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Pastoralism in Natural Parks of Andalusia (Spain): A tool for fire prevention and the naturalization of ecosystems

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Abstract. The Environment Department of the Government of Andalusia (Spain) has recently undertaken the responsibility of integrating extensive livestock grazing as a tool for fire prevention in several Natural Parks of the region. With the participation of 19 shepherds, 910 ha of fuelbreaks are being maintained by sheep and goat flocks. Their effect is being monitored and specific research is being carried out to adjust the system. In exchange for the service provided, shepherds are paid proportionally both to the surface of fuelbreaks they maintain, and to the biomass control outcome they achieve. This is an extra income that drives their production systems towards sustainable activities integrated in the conservation of forest resources. On the other hand, extensive and scarcely managed forest pine plantations and oak-tree communities are in need of diversification (naturalization) actions. Intense grazing – by domestic or wild herbivores – has always been present in Mediterranean forest and rangelands, contributing to their diversity and dynamics. Therefore, livestock grazing is nowadays a tool that can efficiently collaborate with other initiatives in the naturalization of many simplified forest ecosystems. Both fire prevention and naturalization are main forest management issues in the 21st century, and livestock breeders have the opportunity to team up, enhance their extensive production systems and benefit from the increased social and economical recognition of their activity.

Keywords. Mediterranean – Silvopastoral – Forest management – Conservation – Diversification.

Pastoralisme dans les parcs naturels d'Andalousie : un outil pour la prévention des incendies et le retour à l'état naturel des écosystèmes

Résumé. Le Département pour l'Environnement du Gouvernement Autonome de l'Andalousie (Espagne) a récemment pris la responsabilité d'intégrer l'élevage extensif comme outil pour la protection contre les incendies dans plusieurs parcs naturels de la région. Avec la participation de 19 bergers, 910 ha de coupures de combustible sont entretenus par des troupeaux de moutons et de chèvres. L'impact de cette intégration est suivi et fait l'objet d'une recherche spécifique pour ajuster le système. Les bergers sont payés pour le service réalisé proportionnellement à la surface de coupure de combustible qu'ils maintiennent et aux résultats du contrôle de biomasses végétales. C'est un revenu supplémentaire qui conduit leurs systèmes de production vers des activités durables intégrées dans la conservation des ressources de la forêt. D'autre part, les repeuplements de pin et les communautés naturelles de chêne vert ont besoin d'actions de diversification (pour rendre ces surfaces à leur état naturel). Le pâturage intensif – par des herbivores domestiques ou sauvages – a été toujours présent dans les forêts et les parcours méditerranéens, intervenant dans leur diversité et leur dynamique. Ainsi, actuellement, le bétail est un outil qui peut efficacement contribuer avec d'autres initiatives à ce processus pour rendre à leur état naturel de nombreux écosystèmes simplifiés de forêt. La prévention contre les incendies et le processus pour rendre ces surfaces à leur état naturel, sont les principaux outils de gestion de la forêt du 21^{ème} siècle. Ainsi, les éleveurs peuvent renforcer leurs systèmes de production extensifs et profiter de la reconnaissance sociale et économique de leur activité.

Mots-clés. Méditerranéen – Sylvopastoral – Gestion forestière – Conservation – Diversification.

I – Introduction

Andalusia is the southernmost region of the Iberian Peninsula. A varied Mediterranean climate (ranging from under 200 to over 2000 mm of annual rainfall) combined with an abrupt orography (climbing up to 3482 m above sea level) endow Andalusia with very contrasted ecosystems. In a surface area of 87,268 km² (17% of Spain) it gathers some 4000 flora species, representing more than half of the Spanish catalogue of plants (Blanca *et al.*, 1999). The main environmental features of the region are protected by 24 Natural Parks which are managed by the Government of Andalusia.

Agrarian landscapes are dominant in the region due to a very long-lasting anthropogenic influence, dated back as early as 1.3 million years (Gibert *et al.*, 1998) and dramatically intensified during the last centuries. The socio-economic development that has taken place in the last 50 years has promoted the abandonment of many traditional rural activities, and particularly of those related to forest resources' exploitation. This has left human intervened and dependent ecosystems at their own uncertain and *free* evolution, which is only affected by the actions promoted with the limited forest management budget. This abandonment can be considered a major threat for the preservation of the environment (it has been claimed to have increased forest fire incidence, for example) or it could slow down some dynamics of the ecosystems. Therefore, the promotion of certain agrarian activities – such as extensive livestock rearing – is frequently proposed as a tool to revert or contain this process.

The Environment Department of the Government of Andalusia is increasingly aware of the interest of integrating livestock grazing in a number of management practices. Below is described how pastoralism is efficiently helping to reduce the risk of forest fire outbreaks in the region and how livestock grazing could contribute to the naturalization of woods. These are two forest management issues of increasing interest in developed countries.

II – Forest fire prevention

Livestock grazing is considered a valid fuelbreak maintenance technique – particularly after the experience accumulated in the French Mediterranean region (RCC, 2006) – with the added value of producing several positive externalities on rural life and the environment, contributing to a sustainable rural development. In 2006, the Government of Andalusia impelled the progressive expansion of this fire prevention system – previously confined to trial areas – to many other forestlands, with the focus set on Natural Parks of the region. The creation and enlargement of an Andalusian Network of Grazed Fuelbreaks was commissioned from a recently created workgroup integrated by scientists, wildfire specialists, forest managers and rangers, together with extensive livestock breeders interested in the project.

Nowadays, this fast-growing network comprises 910 ha (in 15 different areas of 5 provinces) grazed by 7500 sheep and goats (and some cattle). Shepherd guided flocks have been preferred to other livestock management systems, so as to incorporate the most vocational extensive breeders and avoid the need of using fences to concentrate the animals in the desired areas. Undoubtedly, any consumption of the vegetation in fuelbreaks will lessen the amount of burnable biomass, but this reduction must be significant to comply with fire prevention standards and constitute a real management alternative.

Obtaining such results requires overgrazing – and thus, foraging feed of poorer quality, among other difficulties – and if it is to be done in a large surface area, the potential growth and production of the flock will be negatively affected. To compensate for this and stimulate a satisfactory grazing pressure and biomass control, shepherds are remunerated in exchange for the service provided. The fuelbreaks to be grazed are pre-evaluated in terms of difficulty (a combination of distance, steepness and type of vegetation) to calculate the maximum amount of money to be paid per ha at each of the sites. At the beginning of summer a careful evaluation of

the grazing done is performed, which will result in a cut back of the offered maximum sum, unless vegetation growth has been reduced to a minimum through livestock grazing.

In 2007, the shepherds taking part of this network have been offered rewards from 1050 to 4720 € per year (the amounts per ha range between 34 and 70 €). A preliminary economic study unveils that the application of this prevention system with these parameters costs only an average of 23% of the alternative manual clearing of fuelbreaks, so these quantities could be raised if necessary (Varela-Redondo *et al.*, 2007). Although the outcome attained this year has not been analysed yet, an apparent amelioration of the results has been achieved compared to previous years when no economic compensation existed.

Extensive monitoring activities have been programmed not only at the beginning of summer but throughout the year, with the aim of maintaining a permanent contact with the shepherds and following up the evolution of the fuelbreaks in terms of grazing pressure and shrub encroachment. Furthermore, research on key factors for the proper functioning of the system is underway, including the use of fire-resistant forage shrubs, biomass accumulation under different stocking rates and vegetation scenarios or economic valuation of this prevention system and its externalities.

III – Naturalization of ecosystems

Naturalization of ecosystems and human intervention on them are considered by many as pure antonyms. Nevertheless, there are more and more voices claiming the need to reconsider the meaning of this concept which is linked to the understanding of what the *natural* state of an ecosystem is. Götmark (1992) refuted a narrow definition with several examples, including one regarding the importance of promoting grazing dynamics through livestock to preserve old growth forests of Sweden. Perevolotsky and Seligman (1998) argue that intense grazing has always been an integrated part of Mediterranean ecosystems, and maintaining that process proves necessary for conservation purposes.

In the Mediterranean basin, the flora has co-evolved with big gregarious herbivores that grazed heavily on vegetation, creating open canopy environments and partaking in the formation of animal related adaptations in plants, such as digestion-helped seed germination (Ramos *et al.*, 2006) or herbivory avoidance strategies (Saltz and Ward, 2000). Therefore, we consider that promoting intense grazing dynamics is a tool to be used in the naturalization of ecosystems. In the absence of most of the historical herbivores, domestic livestock is possibly the best tool available to reproduce their effect where management plans require so. A full description of our perspective on the matter can be found in Ruiz-Mirazo (2004).

In Spain, the ongoing rural desertion process that started in the 1950s was coupled until the early 1980s with a large forestation programme. As a result, there are hundreds of thousands of hectares of mainly pine tree woods that have scarcely been managed ever since they were planted, constituting low diversity forests. Some of these relatively simple ecosystems are now being altered through naturalization projects, which put the stress on diversification (planting other tree and shrub species) and structure modification (through variable density thinnings). Even shrubby oak-tree communities, used to obtain firewood in the past but nowadays abandoned, are being thinned and pruned to obtain a taller tree forest that would resemble the *natural* not over-exploited forest.

Pastoralism may well be an excellent complement to these projects. After a thinning, livestock grazing can help control the growth of the new sprouts which would compete with the selected trees for nutrients and water. If the canopy of a dense forest is opened, the undergrowth will develop, offering forage resources to herbivores, which help to accelerate the nutrient and energy cycles with the digestion of organic matter. Furthermore, animals can help transport and spread seeds and nutrients, sewing together distant patches of the landscape and facilitating the expansion of plant species. If the aim of a thinning is to create open spaces to enhance

biodiversity, applying a high stocking rate will avoid it closing back. In fact, certain forest fire prevention measures, such as the opening of fuelbreaks in thick forests, can be considered naturalization actions in which domestic livestock herds can collaborate on their maintenance and diversification.

IV – Conclusion

Forest managers are increasingly concerned about the negative consequences on environmental conservation that rural desertion and forest abandonment are bringing about. Disenchanted of the supposed advantages that releasing forest resources from human use would have, officers now demand cooperation to set up efficient and sustainable management alternatives – and livestock grazing is a tool they have to rethink about – to tackle matters such as the proliferation of forest fires or the need to naturalize low diversity woods.

On the other hand, many Spanish farmers have a great dependency on Common Agriculture Policy programmes, which are favouring agricultural practices that benefit the environment. Therefore, livestock breeders should take the opportunity to participate in sustainable initiatives like these, which will help them access extra incomes through the recognition of their agro-environmental character.

At the beginning of the 21st century, pastoralism offers valuable tools for the management and conservation of forests and rangelands. The service provided must be socially and economically recognised, becoming a source of income for livestock breeders that collaborate on the conservation of the natural resources with their natural low input extensive systems on which stockbreeding has always been rooted.

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