

**TOWARDS A SUSTAINABLE WATER MANAGEMENT PLAN FOR THE NATIONAL PARK OF
TLEMCCEN (NORTH-WEST OF ALGERIA)**

BESSEDIK Madani¹, BOUMAZA Houari Boumediene², BENSOUOLA Fouzia³

¹ Department of Hydraulics, Faculty of Technology, University of Tlemcen, m_bessedik@mail.univ-tlemcen.dz.

² Department of Hydraulics, Faculty of Technology, University of Tlemcen, houarimaza@yahoo.fr.

³ Department of Hydraulics, Faculty of Technology, University of Tlemcen, fbensaoula@gmail.com.

ABSTRACT

The intensification of agricultural activities in the protected area of the National Park of Tlemcen causes an excessive and conflicting use of water resources, which are already weakened by a drought that has persisted since the 1970s. As such, the behavioral analysis of farmers in a spatiotemporal context, with respect to a non-renewable resource and a competitive context within agriculture seems to be a pertinent issue when evaluating it from an arbitrage perspective. The actual research aims to examine the introduction of a Participatory Integrated Water Resource Management program of water resources in this protected area in order to improve the hydro-agricultural efficiency. For this purpose, a multi-disciplinary partnership approach was adopted, as it involved a wide range of competences.

Keywords: Practice, Participation, Collaboration, Sustainable management.

1-INTRODUCTION

The issue of practicing small-scale irrigation in villages plays an important role in the social and spatial changes in the National Park of Tlemcen. The requirement to build a participatory approach and the need to mobilize local skills in order to develop consultation mechanisms (Nicolas V., 2011) should be initiated to identify the wishes and priorities of all users. They turn out to be essential in finding solutions to implement a sustainable Participatory Water Management program to meet the needs of the fellahin while ensuring the protection and maintenance of the ecosystem in this sensitive area. At this point, the following question comes up: what approach should be adopted in such an area to ensure sustainable irrigation based on a fair management of shared and limited water resources in a protected area?

To answer this question, a partnership approach based on the principles of participatory management was adopted, requiring the mobilization and participation of all stakeholders to discuss issues related to water management in the park. To do so, the work was carried out in close collaboration with all stakeholders, namely the National Park of Tlemcen, the Spanish NGO I.P.A.D.E.¹, the local association L.A.S.T.J.², the four rural communes (Beni Mester Terny, Ain Ghoraba and Ain-Fezza), representatives of farmers, the Agricultural Management Services of the wilaya (province) of Tlemcen, and the University of Tlemcen. This study was conducted as part of the 07-C01-018 Convention³.

2-FRAMEWORK OF STUDY

The National Park of Tlemcen was created on May 12, 1993 for the conservation of fauna and flora species living in a humid microclimate. It is located entirely within the wilaya of Tlemcen, covering the territories of seven communes with a total area of 8225 hectares, with nearly ten thousand

¹ Institute for the Promotion and Support Development (IPAD) Foundation is an independent Spanish NGO, committed and dedicated to International Cooperation and Development of Education.

² The League of Scientific and Technical Activities of Young People (LASTJ) of Tlemcen.

³ The main objective of this Convention is to improve the means of subsistence, reduce poverty and vulnerability and enhance environmental and human security of rural populations of Morocco, Algeria, Tunisia, Mauritania and Senegal. It is funded by the *Spanish Agency for International Development Cooperation (AECID)*.

inhabitants (NTP 2012). However, the way this protected area is managed often leads to conflicts between local residents due to their activities (grazing, forest clearing, well sinking, etc...) and the Services of the National Park of Tlemcen. These problems had the following consequences: exclusion and marginalization of autochthones and progressive deterioration of ecosystems. It is also worth mentioning the strong role given to the forest in this region, causing a hypersensitivity to any reform that may change the dynamics in place (PNI 2007).

Yet, everybody agrees on the interest that could arise from the contribution of local populations in terms of knowledge and expertise in the field of traditional water management and irrigation techniques used in a climate characterized by a remarkable imbalance between limited water resources and an increasing demand. This means that it is necessary to integrate social and environmental preoccupations with the traditional criteria of technical performance and economic efficiency (Ganoullis J. 2001).

Involvement of local residents should be supported and encouraged in protected areas. They have to be involved in every stage, i.e. the conception and implementation of legislation and the current management of these spaces. This procedure results in forecasting operations, planning and operational actions (Heir S. 2010) which can reduce conflicts and encourage people to be more receptive to conservation projects or activities being performed in environmentally sensitive areas (Depraz S. 2005). Within this reasoning framework, an attempt was made to identify a model for prioritizing water uses, specifically in irrigation practices, in order to find realistic responses that take into consideration the inability to face and cope with water shortages as well as the social and environmental features of the park (Bessedik M. 2011). To prepare this study, we considered the condition of availability of resources and focused on aspects that can promote mobilization. Second, we identified the uses through an accurate examination of ways of tangible resource appropriation and social practices in use. This required access to different data, in addition to quantitative and qualitative investigations carried out among users.

The prepared questionnaire included direct and substantive questions, in order to be able to analyze the irrigation practices related to organization and specificity of space on the one hand, and the organization of systems and techniques of irrigation adopted, on the other hand. The size of the sample necessary to generalize the results of the investigation of all irrigators was 120 people (Boumaza HB 2012), distributed as shown in table 1. Regarding the qualitative aspect, some participatory workshops were held, where one of the objectives was to get people together in order to discuss and exchange experiences for an efficient and collective management of irrigation water. The consultations concerned presentations of local projects to improve irrigation water management.

Table 1: Sampling

Commune	Locality	Surveyed people	Locality	Surveyed people
Aïn Ghoraba	Aïn Fetouh	15	Hafir	06
	Chief town	08	Bouhassoun	07
Terny	Tebabla	11	Sidi Hafif	10
	Feraouna		Ouled Oued Fel	12
	Meffrouch	11	Ouled Youcef	08
	Chef lieu	12		
Beni Mester	Ouled Benziane	09		
AïnFezza	Chief town	11		

3-SOCIOECONOMIC CHARACTERIZATION

Most of the agricultural land at the park is private and the average useful agricultural area is about 8.5 ha. Four farmers out of five have less than 10 ha, and one fourth of them do not practice irrigation due to lack of water. Besides, even those who irrigate are not spoiled, as 63% of surveyed farmers work on an irrigated area of less than 2 ha. Grown crops are mainly: cereals, dried vegetables, tree crops (on mountains) and market gardening. In addition, only five farmers out of 120 have machines.

Regarding water resources, each locality has its specific characteristics and difficulties in appropriating the available water resources. However, the results of the survey showed that almost all the water points located inside the perimeter no longer produce the volumes needed to practice proper irrigation, due to the drying up of nearly three quarters of water springs, wells and drillings, after the repeated droughts in the region. The low amounts of water available, identified during the summer of 2009 (survey period), could irrigate only 7.2 hectares over a total irrigable area of 30 ha. In such a situation, a number of fellahin could not practice grain farming, and some of them switched from farming to breeding. However, those who dared to venture into the practice of irrigation used the traditional surface irrigation technique. This is a flood irrigation system, composed of micro-furrows (5 to 10 m long) and micro-basins (with an area between 4 and 5 m²). The major constraints that challenge this mode of irrigation are the large water losses, the difficulties and inconvenience of work required by this system in terms of maintenance of irrigation channels (seguias).

With regard to peasant organization, it should be noted that farms in the studied area are managed either by the owner himself or by the heirs. As for water resources, they are used either individually when this water comes from drilling or wells, or collectively in the case of a water spring whose operation is supervised by a group of farmers, all practicing traditional irrigation. One out of two practices this type of irrigation. This is done using ancestral techniques of mobilization and equitable distribution of water between various operators. Water is distributed through seguias while respecting well defined criteria such as the water flow, area of the parcel of land, its position with respect to the water spring, etc... Finally, each fellah will be allocated a quota of water, based on the above criteria and estimated in hours. The water is conveyed by gravity seguia to the parcel of land in question. Rehabilitation of this irrigation system is done using the Touiza (a traditional support system in the countryside among neighbors and relatives). Despite water losses generated by this irrigation system, it has the advantage of requiring no energy, and preserves social solidarity. Overall, results of the investigation conducted at the park clearly reveal that the irrigated areas are decreasing.

4. THE PARTNERSHIP APPROACH

In order to associate the fellahin in effective decision-making on projects that concern them, seven participatory workshops were organized to bring all the operators together around the planned projects. These workshops aimed at identifying and characterizing the most efficient irrigation system, determining the management system, and organizing the management and maintenance of common property. At each workshop, the fellahin were divided into small groups (see Figure N° 1) in order to have several versions of the irrigation system which will be fed by the spring under discussion (see Figure N° 3). Once these versions established, all fellahin at the workshop consult each other to adopt the most appropriate variant for everyone (see Figure N° 2).

5. IMPLEMENTATION OF PROJECTS.

Consultations and compromises at the participatory workshops enabled all participants to agree on a list of projects ultimately accepted (presented in Table 2). Ten localities received at least one project each. These projects include: water collection, design of irrigation basins, rehabilitation of seguias, and construction of irrigation canals. Following the studies necessary for the implementation, realization of these projects started in early 2012.



Figure N° 1: Small group consultation on a schematic representation of the irrigation system.

Source IPADE 2011



Figure N° 2 : All participants in consultation, to adopt an irrigation model.

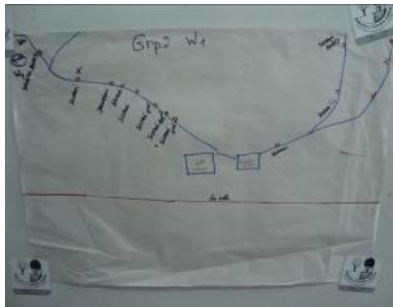


Figure N° 3 : Schematic representations of the irrigation system of Ain El Karma water spring, proposed by subgroups 2 and 4.

Source : IPADE 2011

This work improved the efficiency of irrigation systems, with no major changes to the existing natural environment (see Figure 4, 5 and 6). From individual interviews, conducted after reception and exploitation of such projects, the efficiency would be between 65 and 85%, depending on the distance between the parcel of land and water spring, on water flow, etc ... This caused a very significant increase in the irrigated area which reached more than 26 ha.

6-CONCLUSION

The general outcome of the present analysis allows us to conclude that the efficiency of irrigation systems has improved; it went from 7.2 to more than 26 ha. This betterment was the result of a work prompted by a desire to change the mentality of some farmers, and the way to intervene in a protected area. Partnership, participation and consultation made up the bases to develop realistic solutions to ensure participatory and sustainable water resource management in a region where water distribution is an absolute necessity.



Figure N° 4 : Spring Water Collection



Figure N° 5 : Realization of irrigation canals

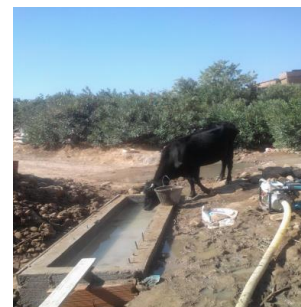


Figure N° 6 : Spring Water Collection

Source : Parc National de Tlemcen

Management aims to promote traditional surface irrigation methods where equity and cohesion constitute the hallmarks of socioeconomic and environmental development of the National Park of Tlemcen. This is an economic and social challenge. The specificities of such a protected area put the fellah at the heart of debates when it comes to taking decisions that concern them.

Table 2: Projects approved and implemented.

Nature of the work	commune	Locality	Unit	quantity	Cost (€)
Water collection	Aïn Ghoraba	Aïn Fetouh (Aïn Derdara)	U	1	3423
		Aïn Fetouh (Aïn El Karma)	U	1	5258
		Bouhassoun (Rass Zitouna)	U	1	10968
Irrigation basins of 200 m ³	Aïn Ghoraba	Bouhassoun	U	1	25597
	Terny	Sidi Hafif	U	1	27060
Rehabilitation of irrigation canals (seguias)	Aïn Ghoraba	chief town (Hassi)	lm	800	6400
Realization of irrigation canals	Aïn Ghoraba	Bouhassoun (Rass Zitouna and Alabna)	lm	710	15400
		Aïn Fetouh (Aïn El Karma)	lm	415	9130
		AïnFetouh (Aïn Derdara)	lm	500	11000
	Terny	Sidi Hafif	lm	665	14630
	Aïn Ghoraba and Terny	Sidi Hafif, A-Fetouh, Bouhassoun, A-Ghoraba	lm	around 3000	Work not started.

lm: linear meter

Source : Boumaza H. B. 2012

REFERENCES

- [1]. BESEDIK M. 2011 : "Pratiques de l'eau en situation de pénurie dans la ville de Tlemcen". Editions Universitaires Européennes, Sarrebruck, 272p.
- [2]. BOUMAZA H. B. 2012 : "Vers une gestion durable des ressources en eau du Parc National de Tlemcen". Mémoire de magistère. Département de l'hydraulique, faculté de technologies, université Aboubekr Belkaïd – Tlemcen, 135p.
- [3]. DEPRAZ S., 2005 : "Le concept d'akzeptanz et son utilité en géographie sociale – exemple de l'acceptation locale des parcs nationaux allemand". *L'Espace géographique*, vol. 34, n°1, pp. 1-16. In Héritier S. 2010.
- [4]. HERITIER S., 2010 : "Participation et gestion dans les parcs nationaux de montagne : approches anglo-saxonnes". *Revue de géographie alpine*, Vol. 98-2010, pp 155-169.
- [5]. GANOULIS J., 2001 : "La gestion de l'eau à l'aube du 3^{ème} millénaire". *Revue Sciences de l'Eau*, Vol. 14/2-2001, pp 213-212.
- [6]. NICOLAS V., 2011 : "Paysage institutionnel des acteurs de l'eau en France" Référence W1710 | Date de publication : 10 août 2011 | : <http://www.techniques-ingenieur.fr/res/pdf/encyclopedia/42506210-w1710.pdf>. Consulté le : 26/01/12.
- [7]. PNI 2007 : "Plan d'Aménagement et de Gestion du Parc National d'Ifrane. Stratégie de conservation et principes de zonage. Version définitive". Rapport : Projet d'aménagement et de protection des massifs forestiers de la Province d'Ifrane. Direction Régionale des Eaux et Forêts du Moyen Atlas Service Provincial des Eaux et Forêts d'Ifrane. Maroc.
- [8]. PNT 2012 : "Projet de réserve mondiale de la biosphère Monts de Tlemcen. Vers une région modèle de développement durable – Rapport : formulaire de proposition". Parc National de Tlemcen, ministère de l'agriculture et du développement rural. Algérie.