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in

Bernués A. (ed.), Boutonnet J.P. (ed.), Casasús I. (ed.), Chentouf M. (ed.), Gabiña D. (ed.), Joy M. (ed.), López-Francos A. (ed.), Morand-Fehr P. (ed.), Pacheco F. (ed.). Economic, social and environmental sustainability in sheep and goat production systems

Zaragoza : CIHEAM / FAO / CITA-DGA
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 100

2011
pages 289-292

Effect of number of utilizations in a barley grass in Mediterranean conditions on biomass production and the admissibe stocking rate of Majorcan red sheep

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Abstract. Majorcan Red Sheep is an endangered sheep breed and its conservation depends on the availability of feed resources and its use for feeding them. Animal production is considered a multifunctional activity due to its implication in economic, ecological and social aspects, which are strongly linked to its sustainability. The Majorcan Red Sheep production system has been directly linked to the exploitation of agricultural production. There is a clear positive economic impact when forage resources are used appropriately. The aim of this study was to determine the effect of the number of uses (1 to 3) on the herbage production of a barley crop and to estimate the suitable stocking rate. Results from this study showed that increasing the number of usesfrom 1 to 3 allowed greater production of forage (1863 *vs* 3274 Kg DM/ha), crude protein (113 *vs* 528 kg CP/ha) and more energy (3546 *vs* 8047 Mcal ME/ha). Therefore the suitable stocking rate is greater when a forage barley crop is used 3 times.

Keywords. Majorcan Red Sheep – Sustainability – Number of forages uses.

Effet du nombre d'utilisations d'un pâturage d'orge sous conditions méditerranéennes sur la production de biomasse et la charge admissible en Brebis de race Roja Mallorquina (Rouge de Majorque)

Résumé. *La brebis Roja Mallorquina est une race autochtone en danger d'extinction dont la conservation dépend, entre autres facteurs, d'une meilleure valorisation des ressources qu'elle utilise. La multifonctionnalité de sa production est due à ses atouts économiques, écologiques et sociales, et est pleinement en rapport avec son caractère durable. Dans ce contexte, la production de cette race est directement liée à la valorisation des pâturages. C'est pour cette raison que l'on a étudié l'effet du nombre d'utilisations (1, 2 ou 3) sur la production de biomasse d'un pâturage d'orge et que l'on a estimé la charge admissible de brebis Roja Mallorquina. Dans les conditions agronomiques de l'étude, le fait de passer de une à trois utilisations a permis d'obtenir plus de biomasse (1863 vs 3274 kg MS/ha), plus de protéine (113 vs 528 kg/ha) et davantage d'énergie (3546 vs 8047 Mcal EM/ha). Tout ceci entraîne que la densité animale admissible soit plus élevée lorsque l'on réalise trois utilisations.*

Mots-clés. *Brebis Roja Mallorquina – Durabilité – Nombre d'utilisations d'un pâturage.*

I – Introduction

In Illes Balears forage crops occupy a total of 45,749 ha, being 20,460 ha cereal crops produced generally under annual rainfall. The most important livestock census is sheep under ex extensive conditions, with over 287,000 breeding females (Cifre *et al.*, 2007). On the island of Mallorca there are two locals breeds, Majorcan Sheep, white and small format, and Majorcan red sheep, red and larger. The system of Majorcan Red Sheep production has been directly linked to the agricultural production, having forages sources significant economic value as a food resource for this breed, besides of the widely recognized environmental and social value.

The multifunctionality of livestock production is due to the economic, ecological and social important aspects which are linked to its sustainability (Atance *et al.*, 2000). The management of sustainable production systems should be based on rational use of existing resources on the farm (Roca *et al.*, 2008). The knowledge of forage has a positive economic effect on the Majorcan Red Sheep production and hence its sustainability.

II – Materials and methods

The experimental plot used was homogeneous area, sown barley to be grazed by Majorcan Red ewes. The controls were done in a continuous blocks with three replications for each treatment. Treatments were: (i) three cuts (FAM: February, April and May); (ii) two cuts (FM: February and May); (iii) two cuts (AM: April and May); and (iv) one cut in May (M) (Table 1). After cutting, forage production was recorded (kg FM/ha). Samples of each treatment were dried on air forced oven at 65ºC to obtain the dry matter production. A portion of each sample was dried in an oven at 100ºC for 16 h to determine DM content and ground through a 1 mm screen using and stored for later analysis. Chemical analysis carried out were crude protein content (Kjeldhal method, AOAC, 1999), acid-detergent fiber (ADF), neutral-detergent fiber (NDF) (Van Soest *et al*., 1991). Metabolizable energy content of forage was estimated from the equations of Mertens (1983).

Forage production per hectare was estimated from the data obtain from cutting and chemical composition. Requirements of energy and protein for animals were calculate from the NRC (1985).

To calculate energy and protein needs were taken proposed by NRC (1985). Statistical analysis was done using statistical package Stratgraphics. A Student t-test was used to test the hypothesis that improvement occurs between treatments for a 0.05 significance level.

Table 1. Abbreviations used to denote treatments

Treatment	February	April	May
FAM	Cut	Cut	Cut
FM	Cut		Cut
AM		Cut	Cut
M			Cut

III – Results and discussion

The number of cuts has significant effect on forage and crude protein and net energy production (Table 2; $P<0.05$). FAM treatment presented greater forage, protein and metabolizable energy production than the rest of treatments ($P<0.05$). Both two cuts treatments (FM and AM) presented similar productions between them, being lower than the former ($P<0.05$) and greater than one cut (M)treatment, which presented the lowest production. Regarding CP production, two cuts treatment had different production depending on the first cut. FM presented a greater CP production than AM ($P<0.05$), which is a consequence of the higher crude protein content of barley forage in February cut as well as to the longer time that there is between cuts.

The nutritional value of grass, indicated as the relationship crude protein / forage production has increased by increasing the number of cuts. Besides, increasing cuts numbers of forage had a positive effect on the availability of forage resources for animals, and then it allows to do the management of sustainable based on rational use of existing resources on the farm (Roca *et al.*, 2008).

Table 2. Accumulated production of biomass, protein and metabolic energy per treatment

Treatment	Forage (kg DM/ha)	Protein (kg/ha)	ME (Mcal/ha)
FAM	3.274±750[a]	528±13[a]	8.728±471[a]
FM	2.739±242[b]	405±34[b]	6.936±562[b]
AM	2.894±225[b]	331±33[c]	6.923±581[b]
M	1.863±158[c]	113±12[d]	3.737±338[c]

Different superscripts across rows indicate significant differences.

Stocking rate was estimate from the ME and CP produced in each treatment and according to the maintenance requirements of ewes (Table 3). According to the ME, the stoking rate increased from 3.18 sheep/ha in M treatment (one cut) to 7.42 sheep/ha in FAM (three cuts). Taking into account crude protein, also the stocking rate increased from 1.63 to 7.61 sheep/ha.

Table 3. Admissibe stocking rate of Majorcan Red Sheep in terms of metabolizable energy and crude protein produced by each treatment

Treatment	ME (Seeps/ha)	Protein (Seeps/ha)
FAM	7.42	7.61
FM	5.90	5.84
AM	5.89	4.77
M	3.18	1.63

IV – Conclusions

Increasing the number of cuts of forage barley crop leaded to obtained higher forage yields with greater nutritional quality and with a better annual distribution. The sustainability of the extensive production of extensive Majorcan Red Sheep is an economic issue.

Acknowledgements

The authors thank the farm Son Forteza Alaro (Mallorca) cooperation received in this study.

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