Rangeland degradation and adaptation of livestock farming in the Algerian steppe: The case of Hadj Mechri (Wilaya of Laghouat)

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Rangeland degradation and adaptation of livestock farming in the Algerian steppe: The case of Hadj Mechri (Wilaya of Laghouat)

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Abstract. The Algerian steppe used to be one of the most important regions of North Africa where farming was mainly based on rangeland grazing. Since the 70s, it has faced many socio-economic and biophysical changes in part caused by recurring droughts. Ecologists and farmers concur that rangeland forage productivity and surface areas have decreased. Our analysis focuses on production systems and the adaptation of their feeding practices bearing in mind the following question: to what extent does grazing still contribute to animal feed? Our research was conducted in the town of Hadj Mechri (Laghouat Wilaya) in the heart of the Algerian steppe. Our hypothesis was that the livestock in the study area required between a quarter and a third of supplementary feed (including barley grain). Results suggest that in this area (65,270 ha), rangelands can cover the needs of animals 0.33 eq. sheep ha^{-1} yr^{-1}. As the total number of sheep is 55,940, the stocking rate of the rangeland should be 0.85 eq. sheep ha^{-1} yr^{-1}. Therefore, to release grazing pressure, farmers implement two strategies and practices: (i) they regularly adjust the size of their herds; and (ii) they provide high levels of supplementation, i.e. >60% of the herd feed needs.

Keywords. Grasslands – Carrying capacity – Desertification – Agro-pastoralism – Livestock herding system.

Régression des parcours et adaptation des élevages en zone steppique algérienne

Résumé. *La steppe algérienne était une des plus importantes régions d'Afrique du nord où l'élevage reposait essentiellement sur la pâture de parcours naturels. Depuis 1970, elle connaît de nombreux changements d'ordre socioéconomiques et biophysiques notamment des sécheresses récurrentes. Les écologues comme les éleveurs s'accordent sur la baisse de productivité des parcours et la diminution de leurs surfaces. Ces parcours régressent, tant en surface qu'en productivité fourragère. D'où notre questionnement qui a porté sur les élevages et l'adaptation de leurs systèmes d'alimentation, avec une première question: Quel est la contribution de la pâture à l'alimentation des animaux ? Notre recherche a été menée dans la commune de Hadj Mechri (Wilaya de Laghouat). Nous avons mené nos recherches avec comme hypothèse que le cheptel en place dans notre commune d'étude devait recourir à un quart voire un tiers d'aliments complémentaires. Nos résultats tendent à montrer que dans la commune étudiée (65270 ha), les parcours peuvent en moyenne satisfaire les besoins des animaux pour 0,33 eq. ov. ha^{-1} an^{-1} Compte-tenu que l'effectif total est de 55940 équivalents ovins le chargement sur les parcours devrait être de 0,85 eq. ov. ha^{-1} an^{-1}. En conséquence, pour soulager la pression pastorale les éleveurs ont recours à deux stratégies et pratiques : (i) ajuster régulièrement la taille de leur troupeau ; et (ii) apporter de forts niveaux de complémentation, supérieurs à 60% des besoins alimentaires de leurs troupeaux.*

Mots-clés. *Parcours steppique – Charge pastorale – Agropastoralisme– Système d'élevage.*

I – Introduction

The Algerian steppe, with about 20 million ha, remains an important area for grazing (16.8 million sheep and 1.6 million goats in 2011). Over the past four decades, it has faced many socio-economic and biophysical changes (more severe recurring droughts, desertification and erosion). Scientists and farmers report that grassland surface areas and productivity have been decreasing (Aidoud *et al.*, 2006; Nedjraoui and Bedrani, 2008; Saidi and Gintzburger, 2013; Daoudi *et al.*, 2013).

These overgrazed lands have been shrinking both in terms of surface area (crops replace pastures, land-use planning, urban development) and forage productivity. Hence, the question is how farmers adapt their feeding system to changes and what the current proportion of pasture is in the feed. This study aims at answering these questions in the context of the central steppe of Southern Algeria, in Hadj Mechri town, Laghouat Wilaya (District).

II – Materials and methods

The vegetation survey was carried out in spring 2007, in the steppe of Hadj Mechri (33°51' N, 01°20' E, altitude 1200 m) at the foothills of djebels Amours (Saharan Atlas) (Fig. 1). It covers 65,270 ha and has about 6,700 inhabitants, 80% of which live in scattered areas. The arid climate, with cold variations (in the sense given by Emberger) of the study area is characterized by an average annual rainfall of 315 mm (El Bayadh station from 1971 to 2008), with high interannual variability of rainfall (variation coefficient of 31%). The ombrothermic diagram shows a lengthening by one month and a half of the dry period between the beginning and the end of the 20th century.

Seventy-four phytoecological samples were collected according to the "quadrat points" method (Daget and Poissonet, 1971), to obtain specific frequencies of species. These frequencies were similar to recoveries. Vegetation groups were determined by a factorial correspondence analysis and a hierarchical cluster analysis using ANAPHYTO software developed by Briane (1992). Productivity and capacity were obtained by calculating the pastoral value, taking into account the specific contributions and the specific quality index (Daget, 1995). Livestock numbers were obtained by crossing administrative census data with data from our investigation.

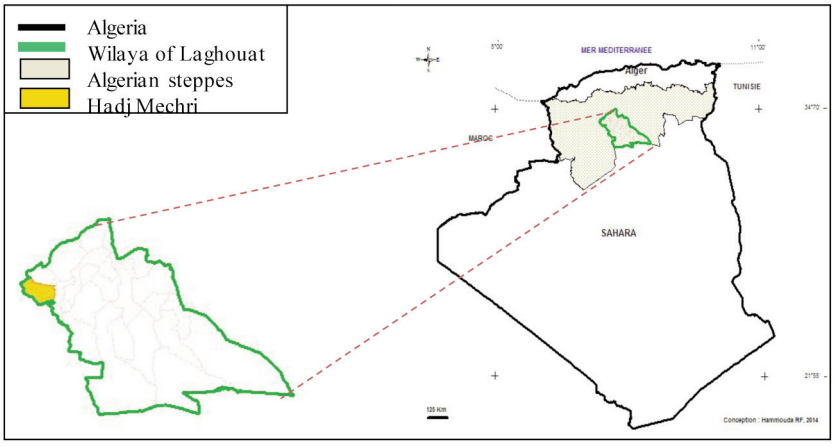

Fig. 1. Location of the study area.

III – Results

1. Definition of plant communities and rangeland condition

The statistical treatment of floristic data helped to characterize four types of rangelands dominated by:

(i) Alfa grass (*Stipa tenacissima*), which is under high anthropogenic pressure;

(ii) Sparte grass (*Lygeum spartum*), because of its high ecological plasticity it can colonize a wide range of soils; the process of alfa steppe degradation is accompanied by eolian sand deposits and a change towards the establishment of a Sparte steppe (Aidoud and Aidoud-Lounis, 1992);

(iii) Drinn (*Stipagrostis pungens*) on sandy soils. Rangelands tend to expand a great deal because of the high anthropic pressure, such as plowing which promotes wind erosion.

(iv) A mix of Alfa, Sparte, and Chih (*Artemisia herba-alba*), as well as *Noaea mucronata* which exemplifies steppe degradation.

The analysis of the state of the rangelands, based on pastoral productivity (Table 1) shows that three quarters of them are undergoing severe to very severe degradation, to the point that any attempt to restore them would be to no effect (Aidoud *et al.*, 2011).

Table 1. Evaluation of the rangeland pasture condition

Rangeland condition	%
Fairly good	27
Moderately degraded	39
Degraded	9
Severely degraded	25

2. Pasture potential of rangelands

The estimation of the carrying capacity shows that grasslands can meet the needs of the livestock in the conditions of 0.33 eq. sheep ha^{-1} yr^{-1}. However, the total number of eq. sheep in the town is 55,942 (Table 2), which translates into 0.85 eq. sheep ha^{-1} yr^{-1}. The difference between the feed supply of the steppe and the livestock feed demand shows that the grazed pastures only cover one third of the needs of the animals, a result similar to that reported by Kanoun *et al.* (2013) in Djelfa region.

Table 2. Livestock distribution and their equivalent sheep

Animal species	Size herds in the study area	Eq. sh.	Equivalent number of sheep
Ovine	45,330	x 1	45,330
Goat	4,640	x 0.8	3,712
Cattle	1,380	x 5	6,900
Total			55,942

IV – Discussion

The study of the vegetation showed pasture degradation caused by anthropogenic actions. This degradation has been amplified by the adverse climatic conditions of the past decades, and by the increase in livestock, land fragmentation and changes in rangeland use (Bessaoud and Tounsi, 1995).

The portions of pasture to the animals (30-40%) keep decreasing compared to the 80s (50-60%) (Le Houérou, 1985). This highlights the ability of farmers to shift from a pastoral system to a system more and more based on grains and other purchased feed. Feed supplementation has become a major practice in as much as farmers have to adapt to both the decline of grasslands and productivity. In 2003, Bensouiah reported that 82% of the farmers in Djebels Amours area used concentrates.

Assessing the contribution of pastures should also include the levels of self-adjustments by farmers through the purchase or sale of livestock based on the season. During droughts and tied-over periods, farmers are under pressure to sell some of their animals so as to have enough feed for the rest of the herd. The state of total decapitalization is easily reached by small farmers in the event of persistent drought (Daoudi *et al.*, 2013). Mobility should also be included in the analysis to understand the seasonal contribution of rangelands. Indeed, movements to search for new forage resources is a strategic option that grants both more flexibility in feed risk management and a rest period to ensure grassland regeneration.

V – Conclusion

This study shows that steppe-type rangelands are still much used even if they are less productive. However their contribution to the animal feed has been decreasing steadily (< 30-40%). Farmers have been adapting their farming systems, but they are vulnerable to drought and even more so to variations in the price of concentrates. In the wake of this work, further functional analyses will be conducted on the use of rangelands in relation to the seasons and within the overall framework of the feeding methods currently applied. Future research will aim to identify methods that enhance steppe resources while ensuring its renewal within a more efficient integration of the feeding systems still in the making.

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