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Use of energetic resources in sheep-pig farms in dehesas of south-west Extremadura

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SUMMARY - Dehesas are farm systems that cover with their own resources a great deal of the livestock's food needs. This paper deals with the group of factors that influence the use of grazing resources in typical dehesas of south-west Extremadura. In the analyzed dehesas, the territory covers up to 73% of sheep's food needs, although this value is only 47% for the "Iberian" pig. From this study we can state that the knowledge of energetic food flows is an interesting starting point to analyze the management and the sustainable use of dehesas' resources.

Key words: Shepherding, extensive systems, energetic analysis, grazing resources, sheep farms, "Iberian" pig farms.

RESUME - "Utilisation des ressources énergétiques dans des exploitations ovin-porcine de la Dehesa du sud-ouest de l'Estrémadure". Les dehesas sont des systèmes d'exploitation agricole qui couvrent les besoins alimentaires de l'élevage par leurs propres ressources. Ce travail étudie l'ensemble des facteurs qui influent sur l'utilisation du pâturage dans les dehesas caractéristiques du sud-ouest d'Estrémadure. Dans les dehesas étudiées, le territoire couvre jusqu'à 73% des besoins des ovins, mais seulement 47% de ceux des porcins ibériques. Il est démontré que la connaissance des flux énergétiques alimentaires est un point de départ très intéressant pour analyser la gestion et l'exploitation durable des ressources de la dehesa.

Mots-clés : Pâturage, systèmes extensifs, énergie, ressources fourragères, ovin, porcine.

Introduction

Dehesa systems are characterized by the pastoral use of the land, and offers a production of grass that covers, in a great deal, the energetic needs of the animals. The seasonal nature of rainfall during the year, together with the interannual rainfall differences, give a grass production with great variability. Scientific research for the last years has allowed to increase and improve the value of dehesa's grazing productions, either optimizing ancestral cattle management techniques or with the fertilization and introduction of new species.

However, and also with the updated knowledge that we have about dehesa's herbaceous and bushy biomass, the grazing productions in dehesa territories are still small. This paper shows an analytical case study on a group of characteristic dehesas of south-west Extremadura, with the aim of determining all the flows of energetic resources which cover the needs of livestock in these farms, both from outside and from inside the territory. The result is the origin of the different resources, together with the use made by each animal species.

Material and methods

Two dehesa farms, characteristic of the dehesa systems of southern Extremadura, have been selected. These farms were collaborating in the Research Project CE CAMAR CT 90-28 (D-I, D-II)¹, with surfaces between 500 and 800 hectares of Surface of Agricultural Use (SAU). The studied dehesa systems are

¹ To preserve the statistical and collaboration secret in the Research Project, the analyzed farms are not located exactly.

dehesas with pasture and holm oaks, with different amounts and uses of agricultural land. The livestock present are "Iberian" pigs and sheep.

To calculate the energetic needs of the livestock and to determine the degree of relation with the environmental resources, we have applied the methodology to calculate cattle density in extensive systems (Pulido and Escribano, 1994, 1995). This methodology allows to evaluate the energetic needs for each kind of animal and physiological state, and both the supplements given and the quantities of resources shepherded, to estimate thus the cattle densities supported by each territorial unit.

Depending on their origin, the food resources used to cover the energetic needs of the livestock can be classified in resources from outside of the system (energetic inputs produced outside the system; they include the supplementation and the grazing of stubble fields located outside the system) and resources produced by the system (the grazing resources of the system together with the supplementation with raw materials produced in the territorial unit (Pulido and Escribano, 1995)).

The total needs and the extraction of energetic resources (either the own resources or those from outside the system) are expressed in ovine units (UGov), which is the maintenance ration for a sheep. One UGov is the daily maintenance needs in metabolic energy (1.730 kcal) for an adult Merina sheep, with a weight of 40 kg, not gestating or lactating. Some correcting factors are applied on these needs depending on the breed, physiological state, etc.

Results and discussion

In dehesa systems the most important commercial production is the livestock, with autochthonous races exploited in extensive systems. These animals need some energetic supplies to cover their maintenance, gestation and lactation needs. These resources needed to cover the energetic needs come sometimes from outside the system. In other cases, the origin of the resources is the own farm, using the grazing resources and the raw materials produced in the farm to feed the livestock.

To analyze properly the energetic use of a certain territory, we need to know the average annual needs and the involved resources, establishing an homogeneous criteria to present the results.

The energetic needs covered with resources from outside the system can be supplementation needs, with raw materials acquired outside the territorial unit or those related to the use of grazing resources located outside the analyzed territory. The resources produced by the system are classified in supplementation with raw materials produced in the own farm and rearing inside the territory.

With this structure, we can evaluate the degree of dependence of the territory on the resources produced by the environment. Table 1 shows the average distribution during the period 1991-93; the analysis of the needs is established according both to the inputs from outside and to the resources extracted from the territory.

Livestock gets, on average, between 53.66% and 56.32% of its needs by rearing. Sheep get between 61.20% and 69.22% of their needs by rearing (without considering rearing outside the territorial unit) and reaching a maximum peak of 73.01% of the territory. The total indicator for the whole livestock is biased by the pigs, which cover their needs by shepherding only between 32.15% and 41.46%.

Energetic inputs in the supply of concentrated food are higher for the "Iberian" pigs than for other species, such as the sheep, where the supplementation needs are covered with hay, straws or with the grazing use of stubble fields and other products got outside the territorial unit. In the analyzed dehesas, for the whole livestock, the supplementation with concentrated food can cover between 27.95% and 42.50% of the energetic needs. These percentages are reduced in the case of sheep to values between 5.32% and 38%, as can be seen in Table 2.

Table 1. Average distribution of energetic needs according to origin and destination, during 1991-93 (UGov ha⁻¹ of SAU)

Species/farm	Inputs from outside the system (RFT)			Inputs from inside the system (RT)			Total inputs NT/ha SAU
	RSF/ha SAU	RRF/ha SAU	Total/ha SAU	RST/ha SAU	RPD/ha SAU	Total/ha SAU	
Pigs	542.50	-	542.50	62.54	286.74	349.28	891.78
%	60.83	-	60.83	7.01	32.15	39.16	100
Sheep	294.54	155.58	450.12	63.24	1154.92	1218.16	1668.28
%	17.65	9.32	26.97	3.79	69.22	73.01	100
Total D-I	837.04	155.58	992.62	125.78	1441.66	1567.44	2560.06
%	32.69	6.08	38.77	4.91	56.32	61.23	100
Pigs	798.60	-	798.60	-	565.70	565.70	1364.30
%	58.54	-	58.54	-	41.46	41.46	100
Sheep	803.65	-	803.65	-	1267.44	1267.44	2071.09
%	38.80	-	38.80	-	61.20	61.20	100
Total D-II	1602.25	-	1602.25	-	1833.14	1833.14	3435.39
%	46.34	-	46.34	-	53.66	53.66	100

RFT = Resources that the livestock gets outside the analyzed territory; RSF = Acquired additional resources; RRF = Resources from stubble fields located outside the territory; RT = Resources produced inside the territory and corresponding to livestock inputs from inside the system; RST = Additional resources produced in the analysis unit; RPD = Grazing resources of the territory; NT = Total needs-resources corresponding to the whole feed used by the livestock

 Table 2. Indicators of herd feeding with annual data depending on the utilized resources in the territory during the period 1991-93 (UGov ha⁻¹ of SAU)

Indicators	D-I Farm			D-II Farm		
	1991	1992	1993	1991	1992	1993
Sheep						
Sheep's total needs (NT)/SAU	1560,67	1788,17	1656,70	2133,47	2099,81	1979,99
% Utilized resources (RED) by the sheep/sheep's NT	70,81	64,35	72,97	61,21	54,06	68,75
% RED and harvested/NT	77,58	67,79	74,33	61,21	54,06	68,75
% needs covered with concentrated food/NT	18,12	24,05	5,32	26,46	38,00	30,02
Pigs						
Pigs' total needs/SAU	925,53	872,03	877,79	1208,31	1447,98	1436,62
% RED by the pigs/pigs' NT	37,56	29,29	29,31	34,65	47,01	41,61
% RED and harvested/NT	51,18	31,18	39,16	34,65	47,01	41,61
% needs covered with concentrated food/NT	62,44	70,71	70,69	65,35	59,99	58,39
% Montanera RED/total RED	50,33	64,72	59,17	81,78	42,55	48,25

The results presented in this paper are similar to those of an analyzed sample of 6% of the dehesa farms in Sierra Morena. The statistical inference gave that the average pig supplementation in dehesa farms is 45.3%, 24.1% for the cattle and 21.8% for sheep. The percentage for all the dehesa farms is 25.7% (Perez and Porras, 1983). These authors state that concentrated food meant 83.5% of the whole dehesa supplementation, and 100% for the pigs. The same results were got for a sample of dehesas in Cadiz (Perez and Porras, 1984).

Dehesa has a low degree of food stocks, and because of that, a great deal of its total extra productions are consumed during the year. The following years are therefore subject to the uncertain

climate, which will produce higher or lower amounts of pasture. Perez and Porras (1983) state the high dependence on the supplementation from outside the system of the livestock in the dehesa systems in Sierra Morena, as 82% of the supplemented energetic needs are brought from outside the system.

Conclusion

An analysis of the supply and use of the territory's energetic resources has been carried out at the time of studying the effects that the different anthropic actions produce on the rearing systems. The aim of this analysis is to improve the knowledge about the sustainable use of the resources produced by the dehesa. In the analyzed dehesa systems, the territory covers a great deal of the energetic needs of the ruminant livestock. The global indicator is biased by the energetic inputs brought from outside and by the higher consumption of concentrated food in pigs. A low level of supply with own resources can also be seen, as almost all the supplementation comes from outside the system.

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