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*in*

Capone R. (ed.), Bottalico F. (ed.), El Bilali H. (ed.), Ottomano Palmisano G. (ed.), Cardone G. (ed.), Acquafredda A. (ed.)  
Pastoralism and sustainable development: proceedings

**Bari : CIHEAM**

**Options Méditerranéennes : Série A. Séminaires Méditerranéens ; n. 126**

**2021**

pages 259-269

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=00008190>

To cite this article / Pour citer cet article

AUTHA. **Territorial intelligence: a collective opportunity for sustainable pastoral development and good rangeland governance in South Tunisia.** In : Capone R. (ed.), Bottalico F. (ed.), El Bilali H. (ed.), Ottomano Palmisano G. (ed.), Cardone G. (ed.), Acquafredda A. (ed.). *Pastoralism and sustainable development: proceedings*. Bari : CIHEAM, 2021. p.259-269 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 126)



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# Territorial Intelligence: A collective opportunity for sustainable pastoral development and good rangeland governance in South Tunisia

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**Abstract.** Pastoralism is still considered an important economic and cultural aspect of the life of the Tunisian communities practicing agropastoral farming in South Tunisia. Our research on fundamental rangeland governance aspects showed that questions on “how to sustain rangelands and enhance their governance” and “how to develop pastoral areas” are highly interlinked. A research was carried out to explore these linkages based on the “territorial intelligence - TI” concept. We particularly aim to explore the opportunities to apply the TI (as reflected by more efficient pastoral development investments) as a wider framework to enhance rangeland governance through more efficient pastoral development actions and investments. A mixed methodology has been used combining both social network analysis and “prospective system” method. To this end, results show that the lack of communication between the main economic actors involved in the management of collective pastoral areas, the dominance of the local authorities on pastoral development program design, and the weak autonomy of community based organizations (CBO's) are the main challenge factors which could enhance harmony between rangeland governance and pastoral development.

**Keywords.** Territorial intelligence, collaborative intelligence, rangeland, governance, social network analysis, Tunisia

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**Résumé.** Le pastoralisme est toujours considéré comme un aspect économique et culturel important de la vie des communautés tunisiennes pratiquant l'agropastoralisme dans le sud de la Tunisie. Notre recherche sur les aspects fondamentaux de la gouvernance des parcours, a montré que les questions sur "comment maintenir les parcours et améliorer leur gouvernance" et "comment développer les zones pastorales" sont fortement liées. Une recherche a été menée pour explorer ces liens sur la base du concept d'"intelligence territoriale - IT". Nous cherchons en particulier à explorer les possibilités d'appliquer l'IT (telle que reflétée par des investissements plus efficaces dans le développement pastoral) comme un cadre plus large pour améliorer la gouvernance des parcours à travers des actions et des investissements de développement pastoral plus efficaces. Une méthodologie mixte a été utilisée, combinant à la fois l'analyse des réseaux sociaux et la méthode du "système prospectif". A cette fin, les résultats montrent que le manque de communication entre les principaux acteurs économiques impliqués dans la gestion des zones pastorales collectives, la domination des autorités locales sur la conception des programmes de développement pastoral, et la faible autonomie des organisations communautaires de base (OCB) sont les principaux facteurs de défi qui pourraient améliorer l'harmonie entre la gouvernance des terres de parcours et le développement pastoral.

**Mots-clés.** Intelligence territoriale, intelligence collaborative, parcours, gouvernance, analyse des réseaux sociaux, Tunisie

## I - Introduction

Pastoralism is one of the main production systems in the world's arid areas (FAO 2001). Over the years, pastoralism has shifted from nomadism to transhumance to agro-pastoralism and intensive livestock farming. Pastoralism, i.e. the use of extensive pastures on rangelands for livestock production, is an important economic and cultural way of life for between 100 and 200 million people worldwide. Extensive pastoral production systems cover about 25% of the earth's surface (Blench 2000). Rangelands can be defined as lands on which native vegetation consists mainly of grasses, herbaceous plants, or shrubs that are grazed or have the potential to be grazed, and which are used as a natural ecosystem for livestock and grazing wildlife production (Allen et al. 2011). In Tunisia, rangelands cover 5.5 million hectares of the country's total area (Gamoun et al. 2018). Three quarters of these rangelands are located in regions where the bioclimatic stage is changing from semi-arid to desert. This geographical importance is of socio-economic, political, biological and ecological importance. It is reflected in its involvement in the country's agricultural and animal production, the historical and social value of these rangelands, and the ecological biodiversity of the plant species encountered.

This activity plays an important role in the circulation of key ecosystem goods and services in drylands. Rangeland areas remain however vulnerable to the effect of climate change and are often exposed to management and governance problems. Complex land tenure systems add complexity to the way rangelands are governed and managed. Collective governance combined with lack of strong local organizations and institutions leads to major governance problems and stakeholders conflicts. Communication, and strong relations between actors/communities are necessary for maintaining good management and governance of natural resources. For the case of Tunisia, the different institutional reforms undertaken in the last century led to the disappearance of traditional governance mechanisms, usually based on strong communication and social leadership. The newly created farmers' associations are still lacking good communication and management skills.

The concept of territorial intelligence (TI) is derived from the "Economic Intelligence" (EI) theory. It refers to territorial governance processes, mainly related to the actors' and stakeholders' interactions and the territorial development. TI provides a set of approaches and tools that facilitate understanding of the territory and assist for knowledge generation and management for territorial development purpose (Meyer 2004). The TI proposes a framework that serves to consolidate the links between actors, create and activate networks in order to encourage knowledge sharing, cooperation and collaboration between the different parties involved in the global process of sustainable development of these territories (Bozzano 2009).

The objective of this paper is to provide an early highlight on relevant aspects of TI which can serve to enhance the effectiveness of pastoral projects and investments in South Tunisia, while ensuring greater sustainability and enhanced governance of rangelands. Local and regional social networks will be analyzed to reflect on the level and intensity of interaction of actors involved in pastoral development and rangeland management.

## **II - Economic and Territorial Intelligence as a Strategy for Local Development**

### **1.1 Economic and territorial intelligence**

There are several definitions of Economic Intelligence. Each society, according to its history, its cultural past, its geographical location, its natural or industrial resources may have a different definition of economic intelligence (Said 2006; Coder 2013). In France, economic intelligence was born early 1990s following the work of the “Commissariat Général au Plan” with Henri Martre's report in 1994, which made it possible to clarify the concept and give it a first definition (DUFAU 2010). In this report, EI was defined as “all coordinated research, processing and distribution actions of information useful to economic actors”. Local and regional authorities and administrations also play an essential role in optimizing information flows. The operational flow of information between companies, local authorities and administrations is a key factor in competitiveness against foreign competition, both offensively and defensively. Nevertheless, local and regional authorities are supposed to provide significant financial support to collect, compile and make available these economic-oriented information (Martre et al. 1994).

The concept of TI consists in the application of the principles of EI during a public action, in the service of the economic and industrial development of a given territory. It is a decision-making tool for local communities who would like to plan for their local development. TI presents a structured framework for researchers, actors and the territorial community to acquire a better knowledge of the territory, but also to better control its development. The appropriation of information and communication technologies, and of information itself, is an essential step for actors to engage into a learning process that will enable them take effective and efficient decisions (Girardot 2011). The TI approach is based on 4 important levers, including development of job-creating projects, anticipation of economic changes, disruptions and risks, the promotion of the attractiveness of territories and the animation of territorial development and social networks (Paillot 2016).

### **1.2 Territorial intelligence and local development of territories**

The emergence of the concept of sustainable development has changed the way problems are considered from a territorial perspective and made its management even more complex. It has become clear to those involved in the management of this physical and/or virtual space that mastering this complexity requires a better understanding of the territory and its natural endowments (resources). Thus, both qualitative and quantitative information will be relevant to consider. In Tunisia, there is growing demand for concepts and approaches of territorial development as results of new economic, social and environmental pressures (Meyer et al. 2018). TI methods and tools would provide the opportunity to confront the needs and demands of local stakeholders with operational solutions being available to meet these needs. In other words, the development of territories would mobilize all technical practices, devices and approaches for data collection and information processing and exchange, in a way that make the gap between the earlier needs and the respective available operational development tools, considered into the local development decisions (Haddad 2008; Slymen 2014).

### **1.3 Resource governance and territorial intelligence**

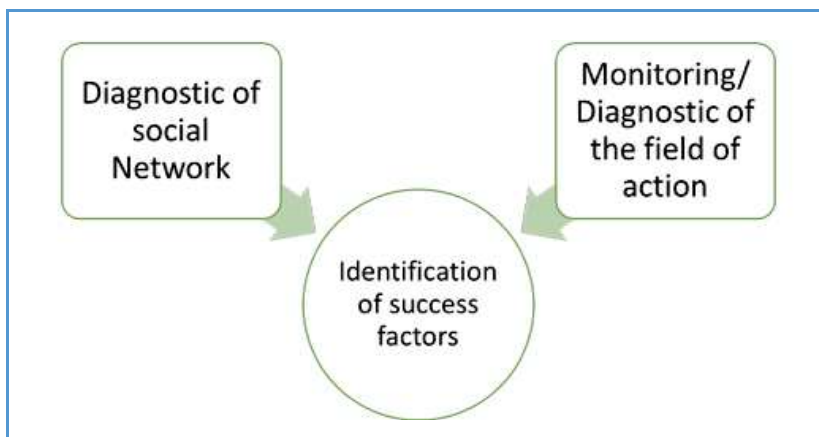
Participatory territorial governance complements representative democracy on subjects of local interest. Its ethical principles: participation, cooperation, coordination, consultation, learning, co-construction, transparency, equity and sustainability, have been identified as evaluation criteria

(Ugarte 2006). TI would contribute to mainstreaming dimensions of sustainable development by involving and stimulating each stakeholder to act into a broader perspective of "well-being of each and every one" (Conseil de l'Europe 2005). This would only happen through intensive exchange of information about the available resources in a territory, threats and opportunities to their sustainability, and collective engagement for their preservation. Doing so will make resources management and conservation part of the decisions about broader territorial development and planning.

### III - Materials and Methods

#### 1.4 Conceptual framework

This study was carried out, by applying TI principles on pastoral development in the governorate of Medenine in southeast Tunisia. A "monitoring framework" has been set up for data collection followed by data processing and analysis. The diagnosis of the field of development-oriented actions was through the application of the "prospective system" analysis of territories. A social network analysis was further performed to characterize current levels of social inclusion and transparency. Social network analysis is used to measure and analyze the structural properties of the interdependent dyadic relationship networks of interorganizational relations between organizations as a whole - including relationships such as joint collaborations, resource sharing, information sharing or even membership in common organizations (e.g., trade associations) (Steketee et al. 2015). We conducted interviews guided by a questionnaire with key stakeholders, internal and external experts in addition to direct observations of these networks (Figure 1).



**Figure 1:** Methodological approach for the study of pastoral TI (Source: Own elaboration, 2021)

The method used to analyse the field of action was the Prospective System method developed by Pacini (Durance, PACINI, and MIRENOWICZ 2021), but enriched by elements of the Meta method developed by the Goux-Baudiment (Auroy and Pacini 2018).

#### 1.5 Data collection

In this study, we combined qualitative data (sociometric questionnaire) and methods (interviews/observations/documentations, etc.) with quantitative analysis. Mixed methods make it possible to enrich the research design either upstream (enrichment of the questioning) or downstream (enrichment of the results) or at both levels (Aldebert and Rouzies 2014). The

study was also based on interviews and collection of archival data, documentation, scientific articles, previous studies (research results) and direct observations. The quantitative data collection method was in the form of a "Face to Face" interview assisted by a questionnaire, which aims at tracking the intensity of social relations and interactions. We have adopted the PAPI (Paper and Pencil interviewing) collection method. Direct data collection was done with PRODEFIL (Projet de développement agropastoral et des filières associées dans le Gouvernorat de Médenine) project members, managers, partners, and beneficiaries including farmers' cooperatives, associations, and land management councils.

## **1.6 Sampling procedure and statistical analysis for SNAs**

The choice of actors included in our SNA was based on network or snowball sampling. This is a nonprobability sampling that consists in choosing several actors that are considered important and that correspond to the desired profile and asking them to list the other actors needed for the network. Obviously, the snowball method does not provide a complete representation of the network because it necessarily introduces biases. Snowball sampling is generally used when the study population is not easily accessible (Wagner et al. 2017; Atkinson and Flint 2001).

For our network analysis (SNA), we used the Gephi software, version 0.9.2. Gephi is an interactive visualization and exploration platform for all kinds of complex networks and systems, dynamic and hierarchical graphics. Works on Windows, Linux and Mac OS X, Gephi is an open source and free software. Gephi is a tool for people who need to explore and understand graphs. Like Photoshop but for data, the user interacts with the representation, manipulates structures, shapes and colors to reveal hidden properties.

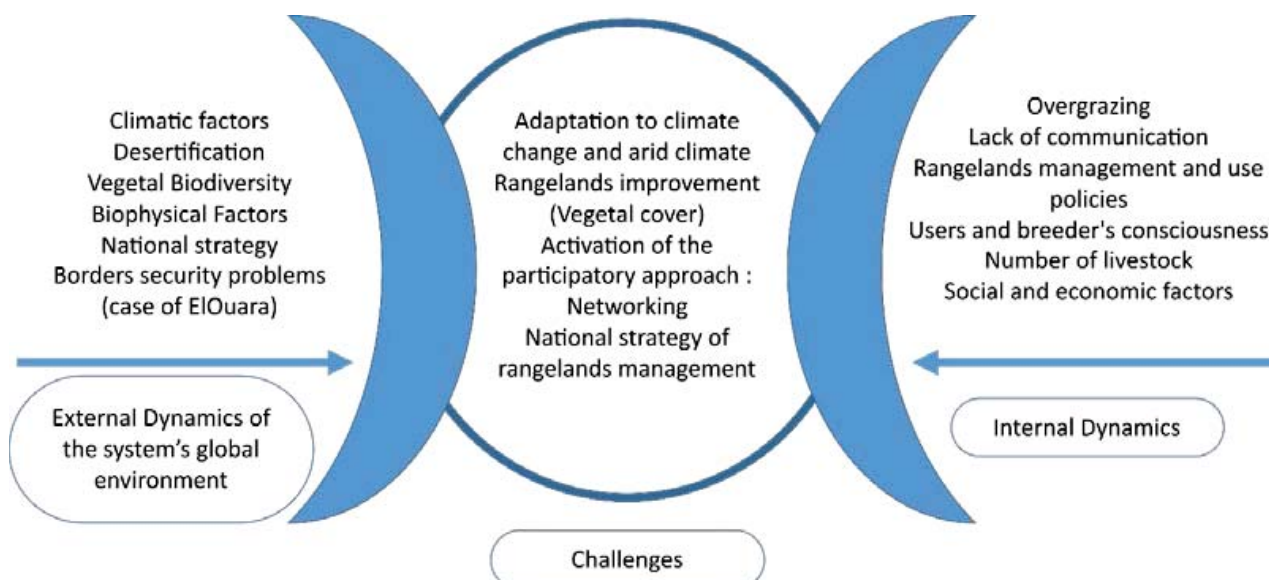
## **IV - Results**

The types of links and relationships between actors considered in our study area are rather cooperative (Boudedja 2013). The relationships between the actors are clearly non-hierarchical. Even in the case of administrations affiliations (subdivisions of the same administration), the nature of their operating status favors cooperative relationships rather than hierarchy. In most cases, these sub-divisions do have their administrative independence.

The analysis of the field of action consists of understanding key factors currently driving and guiding the development of pastoral territories in Medenine. We studied the territory from a prospective point of view by asking the following questions: What environmental and external factors, and what internal factors you consider as currently driving the development of pastoral territories in Southern Tunisia?

The assessment of rangeland system in the target area reveals that pastoral territories, like all other natural systems, are vulnerable to factors that can undermine their sustainable functioning, evolution, and development (Figure 2). The prospective system distinguishes two categories of factors: external factors, as part of global environment, and internal factors. Internal factors refer to factors that are produced by the system itself and external factors are those that come from the outside. Environmental factors are generally those factors where the intervention of actors is limited. The following figure presents the different studied internal and external dynamics of the studied pastoral system.





**Figure 2:** prospective system (source: own elaboration, 2021)

In arid regions, rangelands are facing several climatic and environmental challenges. These factors are mainly: climate change resulting from droughts, erosion, rainfall and desertification, which leads to the degradation of vegetation cover. External factors are not limited only to environmental factors. The national strategy and policy for collective land management and problems related to border areas, mainly the case of the pastoral territory of El Ouara in Ben Guerdane and the borders with Libya.

Environmental factors are divided into two main parts: biophysical factors, including plant biodiversity and soil resources, and climatic factors, which include precipitation, temperature, wind movement and ecosystem variability and the reaction of these elements to climate change (Ouled Belgacem et al. 2011)

In addition to the environmental (i.e. factors), a set of internal factors have been considered in the analysis. These factors summarize the socio-economic factors, in particular, the institutional structure of the actors involved in the territory, the appropriate management and exploitation method, the number of livestock, the point of view of users (herders and pastoralists), the accessibility and the situation of the infrastructure in these territories.

## Mapping Social Networks for pastoral development

Based on the selected factors outlined in the previous section, the adapted sampling method was able to identify 22 main actors intervening in the management and the governance of rangelands. This list of actors is not exhaustive and are clustered in nine main categories. The identification mapping of these actors taking into consideration their categories, fields of activity and interventions in the target territory are outlined in figure 3.





production AP and the forest administration (responsible for the rehabilitation of lands and the application of the forest regimen). Public actors always have the highest values. Local and regional authorities have a higher number of outgoing links than actors such as the Ministry of Defense presented by the army and the Ministry of Internal Affairs presented by the National Guard, which have presented a significant number of incoming links. The two GDAs responsible directly for the management and governance of collective rangelands in the governorate of Médenine, GDA Elouara and GDA Dhaher, presented different values from the other operating GDAs (29 GDAs). The PRODEFIL development project also presented a close value to that of CRDA. Other community organization stands out, the Tunisian Union of Agriculture and Fisheries (UTAP) also showed interesting results. The structure holds a central role between all farmers groups (GDAs<sup>5</sup>) and the regional administration and cooperation projects.

Community-based organizations (CBO's) have always been in a peripheral position. However, GDA Dhaher presented encouraging results (i.e., known for its activism). These results can be explained by the diversity of activities and services presented by the GDA. This GDA has successfully applied the resting technique of the collective rangelands, in partnership with the forest district and the PRODEFIL project. The GDA connects more with the land management councils (LMC) of Beni-khedache (CG6 BK1 to CG BK<sub>n</sub>). This can be interpreted by the good reputation of the GDA with the community and also the regional and local administration/authorities. Most of the other GDAs were created in the frame of the PRODEFIL project. These GDAs are characterized by a lack experience and vision. They are totally dependent on the activities managed by the project. Many of them are not aware of the choices of activities and development opportunities they can bring. The project has launched a program to support and strengthen these GDAs by organizing training sessions on administrative and financial management and specific missions (e. g. creation of a digital archive). The small number of GDAs created before the project were water management groups. The main activity was the management of water points in irrigated areas or public boreholes. This specificity of activity has created a distance between the GDAs and the other areas of intervention. Even after the change of their status to a more global and wider field (development group in general) and the arrival of PRODEFIL, these GDAs still focus on their initial activities. Supporting these organizations is also a bigger step towards smoother and sustainable development and better interaction between different actors to favorize the good management and governance of the rangelands.

The OEP is an organization that intervenes in the case of private rangelands. But it has shown remarkable interactions with the management of collective lands. This can be explained by the complexity of the agro-pastoral system in Tunisia and especially in the south. In arid and Saharan regions, livestock farming is an insurance and savings asset for farmers. Agricultural crops in these regions are subject to several difficult climatic and natural factors. The farmer therefore tries to prepare a second plan to overcome each year with a minimum of losses through this asset. This type of saving or management of the farmer's financial situation is mainly based on pastoralism. This strategy can only be effective if it is affordable with minimal costs and when it does not lead to more difficult situations when the farmer spends more to support the animals' feed and health. Farmers, therefore, use the natural resources of private and collective rangelands. The main role of the OEP is to organize and facilitate information and awareness days/campaigns on pastoral improvement at the regional level, but also to provide technical support on the plots of land for beneficiaries of the pastoral improvement program. In

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<sup>5</sup> GDA : Groupement de développement agricole

<sup>6</sup> CG : Conseil de gestion

practice, OEP's intervention is carried out through the multiple technical field visits of future members to determine the vocation of the plots and the types of development to be undertaken.

The land management (CGs) have a very limited centrality. These results are consistent with the results presented by Ben Saad et al. (2011). The authors emphasized the reduced role of collective land management councils. These structures are not suitable for managing collective land for distinct reasons (Ben Saad 2011). The LMCs are composed mainly and in a large number by farmers focusing on and not livestock farmers. It is true that most farmers in southern Tunisia have a number that varies of animals and adopt a mixed farming system, but this does not negate the fact that the opposite situation exists. There are farmers with a very large livestock population who use the totality of their private land for grazing. The cultivation of olive trees on these lands is a common practice and is used for the same insurance purpose. The objectives and motivations of these two groups of farmers to manage this land, are very different. A second factor underscores the inadequacy of these structures (the CG).

Despite the state's efforts to reduce the role of administrations in favour of local authorities, the results showed from this research illustrate the way on how the administration (and these technical services and the project) are the most central actors in the network. The Territorial Communities and local actors have maintained their marginal position. From the 1980s onwards, participatory approaches began to appear in agricultural and rural development programs. This approach aims to involve all stakeholders in the planning and implementation of its projects and development programs. It can be found in the design of development projects financed by International Fund for Agricultural Development (IFAD) and the European Union in the South East such as PRODESUD and PRODEFIL<sup>7</sup>. In Tunisia, the administration is the main decision-maker (Ministry). The adaptation of this participatory approach was intended to involve users, right land holders and local authorities in the planning of development activities. Although the application of this approach remains limited at the level of development programs, local actors encourage this initiative (PRODEFIL and PRODESUD cases). It is often regarded as a practical solution. Local authorities have stressed that the administration is still not aware of the differences and specific attractions and problems to each region and the involvement of local actors can facilitate the development and progress of activities. This lack of communication between the strategic actors of the natural rangelands contributes to the loss of the real contribution of development projects such as PRODEFIL. A project with such an investment figure is poorly assessed by the local population because of this weak coordination. The involvement of local stakeholders in a timely and informed manner could be the key to the success of this project.

## V - Conclusion

The lack of communication between the main economic actors involved in the management of collective pastoral territories in the governorate of Médenine, located in south-eastern Tunisia, presents a main challenge and constraint to the development and good governance of the territory. The purpose of this study is to establish a better understanding of the existent network and the territories main attractions and threats.

First, we carried out a diagnosis of the field of action; the pastoral territories of the governorate. The governorate's rangelands present several internal and external factors that have led to the production of major challenges. Internal factors mainly include socio-economic factors and

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<sup>7</sup> PRODEFIL : Projet de développement agropastoral et des filières associées dans le Gouvernorat de Médenine

factors related to land management. External factors include factors related to national and social security policies on the one hand, and environmental factors such as climatic, biological and ecological factors on the other. The main issues identified were the challenges of adaptation to climate change, the adjustment of management and exploitation methods to promote the conservation of these natural resources and the issues related to the network of actors and the lack of communication.

Secondly, a social network analysis (SNA) was carried out. The results showed that the regional and local administrations are the most central actor. Despite the state's desire to reduce the dominance of these administrative bodies, local authorities, community-based organisms retain their weak centrality and peripheral roles. The implementation of a capacity development plan for these organizations through training sessions is one other urgent step.

Finally, as this shows, the Governorate of Medenine is a unit in a more global and a wider territory regarding rangelands and agro-pastoral system. The rangelands in Medenine are not isolated from the other governorates where these pastoral territories extend. Our research focused only on this limited region. Therefore, a more comprehensive study of the South-East pastoral territory can be carried out to this extent. The list of actors presented in the study is not exhaustive. An in-depth study in which all actors are involved and where interviews must be conducted with each actor is needed. It can also provide an opportunity to analyze the nature of the links between actors and present a precise categorization of these links.

## Acknowledgement

This work is carried out as part of research collaboration agreement between ICARDA and IRA de Médenine, Tunisia. It is undertaken in the framework of the CGIAR Consortium Research Program (CRP) on Livestock with additional support from the CRP-PIM (Policies Institutions & Markets, under Flagship 5, led by the International Food Policy Research Institute and implemented by ICARDA in Tunisia). Authors express their thanks to the managers of the three CRDAs (Tataouine, Kebili and Medenine) and to the staff of the three pastoral development projects (PRODESUD, Tataouine and Kebili; PRODEFIL in Medenine) for their kind collaboration during the discussions and the data collection.

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