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“Mediterranean Pastures and Forage Crops” and “Mountain Pastures”

Agrosilvopastoral Futures: Bridging Tradition with Innovation in Mediterranean and Mountain Pastures

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(No. 27 – Poster)

OLD AND NEW CLIMATE CHANGE ADAPTATION STRATEGIES BY MONTESINHO MOUNTAIN PASTORALISTS, PORTUGAL

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Summary: Mountain pastoralists are among the communities most affected by climate change, rendering empowerment of mountain communities and supportive policies essential.

Keywords: adaptive management, land use, climatological normals, local breeds, mobility

Introduction

Landscape changes arising from social, political, climatic and environmental variability can severely impact mountain pastoral communities. Such impacts require adaptive capacity from communities, with the choice of adaptation strategies and coping mechanisms as important determinants of success and sustainability. In the mountainous region of Montesinho Natural Park (PNM), northeast Portugal, the socio-ecological system sustains a range of agrosilvopastoral activities. Pastoralism of threatened small ruminant local breeds is an ancient activity still developed under an extensive regime. Additionally, low maintenance cash crop plantations cover small to large areas of the landscape. Old customs including hay production, local irrigation management and water recovery, and spatiotemporal grazing mechanisms and labour division within the operational unit, continue to be used, albeit with slight adjustments to respond to contemporary challenges. A wider variety of management options should be available, however, and policies should be developed according to the inherent requirements of a dynamic system, thus maximising climate resilience (Ash *et al.* 2012). Here we apply ecological and social methodologies to investigate how local pastoralists respond to environmental change. Working closely with individual shepherds, we integrate wider pastoral community knowledge to address and inform policy and decision makers on pastoralist needs.

Materials and methods

This study was carried out with six shepherds that practise extensive pastoralism in Montesinho Natural Park (PNM), northeast Portugal. This mountainous area (~74,000 hectares) has been protected since 1979. The elevation ranges from 438 to 1486 masl, with average annual rainfall between 806 and 1262 mm, and average annual temperature of 8.5-12.5°C (INMG 1991). Regional climatic and geological characteristics promote extensive floral and faunal biodiversity. The park's river system is part of the Douro River basin with transboundary sub-basins. Currently, the 92 settlements within the park support a population of around 9,000 whose livelihoods depend on several activities. The current pastoral territory consists of rangelands (shrublands and woodlands) and cultivated areas that occupy 35,296 hectares of the PNM and sustain 40 herds of sheep (4042 head) and seven herds of goats (248 head). Along with climatic variations, the area has undergone social and economic changes (Castro *et al.*, 2021). Conducting research in a socio-ecological system demands interdisciplinarity, hence our approach integrating ecological and social data.

Land use changes were identified through the analysis of transition matrices from satellite images (1995 to 2021). The impact of climate change on hydrological dynamics and pastoral activities in the studied region was assessed using 70 years of climatological data (1951–2020). Six herds of small ruminants of two endemic breeds, namely Churra Galega Bragançana sheep (black and white) and the Preta de Montesinho goat, were tracked through precision animal husbandry techniques using Global Positioning System (GPS), to determine the total grazing area used. Data was collected from March 22 to September 12, 2023 and resulted in a total of 7,223 hectares within the PNM being used as pastures for these herds. Walking ethnographies was the methodology used to understand the individual adaptive

response of pastoralism to climatic change. Seasonal walks were performed by anthropologists with six pre-selected shepherds over two years (2021-2023). During this time, local adaptations currently applied or planned by the herders were identified. Lastly, adaptations at the community level were evaluated for its viability and sustainability in the PNM through co-participatory consultation workshops with several other herders, representatives of the national associations of local breeds, and members of governmental agencies.

Results and discussion

Land use changes reveal substantial transformations in silvopastoral landscapes. As rural depopulation progressed, dryland cereal fields were replaced primarily by perennial crops, with chestnut orchards increasing by 41% and olive groves by 3%, while dryland areas experienced a significant 53% reduction. In contrast, oak groves expanded by 18%, and shrublands grew by 30%, mainly due to vegetation development and natural succession (Seripieri, 2023). These changes, if sustained in the coming years, could heighten wildfire risks, emphasising the need for proactive management strategies. Significant alterations in both precipitation patterns and temperature trends were detected, particularly with spring precipitation decreasing negatively affecting crop productivity, and autumn rainfall increasing. Additionally, a consistent upward trend in average temperatures was observed, with a 1.0°C increase. These climatic changes have affected the hydrological cycle, resulting in more frequent extreme weather events such as prolonged droughts (Oliveira, 2023), clearly demonstrating a critical need for water resource management improvement. Other climatic hazards were identified by local pastoralists, and several adaptations were listed by all local stakeholders as feasible solutions to overcome regional ecosystem shocks and trends in PNM. Local pastoralists' adaptive management also rely on adjusting shepherding routes and water management practices, on growing other and more drought resistant crops to feed animals in face of pasture shortage, or shift in production due to seasonal changes.

Conclusion

Local ecological knowledge at individual and community scales were important for the documentation of adaptations to climate change at the rangeland level. We hope that the results of this integrative approach can encourage practitioners and decision-makers to rethink policies and management strategies in a non-static environment to contribute to the resilience of traditional mountain pastoralism. By promoting local small ruminant breeds pastoralism in PNM and involving the community in decision making plans we can promote sustainable environmental services while preserving the region's cultural heritage in this region and other areas with similar agro-pastoral systems.

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