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Livestock farming systems and conservation of Spanish Mediterranean mountain areas: The case of the “Sierra de Guara” Natural Park. 1. Characterisation of farming systems

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RESUME – “Systèmes d'élevage et préservation des zones de montagne méditerranéennes. Cas du Parc Naturel de Sierra de Guara (Espagne). 1. Caractérisation des systèmes d'élevage ovins”. Les systèmes d'élevage en zones de montagnes méditerranéennes développent plusieurs fonctions: productive économique, social et la préservation de l'environnement. Cette dernière devient très importante dans les espaces protégés parce que l'élevage est un outil d'entretien et de gestion de l'espace. Dans ce travail on fait une description de l'utilisation pastorale d'un espace protégé et une typologie des exploitations ovins sur quelques variables de structure et d'utilisation des surfaces. Ce série de trois communications est cadrée dans un projet qui vise établir des pratiques de gestion de l'espace soutenables aussi qu'évaluer des stratégies de gestion technique des exploitations en essayant de concilier les objectives économiques et la préservation des ressources naturelles.

Mots-clés : Espace naturel, pâturage, typologie des exploitations, gestion soutenable.

Introduction

The multifunctional role of livestock farming in European mountain areas is widely recognised. Apart from productive, economic and social objectives, these systems contribute to preserve the environment. This role is specially important in protected natural areas, where the use of natural resources by grazing animals can contribute to maintain the landscape and reduce environmental risks (Doyle 1996). Therefore, the search for management strategies that ensure the sustainable use of natural resources is regarded as one of the main objectives in these areas.

The ‘Sierra de Guara’ Natural Park (SGNP) is located in a Mediterranean mountain area in Aragón, North-east Spain. Around 50% of the total area of the SGNP (80,739 ha) constitutes the ‘protection area’ (PA), the rest being ‘peripheral protection area’ (PPA), which has a lower level of protection. Population and farming activities in the Park have decreased drastically in the last decades and this phenomenon has produced the abandonment of large agricultural and grazing areas and, as a consequence, changes in the vegetation, reduction of biodiversity, degradation of traditional landscapes and environmental risks, the most important one being forest fires.

The next three papers describe preliminary results of a research project whose main objectives are to provide decision support tools for the sustainable management of the Park, and to evaluate alternative farming practices that are compatible with economic and environmental objectives. In the first paper, a general description and characterisation of the farming systems is presented with special focus on the land use and grazing management.

Material and methods

Data were collected from all sheep and cattle farms that used grazing areas inside the Park in 2000 (n=62). A structured questionnaire collecting information on family composition, labour force, land use, herd composition, general management, grazing management, etc. was designed. Opinions and attitudes of farmers towards the Park regulations were also collected.

Multiple Correspondence Analysis (MCA) and Cluster Analysis were performed to typify farms using indicators about farm size, land use, location of grazing resources in the Park and stocking rate.

Results

Firstly, a general description of the characteristics of the farms, land use, location and utilisation of grazing resources is presented.

Size of herds was very large in comparison to other nearby mountain areas (Manrique *et al.*, 1999): 505 sheep and 235 beef cattle in average. Reproductive management was diverse in sheep (10.2% of farms had continuous breeding; 38.7% had one lambing per year; 42.9% three lambing in 2 years; and only 8.2% had 5 lambing seasons in 3 years). All cattle farms had continuous breeding.

Farm land was also very large: 694 ha in average (23.4% are owned by farmers and 76.6% rented), whereas in other mountain areas of the Pyrenees this figure is only 25 ha (Manrique *et al.*, 1992). Globally, 77.4% of farm land corresponded to pasture land, 5.3% was agricultural grassland and 3.5% corresponded to forage crops. Agricultural crops represented 12.8% and 1% was fallow. Pasture land was mainly located inside the Park (30.6% in the PA and 43.7% in the PPA). Apart from the farm land, many herds also utilized communal pastures, which were mainly located inside the Park (Fig. 1).

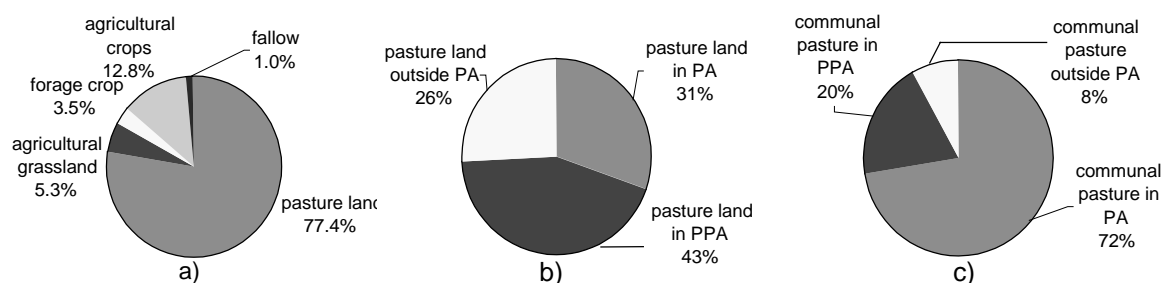


Fig. 1. Distribution of a) farm land use; b) location of own pasture land; c) location of communal pastures.

The farms were very extensive in terms of utilisation of natural resources. The grazing period lasted practically all year round. Only animals in late pregnancy or in early lactation were kept indoors. However, the type of resource and the level of utilisation differed widely between grazing seasons: pasture land and grassland were used all year round by most farms; forage crops mainly in the spring and autumn; stubble in the summer; and fallow in spring and winter (Fig. 2). Forty four per cent of farms moved between different geographical grazing areas inside the Park; the average distance between areas was 14.1 km.

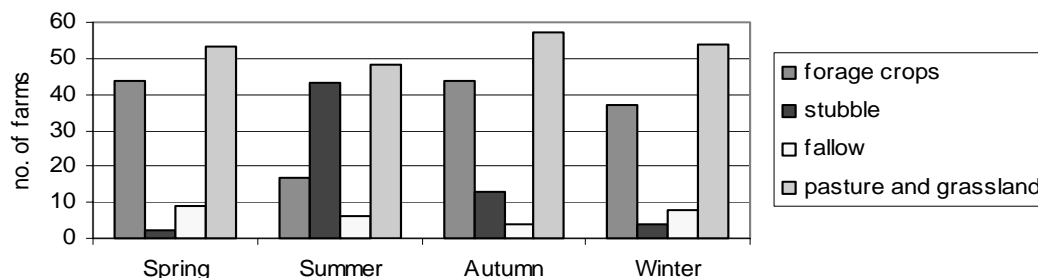


Fig. 2. Type of resource and number of farms that use them.

In-doors feeding for pregnant and lactating sheep was necessary, specially in the winter (64.5% of farms). In the spring and autumn, 32.2% and 38.7% of farms gave foodstuffs to the sheep, respectively. In the summer, this figure was only 20.1%.

A typology of farming systems is now presented¹. The main 4 factors obtained in the MCA, which explained 59.7% of the total inertia, could be briefly defined as:

- (i) Factor 1. *Large size of farm land, mainly pasture; little agriculture; mainly located in PPA.*
- (ii) Factor 2. *Importance of agriculture (low pasture land); mainly located outside the Park.*
- (iii) Factor 3. *Large size of herd; intermediate farm land; located inside the Park (PPA or PA).*
- (iv) Factor 4. *Mixed agriculture-sheep farms; important use of communal pastures.*

These factors were used in the Cluster Analysis. Four groups of farms were obtained that are described below (Table 1).

Table 1. Main characteristics of the groups of farms obtained from the Cluster Analysis

Variables	Classes	Group 1 n=16	Group 2 n=13	Group 3 n=18	Group 4 n=7	Total n=54
Farm land (ha)	≤ 250	87.5	7.7	33.3	85.7	50.0
	> 250 ≤ 1400	12.5	38.5	61.1	14.3	35.2
	> 1400	0	53.8	5.6	0	14.8
% farm land in PA	≤ 10	6.3	53.8	16.7	85.7	31.5
	> 10 ≤ 55	0	7.7	77.8	14.3	29.6
	>55	93.8	38.5	5.6	0	38.9
% farm land in PPA	0	100	23.1	38.9	0	48.1
	≤ 55	0	38.5	50.0	28.6	29.6
	> 55	0	38.5	11.1	71.4	22.2
% Agricultural crops/ farm land	≤ 20	37.5	100	5.6	0	37.0
	> 20 ≤ 40	62.5	0	44.4	0	33.3
	> 40	0	0	50.0	100	29.6
Sheep Livestock Units (SLU) ²	≤ 50	62.5	15.4	11.1	57.1	33.3
	> 50 ≤ 100	37.5	61.5	50.0	28.6	46.3
	> 100	0	23.1	38.9	14.3	20.4
SLU /ha communal pasture	no communal	43.8	46.2	44.4	85.7	50.0
	≤ 0.01	37.5	53.8	38.9	14.3	38.9
	> 0.01	18.8	0	16.7	0	11.1
% pasture land /farm land	< 55	18.8	0	50.0	85.7	33.3
	> 55 ≤ 80	68.8	0	50.0	14.3	38.9
	> 80	12.5	100	0	0	27.8

Group 1 represented comparatively small farms (87.5% has less than 250 ha), with a high proportion of land located inside the 'protection area' of the Park. They were also small in terms of herd size. The importance of agricultural land and pasture land was intermediate.

All farms of Group 2 had a very high proportion of pasture land (80% of total farm land) as opposed to agricultural crops. They were very large farms in terms of land (53% had more than 1400 ha) but intermediate in terms of herd size.

Group 3 represented farms with intermediate area and medium or large herd. Agriculture was also important in these farms. These farms have an intermediate percentage of land in both the 'protection area' and 'peripheral protection area' of the Park.

Finally, farms of Group 4 were comparatively small, mainly located in the 'peripheral protection area' of the park (low percentage of land in the 'protection area') and with a clear orientation towards

¹ In this part of the study only sheep farms were considered (n=54).

² 1 adult ewe = 0.15 SLU.

agriculture. Herd size is medium or small. The importance of pasture land is low and do not use communal pastures.

From the groups of farms obtained, few case studies will be selected for future in-depth analysis of grazing management and interactions between farming and natural resources.

Discussion

The farms that utilize the grazing resources of the SGNP are comparatively very big in terms of land and herd size. Few factors can partially explain this phenomenon. Firstly, the number of farms has decreased dramatically during the last decades and the pasture land is used now by the remaining farms (more than 75% of farm land is rented). Also, the subsidies established by the Common Agricultural Policy of the EU have contributed to increase herd size in many European Mediterranean countries. Finally, agro-environmental policies and direct economic support to farmers by the Park authorities are playing now an important role.

From the results of the survey, it is possible to state that in most cases the profitability of farms is not limiting agriculture and livestock activities in the area, but the lack of successors in some families could jeopardize the continuity of farming systems in the medium-long run.

Farming systems in the Park are very extensive in terms of use of natural resources, although 50% of farms do not utilize communal pastures. The grazing season lasts practically all year round. But there are some factors that can reduce grazing activities in the future as pointed out by many farmers: lack of water in the summer; lack of communications to remote grazing areas; degradation of vegetation; and finally the trend towards reproductive intensification that implies the reduction of the grazing period and the abandonment of remote or low-quality grazing resources (Choquecallata, 2000).

The orientation of production, structure of farming systems and grazing management is clearly related to the location inside the Park and the availability of different resources. A more in-depth analysis of the grazing management in selected case studies, together with the study of vegetation dynamics in different areas of the Park, can be the basis for the sustainable management of farming systems and natural resources of the Park in general.

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