



Landscape of Chenini Tataouine - Tunisia Photo ICARDA

Community-based rangeland management in Tataouine, south-east Tunisia

Institutional settings to revive traditional land restoration “Gdel”

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CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland systems; the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes.

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Acronyms

CBO: community-based organization

CBRM: Community-based rangeland management

CRDA: Regional Administration for Agriculture Development

CRP-PIM: Consortium Research Program on Policies, Institutions, and Market

FGD: focus group discussion

GDA: Groupement de Développement Agricole (Agricultural Development Group)

ICARDA: International Center for Agricultural Research in the Dry Areas

IFAD: International Fund for Agricultural Development

IRA: Institut des Régions Arides

LMC: Land Management Council

OEP: Livestock and Grazing Office

PDP: Participatory Development Plan

PRODESUD: Programme de développement agro-pastoral et de promotion des initiatives locales pour le sud-est

SLM: sustainable land management

UTAP: Tunisian Union of Agriculture and Fishing

A. Introduction

ICARDA involvement under Flagship 4 of Consortium Research Program (CRP) Livestock (on livestock and environment) is related to the study of ecological practices and socioeconomic conditions that help in rangeland restoration under different land tenure systems. This is expected to aid the design and operation of successful natural resource management systems for pastoral drylands, and assist policymakers, government agencies, and development actors in their pastoral development agenda to ensure sustainable rangeland resources. Such programs require holistic understanding of socioecological interactions that have significant impact on resource governance.

Part of ICARDA's activities in this framework are focusing on better understanding drivers for successful governance of community-based rangeland management (CBRM) in a constraining land tenure context. The CBRM can be considered as a subset of the community-based natural resource management approach, adapted and applied to rangelands (Robinson et al. 2018). Robinson et al. (2018) suggest a common core set of characteristics that include participatory approaches, the creation of a new or strengthening of an already existing community organization at a medium to large rangeland scale (that is, larger than "village level"), and a fairly common suite of technical practices that a community committee implements and enforces. They developed a protocol that aims at collecting systematic holistic information about "how this approach is implemented, and also in the social and biophysical context in which it is implemented", thus affecting its success or failure. The current report is an implementation of the protocol developed by Robinson et al. (2018) for a case study of CBRM in the region of Chenini in South Tunisia (Tataouine Governorate). This case is based on collaboration between two key local farmer organizations (a farmers' association managing use of rangelands and an owners' association managing ownership of the land) to install rangeland resting at a very large scale (usually thousands of hectares).

B. Methods and case study on community-based rangeland management

Description of case study on community-based rangeland management

The study was conducted in Chenini region, located in the north-west of the Tataouine Governorate which is in the extreme south-east of Tunisia. The Tataouine Governorate is one of the largest geographical governorates in the country with 38,889 km², representing around 25% of the national territory. Despite its immense size, the Tataouine Governorate has only 200,000 ha of agricultural land, or about 5% of the governorate's total area, and rangelands occupy 1.5 million ha. Non-agricultural land but with significant natural resources (such as oil or minerals) is located on the largest part of the territory formed by the Saharan area of the Great Eastern Erg and mountains and extends over 2.689 million ha. Pastoral livestock is a major economic activity with a productive potential estimated in 2017 at 299,772 head of small ruminants (202,787 sheep, 96,985 goats), and 10,292 head of camels, allowing production of 2,760 tons/year¹ of red meat (1,600, 860, and 300 tons, respectively). The size and production of livestock are very variable under the influence of drought and cross-border transactions with Libya. Cattle raising is a new speculation that offers the production of 1600 tons/year of fresh milk (ODS 2018). The Tataouine Governorate also contains important diversified pastoral resources, occupying various ecological areas, each with unique capacities. This implies a management mode essentially based on animal mobility. The pastoral resources are estimated in an average year as 81,794 million forage units. Given the vulnerability of the region's ecosystems, low productivity, and strong pressure on rangeland from increasing demand from pastoralists and cultivated areas, these resources are now highly threatened, and risks of degradation are omnipresent in these pastoral areas.

Different types of rangeland tenure systems exist in the study area, including private and collective land occupying 170,000 and 530,000 ha, respectively. The latter is under the supervision of land management councils (LMCs).

¹ Tons refers to metric tons throughout.

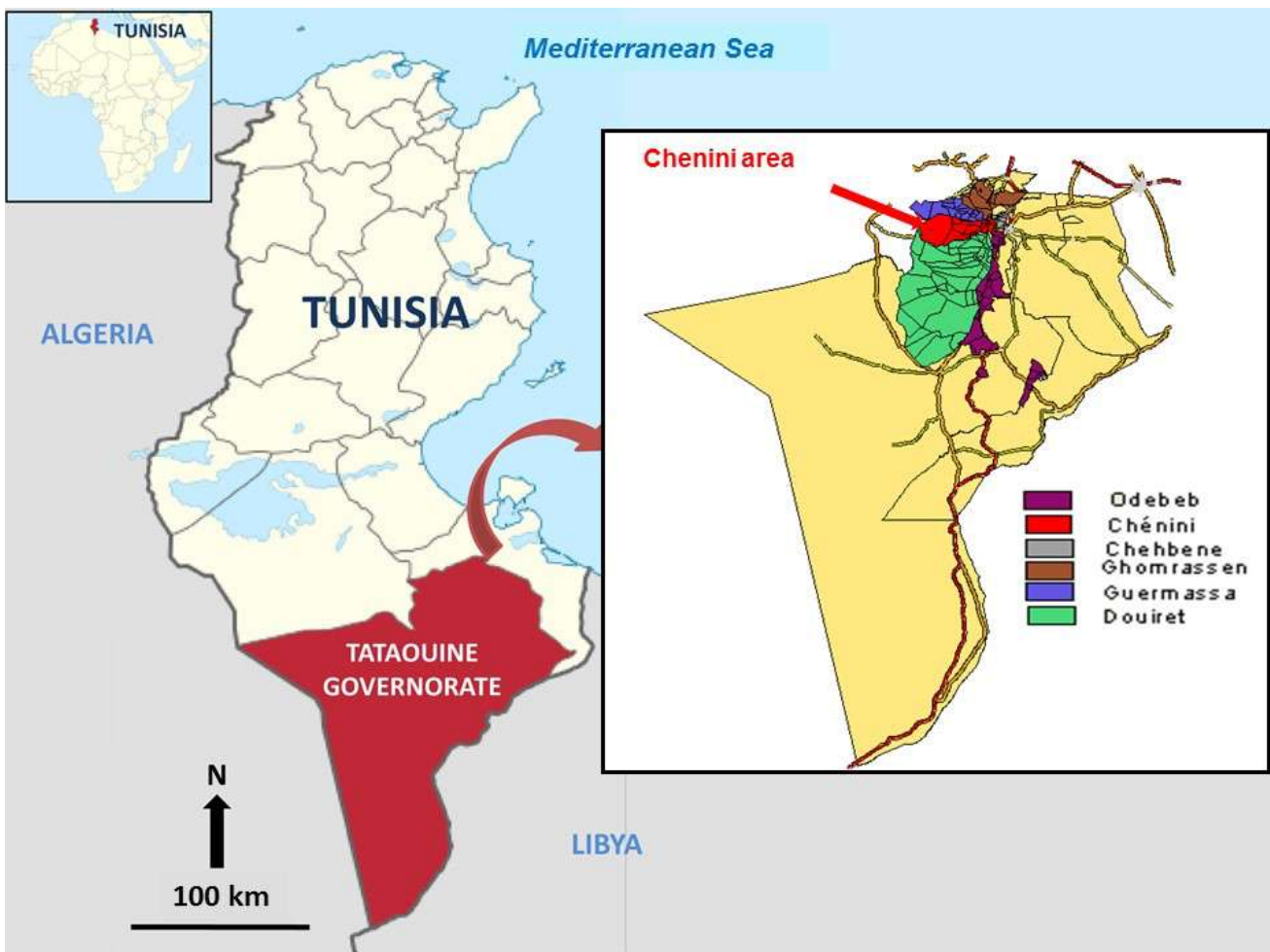


Figure 1. Location of Chenini area, Tataouine Governorate, Tunisia
 Source: Own elaboration, adapted from Bel Fkih and Jarray (2018).

Methods

This report is framed by a protocol developed by Robinson et al. (2018), which provides a structured characterization of CBRM. Most of the findings presented in this report are a compilation of research conducted through other projects, including particularly the CGIAR Research Program on Dryland Systems (CRP on Livestock & Environment Flagship; and CRP-PIM, Consortium Research Program on Policies, Institutions, and Market) and also from literature, national statistics, and other academic works. Most of the variables in the protocol are categorical, straightforward, and factual in nature. Qualitative and exploratory data were also collected, both from primary and secondary sources (Ontiri and Robinson 2017).

Further information used in this study was gathered through focus group discussions (FGDs) and individual interviews with key resource persons and representatives of community-based organizations (CBOs) such as Groupement de Développement Agricole (Agricultural Development Groups, or GDAs) and LMCs during October 2019, who are the main actors involved in restoration of collective and private

rangelands in the Tataouine Governorate. The protocol guide provided by Robinson et al. (2018) was used to moderate FGDs during key informant interviews.

The focus group brought together 25 participants representing the main stakeholders concerned with the pastoral development and rangeland restoration under collective and private statutes in the case study: representatives of technical public services from the Regional Administration for Agriculture Development (CRDA) and the Livestock and Grazing Office (OEP), LMC and GDA representatives, farmers, researchers, and members of the Regional Commission for Rangeland Development.

The objective of these discussions and interviews were to gather complementary information related to main issues, constraints, challenges in the implementation and adoption of rangeland restoration, and the relationships between these actors and issues for better rangeland governance in the study area.



Focus group discussion

Photo credit: IRA, ICARDA

C. Basic information on the case

Summary of the case

1. General information

1a. Development agent(s)

Below are the actual development stakeholders leading different programs on rangeland restoration in the Chenini region. They also provide technical and institutional assistance to local farmers and farmers' associations in better managing their rangelands.

- LMCs,
- GDAs,
- Tunisian Union of Agriculture and Fishing (UTAP),
- CRDA, and
- OEP.

1b. Name of program(s)/project(s)

The main pastoral development (investment) project in the region is entitled “PRODESUD” (Agro-pastoral Development and Promotion of Local Initiatives in Southern Tunisia). This is a development project implemented since 2003 in the region and co-funded by the International Fund for Agricultural Development (IFAD). The project plays an important role in rangeland restoration by using a participatory approach and working with CBOs. In addition to investments in physical infrastructure in the pastoral areas, the project also invests in CBO empowerment, value chains, and other organizational issues. The PRODESUD is supporting the community and the GDA of Chenini to design in a participative approach and to fund its participatory development plan (PDP) 2015–20 with 1.786 million Tunisian dinar (TND)². The budget dedicated to rangeland restoration (including resting technique in 4,000 ha, digging watering wells, and creating artificial shade shelter to protect animals from the sun) is estimated at TND 300,000.

1c. Terminology used by the development agent to describe their CBRM approach

Participatory sustainable management: The local population of end users of the rangeland restoration programs and interventions are represented by their local CBOs in the participatory approach implemented by different technical public actors through various administrative programs, such as CRDA and PRODESUD.

Resting technique (locally called Gdel): This method consists in leaving part of the rangeland at rest (pasture resting) for a definite period of time with the aim to reconstitute the plant cover. This has shown increases in fodder production, soil organic matter, and biodiversity and reduction in soil erosion (Ouled Belgacem 2012).

² Average exchange rates of foreign currencies quoted in Tunisian dinar (TND) on Interbank exchange market 1 US\$ = TND 2.8255 on October 31, 2019.

1d. Extent of the case (rangeland unit)

The rangeland unit (that is, Chenini rangelands) is located in the west of the Tataouine Governorate and approximately 16 km from the governorate center. It stretches over a total area of 46,606 ha and is bound by the Great Eastern Erg, the Matmata Range, the Dhahar Plateau, the eastern plains of the Jeffara, and El Ouara Ben Guerdane) (Figure 1). The two zones of Dhahar and El Ouara offer the widest pastoral areas in southern Tunisia. Different types of rangeland tenure systems exist in this rangeland unit, including private and collective rangelands that occupy 16,629 and 24,424 ha, respectively. Pastoral resources have highly valued potential but are vulnerable and endangered by different unsustainable practices.

1e. Briefly identify and describe the key community governance structures and/or processes for the case

Governance is based on key community organizations as follows:

- **LMC:** The Chenini community has its new LMC, which was elected by the community for a period of five years in February 10, 2016. Its board is composed of six members and is led by its president. It has several roles that include privatizing collective land, managing the community's heritage, ensuring protection of areas reserved for rangelands, and managing all operations that improve community living conditions. Its role in the collective rangeland restoration is crucial through the facilitation of dialog between the technical services, authorities, and local communities (Sghaier 2010).
- **GDA:** This is a CBO with a formal structure dedicated to managing collective and in some cases private rangelands. The GDA of Chenini was re-elected on November 25, 2019. Its board is composed of five members and led by its president. The history of the GDA began in 1991 with the creation of a collective water management association, and in May 2004 transformed into GDA. This CBO is involved in agricultural and pastoral development and therefore specifically plays a central role in the participatory management of collective rangelands. According to the law, only the LMC is empowered to make important decisions in this regard. However, it should be noted that some members of the GDA are also part of the LMC.
- **UTAP:** The UTAP effectively ensures its role as a representative of organized labor, through the combined role of management of its basic, local, and regional structures, but also of the development of agri-food economic sectors. It is also represented in national committees and councils that affect the agricultural sector (such as professional groups, cooperatives, joint committees, and offices). The UTAP plays an important role in rangeland restoration (private or collective) and supports the CBOs in the region.
- **CRDA:** This is a regional development administration dedicated to planning, implementation, monitoring, and evaluation of agriculture, but also rangeland management and restoration.
- **OEP:** This is a non-administrative public enterprise responsible for the development and promotion of the livestock and pasture sector and plays roles of adviser and technical reference for public authorities. The OEP rangeland interventions are part of the National Strategy for Reforestation and focus on the private rangeland sector.

2. Specification of approach

2a. Short description of approach

Due to the deep socioeconomic changes in the nomadic and ancient pastoral systems since the 20th century (for example, land tenure changes, limitation of mobility of herds, modernization, sedentarization, and presence of new actors), the management and governance of rangelands in Chenini has evolved toward the adoption of participatory approaches and the involvement of local stakeholders. This is a participatory approach carried out by pastoralists and coordinated by the LMC and GDA of the Chenini area. The technical services represented by CRDA and OEP provide technical support and supervision through pastoral development programs.

2b. Detailed description of the approach

The type of actors and institutional arrangements involved in rangeland use and management changed greatly during the 20th century in the Tataouine Governorate and specifically in Chenini.

At the beginning of the century, rangelands were strictly managed and controlled by traditional institutions, called “Myâad,” which were composed of tribal leaders and decided about grazing management (opening and closing dates of different rangeland areas of private and collective rangelands) (Gamoun et al. 2018).

During the French occupation of Tunisia, the Myâad changed into a more formal structure of LMCs, mainly composed of land owners who met frequently to decide about rangeland access and use by different third parties (decree of December 30, 1935).

Later, with the decentralization process of natural resources management in the country, the Tunisian Government created formal CBOs called GDAs, as more inclusive local users’ associations which directly manage farmers access to rangelands and provide a space for collective actions for the preservation and restoration of the range areas under its mandate. The existence of “traditional” institutions (LMC), along with GDAs, sometimes creates complexity in ensuring good governance of rangelands. The administration’s main roles are related to the development of resource management programs, implementation of agricultural investment programs in rural rangeland areas, extension services to individuals and to GDAs, the control of excessive use of rangelands, and facilitation of coordination across other local and regional actors.

Nowadays, the coordination of this approach is ensured by technical services of governmental agencies represented by CRDA and OEP. The pastoral population and the local CBOs (GDA and LMC) are completely involved through this participatory approach.

Recognizing the need to promote effective restoration and inclusive coordination of rangelands in a sustainable development perspective, researchers and technical services of the Ministry of Agriculture in Tunisia advocate the reintroduction of the Gdel technique as an approach in the participation of local pastoral communities and technical services of governmental agencies within pastoral development programs. This renewed approach was first extensively tested by OEP in private rangelands and by PRODESUD in collective rangelands with the collaboration of technical services of governmental agencies (CRDA) and local populations represented by LMC and GDA (mainly composed of land owners and users).

These actors meet frequently to decide about rangeland access and use by different third parties such as groups of pastoralists and tribes. Three main relationships characterize this rangeland management and restoration participatory approach as outlined in the following.

The horizontal relationship concerns the relations of cooperation and dialog between the tribes and herd pasture in the collective rangelands to coordinate the spatial and temporal distribution of herds around

the watering wells and rich pastures. These discussions are usually undertaken annually within the community of Chenini led by LMC and GDA, and consider the climatic conditions and the resulting variable distribution of rangeland biomass.

The lateral relationship involves interaction between neighboring tribes within the Tataouine Governorate (Ghoumrassen, Douiret, and Ouled Debbab) and with external tribes (mainly Merrazigue from neighboring Kebili Governorate) and adjacent private land (rangelands and/or cultivated areas). Relationships can be conflictual in dry years when pastoral resources are scarce as they can be based on intra- and inter-tribal collaboration and solidarity.

The vertical relationships consist of the interactions between the rangeland users, GDA, and LMC with the technical services, mainly PRODESUD and authorities. These relations are related to several aspects including planning, consultation on rangeland management decisions, access to credit and state incentives, implementation of infrastructure and community facilities, territorial development aspects, and security issues. These relationships are sometimes positive but can be conflictual when decisions concern land issues and land-sharing aspects.

Photos of the approach



Rested private rangeland: Chenini



Open private rangeland

Photo credit: IRA, ICARDA



Focus group discussion workshop with main actors



Photo credit: IRA, ICARDA

2c. Country/region/locations of the specific case

Tunisia/South East/Tataouine Governorate/Collective and private rangelands

2d. Key dates

The key dates related to rangeland governance in Chenini area are given by the table 1.

Table 1. Key dates

Key date	Activities
1900s	Rangelands were strictly managed and controlled by traditional institutions, called "Myâad". The Myâad was composed of tribal leaders (representatives of land owners), who frequently met to decide about grazing management arrangements and options to use collective rangelands (Decree of February 28, 1920 on the grazing right).
1935	The Myâad changed into a more formal structure called a "Land Management Council" (LMC), which was mainly composed of land owners who frequently met to decide about rangeland access and use by different third parties (Decree of December 30, 1935 on collective lands of tribes).
1956	Independence of Tunisia from the French occupation.
1964	State policy of privatization of collective lands by Law No. 64-28 of June 4, 1964, establishing the system of collective land.
1966	Law 66-60 of July 4, 1966, promulgating the Forest Code integrating natural rangeland.
1988	Forest Code revised by Law No. 88-20 of April 13, 1988.
1990	Implementation of the 1st National Strategy for Pastoral Improvement (OEP). Promotion of rights holders and users of private rangelands to adopt the resting (Gdel) technique by assigning compensatory subsidies in return for giving up the use of the rested areas.
1991	Creation of a water Association of Common Interest (AIC) in Chenini (election of a president and eight members).
1999	Implementation of the legal and institutional framework of GDAs, by Law No. 99-44 of May 10, 1999.
2001	Election of new members and president of AIC Chenini.
2004	Amendment by Law No. 2004-24 of March 15, 2004, which specified the mode of operation and the prerogatives of the GDA by withdrawing any lucrative activity of the GDA.
2004	Creation of GDA Chenini on May 2004 (election of a president of the GDA and five members).

2003-2020	<p>Implementation of PRODESUD project (first and second phases) in Tataouine Governorate (Agro-pastoral Development and Promotion of Local Initiatives in Southern Tunisia), including the Chenini region. This project is co-funded by IFAD and plays a huge role in rangeland restoration through the participatory approach.</p> <p>Promotion of rights holders and users of collective and private rangelands in Chenini to adopt the Gdel technique by assigning compensatory in return for giving up the use of the rested areas.</p> <p>In the first phase, GDA and LMC had only a marginal role and did not intervene directly in the setting up of the resting technique in private rangeland. They only facilitated communication with private beneficiaries.</p> <p>In the second phase, GDA and LMC became partners of PRODESUD to implement the resting technique in collective rangelands.</p>
2011	“Arab Spring” or Tunisian revolution.
2014	Establishment of a new, more democratic constitution allowing citizens to participate actively in decision-making and managing their own resources.
2016	Law No. 2016-69 of August 10, 2016, modifying and completing the Law No. 64-28 of June 4, 1964, fixing the system of collective land.
2016	Election of a new commission (a president and six members) of the LMC Chenini.
2016	Election of a temporary commission and a new president of the GDA Chenini.
2019	Election of a new permanent commission (five members) and a president of GDA Chenini.

D. Characterization of the social, economic, and biophysical context

Issues and challenges for climate change adaptation

Overview of the context

Table 2. Social, economic, and biophysical context—summary

Dimension	Variable/characteristic	Value/comments
Biophysical	Mean annual precipitation	124 mm
	Rainfall variability	CV = 34%
	Rangeland condition at initiation of the intervention	Degraded rangelands
Demography, livelihoods, and social structure	Population density	3 persons/km ²
	Degree of competition for/pressure on land	- High competition and increased pressure on natural resources especially natural vegetation and water. - Cultivation of olive trees in rangelands.
	Ethnic hetero/homogeneity of the rangeland unit	Ethnically homogeneous.
	Ethnic hetero/homogeneity of the region within which the rangeland unit is situated	Ethnically heterogeneous.
	Percentage of land within the rangeland unit under cultivation	Private rangeland 64% and collective rangeland 5%.
	Percentage of land within the region unit under cultivation	29%
	Predominant livelihoods	Agro-pastoralist livelihoods dominate (>50% of the population).
Governance and tenure	Type of land tenure	Private and collective land.
	Security of land tenure	Secure (borders and ownership are known and legally recognized) with some conflictual situations of ownership and rangeland usage especially in collective land.
	Is there elected local government?	Yes
	Strength of customary institutions for natural resource management	Weak

Neighboring communities and inter-community relations	Extent to which other communities/rangeland units within the region also have similar CBRM and governance structures	Most communities have similar CBRM and governance structures, such as GDA and LMC. The difference in management structure is between private (OEP, CRDA, and GDA) and collective rangeland (CRDA, GDA, and LMC).
	Strength of community organization in other communities/rangeland units within the region	Weak
	Severity of inter-community conflict and livestock theft	Some inter-community conflicts with neighboring communities, such as Dhahar (Douz region, Mrazigue tribe, Kebili Governorate) and Ouara Benguerdane (Touazine tribe, Médenine Governorate).
	Describe the source(s) and nature of the conflict, if known	Source of conflict from the use of the rangeland unit by neighboring communities and sometimes between local tribes.

Biophysical context

Chenini region is characterized by extreme aridity. Rainfall is low and irregular, occurring in winter and spring. The annual average is 124 mm, with a minimum of 50 mm and a maximum of 500 mm. The interannual rainfall variability is very strong and the ratio between the extreme rainfall amounts is 34%. The temperature is quite cool in winter (with an average of 4.8°C in January, the coldest month), and very high in summer (with an average of 37.9°C in July, the warmest month). Rangelands in Tataouine Governorate suffer from severe degradation due to these climatic conditions, but also because of multiple socioeconomic changes.



Landscape of agroecological system in Tataouine area (rested area in private rangeland)
Photo IRA/ICARDA

Demography, livelihoods, and social structure

The population of Chenini is 100% rural and is around 1,350 inhabitants and 250 households (INS 2014), with a very low population density of 3 persons per km². Half of the population is under 40 years old. Employed persons in agriculture constitute a much older demographic category, with 50% of farmers being over 60 years old.

The working population practices five main activities (results of the investigation). They follow in order of importance: ordinary labor (various building sites) with 33%, agriculture with 24%, government employees with 15%, immigration with 15%, and trade with 4%. Retired persons perceiving pensions constitute 9% of the working population.

Diversification of the sources of income characterizes the households' strategies. Agricultural income comes primarily from livestock and tree cropping behind small dams, known as Jessours.

Emigration (toward Tataouine and/or Tunis) and immigration (toward Europe) involves a high proportion of the population and drains substantial income from the community.

Some tourist-related activities have emerged with the opening of a group of good restaurants in the center of the old village. So far, travel agencies and other tour operators have benefited from the rich cultural and archaeological heritage of the zone by integrating Chenini in their Saharan circuits prolonged until Douz. These initiatives are still considered insufficient and this seems due to the absence of local initiative at the community level in developing their local products and attracting the interest of the mass of tourists that cross the area daily.

Until recently, women's involvement in the economic activity of the community was limited to housework, assistance with agricultural work, and especially to traditional handicraft manufacturing (Berber weaving).

The multiple socioeconomic changes that occurred in Tataouine and especially in Chenini during recent decades, such as in pastoral and agro-pastoral societies, mobility and accessibility, land tenure systems, and mechanization, have led to a high competition and increased pressure on natural resources. This is especially the case for natural vegetation and water due to cultivation of olive trees on rangeland (olive trees extend over 64% of private and 5% of collective rangeland).

Governance and tenure

The dominant agrarian systems follow:

- I. Zone of El Ferch: covers an area of 5,553 ha. It is mainly characterized by the extension of arboriculture (palm, fig, and especially olive trees) behind Jessours along the principal wadis that cross this zone (Chenini, Zmila, and Dkhila wadis) and in irrigated perimeters.
- II. Zone of the private part of the Dahar or "melk": with a total area of 16,629 ha. The main practice in this zone is olive plantations. These plantations are showing signs of degradation due to repeated droughts during the last decade and lack of water for irrigation.
- III. The communal Dahar zone: covers an area of 24,424 ha. It is a wide communal rangeland, with a large part under a forest regime. These rangelands are characterized by the establishment of many water points (including Foug Akir, Mijna, and Angoud) where the majority of the herds settle.

Different types of rangeland tenure systems exist in Chenini, including mainly private and collective land.

Under private tenure systems, the property of the land belongs to a single person (individual), a very small group of people (generally a 'large' family), or a corporate body such as a commercial entity or non-profit organization. Only land owners have the right to use, control, and make decisions concerning the exploitation of their respective rangelands. These also include decisions for property transfer through land market or inheritance.

The collective rangelands are owned and managed by a given community (or 'tribe'), and belong to all members of this community and are supposed to be used for the benefit of all members. Individual families have the right and freedom to use the land within this communal framework and according to the internal rules defined by the community representatives.

Normally, rangeland borders and ownership are known and legally recognized, but with some conflictual situations of ownership and rangeland usage especially in collective land. The latter are under the supervision of elected local LMCs and GDAs, which show weaknesses in terms of natural resource management.

Neighboring communities and inter-community relations

Mutual access of pastoralists from neighboring tribes to the rangeland unit is usually allowed and helps the communities in adapting their coping strategies to climate variability by jointly using the most productive ranges each year. In practice, different tribes have joint agreements with one or more other

distant tribes to mutually exchange land for grazing depending on climate, particularly current rainfall conditions, in both areas. These neighboring communities such as in Dhahar rangelands have similar CBRM and governance structures as in the study case (the rangeland unit), which also present weaknesses concerning natural resource management. Conflicts between these neighboring communities sometimes occur in relation to the delimitation and use of collective rangeland.

Relevant enabling and hindering factors

Table 3. Enabling and hindering factor

Condition	Specification
Potential of resources	<p>Enabling:</p> <ul style="list-style-type: none"> - Rich potential of pastoral livestock as a major economic activity with a productive potential estimated at 1,700 head of small ruminants (1,060 sheep and 640 goats) and 16 of camels. - Important diversified pastoral resources, occupying various ecological areas, each with special capacities. This implies a management mode that must be essentially based on animal mobility. - Wide pastoral area which produces part of the livestock nutritional requirements. - Important underground water reserves that are technically difficult to exploit. - Rich cultural heritage which offer good investment opportunities. - Village position favored by Saharan tourist caravans.
	<p>Hindering:</p> <ul style="list-style-type: none"> - Risk of degradation of pastoral resources (due to both climate and human causes). - Environment aridity as well as the scarcity and not easily accessible resources (great depth to underground water reserves and increasing desertification). - Limited basic infrastructure (such as drinking water supply, restoration of the old Ksar (fortified building composed of storied rooms, used to store goods of local populations), and rural tracks in Dhahar.

	<ul style="list-style-type: none"> - Insufficient valorization of the local heritage despite UNESCO's classification of Chenini as an international heritage.
Social/cultural/religious norms and values	Enabling: Rich local knowledge and some religious norms (faith and ethics) are the basis of good organization of a planned grazing system (customary practices, cultural beliefs, and vast traditional ecological knowledge of the community were integrated into intervention design and implementation).
	Hindering: Socioeconomic changes.
Availability/access to financial resources and services	Enabling: Access to financial resources from non-agricultural external income due to emigration and other activities (for example, services).
	Hindering: Extreme dependence of these systems on climatic hazards.
Institutional setting	Enabling: Strong institutional framework (many and multi-level institutions).
	Hindering: Lack of management capacity, financial capacity, and overlap among LMC, GDA, and local NGOs.
Collaboration/coordination of actors	Enabling: Positive institutional framework; customs and religion.
	Hindering: Weak coordination and communication between stakeholders.
Legal framework (land tenure, and land and water use rights)	Enabling: Positive institutional framework and clear land tenure status (private and collective land).
	Hindering: Some conflicts in collective rangeland concerning use of pastoral and water resources.
Policies	Enabling: Future elaboration of pastoral code and new policies for good governance, and financial and technical support for rangeland management and good governance.
	Hindering: Lack of full support to rangeland management (role of authorities) and insufficient means.
Land governance (decision-making, implementation, and enforcement)	Enabling: Controls and decisions on land governance by administrative institutions, state encouragement, and role of UTAP.
	Hindering: Weaknesses of local institutions (LMC and GDA) in terms of decisions and disagreements between them.
Knowledge about SLM, access to technical support	Enabling: Local community has deep knowledge of SLM and access to technical support.

	Hindering: Problem of communication and knowledge transition to youth.
Markets (to purchase inputs and sell products) and prices	Enabling: Ease of access to local markets, and existence of cooperative services for sale of animal feed.
	Hindering: Problem of access to regional, national, and international markets (livestock and agricultural production), and low selling price of animals.
Workload, availability of manpower	Enabling: Administrative support for professional training.
	Hindering: Lack of specialist shepherds, lack of skills, lack of professional training, and high workload.

Other hindering factors

- High cost and difficulties of maintenance of pastoral infrastructure,
- Lack of valorization of research results and monitoring of development projects,
- Increase in cultivated area at the expense of rangelands (extension of arboriculture, mainly olive trees),
- Lack of proper communication among the members and customary leaders,
- Lack of local institutional capacity to effectively manage rangelands and resources,
- Lack of supervision/training of professional structures' members, and
- Inter-community conflicts.

E. Characterization of the approach to community-based rangeland management

Overview

Table 4: Characterization of the approach—Summary

Dimension	Variable/characteristic	Value/comments
Methods used by development agent	1. Methods	
	1a) Community entry process and participatory activities used by the development agent	Entry process used by administrative actors such as CRDA and OEP is through NGOs and CBOs (GDA and LMC). PRODESUD/CRDA and OEP are implementing and supporting the promotion of pastoral improvement

		techniques through in-kind grants to individual farmers or GDAs.
	1b) Approach to capacity building used by the development agent	Both CRDA and OEP have conducted training workshops and extension activities (demonstrative and pilot activities), with a participatory research action and research-for-development activities coordinated by research institutes (IRA and ICARDA).
	1c) Nature of incentives and business model	Land owners may earn income from livestock and valorization of pastoral resources and landscape (aromatic and medicinal plants, eco-tourism), subsidies, and compensatory financing (in money or feed). PRODESUD/CRDA and OEP implement and support the promotion of pastoral improvement techniques through in-kind grants to individual farmers or GDAs that adopt the resting technique.
	1d) Types of technical rangeland management options being supported by the development agent	- Resting: rest (without grazing) part of the rangeland for a period of time with the aim to reconstitute the plant cover and increase pastoral resources. - Annual and seasonal planned grazing management. - Rehabilitation (reseeding). - Restoration (silvopastoral plantation).
	1e) Advisory service	CRDA, OEP, and IRA specialists.
	1f) Involvement of local communities in different phases	Yes. GDA, LMC, and UTAP were consulted from the start with restoration activities (decision taken, choice of sites to be conserved, beneficiaries, nature and quantity of incentives, resting time, access conditions, opening period, animal load/numbers of permitted heads, and responsibilities of each). A technical consultation committee created in the region, bringing

		together all the stakeholders to validate the action program.
	1h) Is monitoring and evaluation part of the approach?	Yes. A technical monitoring system of the state of the rangeland by season and by year set up by IRA and ICARDA.
Governance Management	2. Governance design	
	2a) Governance type: which type(s) of actors participate in decision-making in the rangeland unit's main governance structures or processes?	Collaborative governance between administration (CRDA/PRODESUD/OEP), local authority (delegate), research (IRA and ICARDA), farmers' organization (UTAP), and local NGOs and CBOs (GDA and LMC).
	2b) What form does community representation take? Participation/representation...	Participation/representation-based stakeholder groups (groups each get a representative on the LMC/GDA).
	2c) Are there provisions for regular election of officers/representatives?	Yes. GDA and LMC should organize a regular election toward the end of the exercise period during a general meeting of their members (farmers).
	2d) Involvement of women, minorities, and other groups	Yes. Involvement of women and youth is encouraged.
	2e) Relation of the rangeland unit's governance structures/processes to local government	Relations between delegation and GDA and LMC (such as coordination and planning).
	3. Basis of structures/processes in customary institutions	
	3a) The decision-making structures/processes for the rangeland unit	In collective rangelands: based on customary institutions and decision-making procedures. In private rangelands: involves elders or customary leaders as members of decision-making bodies but does not otherwise formally include customary institutions and decision-making procedures.
	3b) Are there any hereditary or other customary leaders?	No

	3c) Who is automatically part of the leadership structure?	GDA, LMC, and UTAP.
Authority	4. Legal mandate	
	4a) Is the main decision-making structure registered as a legal entity?	Yes
	4b) Are the decision-making structures or processes of the rangeland unit recognized and given legal mandate by a legislative framework?	Yes
	5. Authority and governance powers of the rangeland unit's governance structures/processes	
	5a) What governance powers do the rangeland unit's governance structures/processes have?	A framework-setting mandate but little authority for actual management.
	5b) In cases where rangeland unit's governance structures/processes have limited authority (merely an advisory/coordination function), where instead does the bulk of authority lie?	Not applicable.
	5c) Who decided on the selection of technical options to be implemented?	All relevant actors, as part of a participatory approach, but not yet effective.
	5d) Specify on what basis decisions were made (several options are possible)	Evaluation of well-documented SLM knowledge (evidence-based decision-making), research findings, personal experience, and opinions.
	5e) Graduated sanctions	Yes
	5f) Conflict resolution mechanisms	Yes
Management	6. Staffing	
	6a) Is there a secretariat (for instance, paid staff working for the community organization in an office)?	Yes. Chenini GDA has their own office and staff.
	6b) Are there paid field staff (such as rangers and rangeland managers)?	Yes. Guards ensure the resting of chosen sites.
	6c) Does the rangeland unit hire professionals (such as rangeland ecologists and tourism managers)?	No
Spatial organization,	7. Definition of the rangeland unit	
	7a) How is/was the geographic extent of the rangeland unit defined?	The borders of GDA/LMC territory are determined by the text of the creation of the GDA, published in the

scales, and levels		official journal of the Tunisian Republic.
	7b) What criteria are/were used to define it?	A mix of ecological and biophysical characteristics of the ecosystems, and uses rules of owners and rangeland users.
	8. Nesting and multi-level planning approach	
	8a) Are there clearly defined territories and associated institutions nested within the rangeland unit structure?	Yes, mostly
	8b) Is the rangeland unit formally nested within a larger structure?	Yes
	8c) How does resource planning at the rangeland unit level relate to planning at levels above and below?	Planning and management are done at the LMC/GDA level with the supervision of technical services of CRDA and local provincial authority.

Methods

Methods used by development agent

The entry point to the restoration process used and applied by administrative actors such as CRDA and OEP starts with building consensus, partnership, and collaboration with CBOs (GDA and LMC), UTAP, and local NGOs.

PRODESUD/CRDA and OEP are implementing and supporting the promotion of pastoral improvement techniques through in-kind grants to individual farmers or GDAs that adopt the resting technique. The GDA, LMC, and UTAP were consulted from the start with resting activities (decision taken, choice of sites to be conserved, beneficiaries, nature and quantity of incentives, resting time, access conditions, opening period of courses, animal load/numbers of permitted heads, and responsibilities of each).

Collaborative governance is set up between CBOs (GDA and LMC), administration (CRDA, PRODESUD, and OEP), local authority (delegate), research (IRA and ICARDA), UTAP, and local NGOs. A technical consultation committee is set up in the region bringing together all stakeholders to design and frame, carry out, monitor, and evaluate the rangeland improvement action plan.

The administrative actors such as CRDA and OEP ensure management of rangelands through CBOs (GDA and LMC). The CRDA plays the role of planning, implementation, monitoring, and evaluation of rangeland management and restoration. The OEP development agent is responsible for the development and promotion of the livestock and pasture sector and plays the roles of adviser and technical reference for public authorities. These development agents use a collective decision-making process in which they involve LMC and GDA in the participatory management of collective rangeland.

The development actors used participatory action research in which the partnering organizations approached and engaged the community in carrying out a set of activities aimed at rangeland improvement, conservation management, land rehabilitation, and land restoration efforts. Both CRDA

and OEP conduct training workshops and extension activities in the community (for example, site visits, farmer to farmer, demonstration areas, and public meetings), with participatory action research coordinated by research institutes (IRA and ICARDA).

The business model conceptualized is one in which the financial resources raised can be directed toward rangeland management and improvement of household livelihoods. In addition to income from valorization of pastoral resources and landscape (aromatic and medicinal plants, and eco-tourism), development agents give subsidies (compensatory financing in money or feed) to land owners and this plays a significant role in incentivizing community engagement.

For example, the approach and planning of the rangeland improvement during the period 2014–2020 are described as follow:

- Improving private and family rangeland by resting techniques over a period of five years by the rangeland team (resting during three first years, exploitation for the fourth year, and resting in the fifth year).
- Maintenance and upkeep of 7,000 ha from the old rested areas.
- Implementation of the resting technique in new sites covering 10,000 ha.
- Involving the management councils in studying some of the demands (legal argument, land attribution, and certificate of disposal in real estate).
- Improved rangeland management, protection and management during the contracting five years with the involvement of beneficiaries, GDA, and LMC. The GDA will ensure the control and supervision of the rested area in return for a premium of TND 6.0 during the five years of resting (TND 1.6 per ha per year during the first three years and TND 1.2 per ha per year during the fifth year). Beneficiaries will receive compensation in-kind in the form of livestock feed equal to TND 69.0 during the five years of resting (that is, TND 18.4 per ha per year for the first three years and TND 13.8 per ha per year for the fifth year).
- Older rested areas will receive in-kind compensation in the form of livestock feed equivalent to TND 30 per ha per year.
- Adopting the geographic information system in order to locate the improved pastoral areas.

Different types of technical rangeland management options are implemented in the rangeland unit, such as rehabilitation of rangelands through the resting technique that consists of preventing grazing of part of the rangeland for a period of time (with the aim to reconstitute plant cover) and restoration planting of silvo-pastoral plants. These techniques have been tested and applied in several places on the basis of negotiation and consultation with landowners. These latter have access to advisory services (technical assistance provided to NGOs, CBOs, and land users by administrative and development agents).

The monitoring and evaluation of resting areas are a part of the approach. All actors are actively involved in the process in all phases (initiation/motivation, planning, and monitoring/evaluation) and several studies have assessed the impact of the resting technique on natural vegetation and the sustainability of rangelands in general. A technical monitoring system of the state of the rangeland by season and by year was set up by IRA and ICARDA. Land owners may earn income from livestock and valorization of pastoral resources and landscape (aromatic and medicinal plants, and eco-tourism), subsidies, and compensatory financing (in money or feed).

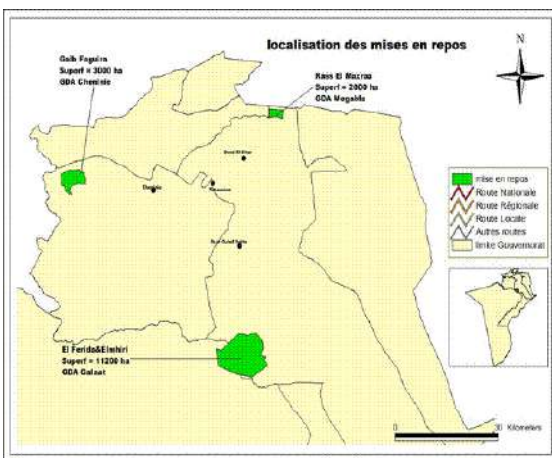
Beneficiaries have access to an advisory service provided by the technical services and the members of the rangeland improvement commission. Indeed, a formal technical consultation committee was set up in the region, bringing together all stakeholders to validate, follow up, and implement the action program.

Table 5. Involvement of local community members (example of resting technique)

Phase of the approach	Involvement of local land users/local communities					Specify who is involved and describe activities.
	None	Passive	Active			
			Payment/external support	Interactive	Self-mobilization	
Initiation/motivation	_	_	_	_x_	_	<p>In the case of collective rangeland, the approach is initiated by PRODESUD. The GDA and LMC participate actively in the planning stage and the implementation/management of development activities such as the resting technique.</p> <p>In the case of private rangeland, the resting approach is initiated by individual farmers.</p>
Planning	_	_	_	_x_	_	<p>The planning process is interactive and is facilitated by PRODESUD with collaboration of CRDA, but also with LMC, GDA, and local communities.</p> <p>In the case of private rangeland, OEP plans the resting areas with land owners (localization and extension).</p>
Implementation	_	_	_	_x_	_	<p>The implementation of the approach in the case of collective rangelands is ensured by PRODESUD, CRDA, LMC, and GDA—generally after agreement of all concerned tribes.</p>
Monitoring/evaluation	_	_	_	_x_	_	<p>Local monitoring by GDA and LMC, and regional monitoring by the regional rangeland improvement commission.</p> <p>Evaluation of technical aspects and impacts of rested ecosystems in the rangeland unit are done by research projects (ICARDA and IRA).</p>

Research	_	_	_	_x_	_	Research activities carried out by IRA in collaboration with ICARDA (Mashrek & Maghreb project, other projects). Breeders, local stakeholders, and technicians have been trained and are actively involved in research activities.
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The monitoring and evaluation approach is carried out by all stakeholders involved: local monitoring by GDA and LMC, regional monitoring by the regional rangeland improvement commission, and ecosystem monitoring and evaluation by IRA and ICARDA. This approach helps to assess the progress and effectiveness of the CBRM system being put in place and contributes to strengthening implementation of the resting technique.



Geographical location of vegetation monitoring plots being chosen for resting technique in collective rangeland (research activities carried out by IRA and ICARDA)

Field training for farmers, CBOs, and technicians (provided by IRA researchers in rested area of Rass El Mazraa, Megabla GDA)

Governance and management

1. Governance design

The governance design used is collaborative/shared between CBOs (GDA and LMC), administration (CRDA, PRODESUD, and OEP), local authority (delegate), research institutions (IRA and ICARDA), UTAP, and local NGOs. These actors participate in decision-making in the rangeland unit's main governance structures or processes based on stakeholders' groups (decision-making shared jointly between community and state). A technical consultation committee is set up in the region bringing together all stakeholders to design and frame, carry out, monitor, and evaluate the rangeland improvement action plan.

Elected by the community for a period of five years, the LMC has a somewhat important role in rangeland management if people are not influential, and a dominant role if members have some social authority through the facilitation of dialog between the technical services, authorities, and local communities. The

LMC has an important role in the decision of implementing the resting technique and of the choice of the area to be rested.

The GDA is governed by a general assembly that meets once a year and has a governing board composed of three to six administrators elected in secret ballot by the general assembly of the members. On the occasion of the holding of the general assembly, one-third of the members of the board are replaced by election. The board meets twice a year and its deliberations are recorded by minutes recorded in a special register quoted and initialed by the president. The board appoints a director who ensures day-to-day management of the GDA.

Women and youths are involved ineffectively in rangeland management processes, especially in decision-making. Their role is limited to implementation of the approach.

2. Basis of structures/processes in customary institutions

The decision-making structures/processes for the rangeland unit are based on customary institutions and decision-making procedures. Indeed, LMCs and GDAs in their current form are nothing more than the formalization by the state of the traditional informal institution, Miâad. Although this traditional institution includes all social functions and decision-making regarding the management of collective resources (such as pasture, water, and wildlife) for the tribe, the current institutions are much more specialized in specific tasks: the LMC is concerned with management of collective land and the GDA with the agricultural and pastoral development issues in its territory.

The internal institutional structures such as CBOs (GDA and LMC) and NGOs are created through community participation and representation in the committees that are the governance institutions and which operate at different levels and with different mandates. The UTAP ensures a role for farmers' associations and supports the CBOs in the region and has an important role in rangeland restoration.

3. Legal mandate

The GDA and LMC are legally mandated with authorities according respectively to Law No. 2004-24 of March 15, 2004 (which specifies the mode of operation and the prerogatives of the GDA) and Law No. 2016-69 of August 10, 2016 (modifying and completing Law No. 64-28 of June 4, 1964, fixing the system of the collective land and the statute of LMC) but do not have a legal mandate giving them responsibility for managing grazing and rangeland. The technical consultation committee, designated by the Governor of Tataouine, is mandated to take decisions in allocation to the resting program within this rangeland unit.

4. Authority and governance powers

For the case of collective rangelands, research shows that there are dominant actors who have a strong influence on the others without being strongly influenced themselves (for example, UTAP and IRA). Regional and local authorities (Governor and Delegate) have the role of applying laws and management of national programs, but it is strongly dependent on global and national political and socioeconomic changes and behavior of some stakeholders (in term of acceptability and then success and sustainability of the different programs). The GDA, LMC, and CRDA have weak influence and are strongly influenced, which indicates that they are dominated. Stability and success of rangeland restoration processes in collective rangelands would then require some of the key stakeholders to develop more influence and dominance.

All actors (users, NGOs, CBOs, development agents, and authorities) decided on the selection of technical options to be implemented, as part of a participatory approach which is in fact not yet effective.

Decisions were made on the basis of evaluation of well-documented sustainable land management knowledge (evidence-based decision-making), research findings, and personal experience and opinions.

Gradual sanctions are applied toward breeders that do not respect the limitations to access for resting areas. Agents from CRDA function in this role of usage control, and also to resolve all conflicts related to the use of rangeland resources with collaboration from communities and local institutions (NGOs and CBOs).

5. Management

At the rangeland-unit level, no paid staff work for the community organization. The legally mandated LMC and GDA staff work as volunteers. The members of these local institutions are not necessarily selected based on their professionalism, but are elected based on community acceptance. However, there are paid field staff (administrative agents) who control access to the rested areas. In addition, the development agents can hire professionals (rangeland ecologists and socioeconomists) from research institutes or development services in order to assess and monitor the rangeland state.

As an example, the main general principles for implementation of the resting technique in private rangelands follow:

- I. Rested sites are suggested by users.
- II. The resting process does not affect property.
- III. There is no role for resting without the support of beneficiaries: written demands from farmers proving their desire are accompanied by a private ownership certificate or a family ownership certificate accompanied by a power of attorney delivered by the LMC.
- IV. Technical study of the sites to be rested, based on:
 - a. Assessing the state of the rangeland in terms of productivity and degree of degradation,
 - b. Areas to be rested should be 20–100 ha,
 - c. Proposed areas of resting technique should respect the movement of herds (animal crossings).
- V. Establishment of agreements between GDA, beneficiaries, and technical services (CRDA and OEP).
- VI. Rested area are only marked by signposts without a protective fence.
- VII. Rested area protection is provided by the beneficiaries themselves.
- VIII. Monitoring and inspection of the rested area are provided first by LMC and GDA, and second by the Regional Commission of Rangeland Improvement.
- IX. Assigning in-kind compensatory subsidies in the form of livestock feed depends on real achievements on the ground.

Spatial organization, scales, and levels

1. Definition of the rangeland unit

The geographic extent of the rangeland unit was determined based on the administrative limits of Chenini village (private and collective land limits also are considered). The watersheds also often constitute a consensual limit between rangeland units and regions.

2. Nesting and multi-level planning approach

There are clearly defined territories and associated institutions nested in the rangeland unit. Resource planning is carried out primarily at the rangeland unit level and then further details and planning are done at both higher and lower levels.

The nesting and multi-level planning approach has eight steps (Figure 2):

- I. Participatory diagnosis of the socioeconomic and biophysical conditions,
- II. Participatory planning with main stakeholders—elaboration of the PDP,
- III. Elaboration of the annual program,
- IV. Pastoral planning—rangeland management plan,

- V. Agreement of the resting technique implementation (between CRDA, GDA, and LMC),
- VI. Implementation of the resting technique,
- VII. Monitoring and evaluation (local monitoring by GDA and LMC, regional monitoring by the regional commission, and ecosystem monitoring and evaluation by IRA),
- VIII. Decision to open and exploit the rested area (such as period, beneficiaries, number of animals, and fixing the amount of royalty per head).

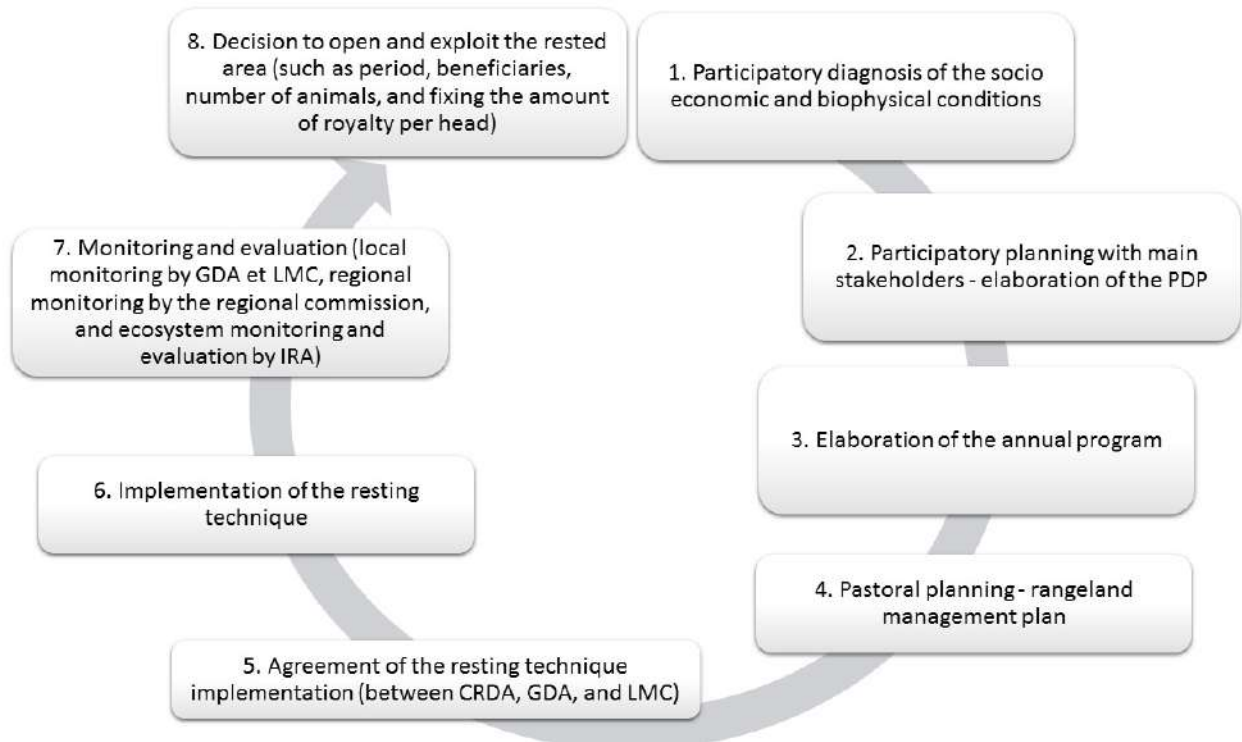


Figure 2. Nesting and multi-level planning approach in rangelands of Chenini, Tataouine Governorate

F. Outcomes, impacts, and changes over time

The impacts of the approach were assessed in the framework of FGDs organized on October 30, 2019, at IRA Tataouine with the main stakeholders concerned with rangeland management in both private and collective rangeland. This participatory assessment was held to assess the impacts of the approach on rangeland conditions but also on socioeconomic and environmental aspects. Participants in the FGDs were asked to assess overall changes in rangeland condition for the rangeland unit as a whole, in comparison with a reference site(s). This latter is the location(s) that have not had CBRM. We considered also the before/after implementation of the approach. Two focus groups were set based on land tenure status:

- Focus group dedicated to collective rangelands managed by the GDA and LMC
- Focus group dedicated to private rangelands (individual or grouped/familial).

The FGDs were managed in two steps. First, a set of 13 common indicators of rangeland condition/pasture quality was established and validated by participants. The indicators were phrased positively so that a higher score was always better. The set of indicators is presented below:

1. Improvement of pastoral production of rangelands,
2. Richness of plant and animal biodiversity,
3. Better participation and involvement of stakeholders in the management of their own pastoral resources,
4. Increased willingness to pay for ecosystem services,
5. Development of stakeholders' managerial capacities,
6. Increasing pastoral farming productivity,
7. Increased breeders' incomes,
8. Improved living conditions of pastoral populations,
9. Conservation of the natural environment/reduction of desertification and degradation of rangelands,
10. Increased ecosystem services of rangelands,
11. Improvement of the landscape and attractiveness of pastoral territory,
12. Improving governance approaches to pastoral improvement, and
13. Youth and women participation in pastoral activities.

In a second step, a scoring criterion for each indicator was established. Participants were asked to give individually a score of 1–5 according to the level of impact of the experience gained in the field:

- 1: Very low—very low satisfaction,
- 2: Low—low satisfaction,
- 3: Average—average satisfaction,
- 4: Good—high satisfaction, and
- 5: Very good—very high satisfaction.

The results of the scoring for both cases (collective and private rangelands) are given in Tables 6 and 7. The scores mentioned are the average of all scores recorded individually by all stakeholders.

Table 6. Scoring from focus group dedicated to collective rangelands managed by the GDA and CG

Indicators	Before/without implementation of resting technique	After/with implementation of resting technique	Comments
Improvement of pastoral production of rangelands	1.0	4.0	Pastoral production was significantly improved.
Richness of plant and animal biodiversity	1.3	3.9	Several pastoral species were generated and observed in the rested area.
Better participation and involvement of stakeholders in management of their own pastoral resources	1.7	3.9	Participative planned grazing created a platform which helped participation and involvement of stakeholders.
Increased willingness to pay for ecosystem services	1.7	3.4	Participative planned grazing motivated users to pay for ecosystem services. The payment of a fee of DNT 0.5–1.5 per animal was accepted by the breeders who benefit from pasture in open resting.
Development of stakeholders' managerial capacities	1.1	2.7	Change was positive but still low because capacity development is related to many other factors (such as strategies and policies) and will take time.
Increasing pastoral farming productivity	1.6	3.2	Participative planned grazing has helped improving productivity (minimal constraints of animal and human pressure).
Profitability of Gdel's intervention	1.8	3.6	Perception of profitability change was low due to high livestock demand.
Costs and resources mobilized	1.5	3.1	Change in costs was perceived as low (less than 2 points gained).
Increased breeders' incomes	1.4	2.6	Change in breeders' incomes was perceived as low (1.2 points gained) due to weakness of profitability of resting technique.

Improved living conditions of pastoral populations	1.8	2.9	Change in living conditions was perceived as low (1.1 points gained) due to weakness of profitability of resting technique.
Conservation of the natural environment/reduction of desertification and degradation of rangelands	1.6	2.8	Participative planned grazing helped reduce erosion, plant degradation, and so land degradation and desertification.
Increased ecosystem services of rangelands	1.6	4.2	Participative planned grazing helped improve ecosystem services by improving biodiversity.
Improvement of the landscape and attractiveness of the pastoral territory	1.5	4.1	Participative planned grazing helped improve landscape and attractiveness by improving biodiversity.
Improving governance approaches to pastoral improvement	1.6	4.2	Participative planned grazing created a platform which helped the participation and involvement of stakeholders. New rangeland conditions push these stakeholders to improve governance for rangeland sustainability.
Youth participation in pastoral activities	1.4	3.7	Rangeland condition improvement motivated youth and women to participate in the resting process.

Table 7. Scoring from focus group dedicated to private rangelands (individual or grouped/familial)

Indicators	Before/without implementation of resting technique	After/with implementation of resting technique	Comments (same as in collective rangelands)
Improvement of pastoral production of rangelands	1.8	4.1	Pastoral production significantly improved.
Richness of plant and animal biodiversity	1.9	3.9	Several pastoral species were generated and observed in the rested area.
Better participation and involvement of stakeholders in management of their own pastoral resources	2.6	3.4	Perception of change is very low (less than 1 point gained) because of the high initial level of participation and involvement of private people.

Increased willingness to pay for ecosystem services	1.4	2.5	Participative planned grazing motivated users to pay for ecosystem services. The payment of a fee of DNT 0.5–1.5 per animal was accepted by breeders who benefit from pasture in open resting.
Development of stakeholders' managerial capacities	1.8	3.1	Change was positive but still low because capacity development is related to many other factors (such as strategies and policies) and will take time.
Increasing pastoral farming productivity	1.8	3.4	Participative planned grazing helped improve productivity (minimal constraints of animal and human pressure).
Profitability of Gdel's intervention	1.4	3.7	Perception of profitability change was low due to high livestock demand.
Costs and resources mobilized	1.6	2.6	Change of the costs was perceived as low (1 point gained).
Increased breeders' incomes	1.6	3.6	Change in breeders' incomes was perceived as medium (2 points gained) due to medium impact on profitability of the resting technique.
Improved living conditions of pastoral populations	1.7	3.0	Change in living conditions was perceived as medium (1.3 points gained) due to medium impact on profitability of the resting technique.
Conservation of the natural environment/reduction of desertification and degradation of rangelands	1.8	4.2	Participative planned grazing helped reduce erosion, plant degradation, and so land degradation and desertification.
Increased ecosystem services of rangelands	1.8	4.1	Participative planned grazing helped improve ecosystem services by improving biodiversity.
Improvement of the landscape and attractiveness of the pastoral territory	1.7	3.9	Participative planned grazing helped improve landscape and attractiveness by improving biodiversity.
Improving governance approaches to pastoral improvement	1.7	3.5	Participative planned grazing created a platform which helped the participation and involvement of stakeholders. New rangeland

			conditions pushed these stakeholders to improve governance for rangeland sustainability.
Youth participation in pastoral activities	1.4	2.5	Rangeland conditions improvement motivated youth and women to participate in the resting processes.

Finally, the results were consolidated in Table 8, which summarizes all the scores.

Table 8. Consolidation of focus group (FG) scores

Indicators	FG 1: collective rangelands managed by the GDA and CG		FG 2: private rangelands (individual or grouped/familial)		Average	
	Before	After	Before	After	Before	After
Improvement of pastoral production of rangelands	1.0	4.0	1.8	4.1	1.4	4.1
Richness of plant and animal biodiversity	1.3	3.9	1.9	3.9	1.6	3.9
Better participation and involvement of stakeholders in management of their own pastoral resources	1.7	3.9	2.6	3.4	2.2	3.7
Increased willingness to pay for ecosystem services	1.7	3.4	1.4	2.5	1.6	2.9
Development of stakeholders' managerial capacities	1.1	2.7	1.8	3.1	1.5	2.9
Increasing pastoral farming productivity	1.6	3.2	1.8	3.4	1.7	3.3
Profitability of Gdel's intervention	1.8	3.6	1.4	3.7	1.6	3.6
Costs and resources mobilized	1.5	3.1	1.6	2.6	1.5	2.8
Increased breeders' incomes	1.4	2.6	1.6	3.6	1.5	3.1
Improved living conditions of pastoral populations	1.8	2.9	1.7	3.0	1.7	3.0
Conservation of the natural environment/reduction of desertification and degradation of rangelands	1.6	2.8	1.8	4.2	1.7	3.5

Increased ecosystem services of rangelands	1.6	4.2	1.8	4.1	1.7	4.2
Improvement of the landscape and attractiveness of the pastoral territory	1.5	4.1	1.7	3.9	1.6	4.0
Improving governance approaches to pastoral improvement	1.6	4.2	1.7	3.5	1.6	3.8
Youth participation in pastoral activities	1.4	3.7	1.4	2.5	1.4	3.1
Overall score	22.6	52.2	26.0	51.6	24.3	51.9

The findings from assessments of changes in rangeland condition based on field studies (research-development project) and participatory assessments (FGDs) in both collective and private rangelands showed that all the indicators had very low to low satisfaction before or without a participative management of rangelands. However, there were huge improvements following implementation of the approach, with benefits shown in all indicators.

There was a common perception that rangeland conditions in terms of production and productivity had improved. For example, participative planned grazing helped to reduce the pressure within the grazing areas.

Also, the approach seemed to improve biodiversity. This can increase the ecosystem services of rangelands and improve the landscape and attractiveness of the pastoral territory.

In environmental terms, the approach contributed to minimize risks of desertification and degradation. For example, participative planned grazing helped reduce erosion, plant degradation, and so too land degradation and desertification.

There were similar findings for social indicators with a common perception that stakeholder and youth participation in rangeland management process had improved. In fact, there was improved interaction between the community and government agencies. Rangeland conditions improvements motivated youth and women to participate in the resting process. There were also social improvements in farmer income and living conditions, indirectly from livestock production.

In term of economic indicators, there was an increase in rangeland profitability and minimization of costs where this participatory approach was implemented.

Results showed that the perception of change in the impact of this approach was higher for private than for collective rangeland because of the complexity of the management process and the larger area of collective rangeland. The decision-making process and the interaction between private beneficiaries and technical services and researchers was easier and more effective compared to the collective situation.

G. Discussion

As consequence of the multiple changes in pastoral and agro-pastoral societies and in land tenure systems during recent decades, combined with climate variability and climate change, rangelands in Chenini are characterized by high competition and increased pressure on natural resources, especially natural vegetation.

Recognizing the need to promote effective restoration and inclusive coordination of these rangelands in a sustainable development perspective, researchers and technical services of the Ministry of Agriculture in Tunisia advocate the implementation of a approach incorporating participation of local pastoral communities and technical services of governmental agencies within pastoral development programs.

Several stakeholders are actively involved in the process in all phases (initiation/motivation, planning, implementation, and monitoring/evaluation) and several studies have assessed the impact of this approach on natural vegetation and the sustainability of rangelands in general. Participative planned grazing, for example, gives good results in terms of regeneration of vegetation and helps communities adapt strategies to cope with climate variability by jointly using the most productive rangeland each year.

These stakeholders already have a rich participatory management experience in the field where restoration interventions are an integral part of the management process from planning to monitoring and evaluation. Nevertheless, there are weaknesses in the approach generated by the socioeconomic dynamics and climatic variations, but also because it is a long-term process. Furthermore, the multiplicity of involved stakeholders, the complexity of interactions, and sometimes conflicting relationships among them around common pastoral resources, has led to problems in governance and management of rangelands. The users and CBOs (LMC, GDA, and UTAP) play crucial roles in implementation of restoration techniques in their rangelands but self-mobilization remains low. Implementation of this approach is still driven by the technical administration and researchers, generally after agreement of all concerned tribes and with the participation of CBOs. There are also conflictual interactions between users within the same tribe and between tribes, as the pastoral area and resources are scarce and unstable—in addition, boundaries are not always well defined.

Current mechanisms to resolve these conflicts between users of the same tribe or between tribes are no longer effective. Indeed, stability and success of rangeland restoration processes in collective rangelands requires that some key stakeholders grow in terms of influence and dominance. Additionally, improving the effectiveness of the existent advisory service provided by the technical services and the formal technical consultation committee is essential because these services have the advantage of bringing together all involved stakeholders to validate, follow up, and implement the action program. Furthermore, the creation of an institutionalized structure to manage rangelands is essential for increasing the effectiveness of these services.

The involved stakeholders (users, NGOs, CBOs, development agents, authorities, research, and farmers' organizations) decide on the selection of technical options to be implemented, as part of a participatory approach that is not yet effective. Thus, effective rangeland restoration is related to the degree or depth of involvement and participation of these stakeholders at various stages of the actions. They should participate in decision-making in the rangeland unit's main governance structures or processes based on stakeholders' groups (decision-making shared jointly between community and state).

Improving the effectiveness of the CBRM system contributes to strengthening the implementation of the restoration techniques. Indeed, the establishment of a new pastoral code in Tunisia, currently in progress, may open new horizons for improving the governance and the development of rangelands and pastoral societies.

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Annex

FOCUS GROUP DISCUSSIONS

Focus group discussion workshops were held with main actors to describe key successes, key challenges, and solutions that have been applied to those challenges, and major failures, if any. Changes over time in governance and management approaches were described. Focus group questions also attempted to address aspects of the impact of the approach, such as changes in the following:

Biophysical and livestock production impacts

- Rangeland condition,
- Livestock numbers and body condition,
- Livestock products,
- Livelihood diversification, and
- Livestock diversification (for example from cattle to camel and small stock).

Social impacts

- Empowerment of local people and participation by different stakeholder groups in decision-making,
- Social status of people/groups within the community,
- Participation between genders and different age groups,
- Mitigation of conflicts,
- Tenure and user rights over rangeland resources,
- Creation of employment and income earning opportunities,
- Coping strategies,
- Food security and nutrition, and
- Access to water and sanitation.

Effects on management capacity

- Rangeland management capability,
- Evidence-based decision-making,
- Local people implementing and maintaining technologies and practices for land management and restoration,
- Coordination and cost-effective implementation,
- Mobilization of financial resources for land management and restoration, and
- Knowledge and capacities of other stakeholders.

Ideally, a study based on this protocol should be accompanied by assessments of changes in rangeland condition based on field studies and remote sensing. These can also be accompanied by a participatory assessment of rangeland condition.