

Pastoralist conservation: Local Ecological knowledge and collective action for grassland conservation in Sierra de Segura (Spain)

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Abstract

Even if Pastoralism is not practised anymore by a majority of families in the Sierra de Segura (south-eastern Andalusia, Spain), it is still considered a paradigmatic way of life and management of its highlands and a key cultural heritage deeply rooted in local identity. In this article we explore two pastoral communities of this region, Santiago and Pontones, with their body of situated knowledge of the territory and natural resources, which helps pastoralists to organize their livelihoods, while requiring collective organization to manage access to grasslands. Through an ethnographic research based on participant observation and in-depth interviews, we explore the knowledge system, practices and institutions relevant for the use and maintenance of mountain pastures. The results show how local governance strategies and management of pastures are organized, among other drivers, to be able to adapt over time to change. On the other hand, collective actions have a notable social component to enable access to pastures. However, the community faces challenges for its sustainability such as environmental change, low generational turnover and the diminishing presence of women, very particularly in pastoralist practice and decision-making.

Introduction

Pastoralism is an important livelihood for millions of families around the world (Blench, 2001; Scoones, 2020), being rangelands one of the most extended (if not the most) of Earth's land uses in terms of surface (Reid et al., 2014). Pastoral communities, for their mobility and ability to use scarce resources especially in arid and semi-arid environments (Blench, 2001), such as the Mediterranean basin (Blondel, 2006), still currently manage large areas of territory through collective rules established on mobility, herd size and protection of areas for seasonal use (Herrera et al., 2014). This is exactly the case, especially in the south of Spain (Palomo-Campesino et al., 2018). The conservation of ecosystems based on knowledge and collective decision-making, can imply benefits both for the interests of the communities and for the maintenance of biodiversity and ecological functions of global interest (Berkes, 2004; Borrini-Feyerabend et al., 2014; Pretty et al., 2009). Adapted from the most accepted definition of traditional ecological knowledge made by Berkes, in this study we define traditional agroecological knowledge (TAeK) as a cumulative body of knowledge, traditions, practices, beliefs, institutions, and worldviews acquired through the direct dependence between a society or cultural groups and their agroecosystems, that is transmitted in generational way, adapting and enriching over the time (Berkes, 1999; Calvet-mir et al., 2018; Toledo, 2002).

Considering the role of local communities in the management of the territories they take advantage of and govern (Ostrom, 1990) and most grasslands of the world have been communally governed and pastoralists are still adapting to many socioenvironmental changes (Galvin, 2009), the main aim of the research is to define how forms of local governance incorporate ecological knowledge for the management of grasslands and the whole livestock system. Thus, management and decision-making is hypothesized based on ecological knowledge, practices and local institutions, capable of developing effective mechanisms of control and management for the optimal state of pastures and adapting management strategies to the different changes that community faces.

Three aspects of this body of knowledge are addressed in this article: 1. Ecological knowledge of characteristics and key functions of pastures and spatial mobility along seasons; 2. Configuration of local institutions for regulated access to grasslands; 3. Collective strategies for environmental and socio-economic adaptation.

Methods and Study Site

The case study is located in the mountain region of the Sierra de Segura, in the south-east of Spain ($38^{\circ}01'05.5''\text{N}$ $2^{\circ}42'25.5''\text{W}$; Figure 1). Rangelands are located between 1.400-1.900m (i.e. subalpine areas) with snowy and cold winters with temperatures reaching up to -15°C , and dry and hot summers with temperatures reaching up to 35 and 40°C . The communal pastures represent about 30,000ha, managed by 90 shepherds, organized into two formal governance institutions (SAT Santiago and SAT Pontones). However, its management affects other areas, since approximately 67% of the shepherds practice transhumance to winter lowlands, so their decisions and activities go beyond the Sierra. Since its colonization by the Crown of Castilla during the XIII century, the local communities had their own rights over the territory, recognized by medieval ordinances (E. De la Cruz, 1980). Nowadays, the shepherd's communities are most often represented as a case of traditional pastoralism, even if strongly influenced by processes of globalization, especially at economic but also cultural level.



Figure 1. a) General localization of study site, within a mountain area in the south-east region of Spain. b) The main rangeland area in Sierra de Segura, highlighting Pontones' grassland area (green) and Santiago (red).

Data collection is based on: a) an ethnographic phase, through participant observation and a daily notebook accumulating up to 12 months throughout all seasons; b) a phase of in-depth interviews ($N=17$), around rangelands ecosystems knowledge and pastoral practices, local governance institutions, climatology, change perception and challenges, to capture the three bodies of knowledge above mentioned. While participant observation comprehends not only livestock farmers, but also their families and socialization spaces and rangelands, interviews were made to people directly related with animals and pastoralist spaces. Both daily notebooks and transcribed interviews were imported into and coded in QSR NVIVO (QSR International, 1999).

Results

Our findings show that the current pastures of the Sierra have evolved during the last 40 years, going from a landscape with a large subdivision and combination of agro-pastoral systems to a landscape with a large majority of grassland and a reduction of cultivated areas as well as a concentration of agricultural plots in larger ones. At the same time, livestock farming has gone from an extended family model and small herds (50-100 sheep) to a much more individualized model, centered on middle aged and older men, and with herds increasing in size (average of 650 sheep, maximum of 1,400), which at the same time does not compensate in any case the overall livestock decrease. Although the production has been intensifying over time, the livestock farming in Sierra de Segura is still considered by herders as a traditional system, for its seasonal mobility and pastures' uses. Beyond this contextualization, and following aspects of knowledge that we have explored, we define the relationship between shepherds and Sierra' grasslands through three components.

Ecological knowledge of pastures and spatial mobility

The pastures of the Sierra are perennial herbaceous vegetation that dries up in the warm Mediterranean summer, even if it is still consumed by flocks beyond its more flourishing moments of Spring and Autumn when it is also consumed. Shepherds especially value perennial grasses, which guarantee food throughout the summer season in a moment when the lowlands have dried up and there is not much more left, assuring so the continuity of the pastoral system and which, for this reason, without these summer pastures would collapse. But leaving the pastures in mid autumn before the snows does not guarantee a very strong rest and restoration of the grass by itself, being spring the critical period for its growth and reproduction (flowering

for the continuity of the pastures year after year). Therefore, based on the knowledge of the productive periods of the pastures, herders must therefore take care to keep the area they will use in good condition throughout the summer and allow the transhumant flocks to reach their grazing areas taking advantage of all the spring production when their specific zones have been respected during their absence. Self-imposed sanctions are contemplated by the livestock community and these are of monetary nature in case of non-compliance (6€ per head of cattle of the owner that made the infraction), or even exclusion from the group in case of repeated non-compliance. At the same time, mobility to winter areas is encouraged, through the payment of a higher price for those farmers who decide to spend the winter in the Sierra (1€ more per head of cattle that remain in the Sierra), which comes to add to the costs of the food they must buy to maintain the flock). But methods for monitoring the state of the pasture or *an adaptive regulation* of spaces and dates of use of the pastures are not included.

Regulated access to grasslands

The main function of local governance institutions (table 1) is to distribute access to pastures reasonably and relatively democratically. The process is aimed at the use of pastures by local herders, through agreements and recognition by institutions on which access to pastures depend.

Table 1. Traditional institutional arrangements in the area based on interviews and the review of shepherds internal regulations).

General information		
Name	SAT Santiago	SAT Pontones
Members	60 (but only 25 had plenty rights and duties in governance process)	25 (all members has full rights and duties in governance process)
Grasslands surface managed	≈20.000ha	≈10.000ha
Institutional arrangements and decision-making over land access		
Function	Access to grasslands is only permitted to flocks of SAT members or must be approved by assembly.	
Principal unit of decision making	The assembly of local livestock farmers must approve the access price, according to a negotiation with land owners (Spanish state, particulars and municipality). All members must be born or live in the municipality.	
Internal rules for grasslands use	Free mobility within Santiago' grasslands zone, even if de facto most shepherds stay in their traditional zones.	From May 1st each flock must be within their zone. Shepherds that take their flocks to grasslands before that date should pay an extra fee per animal.
Water use and other infrastructures	Both communities provide access to all pasture areas and water points, softening possible grievances between farmers due to the different location of their areas.	
Sanctions	Economic sanctions for not respecting the rules related to grasslands' uses but also due to non-attendance at assemblies or arrears in pasture payments; land-access exclusion for extreme cases.	
Reciprocity norms (non-formal agreements)		
Mobility	The sense of community is shown in flock mobility cooperation, which goes beyond kinship and implies neighbourhood relations.	
Mutual respect	Even if there are formal sanctions for the invasion of other shepherd's area, most conflicts are resolved by the intervention of key SAT members in a collaborative way.	

First, competition between herders at the individual level is avoided, since the right to graze is only collectively obtained; and second, it is difficult to take advantage of it by large landowners, thanks to the power that all the shepherds manage to exercise together. A price is established per animal that accesses communal pastures (about € 8-9), so that livestock farmers with large herds must pay more than ones with smaller herds (presumably with fewer economic resources). The final amount collected is then paid (a sort of rental of these highlands every 5 years).

Considering the sociocultural context, it is necessary to highlight that a lot of the herders, mostly shepherds, are elders and the community is progressively getting older, almost without a generational shift. Equally, we

highlight the null presence of women both in the main pastoralist activities and effective decision-making, while they are said to be much more present before.

But governance institutions are not the only way for socioecological management. The identity, and sense of belonging to a group and a territory contributes to mutual collaboration and respect between people and to grasslands. Likewise, cooperation in pastoral tasks and the collective use of infrastructures such as drove roads or water points, is a key point, and continues to require mutual support and collective organization.

Collective strategies for environmental and socio-economic adaptation

The experience and perception of the shepherds gives an account of the challenges for the Sierra, being the increasing periods of drought the most critical environmental risk. Climate change is particularly perceived as a critical process in this fragile environments of extreme climatic conditions, not only for the productivity of the pastures, but also for the maintenance and health of the herds (e.g. dry grass needs large amounts of water; heat problems can bring in parasites etc.). Several strategies are adopted to solve such climatic risks and to minimize the impacts. For instance looking at water deficit, as one of the major concerns in the area, shepherds don't change the dates of access in long periods of drought, but they try to guarantee access to water for all herds. Due to the geological characteristics of carbonate rocks (karst formations), surface water is very scarce in the Sierra, where, according to informants, numerous water sources have dried up in recent decades. To minimize that and soften the effect of droughts, the communities have installed ponds and troughs, usually used by not all flocks but collectively paid and kept, so that those most affected by droughts do not have to assume it individually.

But local ecological knowledge and governance institutions are not the only component that outlines the relationship between livestock farmers and grasslands. The herders express always the great impact of European Common Agricultural Policy (CAP) and subsidies in their activity, which affects the relationship with the territory and the dynamics of governance institutions, determining the amount of livestock that can access pastures. Once again, the collective organization plays a decisive role here, in adapting resiliently every new CAP, ensuring that the group of shepherds organises at each time so as to have enough allocated surface area to receive subsidies that, on the other hand, herders depend on to maintain their way of life.

Discussion

The case studied represents a complex system of communal grasslands use, considering that who maintains and takes advantage of them does not own the land, and still effectively manages it. The lack of recognized rights creates tensions and uncertainty to carry out actions. However, the two communities of herders establish a series of formal norms and informal relationships, product of a deep historical and cultural legacy and adaptations to the current ever evolving context, that result in benefitting their economies and livelihoods as much as the maintenance of the pastures.

Loss of land tenure is identified as one of the key challenges pastoral communities are facing (Galvin, 2009; Reid et al., 2014) and this case study provides an example of communal governance without property that puts communality at a great risk. Land tenure characteristics imply that acting otherwise would increase the price of pasture and leave many pastoralists out of grasslands access possibility, and therefore, the main guarantors of their conservation. At the same time, having to dialogue with other institutions can encourage the community to organize and act collectively. Similarly, these agreements can also help to value and conserve them, not overgrazing beyond their ecological capacity. This is especially relevant considering that we don't find resources monitoring strategies developed by shepherds, such as an explicit recognition of vulnerable areas or recovery strategies for degraded pastures (Herrera et al., 2014).

Finally, it is clear that the low presence of women and youth in both pastoral activities and decision making spaces is a problem for the present and future sustainability of the system. The issue is not only on how the community works, but by whom it is constituted.

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