Appraisal Report is 3,262 ha, when the real arranged surface is 2,950 ha. Consequently, the SAU lost ground from 3,000 ha to 2,725 ha.

Goubellat perimeter design as it was carried out is as the following :

- a threshold pouring on the level of the river to ensure a sufficient draught in the intake. This threshold was realized regarding the adopted site in STUDI 's study (the actual threshold realized for Mjez El Bab perimeter installation) ;

- a water intake installed on the right bank and communicating with the station ;

- a pumping out station raising water from the threshold level towards a right settling pond. This outline meets with the adopted design by STUDI, with a modification of pumps number and properties ;

- a settling pond and filtration civil engineering work eliminating almost the total solid charges transported by Mejerdah 's water. It's the same STUDI 's outline ;

- a first pumping station SP1 established in the same site as the preceding civil engineering works (the same equipment as envisaged in STUDI 's study was adopted) ;

- a second pumping station SP2 known as for recovery located halfway between Mejerdah and the storage basin. The total pumps flow was reviewed to be lower than the envisaged one during the studies (flow overestimation during the studies)

- A storage, regulation and loading basin, located on a hill between Goubellat and Mjez El Bab, realized as envisaged in STUDI's study (a basin to compensate the STEG 4 hours withdrawal) ;

- a discharge pipe in Φ 1,000 transferring water from Mejerdah river to the storage basin (the length of the installed pipeline is lower than the one mentioned in the studies after the design optimization) ;

- an adduction pipe in Φ 1,250 feeding the perimeter from the storage basin, the same as SERAH study (the study carried out by STUDI stops at the tank's level and did not concerned the network study on the perimeter's level)

- distribution and sanitation networks as they were realized are totally different from those envisaged by SERAH study following the modification of the perimeter's site.

a.2) ***Variations between planned and realized irrigated productions in Goubellat perimeter***

For a lack of an effective setting in water, it was not possible to carry out an analysis regarding the variations between planned and realized irrigated productions in Goubellat perimeter.

b) **Variations between planned and observed deadline**

b.1) Variationss between planned and observed deadlines for the perimeters setting in water

b.1.1) Variations between planned and observed achievement deadlines for irrigated perimeters arrangement

The estimated realization planning of the 3,262 ha equipped surface for Goubellat perimeter was scheduled to be spread out between December 1996 and December 2000, i.e on 48 monthes.

In practice, the real achievements planning (see appendix) indicates that the realization had proceeded from January 1999 to September 2004, for a finally equipped surface of 2,950 ha. Some deadlines suspension were recorded on the level of the following markets:

- pumping station and tank equipment ;
- installation of pipes in reinforced concrete (3 monthes) ;
- installation of pipes in polyethylene (6 monthes).

On the level of the same markets indicated previously, some delays were recorded and are justified by the followings:

- slow administration procedures of markets' attribution
- saturation on the level of reinforced concrete pipes production
- bad climatic conditions

Table n°II-40 : Comparison of planned and actual hydraulic installations

Request	Planned (Detailed SERAH 's study 1994)	Planned (Detailed STUDI 's study 1999)	Actual	Comments
Irrigation basic parameters of the (equipment flow, needs, rotation...)	Rush month Need : 740 m^3 Annual Need : 3,450 m^3 /year Qs = 0,4 L /S /ha. Q = 2 L /S (lots of 5 ha) Q = 4 L /S (lots of 10 ha)	Rush month Need : 960 m^3 Annual Need : 4,480 m^3 /year. Qs = 0,5 L /S /ha.	Network upstream is sized on the basis of 960 m^3 / ha /month (Qs = 0,5 L /S /ha), whereas Network downstream is sized on the basis of 740 m^3 /ha month (Qs = 0,4 L /S /ha) thus Rush month Need : 740 m^3	With the mofification of the perimeter site, the rotation must be changed (migration to better grounds) and water needs should increase
Type of intake Pumping out station	Threshold on river with siphoning (upstream of the Mjez El Bab IP) Q = 1,460 l/s (780 X 2) HMT = 12 m P = 265 KW	Threshold on river with submersible pumps (same intake that Mjez El Bab IP) Q =1,700 l/s (425 X 4) HMT = 10,5 m P = 270 KW	Threshold on river with submersible pumps (same intake that Mjez El Bab IP) Q = 1,710 l/s (3 X 570) HMT = 12 m P = 315 KVA	
Pumping Station	Q = 990 L /S HMT = 82 m P = 1032 KW	Q = 1,546 L /S (= 515 * 3) HMT = 89 m P = 564 X 3 = 1,692 KW	Q = 1,500 L /S (=500 * 3) HMT = 93 m P = 2,000 kW	
Recovery Station	Q = 990 L /S HMT = 82 m P = 1,032 KW	Q = 1,452 L /S (= 484 * 3) HMT = 73 m P = 430 X 3 = 1,290 KW	Q = 1,335 L /S (= 445 * 3) HMT = 76 m P = 1,600 kW	the calculated flow is estimated at 1,330 L /S (= 960 / (20x3.6x30) * 2,950)?
Discharge pipe	8,550 lm of Φ 1,000	6,900 lm of Φ 1,000	7,500 lm of Φ 1,000	
Tank	15,000 m3	20,000 m3	20,000 m3	
Adduction Control	4,809 m of Φ 1,250	As planned		
Distribution network	41,601 lm of Φ 100 - 14,846 ml of Φ 150 - 9,762 lm - 6,997 lm of Φ 250 - 3,029 lm of Φ 300 – 2,938 lm o 8,202 lm of Φ 500 – 3,602 lm of Φ 600 – 2,160 lm of	As planned	71,000 lm from Φ 90 to Φ 500 18,500 lm from Φ 600 to Φ 1,250	
the terminal diagram	Filter – cutting valve - flow control valve – watermete	As planned	As planned	
Sanitation Network			- 25 km (rehabilitation of 24 km + creation of 1 km)	Reinforcement need (extension of the network)
Tracks Network			82 km	
Windbreaks Network			84 km	Realized by private company

b.2) Variations between planned and observed completion work dates for the land reform

The regrouping action is about to be completed at the beginning of 2005, whereas it should have been completed into 2003. Displacements in the localization of plots relative to " Technicians " and the increase of the plots which are under installation and relative to " Young Farmers " explain mainly these delays.

b.3) Variations between planned and observed completion dates for the GICs effective constitution

Though there is no delay concerning the GIC constitution, it is necessary to note that the constitution is not completely effective (no general meeting held to elect Boards of Directors) since the GIC are still functioning with temporary committees recognized by the authorities.

c) **Variations between estimated and real investment costs (APD)**

The envisaged amount in the initial contract was 3.516 Million JP¥, which corresponded to 31,964,000 TD on the basis of conversion rate of 1,000 Yens = 12.0339 TD. This amount was distributed between the following components:

- transfer infrastructure (Works and equipments) ;
- distribution infrastructure ;
- mobile materials ;
- sanitation network reinforcement and rehabilitation ;
- land improvement.

In practice, 16 markets were actually concluded and Table n°II-42 below displays the approved amounts.

Table n°II-42 : Really carried out expenditure

Work designation	**Prévision (DT)**	**Contractor**	**Budget (DT)**	**JBIC (DT)**	**Amount (TD)**
Civil engineering	3,116,374	ETHA-BONNA	1 ,117, 892	1,995,743	3 ,113 ,635
Electromechanical equipment supply and transportation	4,163,070	CACAVALLI	498,362	2,825,556	3, 323,918
Supply of the Principal pipes 400≤ ϕ ≤ 1,250 mm	8,508,832	KANAOUET SICOAC	1,933,026	5,832,308	7, 765, 334
Transportion and installation of principal pipes 400≤ ϕ ≤ 1,250 mm	2,726,205	SOGIT	506,303	1,735,943	2, 242, 246
Supply and transportion of pipes 90≤ ϕ ≤ 400 mm	2,998,197	EL MAWASSIR	747,787	2,250,402	2, 998 ,189
Installation of secondary pipes 90≤ ϕ ≤ 400 mm	1,560,641	LOTFI ALI	266,798	909,771	1, 176, 569
Supply and transportion of special parts in cast iron	209,741	SOFOMECA	48,608	909,771	958, 379
Supply and transportion of valves and fittings	337,602	SERIN	110,797	226,581	337 ,378
Supply and transportion of irrigation terminals equipment	347,579	SIPAH	111,375	236,204	347 ,579
Supply and transportion of networks protection equipment	217,116	SIPAH	50,349	166,768	217, 117
Agricultural cleansing	484,600	LOTFI ALI	118,721	364,351	483 ,072
Agricultural tracks	3,127,951	PUGLISI COSTRUZIONI	772,555	2,321,862	3 ,094, 417
Pumping stations electrification	1,529,727	STEG	344,068	1,074,438	1 ,418, 506
Vehicles acquisition	126,700		31,339	95,361	126, 700
Hydraulic complexes study	234,495	STUDI	16,956	169,565	186, 521
Total	**29 ,688, 830**		**6, 674, 936**	**21 ,114 ,624**	**27 ,789 ,560**

On this total cost, only 27 ,789 ,560TD were really consumed, i.e. 93% of the budget initially envisaged

The permanent rise of the conversion rate JP¥ /TD during all the considered period ;

- a strong competition on national and international markets ;
- the owners refusal of drainage or distribution pipes crossing their lands. That makes the installed lengths lower than the envisaged ones.

II.2.4 - Analysis of TS-P11 Project efficiency

a) **Presentation of the TS-P11 Project major effectiveness indicators**

At the end of this TS-P11 Project achievements mid-term evaluation, carried out in February-March 2005, mainly before the setting in water, one can notice that only some Project effectiveness indicators really observed can be compared with those which had been planned at the time of the conclusion of the loan agreement between JBIC and Tunisian State.

Table n°II-43 of page II-4850 shows the Project efficiency major indicators planned values and compares some of them with the values really observed in February-March 2005.

Table n°II-43 : Values of TS-P11 Project major effectiveness indicators

Indicators	Planned in 1995			Observed in March 2005	
Arranged area	Total : 3,260 ha	private : 950 ha UCPA's : 2,310 ha		Totale : 2,953 ha	private : 906 ha UCPA: 2,047 ha
Useful agricultural area	Total : 3,000 ha	private : 900 ha UCPA's : 2,100 ha		Totale : 2,725 ha	private : 815 ha UCPA : 1,910 ha
Recipients Number	Total : 70	Private : 62 households UCPA's : 8		Total : 568	Private : 351 households T Dom : 15 SMVDAs 21 technicians 23 households 158 « Y Farmers »
Irrigated grounds	Principal cultivations	Occupation	Output		
	Sloe tree	60 ha	16.0 T /ha		
	Pear tree	60 ha	17.5 T /ha		
	Apple tree	60 ha	17.5 T /ha		
	Peach tree	60 ha	16.0 T /ha		
	Pomegranate tree	120 ha	18.0 T /ha		
	table vine	115 ha	20.0 T /ha		
	Wheats	600 ha	6.5 T /ha		
	Barley-grain	125 ha	6.0 T /ha		
	Leguminous plants	185 ha			
	Bersim	166 ha	70.0 T /ha		
	Tare-Oats hay	332 ha	8.0 T /ha	N.A.	
	Tare-Oats Reservation	332 ha	40.0 T /ha		
	Sorghum Fodder	72.5 ha	70.0 T /ha		
	Alfalfa	72.5 ha			
	Potato of late season	545 ha	30.0 T /ha		
	Carrot	45 ha			
	Turnip	45 ha			
	Green onion	45 ha			
	Broad bean in green	45 ha			
	Tomato	95 ha	40.0 T /ha		
	Melon	45 ha			
	Water melon	45 ha			
Collection rate of irrigation fees	100 %			N.A.	
Increase in the agricultural income	year 2010	+ 11,750,000 TD		N.A.	

b) **Arranged surfaces**

b.1) Situation and delimitation of arranged surfaces

Map n°II-3 of page II-657 shows the initially planned perimeters limits in CNEA feasibility study carried out in 1996. In Total, the arranged surface represented 3,052 ha, including 2,310 ha Nets in the state-owned lands of the old Cooperative units of Agricultural Production (UCPA) and 952 ha in the lands belonging to private sector. The JBIC evaluation study of December 1996 deals with only 2,900 equipped ha.

Map n°II-3 of page II-6567 shows also the limits of the parcels object of the land reform operation carried out by AFA between 2001 and 2004. The plotting of the actual equipped plots object of the land

reform is 2,953 ha including 2,047 net ha in the state-owned lands of the old UCPA and 906 ha in the private or privatized (Habous estate) lands.

The distribution inside the 2,047 ha of the state-owned lands is as follows : 1,180 ha are managed by 15 SMVDA, 444 ha by 158 former cooperators or young farmers, 210 ha by 21 agricultural technicians and 213 ha by 23 private farmers.

b.2) Arranged SAU = indicator n°1

In the initial feasibility study, the arranged SAU was 3,000 ha, including 2,100 ha in the old UCPA and 900 ha for the private sector. The evaluation study did not mention arranged SAU.

From the arranged SAU, Table n°II-45 below shows the irrigable SAU calculation considering the SAU "economies" allowed by large and average exploitations (tracks and windbreaks networks less concentrated)

Table n°II-45 : Calculation of the arranged SAU

Types of ground	Types of owners	Surfaces equipped (ha)	Rate	useful agricultural (ha)
Private	Private	660	90.0%	594.0
Privatized	Private	246	90.0%	221.4
Sub-total private grounds		**906**	**90.0%**	**815.4**
State-owned	Private	213	92.0%	196.0
State-owned	Agricultural Batches (*)	444	90.0%	399.6
	Sub-total private owners	**1 563**	**90.3%**	**1 411.0**
State-owned	Technicians batches	210	92.0%	193.2
State-owned	SMVDAs	1 180	95.0%	1 121.0
Sub-total state-owned grounds		**2 047**	**93.3%**	**1 909.8**
	GENERAL TOTAL	**2 953**	**92.3%**	**2 725.2**

(*) young farmers or former cooperators.

This calculation of the equipped plots SAU gives 2,725 ha as total arranged SAU, including 1,910 ha in the state-owned lands of old UCPA and 815 ha in the private or privatized lands. There was a decrease of 9% of the initially envisaged SAU following the relocation of the central part of Goubellat perimeter.

c) Initially proposed grounds occupation in Goubellat perimeter

The initial estimations regarding the ground occupation of the Economic Evaluation Detailed study carried out by SERAH in 1996 are indicated in the Table n°II-46 below.

Table n°II-46 : Variation of the estimated grounds occupation

Cultivation	Area (ha)
Sloe tree	60.0
Pear tree	60.0
Apple tree	60.0
Peach tree	60.0
Pomegranate	120.0
Vine of table	115.0
Wheat	600.0
Barley-grain	125.0
Leguminous plants	185.0
Bersim	166.0
Tare-Oats hay	332.0
Tare-Oats Reservation	332.0
Sorghum Fodder	72.5
Alfalfa	72.5
Potato of late season	545.0
Carrot	45.0
Turnip	45.0
Green onion	45.0
Broad bean in green	45.0
Tomato	95.0
Melon	45.0
Water melon	45.0

Table n°II-47 below shows the enhancement outline proposed in the Detailed study established by SERAH in 1996.

Table n°II-47 : Rotation held by SERAH study (December 1996)

Exploitation models Ground occupation	10 ha (organized sector)	5 ha (private sector)
Fruit-bearing plantations (among them ¼ peach-tree/sloe-tree, ¼ apple-tree/pear-tree, ¼ pomegranate-tree and ¼ table vine)	1.5	1.00
Sugar beet	2.0	0.50
Cereals (wheat)	2.5	1.25
winter fodder crops (including 4/5 of tare oats and 1/5 of bersim)	3.0	1.25
summer fodder (1/2 alfalfa, ½ sorghum)	0.5	0.25
winter truck farming (1/4 potato, ¾ various vegetables)	0.5	0.50
summer truck farming (1/2 tomato and ½ melon/water-melon)	0.5	0.50
Leguminous plants with seeds	0.5	0.50
Total	**11.0**	**5.75**
intensification rate	110%	115%
Average numbers of zoo-technical bovine units (UZB)	3.8	1.70

The rough annual water requirements for irrigation were estimated:

- for the organized sector to 3,415 m^3 /ha /year, with total water requirements for the rush-month (June) rising to 746 m^3 /ha ;
- for the private sector to 3,540 m^3 /ha /year, with total water requirements for the rush-month (June) rising to 710 m^3 /ha.

Following the modification of the perimeters' part (located in
Map n°II-3 of page II-6567 in shollows) and the new economic conditions (disappearance of sugar Beet industry transformation), a new rotation was adopted by STUDI s' study carried out on the pumping complex in 1999. The rotation held during the study brought out a peak output of 957 m^3 /ha

d) **Networks capacity**

d.1) Equipment Flow of pumping out and adduction systems

The perimeter networks can easily meet the needs in average year, and even for a dry year.

In fact, and in accordance with the rotation recommended by the study carried out by STUDI in 1999, the primary adduction is sized on the basis of need for 960 m^3 /rush month /ha.

d.2) Equipment Flow of terminals

In accordance with the rotation recommended by the study carried out by SERAH in 1996, the distribution network is in contrary based on a need for 740 m^3 /ha in rush month.

d.3) Flow provided in rush month = indicator n°5c

It is the smallest of these two equipment flows, i.e. the terminals equipment flow which corresponds to the flow affordable in rush month.

Locally, the terminals will be able to distribute the rush-month water requirements for some summery cultivation only on some proportion for the SAU to irrigate, as Table n°II-48 indicates it below.

Table n°II-48 : Unit needs for rush month (m^3/ha)

Cultivation	Month	Average values (m^3 / ha)	Occuption rate max
Pear tree	July	1 500	49.3%
Apple tree	June	1 160	63.8%
Peach tree	June	920	80.4%
Apricot trees	May	800	92.5%
Pomegranate trees	July	1 090	67.9%
Fodder sorghum	July	1 930	38.3%
Tomato	July	1 690	43.8%
Pepper	July	1 600	46.3%
Melon	July	1 480	50.0%
Water melon	July	1 200	61.7%

These proportions representing the SAU maximum proportions which can be occupied by this crop, whereas the remaining surface should be left for summer fallow, show that early species (Apricot trees) or late one (Pomegranate trees) are very interesting, because their rush-month needs are not situated in July.

To benefit the maximum of the offered conditions by the network, the plot irrigation equipment is to be chosen according to the adaptation of the plot to the exploitation context (boundry marking, surface, water quality, type of ground, type of cultivation, the plot configuration). This is by ensuring a minimum of investigations (ground infiltration factor, ground storage capacity, water quality distributed in the terminal).

e) **Modification of the agro economic perimeters background**

e.1) Stratification of the beneficiary exploitations

Table n°II-49 below shows the stratification of the exploitations located in Goubellat perimeter.

Table n°II-49 : Stratification of the exploitations

	Exploitations			Surface		
Plots surface	Number	%	Total (%)	Ha	%	Total (%)
0 to 1 ha	0	0	0	0	0	0
1 to 2,5 ha	3	7,5	7,5	4,69.92	0,5	0,5
2,5 to 5 ha	4	10,0	17,5	16,18.63	1,7	2,2
5 to 10 ha	12	30,0	47,5	79,21.23	8,5	10,7
10 to 20 ha	11	27,5	75,5	152,38.48	16,4	27,1
+ 20	10	25,0	100	678,51.74	72,9	100
Total	40	100		931,00.00	100	

e.1.1) Comparison between the stratifications on the state-owned lands and private ones

Diagram n°II-7 of page II-535 compares the distribution of beneficiaries' number occupying the state-owned lands and those exploiting the private lands.

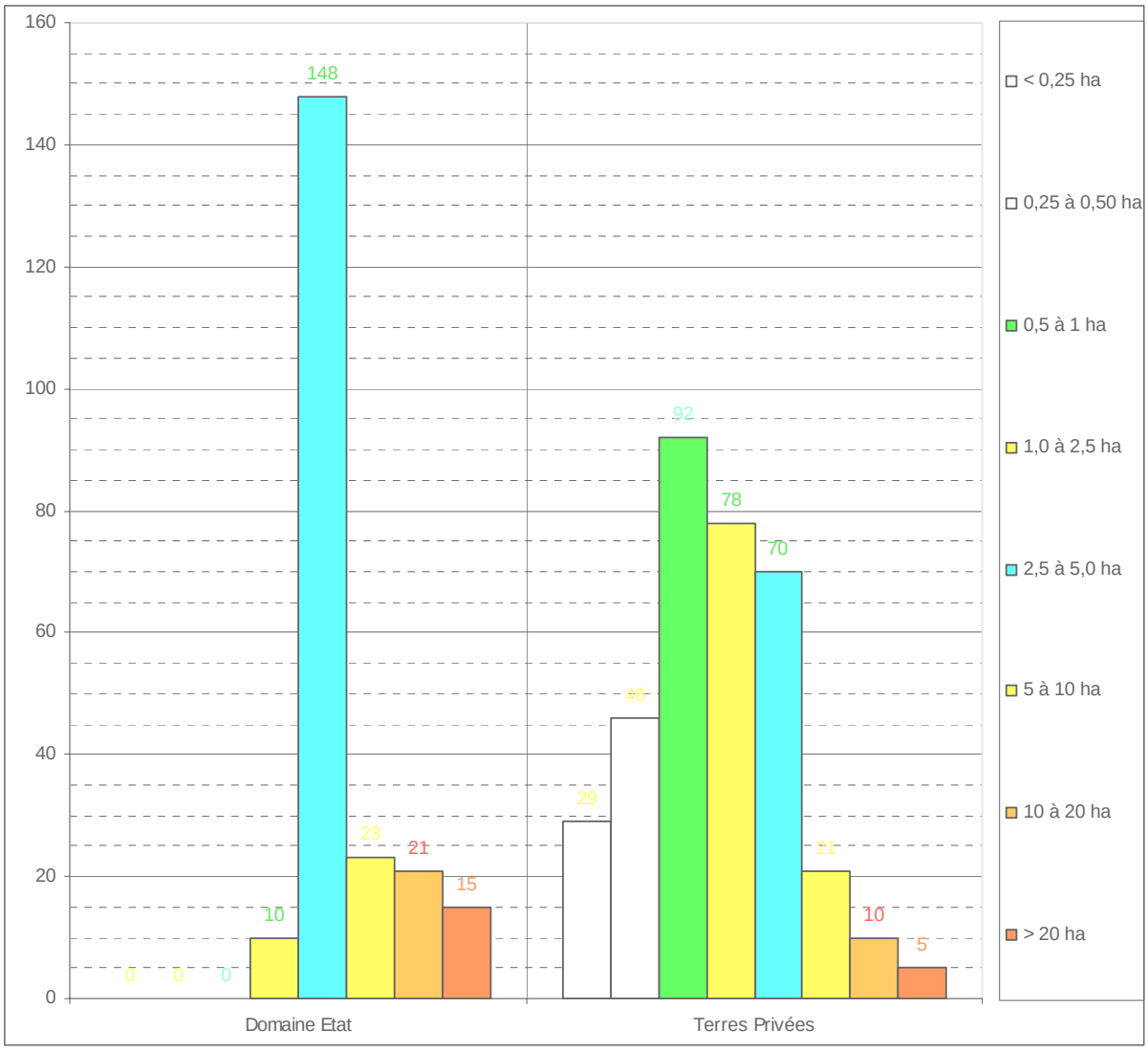


Diagram n°II-7 : Comparison of the stratification of beneficiaries exploiting the state-owned lands and the private lands.

One can notice that the plot is more parcelled out on the level of private lands where predominate SAU 's three plots ranging between 0,5 and 5,0 than in Nefza perimeter where the SAUs' three plots ranges between 2,5 and 20,0 ha.

This situation is encountered again on the level of the two perimeters beneficiaries SAU's distribution by plot size. **Diagram n°II-9** of page II-5456 presents it

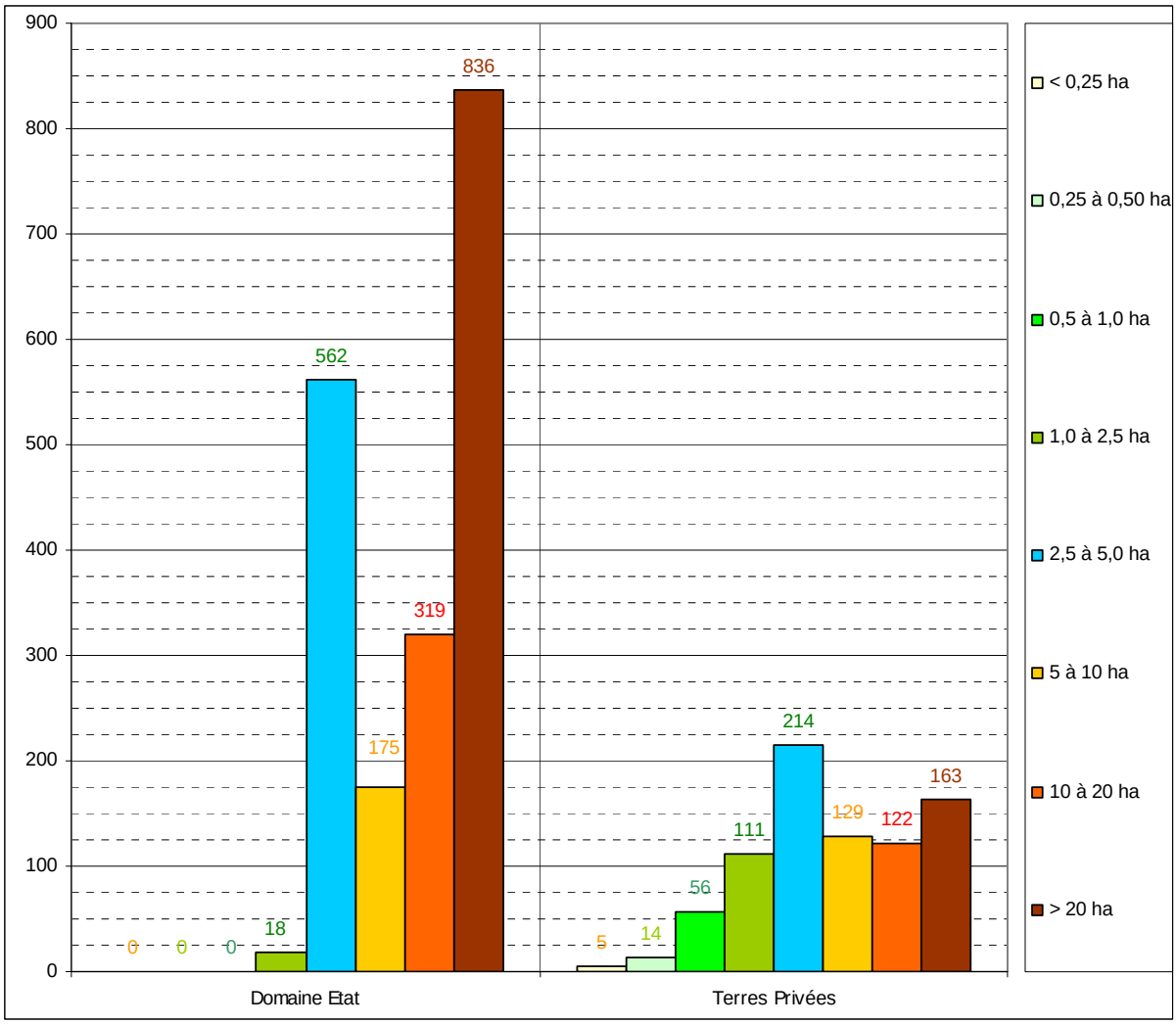


Diagram n°II-9 : Comparison of the SAU in the stae-owned lands and private lands

One can notice that the plot is more parcelled out on the level of private lands where predominate the SAU ranging between 2,5 and 5,0 ha than on the level of the state-owned lands where the SMVDA is higher than 20 ha.

e.2) Evolution of the land situation

e.2.1) The land situation before project

Two land types are present in Goubellat perimeter: state-owned lands and private lands. The perimeter is indeed made up of 2/3 of state-owned grounds (2,075 ha) and 1/3 of private grounds (931 ha). Table n°II-50 below shows the beneficiaries' number as well as the number and the surfaces of their exploitations.

Table n°II-50 : Distribution of the exploitations

Exploitations Number	Beneficiaries Number	Average exploitation surface	Minimum Surface	Maximum Surface
40	147	23,27.50 ha	20 are	71 ha

The majority of the private grounds are registered within the framework of the old land register (86.5%). The majority of the changes which have occurred since, in consequence of sales or inheritance divisions, were not however subject to regularization and update (13.5%).

e.2.2) The land situation after project

This situation is showed in AFA plot maps.

e.3) Evolution of the population organization level = indicator n°6c

The perimeter s' population is not homogeneous, which can be a positive factor in case of complementarity between the different categories, and conflict source if a category seeks to control over the country s' organizations.

The population organization will start to take form and to function only with the beginning of the distribution and the use of irrigation water. It starts also by organization of the general meetings and the operation of the GIC managed by a Board of directors elected and assisted by a technical director already available.

II.2.5 - Analysis of TS-P11 Project impact

a) **Determination of the major socio economic impacts**

a.1) Determination of the major direct socio economic impacts

Due to the non-setting in water of Goubellat perimeter, it is difficult to study the real socio economic impact on the incomes of households whose exploitation is set in water. A theoretical analysis bringing out the positive socio economic impact on beneficiaries agricultural income, could be however carried out.

a.1.1) Beneficiaries distribution by sub category before setting in water

The ground occupation is actually completely directed to pluvial mode large cultivations practice, with a large fallow rotation. In average semi arid bio climatic stage, this situation is explained by a an average income /ha about 250 TD for an owner, and reduced of 100 TD as rental fees for a tenant. The correspondence with the recommendations of small farmers category s' sub categorization mentioned in the PACFS study are therefore indicated in Table n°II-51 of page II-5658

Table n°II-51 : Actual categorization of the future beneficiaries according to their SAU

Type of farmers / SAU	State-owned grounds managed by				Private farmers
	SMVDAs	technicians	Young Farmers	Private farmers	
< 2,5 ha					A 3
2,5 to 3,5 ha			A 4	A 3	A 2
3,5 to 5,0 ha			A 3	A 3	A 2
5 to 6 ha			A 3	A 2	A 1
6 to 9 ha				A 2	A 1
9 to 12 ha		A 1		A 1	A 0
12 to 15 ha				A 1	A 0
15 to 16 ha				A 1	B
16 to 25 ha				A 0	B
20 to 25 ha				A 0	B
25 to 45 ha				B	B
> 45 ha	C				C

These average categorizations should not however make us forget that the owners real situation can vary considerably from one year to another, because of the very random climatic conditions for each average semiarid mediterranean bio climatic stage.

a.1.2) Beneficiaries distribution by sub category after setting in water

Whatever the irrigated grounds occupation is, an average income/ha for an owner is about 2000 TD, reduced of 750 TD as rental fees for a tenant. The correspondence with the recommendations of small farmers category s' sub categorization mentioned in the PACFS study is therefore indicated in Table n°II-53 below.

Table n°II-53 : Potential beneficiaries future categorization regarding their SAU

Farmers Type / SAU	Owner	Tenant
< 0,5 ha	A 3	A 4
0,5 à 1,0 ha	A 2	A 3
1 à 2 ha	A 1	A 2
2 à 3 ha	A 0	A 1
3 à 4 ha	A 0	A 0
4 à 5 ha	B	A 0
5 à 9 ha	B	B
9 à 15 ha	C	B
> 15 ha	C	C

Consequently, the setting in water will automatically generate an improvement of the beneficiaries number distrtibution presented in **Diagram n°II-11** of page II-5759**.**

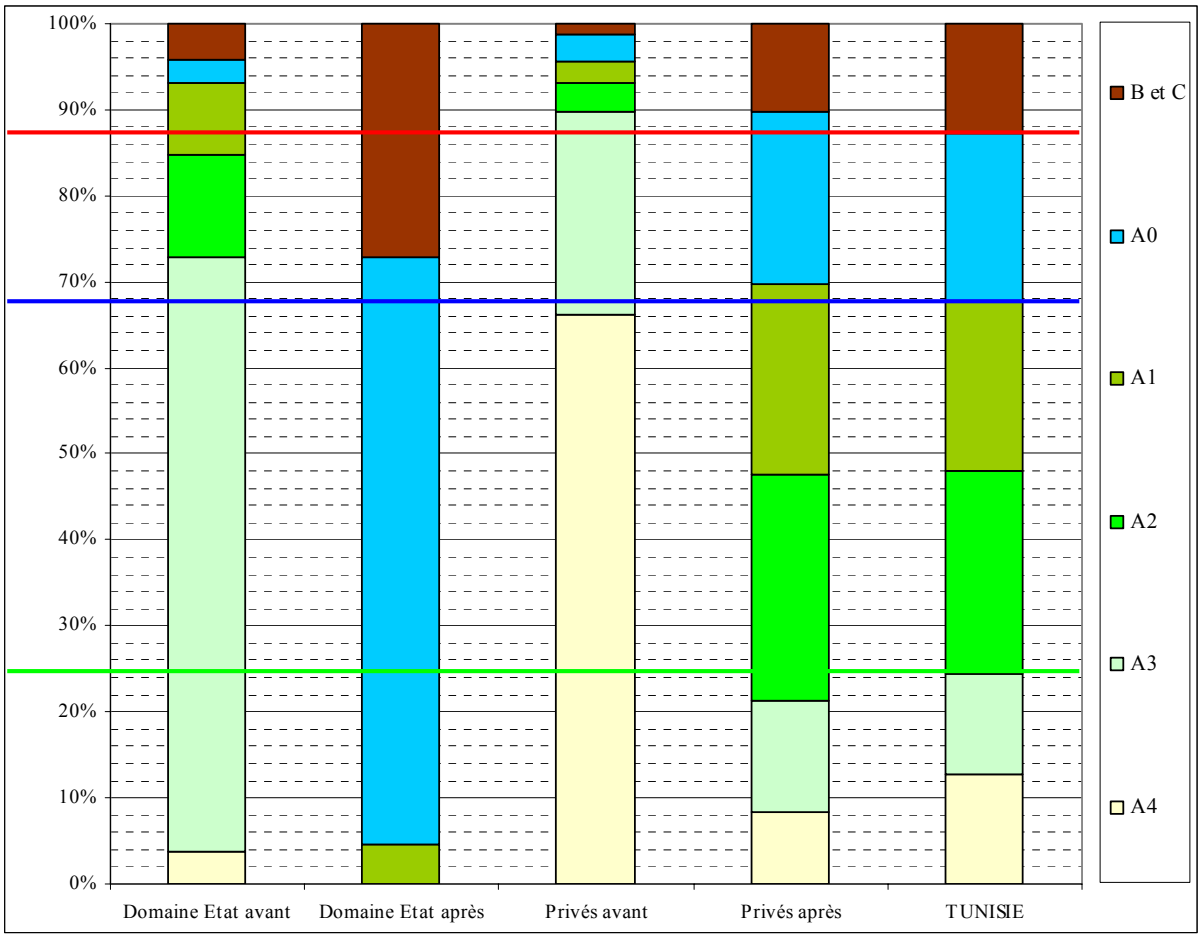


Diagram n°II-11 : Distribution of TS-P11 Project beneficiaries by sub category before and after setting in water.

One can notice indeed a situation connection with the average one on the national scale in the two perimeters, from the fact of:

- increasing everywhere the viable (A0, B and C) and potentially viable (A1) and fragile (A2) sub categories number, in the private lands.
- General decrease of marginal (A3) and very marginal (A4) sub categories number

This improvement is also clearer when we observe the distribution of the exploited SAU between the different sub categories of beneficiaries presented in **Diagram n°II-13** of page II-5860.

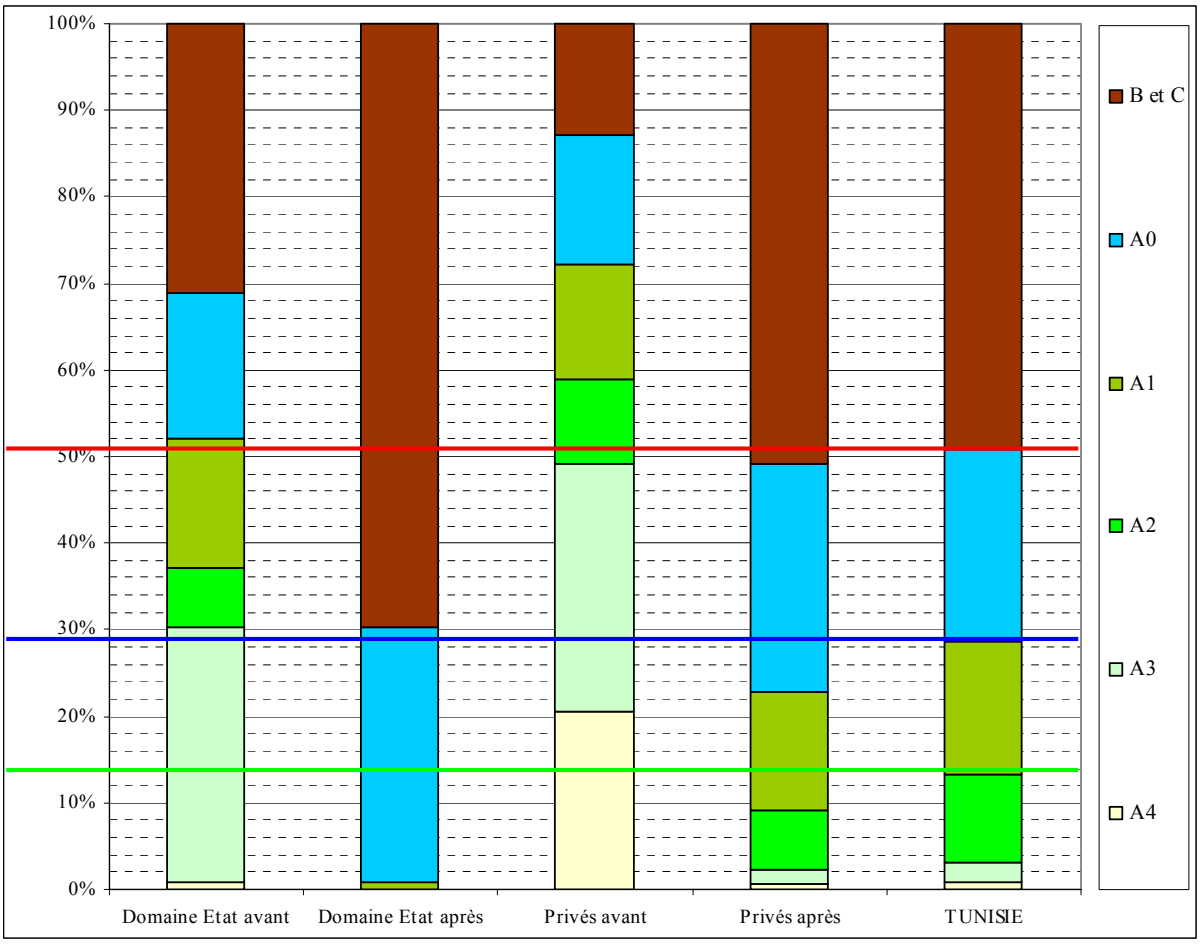


Diagram n°II-13 : Distribution of TS-P11 Project SAU by beneficiaries sub category before and after setting in water

a.2) Determination of the major indirect socio economic impacts

Through Goubellat perimeter non setting in water, it has not been possible yet to study the indirect socio economic impacts generated by TS – P11 Project.

b) Determination of the major environmental impacts

b.1) Determination of the major potential direct environmental impacts

b.1.1) Increase in the streaming towards the downstream after sanitation of the hydromorphic plains put to the irrigation

The plain sanitation will generate an increase in the flow to be forwarded with the downstream by Mejerdah River. It is a question of checking this increase impact on the grounds flooding located at the downstream.

This question will have to be thorough in the continuation of the study to estimate the sanitation effect on the forwarded downstream flows and see whether it is needed or not to prepare preventive interventions.

b.1.2) Contributions of salts and toxins in the perimeters grounds

Water coming from Mejerdah River has a quite high salinity varying from 2 to 3,5 g/l. Thus, in order to avoid salts accumulation in the ground (and consequently a ground salinity on a long term), it is essential to resort to washing dose in order to preserve an acceptable salinity rate for the majority of the considered cultivations. The washing dose is an irrigation overdose in order to forward the water excess to other discharge systems (underground sheet or river).

The washing is to be brought except in rush month in order to avoid the network oversizing, and should complete the natural rain washing. The grounds washing concern should be studied on two levels:

- How to convince farmers to bring a " lost " water excess with a high price of the m^3 (estimated at 110 millimes per m^3) ?
- Which will be the effect of the heavy dose on the hydraulic discharge system: increase and salinity of the water sheet, salinity of downstream water?

The contributions of not controlled manure, in addition to the over costs that they lead to, can increase the the ground salinity process, and this requires a ground quality supervision with the irrigation introduction.

b.1.3) Drainage water rejection in dams located downstream the perimeter

The drained water by the actual sanitation network will be essentially the excess water brought by rain. The part of drained water coming from irrigation water would be low (efficient irrigation at 80%). The flow resulting from the ground washing (natural or artificial) will be however loaded with salts and manure, which can disturb the downstream water quality.

Thus, it is imperative to ensure the quality of the perimeter s' drained water in order to prevent any degradation of Mejerdah s' water and even study the diversion of this water towards other discharge system, if necessary.

b.2) Determination of the major indirect environmental impacts

Due to the non-setting in water of Goubellat perimeter, it has not been yet possible to study the indirect socio environmental impacts generated by TS-P11 Project.

c) **Proposal of socioeconomic indicators to evaluate the project TS-P11**

Thanks to data provided by several regional directions of Beja and Bizerte and by local services based in Goubellat, several socioeconomic indicators concerning these two delegations have benn collected.
As shown by the Table n° II-30 of the page II-30, it's an accessible area where it's easy to move and to practice marketable activities.

c.1) Economic activities in the delegation of Goubellat

The area forms part of field crops region, especially wheat and barey and where arboriculture remains marginal even the olive tree. Ovine and bovin breeding, considered as an integral part of agricultural activity, constitutes the principal source of incomes for the majority of households.

According to the population, agriculture is the principal activity, breeding beeing agriculture integrated activity. The households chiefs have other activities in trade and services. Notice that the majority of the

labour force is employed in the perimeters of Mjez el Bab. It constitutes a work reserve in the new perimeters and allows know how transfer.

The work in the state sights but also in the big cities constitutes a complementary revenue source.

As shown by the Table n° II-32 of the page II-30, unemployment is a complex phenomenon which makes suffer almost the majority of households in the gouvernorat of Beja.

c.2) Drinking water supplying in the delegation of Goubellat

The drinking water service rate in the delegation of Sejnane in 2004 is equal to 95.1%. Population is served by drinking water at home. The SONEDE provides water gathered environments. In the rural environment, collective service is also provided by 20 GIC's, with four concerning the project area.

c.3) The education in the delegation of Goubellat

The delegation of Goubellat has 15 primary schools, 1 secondary school and 4 preparatory schools at its disposal. The number of registered students is equivalent to 1,660 at the primary establishments, 887 at the preparatory classes and 761 at the secondary school.

As shown by the Table n° II-54 below, the percentage of children (6-12 years old) in full-time education in the delegation of Goubellat is 93.14%.

Table n° II-54: numbers in the senior classes of the high school in the delegation of Goubellat

School number	Classrooms Number	Dining hall number	Students number			Professors number	The percentage of children (6-12 years old) in full-time education
			G	F	**Total**		
10	52	9	1,057	949	**2,006**	95	93.14

Source : Direction Régionale de l'enseignement

The percentage of children (6-12 years old) in full-time education for the gouvernorat of Beja has moved from 70.0 to 84.1% between 1984 and 1994 as shown by the Table n° II-33 of the page II-31, and the illiteracy rate of people over 10 years old increased from 56.2 to 40.9% between 1984 and 1994, as shown by the Table n° II-34 of the page II-31.

c.4) Infant and juvenile mortality in the delegation of Goubellat

Infant mortality rate in the gouvernorat of Beja is equal to 24‰, for a national medium rate equal to 22‰. According to the Health Regional Direction responsibles, reliable and precise data about infant mortality and malnutrition is not available.

Nevertheless, they explain that infectious diseases are in the foreground for the child morbidness during the first year. In fact, they represent a third/two-thirds of hospitalizations and near half of deaths. These infections result from nonrecourse to cares linked to unfavourable socioeconomic conditions of the rural population. As for juvenile mortality, they explain that it essntially results from accidents in the home.

II.2.6 - Analysis of TS-P11 Project sustainability after the JBIC withdrawal

a) **Technical abilities of the various concerned institutional participants**

For the exploitation, the development and the maintenance of Goubellat perimeter, only regional structures (CRDA) or local (GIC, CTV, ULAP) will be involved.

a.1) Technical abilities of the CRDA

a.1.1) Technical abilities of the operational department

The operational department of Goubellat perimeter, called "Management cell of IP", will have the responsibility of supervising the water invoicing for the GICs, with water counting on the level of the station antenna departures. This department will also technically assist the GIC to the network exploitation during the first years.

This department includes four units:

- secondary network maintenance (three agent) ;
- the PPI exploitation (two agent) ;
- the store (an agent) ;
- order and invoicing office (an agent).

This department trains also the GIC in the technical and financial management, but it does not have enough material means to ensure the network maintenance.

a.1.2) Technical abilities of the maintenance service

The maintenance service will be responsible for the network primary infrastructure maintenance, since the intake till each GIC s' antennas departures. Accordingly, the physical components consist in:

- pumping out station ;
- pumping station ;
- recovery station ;
- discharge pipe ;
- storage tank;
- supplying pipes until the antennas departures.

This service includes two units:

- maintenance of the principal network ;
- maintenance and management of the stations.

a.1.3) Technical abilities of the popularization coordination service

Beja CRDA lays out, like all the CRDA of Tunisia, of CTV coordination service which schedules annually training and popularization operations and assistance to the organization of demonstration days, training courses for farmers in CFPA, ...

a.2) Technical abilities of the GICs

a.2.1) Technical abilities of water management

The GICs have individual watermeters in each terminal, but there are terminals divided between several exploiters. If nothing is done, problems of water payment and supplying can emerge on these divided terminals.

Moreover, for a sustainable water management, it is necessary to make sure of the watermeters reliability on the long-term (abrasion and vandalism problems). If a problem would arise on this management mode, the GIC should have a management mode alternative.

For the water management, the GIC should have a staff sufficient number to check the watermeters and record consumption. This same staff should play the role of the network police force by checking the watermeters and the flow control valves functioning.

a.2.2) Technical abilities of networks maintenance

Four GICs are made up on the level of the perimeter. The following table indicates each GIC s' physical components. These physical components are described in Table n°II-55 below.

Table n°II-55 : Distribution of the hydraulic equipment between the 4 GICs of Goubellat perimeter

GIC	Shik El Ouediane	Dour Ismaïl	Kharrouba	Gamarti	**Total**
Equipped suf.	431 ha	1 087 ha	617 ha	939 ha	**2 950 ha**
Φ 90	409	601	2 520	1 550	**5 080**
Φ 110	1067	2 841	2 686	4 899	**11 493**
Φ 125	1204	1399	1 576	2 788	**6 967**
Φ 160	605	1 109	963	701	**3 378**
Φ 200	1 810	3 493	1 937	1746	**8 986**
Φ 250	4 002	6 411	6 027	4480	**20 920**
Φ 315	0	0	1 584	692	**2 276**
Φ 400	1 535	1 601	1 671	3 937	**8 744**
Φ 500	2 043	3 216	0	2 410	**7 669**
Φ 600	0	0	0	0	**0**
Φ 800	0	0	0	0	**0**
Φ 1.000	0	0	0	0	**0**
Φ 1.250	0	0	0	0	**0**
Cutting	1	2	4	3	**10**
Antenna s' end	1	2	0	2	**5**
Antenna s' start	4	5	3	3	**15**
Drain	12	40	27	35	**114**
Aeration valve	15	38	38	46	**137**
Terminal	57	92	111	105	**365**

From this analysis, it is very probable that "Dour Ismaïl" GIC would be favoured and "Kharrouba" GIC underprivileged. This reasoning is explained by the alignment of the cost of water on the level of all the GIC, whereas the numbers of the subscribers, as well as the managed infrastructure, are not the same ones.

a.3) Technical CTV abilities

The technical team of Goubellat CTV is relatively formed, but lacks of experience regarding irrigated cultivations and integrated farming.

b) **Determination of the Project organizational aspects sustainability**

b.1) Determination of the populations organization degree

b.1.1) GIC preparation degree for water invoicing

Actually, the 4 GICs are completely ready to invoice the water consumed by the irrigators, with the help of the irrigation staff and the support of the Technical Director already set up.

b.1.2) GICs preparation degree for networks maintenance

Irrigation staff is ready to maintain the distribution networks starting from the tank, with the help of the Technical Director already set up for coordination of the various staff s' operations.

b.1.3) Evaluation of preparation degree for GDA constitution for the agricultural development and official channels management self-financing

In the actual state of the GIC non effective functioning, farmers and GIC have not envisaged a solution yet.

b.2) Determination of coordination degree between participants

These participants belong to:

- CTV, responsible for CRDA coordination on the level of the delegation ;
- ULAP, Beja URAP section and UTAP at the national level ;
- BNA agency.

It should be noted that Goubellat CTV does not have the sufficient human and material means to supervise the new irrigators in a perimeter of 2,725 ha SAU. Having a possibility to gather the various services of network support and water exploitation, the CTV requires a reinforcement in human and material means to ensure the adequate support to private farmers, in particular of young farmers plots recipients as well as other owners.

ULAP activities are seasonal. It does not have its own means for the farmers supervision.

BNA deals with seasonal credits, medium and long-term investment loans. It's used as current accounts for other facilities, such as the subsidies granted by the APIA. With its database, the BNA has the means necessary to treat with all the solvent farmers.

No local credit association has not been yet active in the delegation.

c) **Determination of the Project participants financial sustainability**

c.1) Determination of the beneficaries financial abilities

c.1.1) Beneficiaries actual agricultural incomes

The ground occupation is actually directed completely to pluvial mode large cultivations, with an important fallow rotation. In an average semiarid bio climatic stage, we noticed upper that this situation is

explained in 250 TD /ha as an average income for an owner, reduced of 100 TD /ha as rental fees for a tenant.

c.1.2) Improvement of the agricultural gross incomes following the setting in water

One of the Project objectives is that the irrigated agriculture practice should indisputably increase the profits for its recipients, but it is clear that it will initially oblige them to invest, and then to engage more expenditure to cover higher production expenses.

If the financial conditions are met initially to allow the recipients to borrow at will, subject to refunding carried out in convenient time, it is clear that the beneficiaries resources will be largely increased. Therefore, on long term, the GIC should not have any problem of financing the production expenses and the payment of the contributions and the invoices, mainly after the initial period of refunding of the loans which were contracted for the acquisition of the materials of irrigation, of the additional livestock and of the livestock buildings,

c.2) Evaluation of theGICs financial abilities for water invoicing

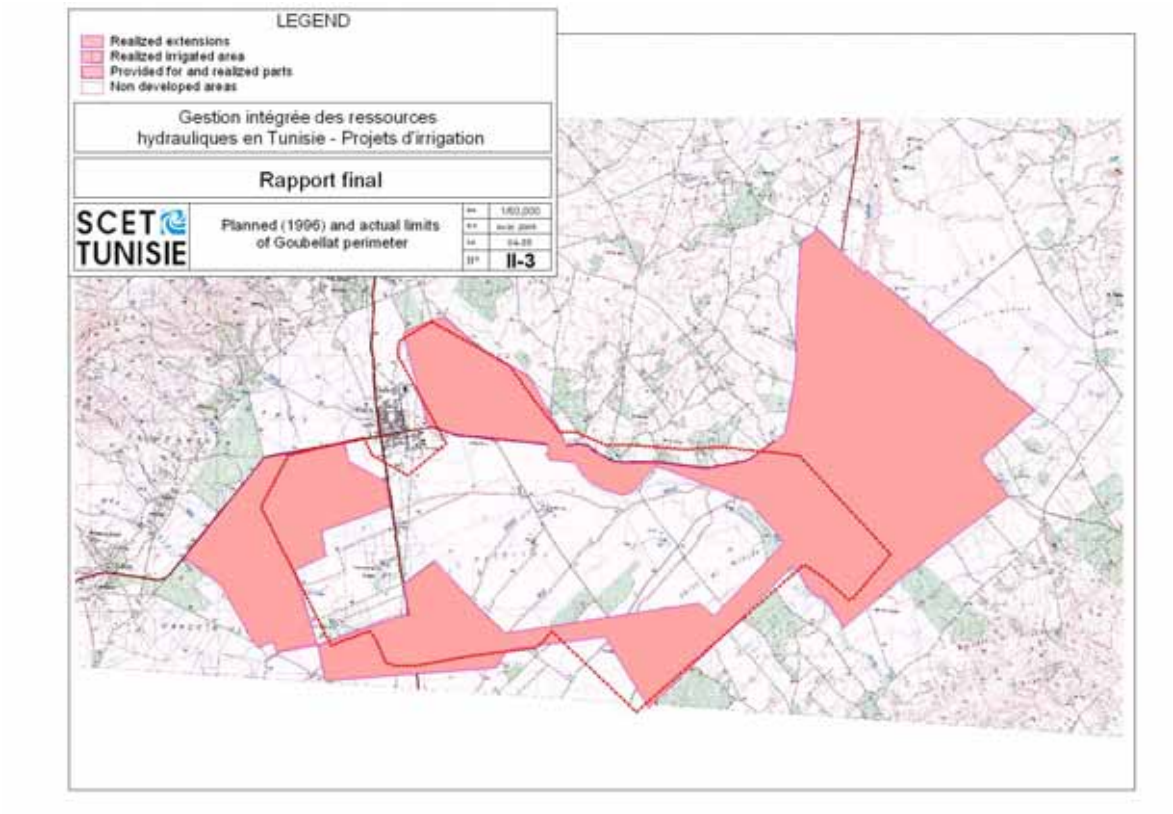
On the economic level, it is justified to have a particular price fixation to each GIC, but this principle does not comply with social aspects. Thus, common price water fixation to the four GIC would favor farmers having large exploitations over the others.

Moreover, the equity principle can be practiced to decrease the water price of the underpreveleged perimeters, like Goubellat perimeter with two pumping stages.

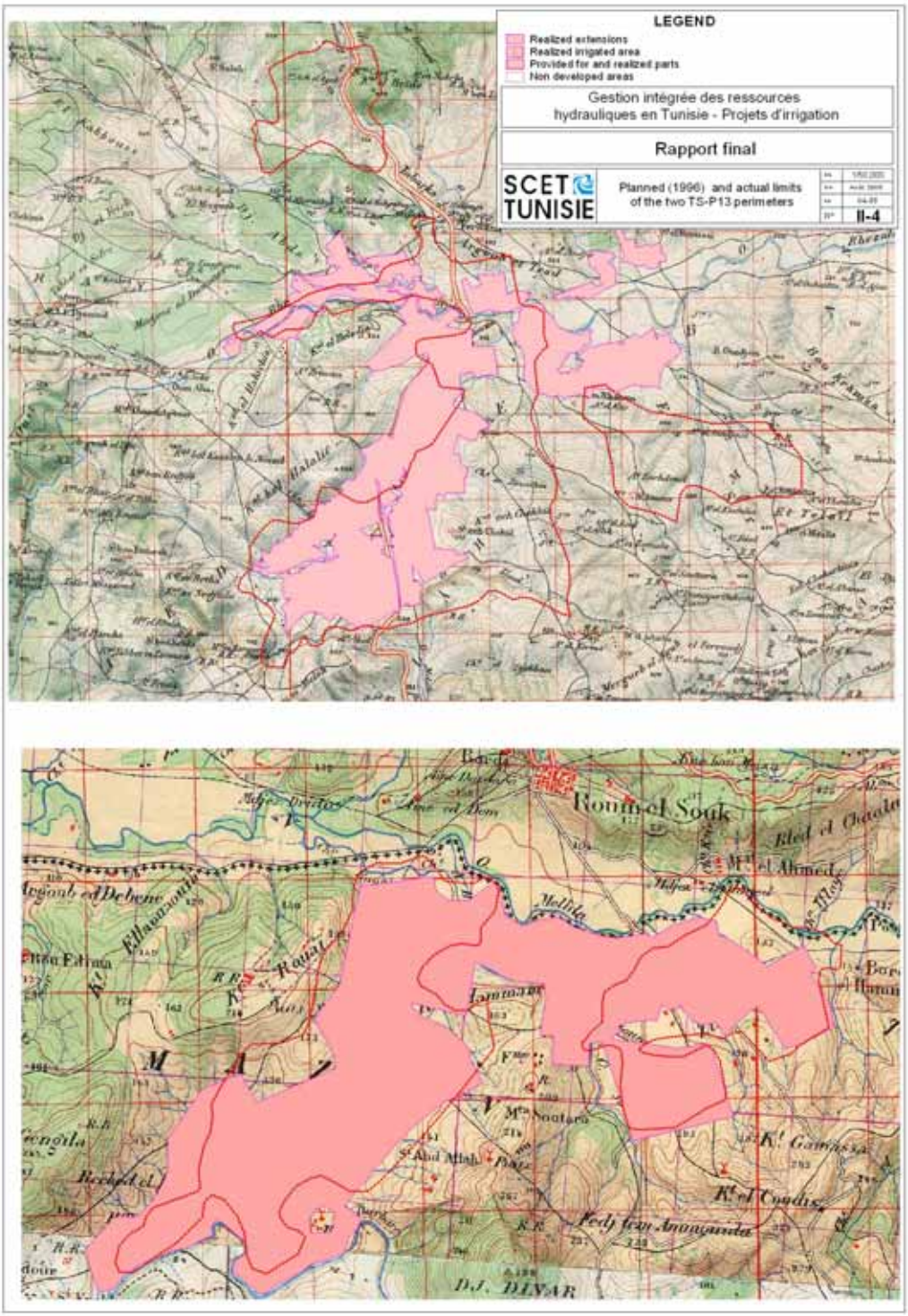
The cost of the m^3 of water sold by the GIC is estimated at 110 ml, which corresponds to a unit margin of 26 ml. It is necessary however to keep in mind that, unlike the GIC of centre and south of Tunisia which feed their budget by selling annually from 3,500 to 5,500 m^3 /ha, the calculations carried out in the Chapter III expressing constraints to the the good Project implementation show that Goubellat perimeter GIC will buy an average water quantity of 2.200 m^3 /ha each year.

Taking into account network losses estimated at 5%, these volumes will allow to release a margin of 54,300 TD /ha and a total budget of the 4 GIC' S of 148,000 TD, i.e. about 37,000 TD on average by GIC.

Moreover, a technico-economic study will have to come to a conclusion about the effect of these water expenses of 110 ml /m^3 on the competitiveness of the agricultural productions of the perimeter.



Map n°II-3 : Planned (1996) and actual limits of Goubellat perimeter



Map n°II-4 : Planned (1996) and actual limits of the two TS-P13 perimeters

II.3 - Mid-term evaluation of TS-P13 Project : Barbara irrigation Project

II.3.1 - Objectives of TS-P13 Project

Zouitina dam, located in Jendouba Division in the immediate vicinity of Algerian border, had been initially built to ensure an additional very fresh waters contribution to Northern Waters system. For that, a7 - km- transfer gallery was arranged, while emerging in the bed of Magroun River which feeds the pond of Bou Heurtma dam, brings back this water in the basin of Mejerdah River

Project TS-P13 was conceived in the objective to develop the summery agricultural productions in Fernana and Hammam Bourguiba plains, by the irrigation of two new perimeters irrigated from the pond of Zouitina dam s' fresh waters. This project envisaged the irrigation of 2,510 ha with 6.7 M.m^3 coming from pumping on the pond of Zouitina dam, among them:

- 1,700 ha are arranged in South of Fernana on both sides of Barbara river. They use by the way 4.8 of the 56 M.m^3 pumped in the pond of Zouitina dam and in transit to the bed of Magroun river towards the pond of Bou Heurtma dam;
- 810 ha arranged in West of Hammam Bourguiba on Tunisian left bank of Mellila river, to use there 1.9 M.m^3.

The Project should thus contribute to an increase of 4.2 M.TD for 640 recipient farmers' income, that is to say an average increase of 6,490 TD per beneficiary.

II.3.2 - Analysis of TS-P13 Project relevance

a) **Coherence of the Project with the national policy**

a.1) Coherence of the Project with national policy s' priorities

The choice of two zones qualitatively and quantitatively deprived of irrigation water resources allows the promotion of their development by diversifying their common practiced agricultural crops. for the first in 770 ha arranged for this purpose, water is pumped in the pond of Zouitina dam, and for the other in 1,300 arranged ha, water is in transit coming from pumping in the pond of Zouitina dam and intended to feed the pond of Bou Heurtma dam.

These two mountainous zones have been constituting until now "shade zones"of the country. Its local economy depends almost entirely on the money sent by expatriates, by the boys working on the building sites in the coastal Administrative Divisions and by girls working as cleaners in the residential districts of the large cities.

The national economic policy seeks to develop the legal economy of the border areas with Algeria in order to avoid the installation of a parallel circuit of fraudulent imports and exports benefiting from the price distortions between the two countries.

a.2) Coherence with the national integrated water resources management policy

The project design considers the national priorities of saving water by the introduction of the sprinkling and drop by drop irrigation, and the limitation of the water volumes to be used. The project also meets an integrated and rational water use by the introduction of flow control valves in the terminals and by a water price fixing adapted to a sound financial management of the infrastructure.

Lastly, the institutional aspect is reinforced by the creation of a GIC (Collective Interest Grouping) in each perimeter, in order to release the State of the direct perimeters management and to allow a more effective management by the owners themselves.

a.3) Coherence with the agricultural national policy

The problems encountered in the Cap-Bon citrus fruit fields led the M/ARH to explore new surfaces where to develop citrus fruit cultivation, in the zones of soft or moderated winter of Kairouan, Bizerte, Beja and Jendouba.

Moreover, and as recommended in the Regional Agricultural Map of Jendouba, it is clear that seeking for competitiveness will lead many recipients to specialize in milk and cereals production.

a.4) Coherence with Tobacco s' Control policy

The Project will allow Fernana and Hammam Bourguiba plains to meet perfectly the pressing needs of the Tobacco s' Control of irrigated grounds by fresh waters. This is to extend there the culture of the new Tobacco varieties, which can be substituted to the imports of Virginia tobacco cigarettes for the making of light cigarettes.

b) Coherence of the Project with the regional policy of integrated water resources management

At the regional level, within the exploitation framework of the hydraulic resources of the North of Tunisia, approximately 8 M.m^3 of fresh water coming from Barbara dam were allocated for the irrigation of two plains of Khroumirie close to the Algerian border, including approximately 5 M.m^3 for the perimeter of 1,300 ha equipped in the South of Fernana, and 3 M.m^3 for the perimeter of 770 ha equipped in the West of Hammam Bourguiba.

The regional concern is to make the water use of these perimeters profitable without touching to the integrity of the downstream resource. However the pond of Bou Heurtma dam, whose water is intended to drinking water supply and irrigation, is located at the immediate downstream of Fernana perimeter. Thus, the irrigation impacts should be considered in total installation.

II.3.3 - Analysis of the TS-P13 Project efficiency

In addition to exchanges with the Administration, the analysis of the Project history is based on the following background documents:

- " Appraisal document " of TS-P 13 project;
- Detailed study (APD) of the two perimeters carried out in 1998 by SCET-Tunisie ;
- Reports of work supervision and verification designs.

a) **Variations between estimated and observed outputs**

a.1) Technical variations between estimated and carried out installations in Fernana perimeter

Fernana perimeter was to cover a rough surface of 1,300 ha, that is to say a net surface of 1,170 ha. Table n°II-56 of page II-71 sums up Barbara Project Unit effective achievements while comparing them with the Detailed Study (APD) s' forecasts carried out by SCET-Tunisie in 1998.

a.1.1) Adduction network

For Zouitina dam water conveyance towards the regulation basin, the design of the hydraulic installation of Fernana perimeter is based on the following diagram which was completely respected in realization time. :

- a concrete threshold on Ghezala river
- a water intake civil engineering work associated with a threshold, on right bank, equipped with a canal for sediments release;
- a pumping out station allowing to raise water on the non easily flooded bank ;
- a regulation basin, located at approximately 320 m from the pumping out station which is connected to the outlet side of the pumps by a siphon made up of a gravitating pipe and is used at the same time for the regulation pumps operation, loading the recovery station and sanding out crude waters to pump ;
- a recovery station comprising two compartment :
  - a low compartment intended to supply the low tank;
  - a high compartment intended to supply the high tank.
- two discharge pipe :
  - a "low sector" pipe, supplying the low tank
  - a " high sector" pipe, supplying the high tank.
- a storage tank feeding the low sector, located at approximately 1,5 km from the recovery station ;
- a storage tank feeding the high sector, located at approximately 2,0 km from the recovery station.

a.1.2) Distribution networks

For the supplying of stored water in the head tank, the design of the hydraulic installation of this perimeter, is based on the following diagram which was completely respected in the realization time:

- several antenna departures equipped each one by a cutting valve and an antenna meter ;
- terminals, equipped with a watermeter and a cutting valve, and for some of them, a flow control valve, each one of which feeds a surface of 5 ha with a flow of 4 L / S,

The total linear of the distribution network (for the two perimeters) complies with that indicated in the study, except that there was a conversion of 4 km from reinforced concrete to Pehd.

Table n°II-56 : Comparison of estimated and actual components of hydraulic installations in Fernana perimeter

Request	Estimations (Detailed study STUDI 1998)	Achievements	Comments
Equipped surface (ha)	total Surface: 1,300 ha, among them low stage: 850 ha – high stage: 450 ha Net Surface: 1,186 ha	total Surface: 1,144 ha, among them low stage: 739 ha – high stage: 405 ha Net Surface: 1,030 ha	
Irrigation basic parameters (equipment flow, needs, rotation...)	4,210 m^3 / ha / year, are an annual total of 5 M..m^3 / year 1,400 m^3 / ha / rush month , i.e. an equipment flow of 0.8 L /S /ha for 16 hours of daily irrigation	Idem	
Type of intake	Intake on Ghezala, with submersible pumps	Idem	
Pumping out Station	4 pumps + 1 emergency, Qu = 200 L / S and HMT = 8 m – 96 kw – 0.400 km. of Φ 1000	4 pump + 1 emergency, Qu =222 L / S and HMT = 7,5 m.	
Pumping Station	high stage: 3 pumps + 1 emergency (87 l/s – 123 m – 480 kw) low stage: 3 pumps + 1 emergency (160 l /s – 83 m – 600 kW)	Idem	
Discharge pipe	low Stage: 1,500 m.l. of Φ 600 high Stage: 2,100 m.l. of Φ 500	Idem	
Tank	R1: low stage: 6,.900 m^3 R2: high stage: 3,700 m^3	Idem	
Distribution network	low Stage: 10,850 m.l. in concrete – 25,350 m.l. in Pehd) high Stage: 7,170 m.l. in concrete – 12,380 m.l. in Pehd : ie totally: 18,.900 m.l. in concrete and 39,600 m.l. in Pehd. Hamam Bourguiba: 24,600 m.l in concrete and 70,300 m.l in Pehd	Total with Fernana: 20,666 m.l. in concrete and 74,365. 9 m.l. in Pehd	
number of terminals	228 terminal	Terminal every 5 ha (with flow control valve of 4 L /S) – total with Fernana: 395 terminals	15 additional terminal
Sanitation network	Recalibration of 6,5 km of existing talweg Creation of 23 km of ditches	Recalibration of 6,5 km of existing talwegs Creation of 6 km of ditches	protest of the downstream part owners who suspected a possible flooding of their fields
Tracks network	22 km	40 km	Extension
Windbreaks network	None	In progress	on the national budget

a.1.3) Tracks network

Manifestly insufficient, the 22 - kilometers service tracks network was developed until reaching 40 kilometers. But even with this development, it has not been satisfying yet all the future recipients. Moreover, the budget lack resulted in neglecting the realization of the gutters of protection, which are insufficient.

a.1.4) Sanitation network

Through failing to regroup the plots in this perimeter, it was possible to do recalibration of the existing 6,5 km talweg only and digging 6 from the initially planned 23 km of ditches

a.2) Technical variations between estimated and carried out installations in Hammam Bourguiba perimeter

Hammam Bourguiba perimeter was to cover a rough surface of 770 ha, that is to say a net surface of 700 ha. Table n°II-57 of page II-7476 sums up Barbara Project Unit achievements by comparing them to the Detailed Study (APD) estimations carried out by SCET-Tunise in 1998.

a.2.1) Adduction network

For Zouitina dam water conveyance towards the head tank, the design of the hydraulic installation of this perimeter is based on the following outline which was completely respected in time of realization:

- one first pumping stage, known as pumping out stage, allowing to raise pond water to the non flooded bank, which functions thus under an adjustable HMT, but reduced to the strict minimum, but with a good output considering speeds adjustment;

- one second stage, known as of recovery stage, allowing to raise water on the level of the bank until the necessary dimension so that the head tank dominates all the perimeter sectors, and thus functioning under a fixed HMT and allows to obtain an excellent pumping output and thus a minimal energy consumption;

- a discharge pipe of the recovery station towards the storage tank;

- a compensation and storage tank, located at the level of the collar to approximately 800 m of the recovery station which feeds in a gravitational way all the perimeter and constitutes the starting point of the supplying infrastructures ;

It was also envisaged to feed the district G of the perimeter from two hilly dams existing on Sabouna and Zitouna rivers. This district will be in priority fed from these two dams until exhaustion of the stored water. Then, when the two ponds are empty, it will be fed from the principal network coming from the storage tank through an appropriate valve and pression stabilizer.

a.2.2) Distribution network

For the distribution of the stored water in the head tank, the design of the hydraulic installation of Hammam Bourguiba perimeter is based on the following outline, which was completely respected in time of realization:

Table n°II-57 : Comparison of planned and actual components of hydraulic installations in Hammam Bourguiba perimeter

Request	Estimations (Detailed study SCET- Tunisie 1998)	Achievements	Comments
Net surface (ha)	total Surface: 770 ha ; net Surface: 700 ha	total Surface: 866 ha ; net Surface: 779 ha	
Irrigation basic parameters (equipment flow, needs, rotation...)	3,430 m^3 / ha / year, total water requirement 2,4 $M.m^3$ / year 1,060 m^3 / ha / rush month , ie an equipment flow of 0,6 L / S / ha for 16 hours of daily irrigation	Idem	
Type of intake	Landing stage	Idem	
Pumping out station	6 floating submersiblepump (Q=70 L / S, HMT between 23 and 45 m – P=390 kw) among them an emergency 1 – discharge pipe Φ 250 in Pehd of 300 m.l. of length.	6 p KSB ump (Qu=80 L / S, HMT between 26 and 49 m, Pu=78 kw).	
Pumping station	4 pump, including 1 of emergency - Q=117 L / S – HMT = 18 m – power = 111 KW	3 KSB pump, including 1 of emergency - (Q=180 L / S – HMT=17 m)	
Discharge pipe	800 m.l. of Φ 600	Idem	
Tank	tank covered with concrete 6.300 m^3 with the dimension of 216 m	Idem	
Distribution network	6.540 m.l. out of concrete 30.940 m.l. in Pehd with Fernana: 24,600 km in concrete and 70,300 km in Pehd	Total with Fernana: 20.666 m.l. in concrete and 74.365 m.l. in Pehd	
Terminals number	146 terminals	Terminal every 5 ha (with flow control valve of 3 L / S) – total with Fernana: 395 terminals	
Sanitation network	recalibration of 2 km of the existing talweg creation of 9 km of ditches	None	No agreement on the plots regrouping
Tracks network	13 km	25 km	Extension
Windbreaks network	None	In progress	on the national budget

- several antenna departures, each one equipped by a cutting valve and an antenna meter ;
- terminals, equipped with a watermeter and a cutting valve, and for some of them a flow control valve, each one of which feeds a 5 ha surface with a 3 L /S flow, i.e. an equipment flow of approximately 0,6 L /S /ha.

The total linear of the distribution network(for the two perimeters) complies with that mentioned in the study , except that there was a 4 - km conversion from reinforced concrete to Pehd.

a.2.3) Tracks network

Manifestly insufficient, the 13 - kilometers service tracks network was developed until reaching 25 kilometers. But even with this development, it has not been yet satisfying however all the future recipients. Moreover, the budget lack resulted in neglecting the realization of the protection gutters which are insufficient.

a.2.4) Sanitation network

Through failing to regroup the plots in this perimeter, it was possible neither to do recalibration of the existing 2 km of talweg nor digging the 9 km of the initially planned ditches.

a.3) Variations between estimated and realized irrigated productions in Fernana and Hamam Bourguiba perimeters

For lack of an effective setting in water, it was not possible to realize an analysis of the variations between envisaged and realized irrigated productions in Fernana and Hamam Bourguiba perimeters.

b) Variations between planned and observed deadlines for the perimeters setting in water

b.1) Variations between planned and observed deadlines for the irrigated perimeters installation

The estimated achievements planning for Fernana and Hammam Bourguiba perimeters are defined as the following: for an equipped surface of 2,070 ha in the two perimeters on the whole, the building sites would start in March 1998 and be completed in December 2001.

The real achievements planning (see appendix) indicates that realization of the finally equipped surface of 1,924 ha proceeded in fact on the whole from June 2000 till November 2004.

Firstly, the works starting up recorded a shift compared to the initial program for administrative questions: a series of recommendations, prior agreement, procedures and visas which take time to be carried out and which should be obtained beforehand.

Moreover, the bad weather and geo technical conditions of the site stopped several times the work progress.

Lastly, the difficulties encountered by the AFA to finalize the two regrouping operations have largely contributed to the recorded delay level.

b.2) Variations between planned and observed completion dates for the land reform work

The action of regrouping is not completed at the beginning of 2005 in some sectors when it should have been completed in 2003. Persistent dissensions on the real plot limits, and thus the validity of some proposed plot exchanges, prevent the concluding of a final agreement.

b.3) Variations between planned and observed completion dates for the GIC effective constitution

If there is a delay concerning constitution of Hammam Bourguiba s' GIC, it is necessary to note that the constitution of Fernana GIC is not completely effective, since no general meeting was held to elect the Board of directors and the GIC is still functioning with temporary committees recognized by the authorities.

c) **Observed variations between estimated and real investment costs (APD)**

The estimated amount in the initial contract was 1,760 Million JP¥, which corresponded to 21,174,000 TD on the basis of a conversion rate of 1000 Yens = 12.03 TD. This amount was distributed as indicated in Table n°II-59 below

Table n°II-59 : Estimated amounts of the market

	Estimated
Works : FB pipes installation	1 879 907.840
Transportion and Phd installation	975 909.286
civil engineering works	3 376 644.599
Cleansing and drainage	764 646.601
Fernana agricultural track	2 494 248.000
H. Bourguiba agricultural track	2 476 348.000
Supplies: 467779-5 FB pipes	3 371 467.450
Supply of special parts in cast iron	139 997.580
Supply of protection equipment	155 409.544
Water meters	170 378.311
pumping St electrification	55 217.334
Electromechanical and elect equipment.	2 980 459.837
Supply of hydro-mechanical parts	237 810.152
Supply of PUHD pipes	1 903 642.294
consulting services	191 950.000
Total	**21 174 036.828**

In practice, 15 markets were effectively concluded. **Table n°II-60** below shows the approved amounts.

Table n°II-60 : Really carried out expenditure

Item	Prevision	ENTREPRISE	Budget	JBIC	**TOTAL**
Works: 467679-4 pipes installation	1, 879, 907.840	BONNA TUNISIE	268, 026.972	1 ,608 ,179.569	1, 876, 206.541
Transportion and Phd installation	975 ,909.286	ESSAFA	147 ,731.716	806, 642.886	954 ,374.603
civil engineering works	3 ,376, 644.599	SIREP	501 ,765.542	2 ,787 ,586.350	3, 289, 351.892
Sanitation and drainage	764 ,646.601	Ghrib Freres	113 ,464.133	631, 489.827	744 ,953.960
Fernana agricultural track	2 ,494, 248.000	Magreb Trv	364 ,533.000	2, 025 ,181.330	2 ,389 ,714.974
H. Bourguiba agricultural track	2, 476, 348.000	Missaoui Fr	374 ,391.851	2 ,079, 954.740	2 ,454, 346.591
Supplies: 467779-5 FB pipes	3, 371 ,467.450	BONNA BBMP	455 ,297.404	2, 380 ,220.394	2, 835 ,517.798
Supply of special parts in cast iron	139 ,997.580	SOFOMECA	22 ,881.580	117,116. 000	139 ,997.580
Supply of protection equipment	155, 409.544	SIPAH	7 ,222.548	148 ,174.267	155 ,396.815
Water meters	170 ,378.311	SIPAH	25 ,989.908	144, 388.403	170, 378.311
pumping St electrification	55, 217..334	STEG	8,422.968	43 ,930.457	52 ,353.425
Electromechanical and elect equipment	2, 980, 459.837	APLICO	382 ,815.749	2, 597, 644.087	2, 980 ,459.836
Supply of hydro-mechanical parts	237, 810.152	SIPAH	63, 434.981	174, 375.000	237 ,809.659
Supply of PUHD pipes	1, 903, 642.294	BESTOPLAS T	313 ,428.000	1, 608 ,852.199	1, 922, 280.199
consulting services	191, 950.000	SCET	14, 293. 000	142 ,930.000	157 ,223.000
TOTAL	**21, 174, 036.828**		**3 ,063, 699.352**	**17 ,296, 665.509**	**20, 360 ,364.861**

From the data of the two preceding tables, **Table n°II-61** of page II-7779 presents the noticed variations between estimations and achievements.

Table n°II-61 : Report and justifications of the variations

Items	Envisaged	Realized	Variations	Justification
Works: 467679-4 pipes installation	1,879,907.840	1, 876, 206.541	-3,701.299	less pipes because of the refusal of some farmers
Transportion and Phd installation	975,909.286	954 ,374.603	-21,534.684	Modification of the plan
civil engineering works	3,376 644.599	3, 289, 351.892	-87,292.707	the forecasts were over- estimated
Sanitation and drainage	764,646.601	744 ,953.960	-19,692.641	Refusal of the drainage by some owners
Fernana agricultural track	2,494,248.000	2 ,389 ,714.974	-104,533.670	Refusal of the farmers
H. Bourguiba agricultural track	2,476,348.000	2 ,454, 346.591	-22,001.409	Refusal of the farmers
Supplies: 467779-5 FB pipes	3,371,467.450	2, 835 ,517.798	-535,949.652	Economy on the special parts (15%)
Supply of special parts in cast iron	139,997.580	139 ,997.580	0.000	
Supply of protection equipment	155,409.544	155 ,396.815	-12.729	
Water meters	170,378.311	170, 378.311	0.000	
pumping St electrification	55,217.334	52 ,353.425	-2,863.909	the forecasts were over-estimated
Electromechanical and elect equipment	2,980,459.837	2, 980 ,459.836	-0.001	
Supply of hydro-mechanical parts	237,810.152	237 ,809.659	-0.171	
Supply of PUHD pipes	1,903,642.294	1, 922, 280.199	18,637.905	Over-estimation of the endorsement
consulting services	191,950.000	157 ,223.000	-34,727.000	Strong competition between control offices
Total	21,174,036.828	**20, 360 ,364.861**	81,3671.967	

This weak variation of the installation cost of the two perimeters in spite of the observed delays is explained by :

- the permanent rise of the conversion rate of JP¥ into TD during all the considered period ;
- a strong competition on national and international markets ;
- the refusal of some owners for the supplying or drainage pipes crossing through their fields, which makes the length of the installed pipelines slightly longer than the initially estimated line.

II.3.4 - Analysis of TS-P13 project effectiveness

a) **Presentation of the major TS-P13 Project effectiveness indicators**

At the end of this mid-term evaluation of TS-P13 Project achievements carried out in February-March 2005, before the setting in water of the irrigated perimeter, only some really-observed effectiveness indicators can be compared with those which had been planned at the time of the conclusion of the loan agreement between JBIC and Tunisian State.

Table n°II-63 on page II-7880 shows the planned values of the major Project effectiveness indicators, and compares some of them with the really-observed values in February-March 2005.

Table n°II-63 : Values of the TS-P13 Project major effectiveness indicators

Indicators	Planned in 1995			Observed in March 2005	
Arranged areas	Total : 2,510 ha	in Fernana : 1,700 ha in H Bourg : 810 ha		Total : 2,063 ha	in Fernana : 1,293 ha in H Bourg : 770 ha
Useful agricultural area	Total : 2,251 ha	in Fernana : 1,526 ha in H Bourg : 725 ha		Total : 1,863 ha	in Fernana : 1,170 ha in H Bourg : 693 ha
Recipients Number	Total : 640 households	in Fernana : 463 households in H Bourg : 177 households		Total : 539 households	in Fernana : 320 households in H Bourg : 219 households
	Principal cultivations	Occupation	Outputs		
Irrigated grounds	Walnut tree	33.9 ha	0.4 T /ha		
	Pear tree	29.8 ha	20.0 T /ha		
	Apple tree	46.2 ha	20.0 T /ha		
	Citrus fruit trees	42.6 ha	20.0 T /ha		
	Oil olive-trees	73.9 ha	2.5 T /ha		
	Table Olive-trees	63.4 ha	7.0 T /ha		
	Wheat	661.1 ha	5.5 T /ha		
	Barley-grain	140.7 ha	4.5 T /ha		
	Leguminous plants	60 ha			
	Sugar-beet	150.2 ha	55.0 T /ha		
	Tobacco	210.2 ha	2.5 T /ha		
	Barley in green	146.2 ha	30.0 T /ha		
	Bersim	212.4 ha	35.0 T /ha		
	Tare-Oats hay	239.4 ha	6.0 T /ha		
	Fodder corn	220.0 ha	40.0 T /ha		
	Sorghum fodder	230.2 ha	60.0 T /ha		
	Off-season potato	130.3 ha	20.0 T /ha		
	Carrot	30.3 ha			
	Green onion	60.6 ha	25.0 T /ha		
	Garlic	19.3 ha			
	Vegetables with sheets	36.8 ha			
	Strawberry	20.1 ha			
	Tomato	56.3 ha	40.0 T /ha		
	Pepper	25.8 ha			
	Melon	15.3 ha			
	Water melon	95.3 ha	35.0 T /ha		
Irrigation fees collection rate	100 %			N.A.	
Increase in the agricultural income	year 2010	+ 4,154,000 TD		N.A.	

b) Arranged surfaces

b.1) Situation and delimitation of arranged surfaces

Map n°II-4 of page II-6668 presents limits :

- planned in the initial feasibility study established by CNEA in 1996 where the arranged surface represented on the whole only 2,510 ha, including 1,700 ha in Fernana and 810 ha in Hammam Bourguiba ;

- planned in the Detailed Study established by SCET-Tunisie in 1998 where the arranged surface represented on the whole only 2,070 ha, including 1,300 ha in Fernana and 770 ha in Hammam Bourguiba ;

- of the plots object of the regrouping study[2] carried out by the AFA since 2002. Plotting of the finally equipped plots provides a total arranged surface of 1,924 ha, including 1,293 ha in Fernana and 631 ha in Hammam Bourguiba.

b.2) Arranged SAU = indicator n°1

[2] *According to local persons in charge, these reallocated surfaces cover only 80 to 85% of the arranged zone served by irrigation terminals*

In the initial feasibility study, the arranged SAU represented 1,863 ha, including 1,170 ha in Fernana and 693 ha in Hammam Bourguiba. Neither the Detailed Study (APD) nor the Evaluation Study mentioned any arranged SAU.

The average size of the actually irrigable plots considering the non finalization of the regrouping study results in considering a 90% arranged SAU of the total surface. The effective arranged SAU is thus estimated to be 1,732 ha (ie77% of the planned area), including 1,164 ha in Fernana (i.e. 76% of planned area) and 568 ha in Hammam Bourguiba (i.e. 78% of planned area).

c) Grounds occupation in the two perimeters

c.1) Initially proposed enhancement outlines

The ground occupations initial estimations of Fernana perimeter Feasibility Study carried out by CNEA in 1996 are indicated in **Table n°II-65** below**.**

Table n°II-65 : Variations of the estimated grounds occupation in Fernana perimeter

Cultivation	Surface (ha)
Walnut tree	20.0
Pear tree	10.8
Apple tree	25.0
Citrus fruits	42.6
Olive tree of oil	47.5
Olive tree of table	15.0
Wheats	460.0
Barley-grain	90.0
Leguminous plants	60.0
Sugar beet	150.2
Tobacco	59.6
Barley in green	85.0
Bersim	132.4
Tare-Oats hay	159.4
Fodder corn	150.0
Sorghum fodder	150.2
Off-season Potato	130.3
Turnip	30.3
Green onion	60.6
Garlic	19.3
Vegetables with sheets	36.8
Strawberry	20.1
Tomato	56.3
Pepper	25.8
Melon	15.3
Water melon	95.3

Table n°II-66 on page II-8082 presents the enhancement outline provided in the Detailed study carried out by SCET-Tunisie in July 1998 for Fernana perimeter.

Table n°II-66 : Held rotations for Fernana perimeter by SCET-Tunisie Detailed study (July 1998)

Ground Occupation	Future occupation (ha)	%
Total SAU	**1 170**	**100.0%**
Field crops	**444**	**38.0%**
Durum wheat	260	22.2%
Common wheat	92	7.8%
Barley-grain	69	5.9%
Broad bean	24	2.0%
Industrial crops	**160**	**13.7%**
Tobacco	45	3.9%
Sugar beet	115	9.8%
Market gardening	**374**	**32.0%**
Winter Market gardening	227	19.4%
Summer Market gardening	147	12.6%
Fodders	**518**	**44.2%**
Winter Fodders	288	24.6%
Summer Fodders	230	19.6%
Arboriculture	**123**	**10.5%**
Total	**1 620**	**138.5%**

From this average ground occupation, the irrigation water rough annual average needss were estimated in this same detailed study to be 4,210 m^3/ha /year, and the rush-month water needs, in July, to be1,400 m^3 /ha, (ie 0,81 L /S /ha).

The initial ground occupation estimations of the feasibility study carried out by CNEA in 1996 for Hamam Bourguiba perimeter are indicated in **Table n°II-68** below.

Table n°II-68 : Variation of the estimated grounds occupation in Hammam Bourguiba perimeter

Cultivation	Surface(ha)
Walnut tree	13.9
Pear tree	19.0
Apple tree	21.2
Oil olive-trees	26.4
Table olive-trees	48.4
Wheat	201.1
Barley-grain	50.7
Tobacco	60.0
Green Barley	61.2
Bersim	80.0
Tare-Oats hay	80.0
Fodder corn	70.0
Sorghum fodder	80.0

In the same way, **Table n° II-69** of page II-8183 presents the enhancement outline provided by the Detailed study carried out by SCET-Tunisie in 1998 for Hammam Bourguiba perimeter.

Table n° II-69 : Held rotations for Hammam Bourguiba perimeter by SCET-Tunisie Detailed study

Ground Occupation	Future occupation (ha)	Proportions
Total SAU	**693**	**100.0%**
Field crops	**242**	**46.0%**
Durum wheat	146	21.1%
Common wheat	47	6.8%
Barley-grain	49	7.0%
Broad bean	74,1	10.7%
Industrial crops	**58**	**8.3%**
Tobacco	58	8.3%
Market gardening		**0.0%**
Winter Market gardening		0.0%
Summer Market gardening		0.0%
Fodders	**357**	**51.5%**
Winter Fodders	213	30.7%
Summer Fodders	144	20.8%
Arboriculture	**124**	**17.9%**
Total	**856**	**123. 5%**

From this average ground occupation, the irrigation water rough annual average needs were estimated in this same Detailed study to be 3,430 m^3 /ha /year, and the rush month water requirements, i.e. July, to 1,060 m^3 /ha, ie 0,6 l/s/ha.

d) Capacity of the networks

d.1) Equipment Flow of pumping out and adduction systems

In Fernana perimeter, the primary adduction was sized on the basis of need for 1.400 m^3 /ha in rush-month for a net fed surface of 1,186 ha, that is to say a monthly distribution capacity of 1,66 $M.m^3$.

In Hammam Bourguiba perimeter, the primary adduction was sized on the basis of need for 1,060 m^3 / ha in rush month for a net fed surface of 693 ha, that is to say a monthly distribution capacity of 735,000 m^3.

d.2) Equipment Flow of the terminals

In Fernana perimeter, the network as carried out provides a flow of 4 L /S per terminal for a surface of 5 ha, that is to say 0.80 L /S /ha. With 16 hours of daily irrigation ; the available flow per hectare is 1,382 m^3 /ha.

In Hammam Bourguiba perimeter, the network as carried out provides a flow of 3 L /S per terminal for a surface of 5 ha, that is to say 0.60 L /S /ha. With 16 hours of daily irrigation ; the available flow per hectare is 1,037 m^3 /ha.

d.3) Flow provided in rush month = indicator n°5d and 5e

In Fernana perimeter, the primary adduction and the distribution network allow easily the intensive and profitable exploitation suggested above which, as it is shown in chapter 3 require during the rush month,:

- 1.19 $M.m^3$ on the whole ;
- 1,020 m^3 / ha

In Hammam Bourguiba perimeter, the primary adduction and the distribution network allow easily the intensive and profitable exploitation suggested above which, as it is shown in chapter 3, require during rush month

- 515,000 m^3 on the whole ;
- 906 m^3 / ha.

e) Modification of the agro economic background of the perimeters

e.1) Stratification of the beneficiary exploitations

Diagram n°II-15 below compares the distribution by plots size of the two TS-P13 Project perimeters beneficiaries.

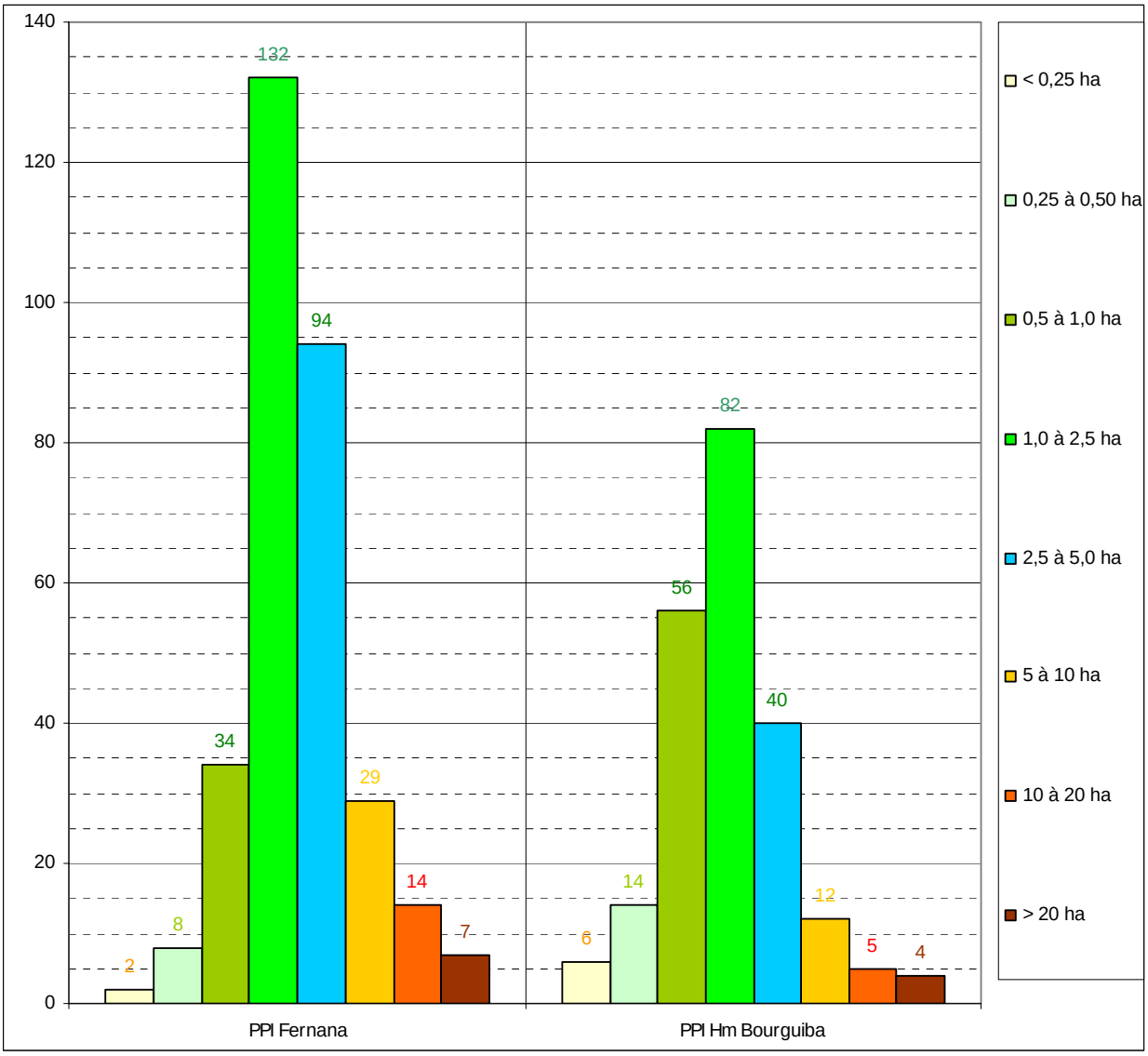


Diagram n°II-15 : Comparison of the beneficiaries stratification in TS-P13 Project perimeters

One can notice therefore that the plot is more parcelled in Hamam Bouguiba perimeter where predominate two SAU plots ranging between 0,5 and 2,5 ha, than on the level of Fernana perimeter where predominate two SAU plots ranging between 1 and 5 ha.

This situation is encountered again in the two perimetres beneficiaries plots distribution by plot size, explained by **Diagram n°II-17** on page II-84.

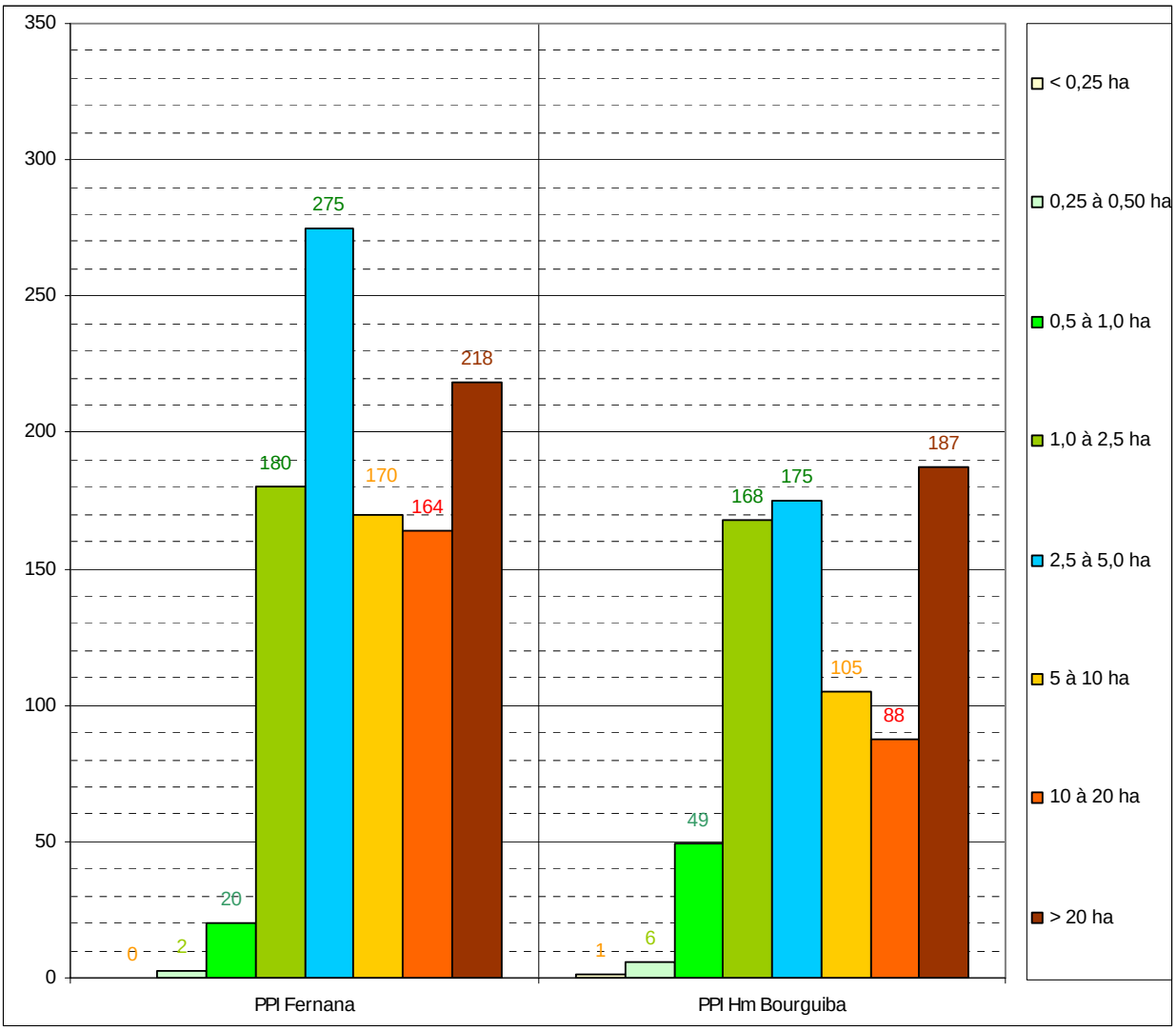


Diagram n°II-17 : Comparison of the plots stratification in the two TS-P13 Project perimeters

One can notice therefore that the plot is more parcelled in Hammam Bouguiba perimeter where predominates three SAU plots ranging between 1 and 5 ha in one hand, and higher than 20 ha in the other hand , when in Fernana perimeter predominates clearly two SAU plots ranging between 2,5 and 5,0 ha in one hand, and higher than 20 ha in the other hand.

e.2) Evolution of the land situation

The land situation in Hamam Bourguiba perimeter was frozen with the block on the level of regrouping operation there.

e.3) Evolution of the population organization level = indicator n°6

The two perimeters populations are not homogeneous. The organization of the population will start to take form and to function only with the beginning of the distribution and the use of irrigation water, the holding of the general meetings and the functioning of the two GIC managed by an elected Board of Directors ,assisted by a technical director already available.

II.3.5 - Analysis of TS-P13 impact of the project

a) **Major socio economic impacts**

a.1) Major direct socio economic impacts

Through the non-setting in water of Fernana and Hammam Bourguiba perimeters, it is difficult to study the real socio economic impacts on the incomes of households whose exploitation is set in water. A theoretical analysis bringing out the positive socio economic impacts on the beneficiaries agricultural incomes, could be however carried out.

a.1.1) Beneficiaries distribution by sub category before the setting in water

The ground occupation is actually directed completely to pluvial mode large cultivations, with an important fallow rotation. In low humid bio climatic stage, this situation is explained in 350 TD/ha as an average income for an owner, reduced of 150 TD/ha as rental fees for a tenant. The correspondence with small farmers category s' sub categorization recommendations mentioned in PACFS study is then indicated in **Table n°II-71** below

Table n°II-71 : Actual potential beneficiaries Categorization regarding their SAU

Farmers type / SAU	Owner	Tenant
< 1 ha	A 3	A 4
1 à 2 ha	A 3	A 3
2 à 4 ha	A 2	A 3
4 à 5 ha	A 2	A 2
5 à 9 ha	A 1	A 2
9 à 16 ha	A 0	A 1
16 à 30 ha	B	A 0
30 à 50 ha	B	B
50 à 90 ha	C	B
> 90 ha	C	C

a.1.2) Beneficiaries distribution by sub categoery after setting in water

Whatever the irrigated ground occupation is, the average income/ha is 2000 TD for an owner, reduced of 750 TD as renatl fees for a tenant. The correspondence with small farmers category s' sub categorization recommendations mentioned in PACFS study is then indicated in **Table n°II-72** below

Table n°II-72 : Potential beneficiaries future categorization regarding their SAU

Farmers type / SAU	Owner	Tenant
< 0,5 ha	A 3	A 4
0,5 à 1,0 ha	A 2	A 3
1 à 2 ha	A 1	A 2
2 à 3 ha	A 0	A 1
3 à 4 ha	A 0	A 0
4 à 5 ha	B	A 0
5 à 9 ha	B	B
9 à 15 ha	C	B
> 15 ha	C	C

Consequently, the setting in water will be automatically explained by an improvement on the level of beneficiaries distribution showed in **Diagram n°II-18** on page II-86.

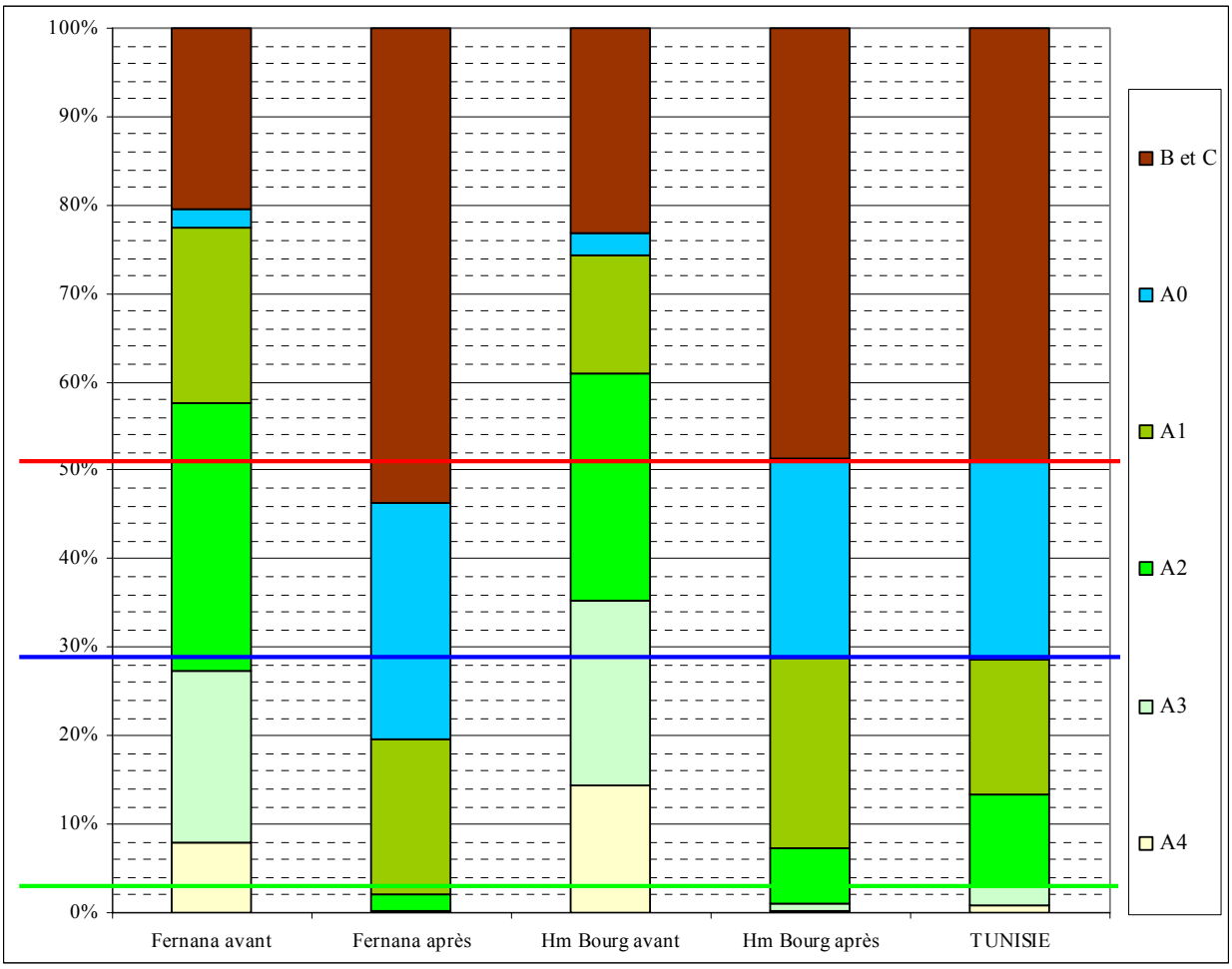


Diagram n°II-18 : TS-P13 Project beneficiaries distribution by sub category before and after setting in water

We can conclude from this **Diagram n°II-18** a connection situation in the two perimeters from the average situation on the national scale, from the fact of:

- an increase of the viable (a0,B and C), potentially viable (A1) and fragiles (A2) sub categories number
- a decrease of the marginal (A3) and very marginal (A4) sub categories number

This improvement seems to be clearer when we observe the exploited SAU distribution between the different beneficiaries sub categories presented in **Diagram n°II-19** on page II-879.

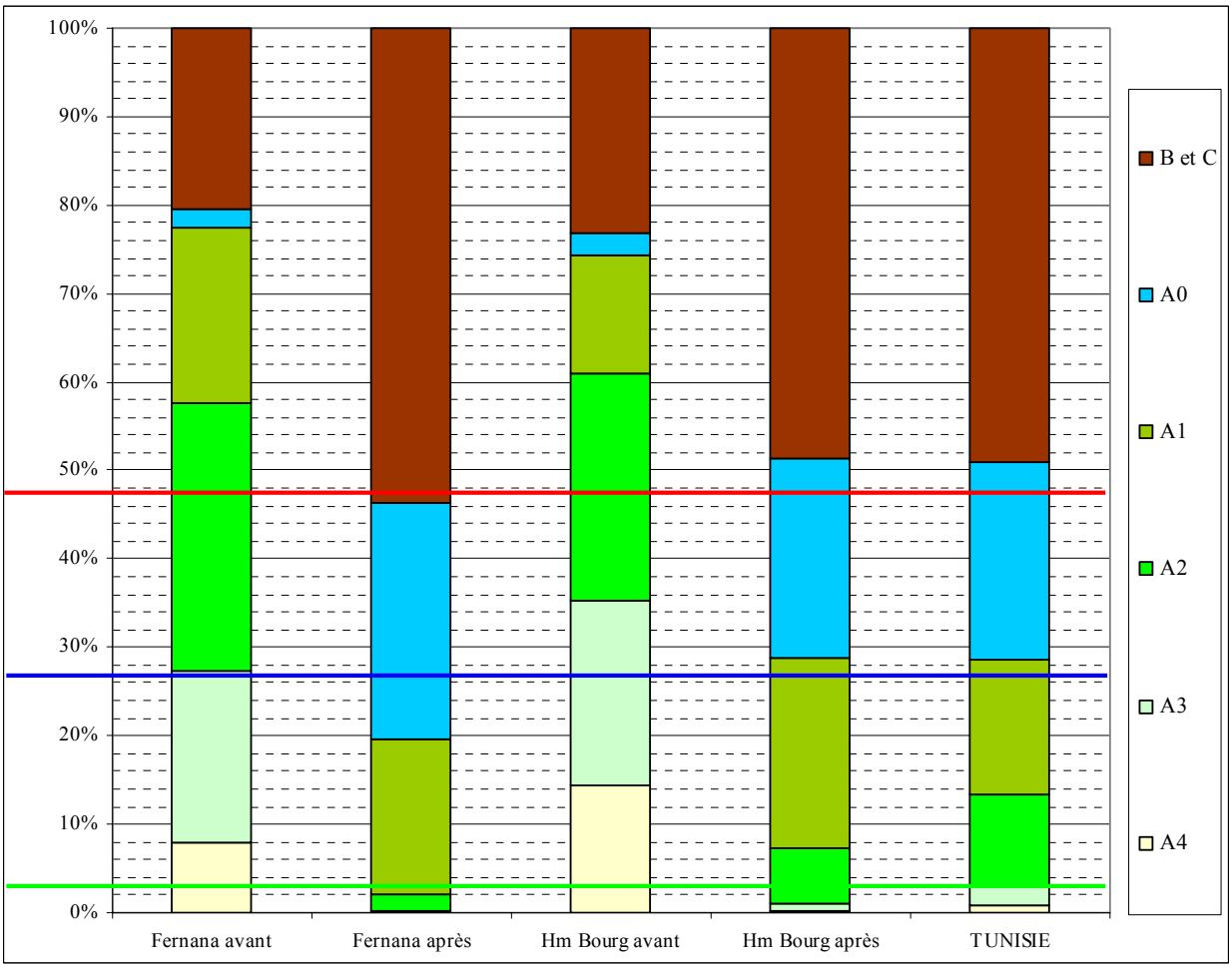


Diagram n°II-19 : TS-P13 Project SAU distribution by beneficiaries sub categories before and after setting in water

We can also conclude from this **Diagram n°II-19** a connection situation in the two perimeters from the average situation on the national scale.

a.2) Major indirect socio economic impacts

Through the non-setting in water of Fernana and Hamam Bourguiba perimeters, it has not been possible yet to study the direct and indirect socio economic impacts generated by TS – P13 Project.

b) **Major potential direct environmental impacts**

b.1) Increase in the streaming towards downstream after sanitation of the hydromorphic plains put into irrigation

The sanitation of Fernana perimeter consisted in recalibrating the natural rivers and to add some sanitation axes. These axes addition was accompanied however by the downstream part owners protest suspecting a possible flooding of their fields following the increase in run off. This situation generated an abandon of the network extension in zones where its realization was though essential.

The increase of the streaming will not have negative impact since the discharge system of the perimeter pours directly in the pond of Bou Herthma dam.

In Hammam Bourguiba perimeter, no sanitation network was carried out. Consequently the risk of the streaming increasing along the natural water ways is weak, especially, as the planned irrigation systems have a high efficiency rate.

b.2) Contributions of salts and toxins in the perimeters grounds

In Fernana perimeter and in spite of a good quality water, it would be necessary to consider the presence of Fernana purification station which pours its purified water on the level of the perimeter intake s' threshold on Ghezala river. Therefore, it seems essential to create drainage axes on the perimeter micro-depressions which are low and of weak slope zones, in order to release water coming from natural washing which is likely to accumulate there.

With a salt load of the used water of 0.3 g /l and an annual rainfall of 1,185 mm, the problem of salinity will not arise in Hammam Bourguiba perimeter, where the rain will ensure the natural grounds washing. It is necessary to envisage the drainage of the zones by overdrawn drainage to facilitate the salts natural washing which are accumulated there.

b.3) Drainage salt-loaded water discharge in the perimeters downstream

In the absence of a real drainage network in Fernana perimeter, the sanitation network arranged by the Project consists in recalibrating some water ways and some arranged axes. This network pours, however, directly in the pond of Bou Heurthma dam. Considering the presence upstream of Fernana purification station, a mechanism of collected water quality control on the sanitation network in the perimeter should be installed to prevent any water quality deterioration on the level of that dam.

The final discharge system of Hammam Bourguiba perimeter s' naturally drained out water is Mellila river. *Right now*, no risk is thus to fear downstream in Tunisia following this perimeter washing water natural drainage which could be sometimes slightly loaded with fertilizers and pesticides.

c) **Determination of the major indirect environmental impacts**

Through the non-setting in water of Fernana and Hammam Bourguiba perimeters, it has not been possible yet to study the indirect environmental impacts generated by TS-P13 Project.

d) **Proposal of socioeconomic indicators to evaluate the project TS-P13**

Thanks to data provided by several regional directions of Jendouba and by local services based in Fernana and Aïn Draham, several socioeconomic indicators concerning these two delegations have benn collected.

d.1.1) Economic activities in Fernana and Aïn Draham

Households average size observed is equal to 6 persons in the project area. 55 years old is the average age of farmers. Almost all farmers have received coranic (kotteb) or limited primary education or they are illeterate. This has certainly impact on the developing process of farmers. Nevertheless, farmers hold an important know how.

The social life is distinguished by a traditional division of social roles. Women have the domestic power, they manage their homes, take care of children and their scolarization and some of them have freedom moving. They go to the souk, buy, sell and negociate. But last decisions are taken by men.

Young girls and boys prefer precarious jobs in the cities rather than farming. Notice that salaried labour force needs are very limited. The recourse to family work force is only used during a limited time for specific interventions (harvest time, sowing..) and jobs in other fields (trade, transport and masonry) are limited in the area.

The range of economic activities in the delegations of Aïn Draham and of Fernana, and especially in the project area is very concise. The only revenue sources for the inhabitants are : agricultural activities, forestry development, emigration and contreband for the minority living in the algerian frontier.

Weakly diversified and mechanized and distinguished by very low yields, agriculture vocation is mainly to satisfy family needs. This agriculture is based on cereal cultivation, leguminous plants, fodders, arboriculture and truck farming.

In the same way, ovine, caprine and bovin breeding is used to satisfy selfconsumption needs, it can also be used as eligible saving.

Some inhabitants practice independant jobs, as grocers, rural carriers…but the principal nonagricultural activity locally practiced is the participation to forest sight organized by CRDA forest departments of Jendouba.

Farmers children move to cities where boys work in construction sight in the Sahel and Tunis and girls as house employees in Tunis, to compensate for the low income of the agricultural activity.

Unemployment rate in the gouvernorat of Jendouba is equal to 17.3%, with 18.3% of unemployed men and 14.5% women. The **Table n°** II-73 below displays the 18-59 years old unemployed allocation according to the sex and the environment in the gouvernorat of Jendouba.

Table n° II-73 : unemployed allocation according to the sex and the environment in the gouvernorat of Jendouba

Environment	communal			Noncommunal		
Sex	man	woman	**Total**	man	woman	**Total**
Number	4,667	1,995	**6,662**	10,993	2,324	**13,317**

Source : Enquête nationale population et emploi 1999

d.1.2) Women work in the delegations of Fernana and Aïn Draham

Salaried feminine work does not exist in the rural areas of Hammam Bourguiba. If they don't migrate, young girls work in farms or in house holding. These jobs are considered as nonproductive, thus they are not paid which dosn't allow them to accede to production factors.

The feminine craft work is weakly developed. It essentially concers weaving and has virtually no commercial opening.

Water and wood chores are exclusively dependent on women.

d.2) Proposal of socioeconomic indicators for the delegation of Fernana

d.2.1) ***Drinking water supplying in the delegation of*** *Fernana*

The general rate of drinking water service in the delegation of Fernana in 2004 is equal to…

The area shows important rainfall which explains water sources abundance during the winter. There are many natural sources but most of them are devoid of health conditions, during the summer, and may have difficult access, notably during winter.

There is at the present time a rural drinking water supply which is being executed and that concerns the zone area. This project will supply 584 families. Four other projects at the frontier zone of the area will concern 1,592 families.

d.2.2) The education in the delegation of Fernana

The percentage of children in full-time education in Fernana equals 98%. Regarding the basic education, there are 21 primary schools frequented by 5,800 students with 229 teachers.

With regard to the secondary education, there are four high schools and only one secondary school, these establishments have drinking water and electricity.

The illiteracy rate in the area of Sejnane among the 10 years old population and above has been estimated to 24% in the delegation of Fernana. Centers of fight against illiteracy exist in the project area, they have been created in 2000 and have been beneficial to 3,600 persons.

d.2.3) The sanitary infrastructure of the delégation of Fernana

The existing sanitation system of the delegation of Fernana is made up of one regional hospital, 14 free clinics, a mother and child center and of one laboratory.

The free clinics are located at each rural sector level. They are open every day from 8.30 a.m to 01.00 p.m and close the afternoons. They are endowed with a permanent health auxiliary and are visited by a general practitioner once to twice a week.

d.2.4) Infant and juvenile mortality in the delegation of Fernana

According to doctors' declarations, there is death's coverage or registry office events declarations delayed: thus, statistics concerning infant mortality are indefinite.

d.3) Proposal of socioeconomic indicators for the delegation of Aïn Draham

d.3.1) ***Drinking water supplying in the delegation of*** *Aïn Draham*

The general rate of drinking water service in the delegation of Hammam Bourguiba in 2004 equals…, almost served by the SONEDE, only one GR executed network exists, in « El Rouai », which is out of the project area, and with a GIC serving 669 families.

In the areas which are not served, women have to use natural spring water, that are generally not fit out.

Four drinking water alimentation projects should be realized by the administration during 2006, but this projects are waiting for financing sources.

d.3.2) The education in the delegation of Aïn Draham

The percentage of children in full-time education in Hammam Bourguiba equals 96%. Regarding the basic education, there are 6 primary schools frequented by 1,062 students. The Table n° II-74 on tha page II-9194 below shows students feminization rate at the first level of the high school allocation during the academic year 2004-2005.

Table n° II-74: first year students' number

Number School	**Total**	Boys	Girls	Feminization rate
Hammam Bourguiba	**26**	17	9	34.6%
El Fath	**26**	15	11	42.3%
Ouled Khamissa	**31**	18	13	41.9%
Rhouyî	**30**	17	13	43.3%
Ouled Dhif allah	**23**	8	15	65.2%
Djbel el Dinar	**22**	4	18	81.8%
TOTAL	**79**	**79**	**158**	**50.0%**

The Feminization rate varies from a school to another, but represents 50.0%. With regard to the secondary education, there are two high schools, these establishments have drinking water and electricity. They are frequented by 332 students with 181 boys and 151 girls (feminization rate : 45.5%).

The illiteracy rate in the area of Hammam Bourguiba among the 10 years old population and above has been estimated to 30%. Centers of fight against illiteracy do not exist in the project area.

d.3.3) The sanitary infrastructure of the delégation of Aîn Draham

The delegation of Aîn Draham has been better off than many other rural regions since the 1980's. In fact, the Aîn Draham hospital is specialized in pediatrics and has a maternity service at its disposal. There are also four free clinics, one maternal and infant protection center (PMI), a basic health care center and three care rooms.

In return, the distance, generally between 2 and 5 km, and the care costs represent restrictive factors to generalized access to health services.

d.3.4) Infant and juvenile mortality in the delegation of Aîn Draham

According to doctors' declarations, there is death's coverage or registry office events declarations delayed:
People have to walk more than 10 km or to ride on a donkey in order to register a death at the municipality, seeing that it's a border area to Algeria.

statistics concerning infant mortality are indefinite. However, an infant mortality survey which has been led in the delegation of Aîn Draham in 1982 and in 1983 gives a mortality rate equal to 55‰, that is below the national average which was equal to 80‰.

II.3.6 - Analysis of TS-P13 Project sustainability after JBIC withdrawal

a) **Technical abilities of the various concerned institutional participants**

a.1) Technical abilities of the CRDA

a.1.1) Technical abilities of the operational departments

For their exploitation, Fernana and Hammam Bourguiba perimeters will be directly attached to the "irrigated Perimeters" district of Jendouba CRDA.

The operational department of Fernana and Hammam Bourguiba perimeters will have the responsibility to supervise the two GIC water invoicing and the station and antennas departures water counting. This

service will be also able to assist technically the GIC during the first years in their share of the distribution network exploitation.

The assistance of this service to the GIC will consist in technical and financial management training. But, this service does not have enough material means to ensure the network maintenance.

a.1.2) Technical abilities of maintenance services

The unit responsible for this activity is attached to the CRDA " Maintenance " district. This service will have the network primary infrastructure s' maintenance responsibility, from the intake to the antennas departures. Thus, the physical components under its responsibility are made up of :

- pumping out stations;
- pumping stations ;
- discharge pipes ;
- regulation tanks;
- distribution pipes until the antenna departures ;
- sanitation network ;
- tracks network.

Actually, a technician is responsible for the stations maintenance on the level of the Project Unit. His mission was extended until 2007.

a.1.3) Technical abilities of the popularization coordination service

Jendouba s' CRDA, like all the CRDA of Tunisia, has a CTV coordination service which annually schedules training and popularization operations and assists to the organization of demonstration days, farmers training courses in CFPA, ...

a.2) GIC technical ability

a.2.1) Technical abilitiess in water management

The two perimeters GIC have individual watermeters in each terminal, but there are terminals which are shared between several exploiters, which can generate problems of water payment and supply.

It is necessary, for a sustainable water management, to make sure the long-term reliability of watermeters (abrasion resistance, but also problems of vandalism). If a problem would arise on this management mode, the GIC should have alternatives.

For the water management, the GIC should have a staff to check watermeters and to record consumptions. This same staff should play the network police force role (checking the flow control valves and the watermeters functioning).

A real vandalism phenomenon is already observed on the terminals, with removed locks and bolts and withdrawn blank flanges, and on the tanks, which must be obligatorily guarded or firmly enclosed.

a.2.2) Technical abilities in networks maintenance

A GIC was made up more or less formally on the level of each perimeter.

So, from this analysis, it is very probable that Fernana GIC is favoured and Hammam Bourguiba GIC is underprivileged, because of the alignment of the water cost for these two GIC, whereas the subscribers number, as well as the managed infrastructures, are not the same.

a.3) CTV technical abilities

The two CTV technical teams of Fernana and Aïn Draham are relatively formed, but actually they are completely inexperienced in the irrigated cultivations and integrated farming, extremely rare speculations in these mountainous zones.

b) Projects organizational aspects sustainability

b.1) Populations organization degree

b.1.1) GIC preparation degree for water invoicing

Actually, Fernana GIC is completely ready, with the help of the recruitment of a Technical Director and his followers.

But for Hammam Bourguiba GIC, the situation has not been restored yet to make emerge one or two GIC providing the necessary functions.

b.1.2) Preparation degree to GDA constitution for agricultural development and agricultural official channels management self-financing

Actually, the farmers and the GIC already set up in place has not reached a purpose in this matter.

b.2) Coordination degree between the staff members

These participants belong to:

- Fernana and Aïn Draham CTVs, responsible for coordinating the CRDA activities in the two delegations ;
- Fernana and Aïn Draham ULAPs, like sections of Jendouba URAP and of UTAP at the national level ;
- BNA agencies.

It should be noted that the two CTVs do not have sufficient human and material means for supervising the new irrigators on perimeters of such a surface. Having various services of support and water exploitation at the same building, the CTV requires a human and material means reinforcement in order to ensure the adequate support to the farmers (owners and tenants).

The ULAP activities are seasonal because it does not have its own means for farmers supervision.

The BNA agency treats with the seasonal credits, the medium and long-term investment loans. It's used also as current accounts for other facilities such as the subsidies granted by the APIA. With its database, the BNA has the necessary means to treat with all the farmers.

c) Financial sustainability of the Projects participants

c.1) Beneficiaries financial abilities

c.1.1) Beneficiaries actual agricultural incomes

Actually,the ground occupation is completely directed towards the practice of the pluvial field crops with an important fallow rotation. We saw previously that in low humid bio climatic stage, an average income / ha is about 350 TD for an owner, decreased of about 150 TD /ha as rental fees for a tenant.

In a low humid bio climatic stage, climatic variations are not disastrous. A weak winter rainfall deficit could even generate less ground flooding and better outputs (in pluvial mode) in the hydromorphic zones.

c.1.2) Improvement of the agricultural gross incomes following setting in water

One of the Project objectives is that the practice of irrigated agriculture should indisputably increase the profits for its recipients, but it is clear that it will initially oblige them to invest, and then to engage more expenditure to cover higher production expenses.

If the financial conditions are met initially to allow the recipients to borrow at will, subject to refunding in convenient time, it is clear that the beneficiaries resources will be largely increased. Therefore in the long term, after the initial period of refunding of the loans contracted for the acquisition of the irrigation materials, of the additional livestock and of the livestock buildings, the financing of the production expenses and the payment of the contributions and the GIC invoices, the financial conditions would not be a problem any more.

c.2) GIC financial abilities for water invoicing

On the economic level, it is justified to have a particular price fixing to each GIC, even if this principle is rejected on the social level. Thus, the common water price fixing to both GIC privileges the situation of the largest, i.e. Fernana GIC.

The water cost was fixed in the CRDA to 65 ml, and 85 ml in the two GIC. It is obvious that this water price does not reflect the real maintenance and depreciation costs, and that it is a balanced cost adopted at the level of the CRDA.

Right now, this adopted cost will encourage the owners to make the resource profitable. One should make sure that the 20 ml / m^3 adopted margin ensures a minimum viability to these two GIC. It is necessary, indeed, to keep present in the mind that, unlike the GIC of the centre and the south of Tunisia which feed their budget while selling annually from 3,500 to 5,500 m^3 /average ha, calculations carried out in the Chapter III expressing constraints to the the good Project implementation for reviewing water requirements of practiced cultivations shows that:

- Fernana GIC will sell each year 1,920 m^3 /average ha and 2.24 M.m^3 on the whole, and
- Hammam Bourguiba GIC will sell each year 2,100 m^3 /average ha and 1.19 M.m^3 on the whole.

With such supplied volumes, the estimated annual gross incomes of these two GIC will rise then to :

- 44,800 TD for Fernana GIC ;
- 23,800 TD only for Hammam Bourguiba GIC.

These sums do not seem to be sufficient to guarantee these two GIC functioning under real exploitation conditions, in particular Hammam Bourguiba GIC, especially watermeters fault risks and the possible handling acts on these parts.

II.4 - Recommendations

In order to identify the future work aspects concerning the concrete and realistic Action plan proposal for the irrigators equipment good enhancement, it will be necessary to focuse on all the constraints to irrigation water pumping out, adduction and distribution systems functioning and maintenance, as well as to irrigated agricultural productions production and marketing.

II.4.1 - Situation of the five evaluation criteria

Initially, it will be necessary to evaluate the constraints importance which are likely to create problems on the level of the five criteria of the investments development quality evaluation authorized by the State within the framework of TS-P7, TS-P11 and TS-P13 Projects financed by the JBIC : namely their relevance, effectiveness, efficiency, impacts and sustainability.

a) **Projects Relevance**

The only Projects relevance problem is at the local level where the absence of attendant measures financing obliges the beneficiaries to plan communitary solutions to guarantee a satisfying sale of their productions or to hope for a fast development of a private sector of agricultural services.

b) **Projects Efficiency**

The modification of the zones planned to be arranged, induced various not perfectly in keeping modifications with the hydraulic, tracks and drainage networks.

As for the delays in the installations realization, they will result in a delayed appearance of the Project advantages and thus in a fall in its IRR, even if the feasibility studies investment and productions' assumptions were respected.

c) **Projects Effectiveness**

c.1) TS-P7 Project Effectiveness

The mobilized possibilities are quite satisfactory in Nefza and in Sejnane, with respectively 28 and 35% of morpho-pedological units having excellent agronomic vocation, 6 and 10% of good vocation and 36 and 24% of quite good vocation. There are nevertheless in the two perimeters 30% of grounds arranged despite a marginal vocation, among which there are in the extension zones in Nefza 11% of grounds arranged despite a very marginal vocation. Consequently, if the suggested development can be preserved with the help of the abandon of sugar Beet cultivation, it is recommended to envisage :

- Productions diversifying with hardy species planting and grainfield extension to the detriment of that of the more difficult species ;
- a sometimes significant reduction in the objective cruising outputs, except for irrigated large crops, Tomato and Potato, for which the feasibility study assumptions were really too pessimistic ;
- a reduction in the two perimeters total and in rush monthes water requirements despite the plots extensions, because of the over-estimated initial assuptions.

c.2) TS-P11 Project Effectiveness

The mobilized possibilities are relatively satisfactory, with 42% of morpho-pedological units having excellent agronomic vocation, 14% of good vocation and 38% of quite good vocation. Consequently, if the suggested development can be preserved with the help of the abandon of Sugar Beet cultivation, it is recommended to envisage:

- a light extension of hardy species grainfield to the detriment of more difficult species.
- a reduction, sometimes significant, in the objective cruising outputs, except for Tomato for which the feasibility study s' assuptions were really too pessimistic;
- a reduction of the perimeter s' total water requirements, but an increase of the rush month needs.

c.3) TS-P13 Project Effectiveness

The mobilized possibilities are quite satisfactory in Hammam Bourguiba, especially in Fernana, with respectively 28 and 35% of morpho-pedological units of excellent agronomic vocation, 6 and 10% of good vocation and 36 and 24% of quite good vocation. Despite a marginal and very marginal vocation,, there are 30 % of arranged plots in the two perimeters. Consequently, if the suggested development can be preserved with the help of Sugar Beet cultivation abandon, it is recommended to envisage :

- productions diversifying with hardy species planting and grainfield extension to the detriment of that of the more difficult species ;

- a reduction, sometimes significant, in the objective cruising outputs, except for irrigated large crops, Tomato and Potato for which the feasibility study assumptions were really too pessimistic

- a reduction in the two perimeters total water requirements and in rush monthes despite the plots extensions because of the over-estimated initial assuptions.

d) **Projects Impact**

The only possible recommendation regarding the measurement of the three Projects impact before the water use for the arranged grounds development consists in recommending to set up two salinity evolution supervision systems.

The first system which is common to the three Projects, will work out the impacts of load and quantities of drainage water recovered by the arranged drainage network ditches - which bring them back to Mejerdah river or the ponds of Bou Heurtma, Sidi El Barrak and Sejnane dams - on the water quality in the hydrographic network located at the downstream part.

The second system which is specific to TS – P11 Project using Sidi Salem dam s' quite loaded water releases, will work out the impacts of salts contributions coming from irrigation water on the perimeter s' edaphic potentialities. This situation was largely improved by installations displacement during the Project realization.

e) **Projects Sustainability**

To keep the activities stable once the Project Unit are dissolved raise different problems. Some are common to the three Projects, as:

- the Projects lack of attendant measures financing which obliged the CRDA to finance within the framework of their regional program, the structures responsible for the good development of the investments installed by the Project Unit : the two CTV staff reinforcement and training, training of GIC office members and beneficiaries in irrigated perimeter ;

- the financial weakness of almost all the beneficiaries which is likely to lead that of the GIC 's in the case of non-payment of their invoices, combined with the problems of access to the investment loans for short duration-leases tenants and small owners.

A third restraint, common to TS-P7 and TS-P13 Projects, relative to the absence of financing of anti-erosive treatment installation on the slopes surrounding the perimeters, from which the streaming generated of this low humid bio climatic stage rainfalls makes the rivers crossing the perimeters swollen while threatening to quickly damage all the Project irrigation installations: tracks, irrigation and drainage networks.

A fourth restraint, specific to TS-P13 Project, is relative to the community activities fragility:
- in Fernana, the local authorities made obligatory the constitution of only one GIC for managing 1,300 ha regardless of the network cutting into two different hydraulic floors.
- in Hammam Bourguiba, it's impossibe to constitute a GIC after the frictions during the equipped land regrouping.

II.4.2 - Situation of the three bottlenecks

It will then evaluate constraints by seeking the importance of the three insufficiency types that have been pointed out in the the study s' terms of reference concerning:
- " cultural acceptability " of the irrigation practice in the projects zones;
- technical control, management and coordination between all the concerned institutions and the farmers, and finally ;
- land problems which generate a lack of financing, encouragement and participation.

a) **Cultural acceptability of the Projects**

The several requests regarding the installations extension in TS-P7 Project two perimeters and the clashes encountered during the grouping in Hammam Bourguiba show the interest of the farmers in the two zones for the irrigation water.

The problem felt at the time of the evaluation missions corresponds rather to a concern of recipients who have never practiced irrigated agriculture:
- the financing of the irrigation equipment / plot
- " Irrigation water " cost in the cultivation expenses;
- with the labour needs for much more difficult cultivations than the pluvial courses and cereals practiced until now.

This feeling of fear is related to several sociological factors which were emphasized in the evaluation report of the three Projects.They are human and financial constraints which reinforce concerns related to the awakening of the two other bottlenecks emphasized by the evaluation missions:
- the technical deficit of control, management and coordination, and the
- inextricable land problems.

a.1) Human constraints

Except the case of Goubellat perimeter with its 15 SMVDA manager and its 21 agricultural technician, the potential private recipients met in all the perimeters do not appear to be very receptive to transpose new activities in their daily work. These negative attitudes toward work, profit and saving are the human elements limiting the acceptance of the irrigation choice.

These human constraints freeze then all concerns that can be related to the farmers other constraints.

a.1.1) ***Beneficiaries age structure***

The advanced age of the majority of the farmers is a brake to the development of irrigated agriculture. With the great age, farmers become attached to cultivation traditional modes and refuse to entrust during their life the development of their plots to their children.

a.1.2) Under-employment or time spent in work at present

It is difficult actually to assess with precision the time spent in the agricultural work. But according to the discussions with the farmers, one can advance that the peasant devotes only one quarter of his time to the agricultural work and the conditioning of products, while the wife is twice more active in these fields.

The actual practice is characterized by discontinuous, seasonal cultivations and with a system of long fallow.

a.1.3) Non activity or lack of professional ability

Farmers are accustomed to a subsistence production system without any economic notion. They are accustomed to a production meeting in priority their family needs and of which only a part, variable according to the years, is developed by the usual commercial channels according to the needs of household consumption.

a.1.4) A lack of activities diversification and specialization

The irrigation choice requires a diversification of the practiced activities. But, actually it does not exist any specialization. There is between neighbours neither activities specialization nor economical exchange.

a.1.5) The farmers low technical background in irrigated cultivations

The lack of knowledge and technical abilities, especially the farmers' incompetence in their exploitation management are a brake to irrigation mode adoption. To this last aspect are attached the shortfalls, even the absence of supervision, and the failure of former experiments.

a.2) Financial constraints

a.2.1) Lack of the necessary capital for the acquisition of equipments, tools and even pesticides and fertilizers

The farmers live a conflict, namely competition between exploitation needs and household ones, which lead them to have permanently to arbitrate between consumption, instantaneous satisfaction, and efforts of reinvestment.

Those who have an income surplus, have tendency, either to spend vainly their scanty means, or to practice unproductive savings.

a.2.2) Significant extension of BNA financing ineligibility

The majority of the agricultural exploitations are threatened by excessive debts, especially that their financial expenses are weighed down by accumulation of rearranged interests caused by payment delays. This debt can lead to the agricultural activity s'abandon.

The farmers mentioned also:

- the quite low maximum financing level with which small farmers are confronted ;
- their fear toward their goods mortgage if they did not manage to refund ;
- for the tenants of state-owned lands, the limitation of the right of use is up to 3 years, and investment loans are medium-term appropriations, i.e for 5 to 10 years.

b) **Technical control, management and coordination lack**

It is obvious that the majority of the recipients have never practiced irrigated agriculture, and that their supervision structures do not have either great experience on that field. No training was given however to them during the hydraulic equipments installation, and the technical and financial expected results in first year of irrigated cultivations leave them in the expectancy.

It appears obvious to them that the Projects should have envisaged the financing of a whole set of attendant measures like institutional strengthening, trainers training, irrigators training, mission of technical assistance to GIC constitution and the three CRDA exploitation and maintenance departments.

b.1) Lack of support from the Administration

The farmers admit not knowing properly the administrative services and engineering departments concerned with irrigated agriculture and near which they should have been able to find the necessary support.

b.2) Absence of transportation means possession

The actual road networks do not consider generally the economic interests of the zones after installation, since TS-P7 and TS-P13 Projects were interested in rather enclosed zones. Moreover, the future recipients who own their transportation means are very few.

The farmers are however concerned about the problem of their productions transportation for sale. Before the project and if the case arises, farmers were compeled, with long and painful displacements, to contact outside and to run out their thin selling productions. Now, they worry about the new situation created by the intensification of their production by the irrigation system and about the quantities of agricultural products which they will have to put on market.

b.3) Marketing Concerns

The farmers expressed their fear in front of the absence of distribution chains, which is a situation likely to leave them at the intermediaries mercy as it was the case in years 80-90 for the dairy farmers in Sejnane plain, or to oblige them to sell their productions at ridiculous prices.

Nevertheless, all these considerations are related to concerns that the future Action plan should be called on to eliminate. Already some of the future recipients, and in particular those residing at the rivers edges are convinced that the choice of irrigated cultivations will make possible to obtain:

- better outputs ;
- a better farmers occupation (who will be able to work during all the year) ;
- a reinforcement of family employment and perhaps even for some sufficient SAU exploitations the recourse to local labour ;
- women tasks lightening.

c) **Land constraints**

It is obvious that the very strong parcelling out, the dissensions between the beneficiaries, the title deed lack and the short duration of the rural tenancy agreements are recurrent problems for the Extreme-North 4 perimeters.

Goubellat perimeter makes an exception thanks to the presence of 2,050 ha of state-owned grounds which will be set in water after division between 15 SMVDAs, 21 technician, 23 young farmer and former co-operator and 158 private.

II.4.3 - Feelings expressed by farmers about responses brought to their needs by JBIC Projects

a) **Answers brought to the needs regarding production system intensification**

a.1) Increase in vegetable and livestock productions in TS-P7 perimeters

Map n°II-5 of page II-103107 shows the actual grounds occupation in the two perimeters. Actually, the major vegetable productions often carried out into pluvial mode (except Nefza fruit plantations) reach:

- 1,050 ton of cereals, 800 ton of leguminous plants, 840 ton of fruits, 320 ton of citrus-trees and 60 ton of olives in Nefza future perimeter;
- 800 ton of cereals, 470 ton of leguminous plants and 20 ton of olives in Sejnane future perimeter.

In the two perimeters, the recipients thus are hoping for a broad diversification of their selling vegetable productions after the setting in water.

Actually, the livestock productions in the two perimeters correspond to bovine of high local race, caprine and ovine productions. These cattle farming system is remained exclusively extensive and based on the forest resources existing in the neighbourhood plains. Only the OEP Sejnane farm practices an intensive system with 38 milk cow and 2,500 sheep.

In the two perimeters, the recipients thus hope to be able to develop the milk bovine farming with pure race cows after the setting in water, by relying on the intensive system model of the OEP farm.

a.2) Increase in vegetable and livestock productions in TS-P11 perimeter

Map n°II-6 of page II-104 shows the actual grounds occupation. Actually, vegetable productions entirely carried out into pluvial mode reach, in the future perimeter where the fallow covers 30% of surfaces, 1,300 ton of cereals and 120 ton of olives. The recipients thus hope for a broad diversification of their selling vegetable productions after the setting in water.

The ovine production actually occupies a significant place in Goubellat region at an average rate of 20 head/exploitation but under an exclusively extensive farming system. This farming actual productions can be estimated at:

- 17 ton of sheep meat;
- 426 young sheep;
- 2.5 ton of wool;
- 85 ton of ewe manure.

As for the bovine farming, the dairy farming is concentrated on the organized sector where its number reaches 182 heads, while one counts only some local cows in the private sector. The recipients are,

however, convinced that bovine meat production will allow the fodder productions development in the perimeter.

a.3) Increase in vegetable and livestock productions in TS-P13 perimeters

Map n°II-7 of page II-107 shows the actual grounds occupation in Fernana and Hammam Bourguiba perimeters. In addition to the fallow which respectively covers 20 and 25% of surfaces, the actual average vegetable productions, carried out almost entirely into a pluvial mode, reach:

- 1,100 tons of cereals, 160 tons of Broad bean, 4 tons of tobacco, 45 tons of fruits and 150 tons of olives in Fernana;
- 400 tons of cereals, 73 tons of Broad bean, 23 tons of tobacco, 17 tons of fruits and 80 tons of olives in Hammam Bourguiba.

The recipients hope thus for a diversification and an inter-annual stabilization of their selling vegetable productions outputs after the setting in water.

The livestock productions in the two perimeters correspond actually to bovine of high local race, caprine and ovine productions. This cattle farming system is remained exclusively extensive and based on the existing forest resources all around the two plains.

b) Answers brought to the needs regarding direct support to the agricultural production

b.1) Organization of the communities

No budget has been planned in any of the three JBIC Projects for these activities. It is the Jendouba, Beja and Bizerte CRDA that encouraged beneficiaries collective organization and tried even to finance some technical assistance operations on their own budgets.

In Nefza, the only existing communities are the 7 GIC from which 4 have recently began with recruitment of a technical director and his followers. The 3 others are still in a temporary status waiting for the setting in water and the perimeter management transfer to the GIC.

The only existing communities in Sejnane are the 4 GIC which have recently pointed their temporary Committee. In concrete terms, these GIC have not been yet functional as the setting in water and the perimeter management transferred to the GIC have not taken place yet.

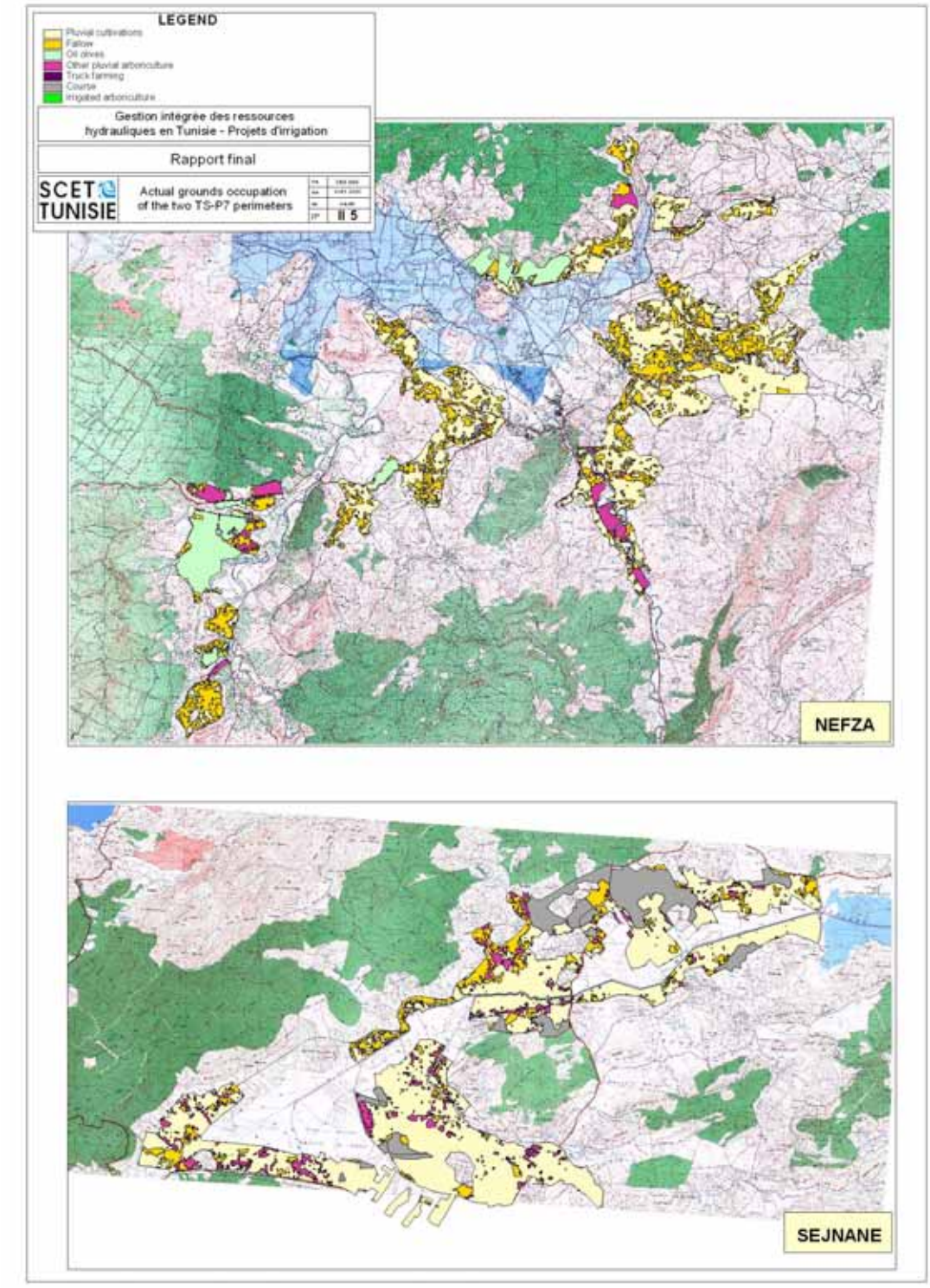
b.2) Perimeters hydraulic installations

Some owners concerns were overall considered by the Project Units during the realization of the hydraulic installations, as:

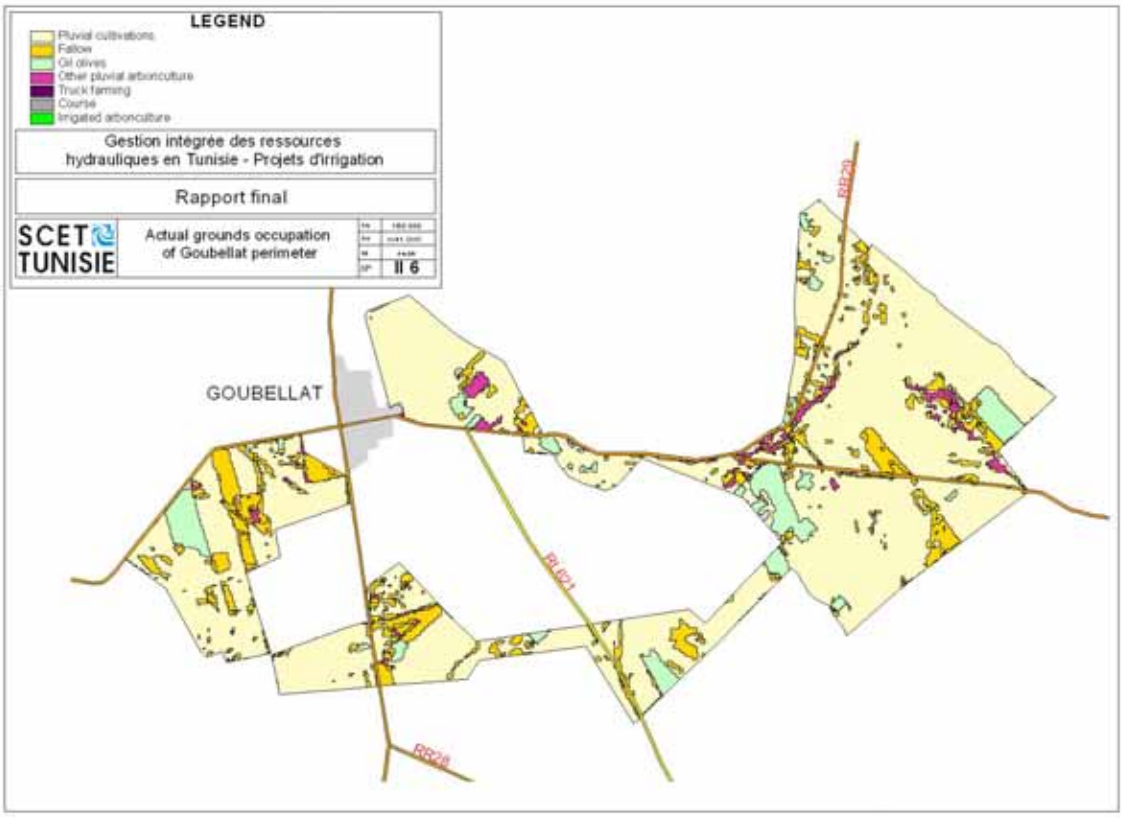
- the plots supplying through a reliable overall hydraulic network with terminals for each 10, 5, 3 h, 2 ou 1 ha according to the cases, with a flow and a pressure allowing everywhere the irrigation with water saving ;

- the realization of a tracks network to facilitate the operating conditions and productions flow out.

The set hydraulic installations led, however, the recipients to raise inconsistencies. Two of these inconsistencies are generalized in all the equipped perimeters:



Map n°II-5 : Actual grounds occupation of the two TS-P7 perimeters



Map n°II-6 : Actual grounds occupation of Goubellat perimeter

- the sharing of some terminals between several recipients without any additional downstream equipment (intakes, watermeters, approach pipe) which will be able to generate management problems for these terminals.

- the absence or weakness of envisaged windbreak networks in order to protect cultivations and improve the irrigation conditions.

A specific inconsistency was recorded in Goubellat perimeter, though located in average semiarid bio climatic stage where the used water volumes limitation at the terminals, i.e.0,4 L /S /ha, is considered to be excessive to extract the maximum profit from the installed pumping out and adduction infrastructures, and therefore for improving the profitability of the perimeter.

b.3) Other installations for the perimeters exploitation

Additional realized installations brought recipients of Sejnane, Nefza, Fernana and Hammam Bourguiba perimeters to raise problems which are likely to disturb the development of these perimeters:

- the sensitivity of the realized tracks network to the climatic changes of winter 2004-2005 whereas no traffic circulated on these tracks is considered worrying;

- the absence of CES work to decrease the flows coming from the strong slopes of the perimeters surrounding heights shown in **Map n°II-8** on page II-108 for the two TS-P7 Project perimeters and **Map n°II-10** on page II-110 for the two TS-P13 Project perimeters, which accelerates ground losses and equipment silting up.

b.4) Sanitation installations

Some owners concerns were overall considered in the Projects realization, with the sanitation networks realization protecting some installed equipment against the floods and facilitating the practice of winter crops by improving their outputs.

The installed sanitation networks led the recipients to raise inconsistencies in comparison with the situation observed during winter 2004-2005, in the absence of any irrigation activity.

A generalized inconsistency in all the perimeters is the feeling of a need for reinforcement of the drainage networks to solve the hydromorphic grounds clogging up problem during the rainy season.

Other more specific inconsistencies were recorded in only some perimeters :

- in Sejnane perimeter, the carried out sanitation in Sejnane Garâa can generate Sejnane river rising to the downstream, which can threaten the installed infrastructure ;

- in the two TS-P13 Project perimeters, the problem of grounds clogging up during rainy season requires :
  - the reinforcement of the sanitation network installed in Fernana perimeter, though already source of problem for the farmers located in downstream zones because, according to them, collected water there can only generate floods, and
  - the creation of a sanitation network in Hammam Bourguiba perimeter.

b.5) Plot irrigation equipments

In general, water pressure and flow in the terminal are sufficient to irrigate all the surface with saving water equipment, sprinkling for cereals and fodder and drop by drop for arboriculture and truck farming.

The existence in some cases of a high number of owners served by the same terminal can however generate problems of water distribution and payment. Thus, the plot irrigation equipment will have to be ordered in a collective way in order to optimize the equipment choice and to offer the same exploitation conditions to all the recipients of the same terminal.

As far as equipment choice optimization and plots arrangement are concerned, a better adaptation to each exploitation size case would had given more satisfaction to great farmers, especially Goubellat perimeter s' SMVDA for which ramps, pins or spoulers, necessitating high pressions and flows, are more adapted to large surfaces irrigation

b.6) Training and popularization concerning the irrigated agriculture

No budget has been planned for these activities in TS-P7, TS-P11 and TS-P13 Projects. So, it is Beja, Bizerte and Jendouba CRDAs that have ensured on their general budget the activities which could take place during these three last years.

c) Answers brought to support needs upstream of and downstream from the production

No budget has been planned in any of the three JBIC Projects for these activities. It is the State that has tried to finance a few actions by its Investments Encouragement system.

c.1) Mechanization, manure and pesticides supply

Farmers expect from the State to help by its Investments Encouragement system some promoters (farmers or others) to acquire motor traction equipment and their necessary attachments for future hire.

c.2) Collection and transportion means

If one makes the exception of Sejnane cheese dairy which has the means of collection and transportion, the farmers can only rely on their own capacities to solve these two questions for other productions in Sejnane, and for all the productions in Nefza, Fernana and Hammam Bourguiba.

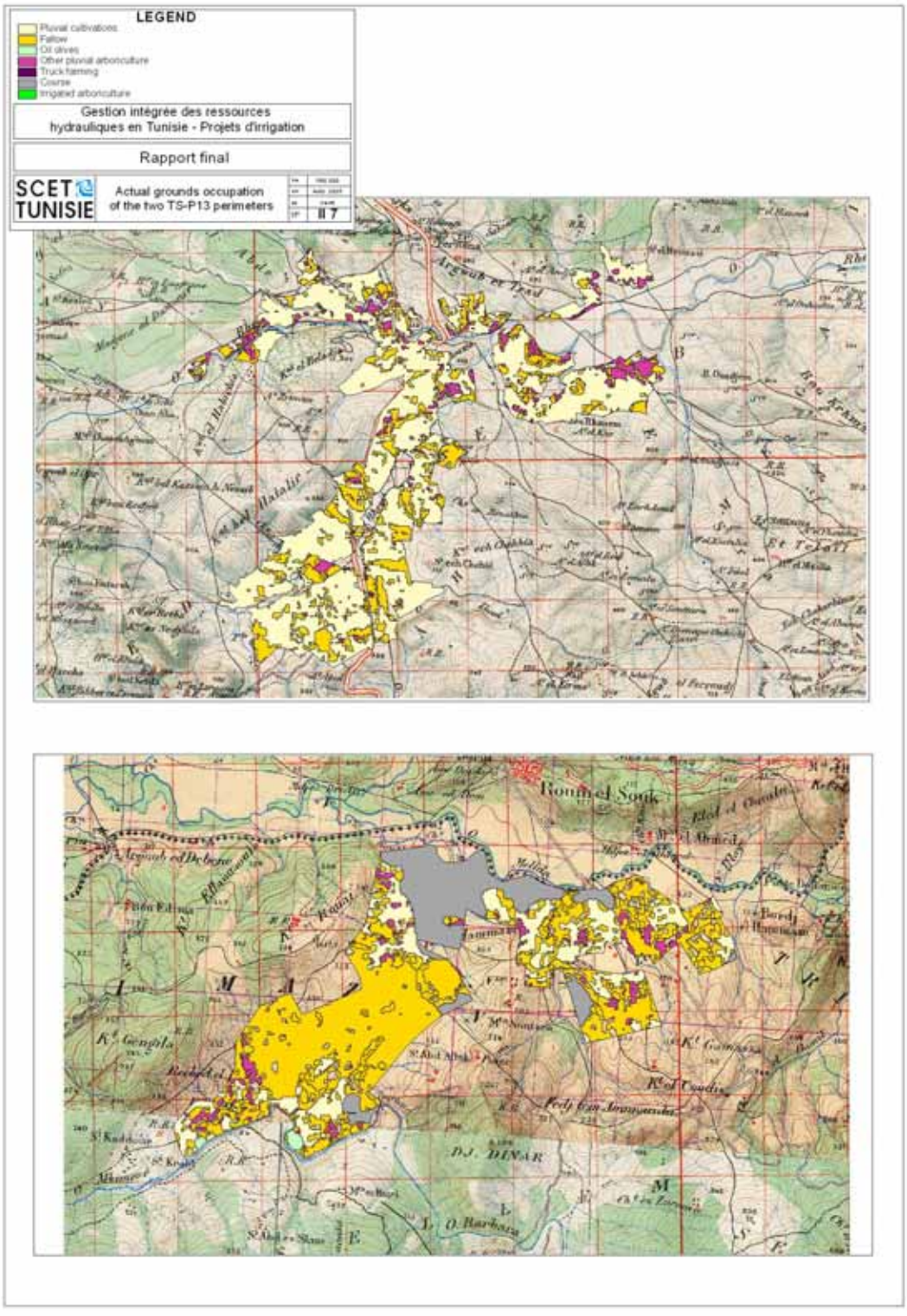
Some hawkers could appear and some milk collecting centres could be created with the development of the dairy bovine farming, which could then take adequate measurements to solve these problems in Nefza, Fernana and Hammam Bourguiba.

c.3) Storage and transformation Infrastructures

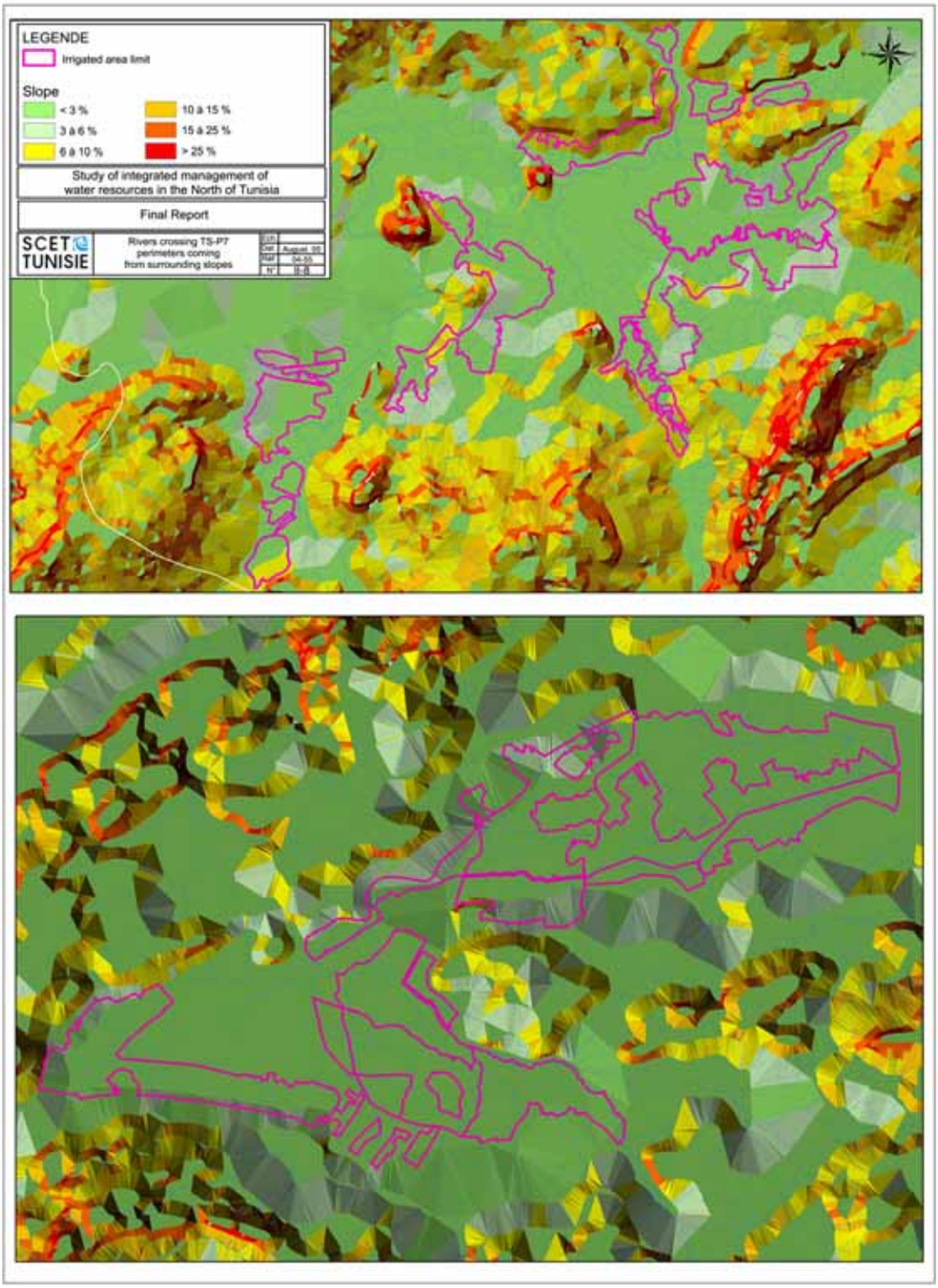
Once more, at the exception of Sejnane cheese dairy which has the means of storage and transformation,and the three cold (storage) rooms being under construction in Goubellat (2 by the SMVDA "Regma" and 1 in town by private farmers), the farmers can only rely on their own capacities to solve these two questions for other productions in Sejnane, and for all productions in Nefza, Fernana and Hammam Bourguiba.

c.4) Support to agricultural productions distribution and sale

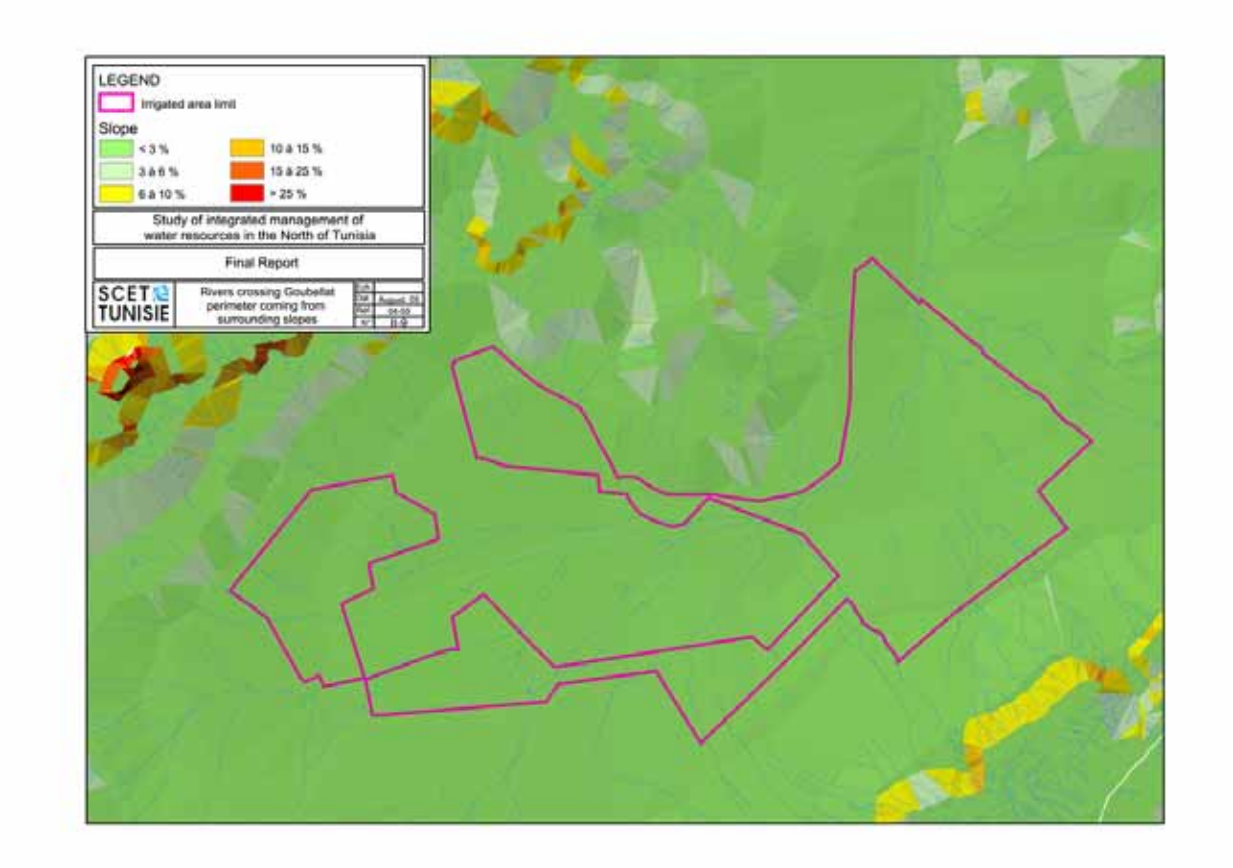
Farmers expect from the State, by its Investments Encouragement system, to help them to finance all actions necessary to early or late varieties introduction.



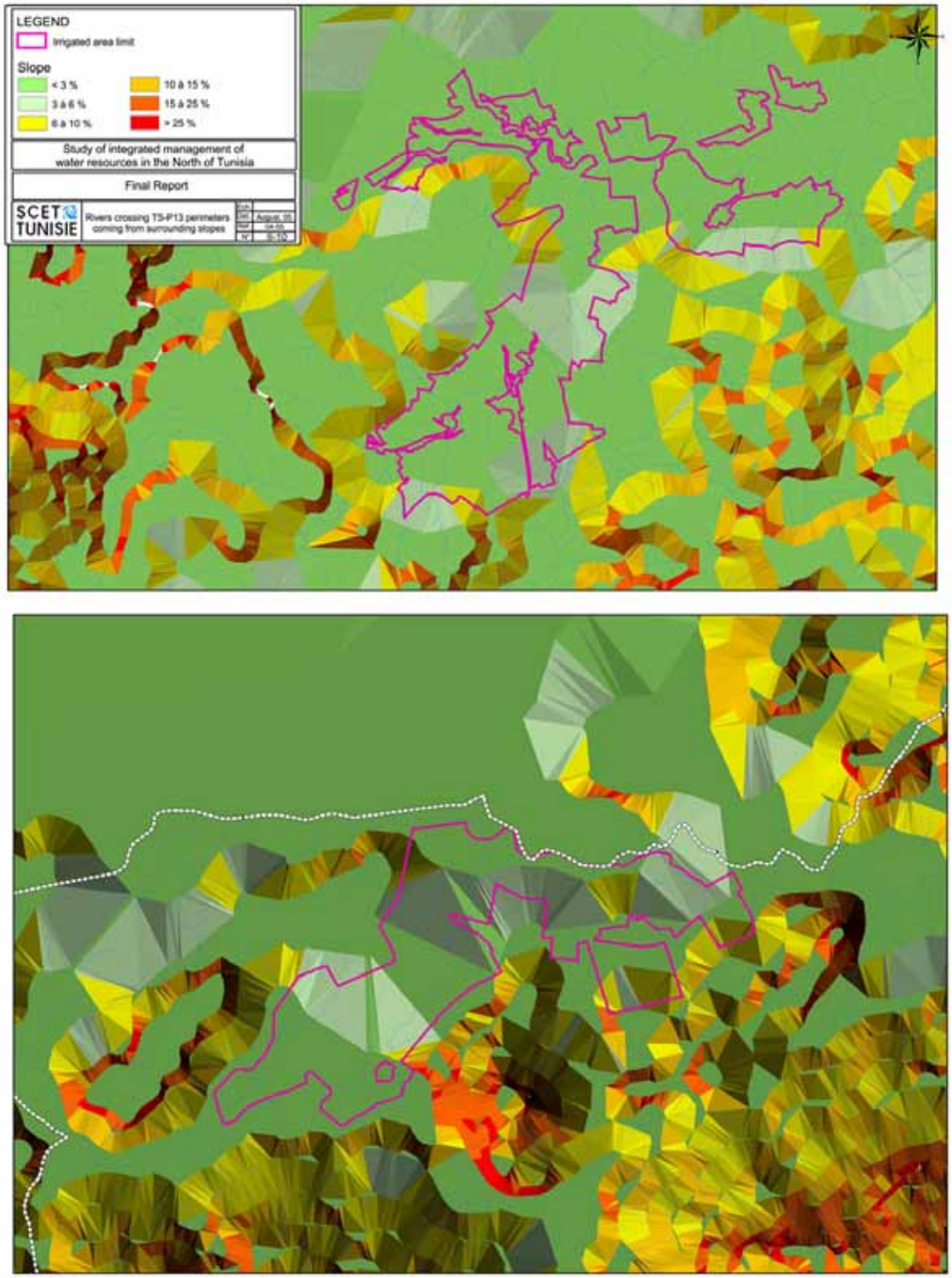
Map n°II-7 : Actual grounds occupation of the two TS-P13 perimeters



Map n°II-8 : Rivers crossing TS-P7 perimeters coming from surrounding slopes



Map n°II-9 : Rivers crossing Goubellat perimeter coming from surrounding slopes



Map n°II-10 : Rivers crossing TS-P13 perimeters coming from surrounding slopes

d) **Answers brought to the needs concerning the financing of the agricultural production**

No budget has been planned for these activities in TS-P7, TS-P11 and TS-P13 Projects for financing of plot hydraulic installations or other equipment for intensification of the production system. So, farmers are waiting from the State, which, by its Investments Encouragement system, can help them to finance these equipments.

e) **Answers brought to the needs of the rural living conditions improvement**

e.1) Households incomes

All the beneficiaries expect that irrigated agriculture will have a positive incidence on rural living conditions improvement, in particular for the bovine farmers who will be able to intensify their fodder crops for better coverage of their pure or crossed races livestock needs.

A concern is however felt for the water invoice which could be too high, in particular during the first years when the irrigators will be acquiring the technical control concerning irrigated cultivations.

e.2) Possibility of access to the plots

With installation of tracks and according to the two perimeters grounds characteristics, the Project facilitated the access to the arranged plots. Considering the access difficulty in winter, plots access improvement needs is, however, still existing, in particular where needs for drainage and CES works are felt.

e.3) Drinking water

Actually, the Project did not plan any component of rural drinking water supply starting from pricking on the irrigation networks. The drinking water supply is assured by the GIC. This supply is, however, carried out generally in a discontinuous way because of not adapted invoicing and covering modes and water systems presenting too many technical constraints (lack of counting, absence of cutting valves, …).

With the development of irrigated agriculture, the needs for the inhabitant rehabilitation and adjustment of drinking water supply networks could appear in a more marked way, to allow individual connections and time saving, in particular for women who are actually in charge of the water drudgery.