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Intensification of pastoralism as a driver of degradation in the Algerian steppe

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Key words: Algerian steppe; pastoralism; surveys; transformations; degradation

Abstract

Land degradation linked to pastoralism use has been a worldwide concern for decades. A biological approach has often been used to understand such phenomena, usually disregarding economic and social factors. Radical transformations of pastoralism at the Algerian steppe constitute a good case study to provide an integrated understanding and to better orient development in other pastoralist areas across the world. Different actions by the public sector since the 1960s, as well as the land legislation adopted and the strong agricultural subventions during 2000-2010, have favored a massive conversion of land and resource management. This translates into conversion of many pastures into crops and overuse of the remaining ones.

In order to understand the consequences of such changes into natural resources (pasture, water and soil), 236 field surveys were conducted (quantitative as well as qualitative) between 2006 and 2017. They were accompanied by phytoecological samplings to estimate impact on vegetation recovery, biomass and pastoralist production.

While nomadic pastoralism practicing north-south transhumance and based on sheep and goats has declined, other more sedentary types of pastoralism (based on sheep, goats or cattle) combined with intensive crops have emerged. Family-related or paid herders live on tents during herd mobility, and live in a fix household the rest of the year. Grass represents just one third of the total livestock intake and barley crops, previously found only in valleys, are today mechanized and expanded into fragile rangeland soils. Vulnerability to climate variability and cereal price fluctuations in the international market is consequently higher. The higher cereal consumption increases fiber demand in animals, devastating plant cover and triggering land degradation.

Specific mechanisms should be envisioned to prevent severe environmental impacts associated with pastoralism intensification. This lesson should be applied to other development interventions currently envisioned by different stakeholders who propose increase of animal feeds.

Introduction

The problem of land degradation has consistently disregarded the integration of knowledge from different disciplines. On the one hand, land degradation linked to pastoralism use has been a worldwide concern for decades. A biological approach has often been used to understand such phenomena, usually disregarding economic and social factors (Manzano et al. 2021). It is well known that pastoralists have powerful elements among their local knowledge to monitor the status of pastures and prevent land degradation (Oba 2012, Jamsranjav et al 2019), and that they still apply such knowledge in spite of modern pressures and constraints (McPeak 2005), thereby showing the potential of integrating social, economic and environmental factors in understanding such phenomenon (Manzano et al. 2021). The Economic and Social Council (ECOSOC) of the United Nations (UN) believes that sustainable development must focus on the three pillars of economic development, social inclusion and environmental protection (UN, 2017). According to Nunes et al. (2013) the sustainability of agricultural and livestock systems will depend on their economic performance, competitiveness factors and the preservation of the environment. In addition, the choice of livestock production system (Flysjö et al., 2012), and different animal feeding systems can impact significantly on the environmental performance (Bartl et al., 2011).

Calls for widespread use of supplementary fodder arise both from the pastoralist civil society (RBM and CEDEAO 2015; Nugteren and Le Côme 2016:31) and from international organizations (FAO 2016; Nugteren & Le Côme 2016) as a means to mitigate droughts and increase food security in the short term. However, past massive interventions based on the widespread use of supplementary fodder have been identified as a trigger for a change of state in North African rangelands (Hazell et al 2001), which could be the root cause that

undermines their productiveness in the long term (Nedjraoui 2004). Radical transformations of pastoralism at the Algerian steppe constitute a good case study to provide an integrated understanding of such interventions and to better orient development in other pastoralist areas across the world.

Indeed, since antiquity, the Algerian steppe has been controlled and managed by nomadic tribes who moved (transhumance) over vast territories, which made it possible to maintain a certain balance between limited natural resources (rangelands) and a mode of exploitation (pastoralism) adapted to the environment. During this time the pastoralists and their herds of sheep and goats moved seasonally in summer to the plains of the North (summer transhumance) and in winter to the Sahara (winter transhumance) in search of pastures rich in fodder. This livestock was essentially based on the direct exploitation by herds of the natural fodder produced by the rangelands of the steppe, the plains of the North (Tell) and the Sahara. This method of managing transhumant herds made it possible to fully exploit limited forage resources, dispersed in large and varied bioclimatic zones, and to ensure a relative balance between these resources and the needs of the herds.

For six decades, this steppe has undergone radical changes in the ways in which the land is used and the way people live. Indeed, different actions by the public sector since the 1960s, as well as the land legislation adopted and the strong agricultural subventions during 2000-2010, have favored a massive conversion of land and resource management. This translates into conversion of many pastures into crops and overuse of the remaining ones.

Methods and Study Site

In order to understand the consequences of such changes into natural resources (pasture, water and soil), 236 field surveys were conducted between 2006 and 2019 with agro-pastoralists in the center, east and west of the Algerian steppe. In this semi-arid climate area (100-450 mm/year) of 20 million hectares, sheep and goat livestock is widely practiced by population on the Alfa (*Stipa tenacissima*), Mugwort (*Artemisia herba alba*) and Sparth (*Lygeum spartum*) rangelands. Rainfall is irregular and temperatures reach 40 ° C in July, and drop below 0 ° C in January. The surveys were carried out in the regions of Djelfa, Laghouat, M'sila, Tiaret and El Bayadh. A non-probability, predefined and reasoned sampling was adopted. Also, around twenty interviews were conducted with various stakeholders involved in agro-pastoral activity: agricultural services, chamber of agriculture, veterinarians, forestry services, academics, and notables. Workshops bringing together all the stakeholders were subsequently organized. In addition, nearly three hundred phytoecological surveys were carried out in the alfa steppes of western Algeria (El Bayadh region), in situations of free access and controlled grazing, to assess the forage potentialities represented here. by the phytomass (expressed in Kg of dry matter / ha / year).

Results

While nomadic pastoralism practicing north-south transhumance and based on sheep and goats has declined, other more sedentary types of pastoralism (based on sheep, goats or cattle) combined with intensive crops have emerged. Family-related or paid herders live on tents during herd mobility and live in a fix household the rest of the year. Grass represents just one third of the total livestock intake and barley crops, previously found only in valleys, are today mechanized and expanded into fragile rangeland soils. Thus, all the farms surveyed cultivate fodder cereals, generally harvested, and a few (21) cultivate irrigated, grazed or wilted alfalfa. The fodder produced is generally intended for farm animals. The herders of the steppe seek to appropriate collective lands in order to carry out intensive breeding and agriculture, subsidized and entitling the concession. Vulnerability to climate variability and cereal price fluctuations in the international market is consequently higher. The higher cereal consumption increases fiber demand in animals to prevent acidosis (Humer et al., 2015), devastating plant cover and triggering land degradation.

The measurements carried out on the variation of the phytomass of perennial species in the western Algerian steppe in the region of Rogassa show that the permanent vegetation cover (perennial) is always relatively more conserved in controlled grazing areas where the rangelands are relatively less degraded. This is linked to the fact that uncontrolled rangelands suffer from degradation by overgrazing, more particularly during periods of drought such as that of 1993 to 2003 and 2016-2019. Agro-pastoral activity in the Algerian steppe is now facing a difficult socio-economic and ecological situation and is currently in crisis. The latter is particularly damaging to small farmers, whose lack of income forced them to sell their cattle at the slightest trouble, and many had to migrate to the city especially during periods of relative drought and high prices of purchased fodder, as in 1993 -2003, and in 2016-2019. The latter practice, in addition to livestock farming activities (sheep, goats, cattle) and crops, other wage activities (guarding, workers) and commercial, working especially

for self-consumption and direct (informal) sale of products. processed (cheese, butter, skins, charcoal, etc.) or not (olive oil, vegetables, etc.).

Discussion [Conclusions/Implications]

In short, we are now witnessing a decline in the old mode of collective management and exploitation, which is relatively regulated and has evolved into competitive family and individual modes of exploitation. Degrading intensive agro-pastoral production systems are emerging in the steppe today. The Algerian steppe has been experiencing desertification over large areas for several decades, and the livestock feed provision can be a major source of this degradation. The abandonment of transhumance and the degradation of steppe rangelands, the impoverishment and exodus of small breeders are major difficulties which risk compromising the desirable development of agro-pastoral activities.

Specific mechanisms should be envisioned to prevent severe environmental impacts associated with pastoralism intensification. This lesson should be applied to other development interventions currently envisioned by different stakeholders who propose increase of animal feeds. Fodder inputs are a very clear measure to mitigate food security problems in the short term (Nugteren and Le Côme 2016:30) as well as a way to increase outputs in regions with a high imbalance between demand and offer that is likely to worsen in the future, as is the case with milk production in West Africa (Nugteren and Le Côme 2016:80; Molina-Flores et al 2020:128). But the experience of land degradation in Algeria shows that in order to implement fodder input strategies that are consistent and positive in the long term, a careful consideration of its collateral effects has to be borne in mind. The complexity of such intervention contrasts with the weak extension services in the areas where fodder input interventions are being proposed (Molina-Flores et al. 2020:145,181) – nevertheless, it should be borne in mind that extension services are in general not aware of the potential problems derived from supplementary fodder, so their capacity should be built on this. Weak statistics, which are also prevalent (Molina-Flores et al. 2020:152), are a fundamental hurdle to establish the necessary distinction between rather extensive and rather intensive animal husbandry systems, which is known to have hampered sustainable livestock development in North Africa (Dutilly-Diane 2007) and which is a prevalent problem in pastoralist systems worldwide (Manzano et al. 2021). Fodder inputs are useful only if information and sufficient skills are available to make the best of them – otherwise they may threaten the sustainability of pastoralism in the long term.

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