A comparison of two grazing regimes during lactation for improving the sustainability of Latxa dairy sheep system

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Abstract

Land use and grazing management practices have changed during the last decades as a result of the intensification of traditional pasture-based systems. These changes have potential adverse environmental consequences. Dairy sheep production in the Basque Country has been based traditionally on a pasture-based farming system with a local dairy breed. The objective of the study was to determine the effect of two grazing management regimes, differing in the number of grazing and rest days per paddock, on pasture and dairy sheep production variables. There was no difference in herbage mass or dairy production variables between the two regimes but the regime with the longer rest periods resulted in greater amounts of herbage being harvested for conservation. The longer rest periods could also reduce the carbon footprint and benefit carbon capture by the pastures.

Keywords: dairy sheep, grazing management regimes, milk yield and composition, pasture, sustainability

Introduction

Land use and grazing management practices have changed during the past few decades as a result of the intensification of traditional pasture-based systems. Some of the consequences of these changes are directly related to environmental impacts, such as on soil quality. Permanent pastures have a huge capacity for improving soil health and carbon fixation. However, little attention has been devoted to grazing practices of these pastures during the past decades.

Dairy sheep production from pasture in the Basque Country has been traditionally based on the Latxa breed (Marijuán *et al.*, 2004). The assessment of the effect of grazing management on this system is critical to improving its efficiency. The main objective of the work is to determine the effect of two different grazing management regimes: grazing and rest periods of 6-10 days and 15 days, respectively (FG) vs grazing and rest periods of 2-3 days and 24 days, respectively (RG), on pasture and on dairy sheep production variables during the spring lactation period. Herbage mass and its nutritive value, and daily milk yield (DMY), milk fat (CF) content and sheep live weight (LW), were monitored in order to determine the effectiveness and sustainability of these grazing management regimes.

Materials and methods

An experiment was conducted using the experimental flock of NEIKER-Tecnalia during the spring lactating period (early April – late June 2014). Sheep were blocked into two homogeneous groups of 60 ewes, according to their age, daily milk yield, live weight and body condition score as described by Russel (1984). Each group was randomly assigned to FG or RG grazing regimes under the same stocking rate. The RG group of ewes grazed 3 times per plot with 2-3 days of stay on each one, and 24±2 days of rest between grazing periods. The FG group of ewes grazed 4 times per plot with 6-10 days of stay on each one and the rest between grazing periods was 15±3 days. Each group had access to a botanically diverse pasture after morning milking.

Data were collected fortnightly. The following measurements were made: 'grazing herbage mass' was estimated by cutting herbage to ground level with scissors in a 0.5×0.5 m quadrat. Herbage samples were dried (60 °C for 48 h) and weighed. The crude protein (CP), acid-detergent fibre (ADF) and neutral-

detergent fibre (NDF) contents of herbage samples were measured. Grass was harvested once during the study period and 'harvested herbage mass' was estimated by weighing the bales of hay obtained in each grazing regime paddocks.

Grazing data were collected daily on grazing-cards to describe the number of sheep per paddock; time spent grazing the pasture and the grazing management regime. Daily milk yield per ewe was measured one day each fortnight and milk samples were taken for analyses of CF content. Daily milk yield was corrected to standard DMY as described by Boquier *et al.* (1993). Finally, at the same time individual LW was determined.

All data were analysed by a generalised linear model (SAS, 2010) considering the following fixed effects: grazing management regime (FG and RG), month (April-June) and their interactions.

Results and discussion

The mean 'grazing herbage mass' for grazing and its mean CP content were similar on both grazing managements (Table 1). The difference was that the RG regime had 14% more 'harvested herbage mass' than the FG regime (4,712 kg DM and 4,062 kg DM, respectively) (Mandaluniz *et al.*, 2015a). The increase in grass availability in the RG regime could save or reduce the purchase of conserved forage under this grazing regime. Moreover, this reduction of inputs could have environmental benefits by reducing the carbon footprint (Mandaluniz *et al.*, 2015b).

According to the information collected on the grazing-cards, grazing time was increasing in both grazing managements from 4-6 h per day in April, to 6-8 h per day in May, and to 15-18 h per day in June.

Daily milk yield, milk fat content and standardized daily milk yield were similar for FG and RG groups (Table 2). Ewes of both groups had similar LW. There was a significant reduction in DMY and DMYs, and a significant increase in milk CF content between April and June.

Since the RG regime paddocks rest 24±2 days between grazing periods, and the FG regime paddocks rested 15±3 days, according to Teage *et al.* (2011), the longer resting time could benefit soil restoration and soil health, increase carbon fixation and herbage production. These variables will be monitored during the next 3 years in the Life Regen Farming project.

Conclusions

In conclusion, both grazing regimes, as carried out in the study, maintained milk yield and milk composition of the Latxa dairy sheep during the spring milking period. The increase in harvested herbage

Table 1. Herbage mass (grass) and nutritive value of herbage by grazing regime (FG and RG) and month.[1]

Variable[2]	Grazing regime[3]			Month			
	FG	RG	*P*-value	April	May	June	*P*-value
Grass (kg DM ha^{-1})	1,290±234	1,291±207	0.99	1,194+220^{a}	1,487+188^{b}	1,239+85^{ab}	0.001
CP content (g kg^{-1} DM)	164±31	156±25	0.26	173±27^{a}	165±17^{ab}	136±25^{b}	0.001
ADF content (g kg^{-1} DM)	250±66	246±30	0.73	215 ±16^{a}	291±30^{b}	254±24^{ab}	0.001
NDF content (g kg^{-1} DM)	480±90	480±60	0.85	423 ±44^{a}	564±62^{b}	467±54^{ab}	0.001

[1] Values in a row with different superscript letters are significantly different.

[2] Dry matter (DM); crude protein (CP); acid-detergent fibre (ADF); neutral-detergent fibre (NDF).

[3] FG = grazing and rest periods of 6-10 days and 15 days, respectively; RG grazing and rest periods of 2-3 days and 24 days, respectively.

Table 2. Daily milk yield (DMY), standard daily milk yield (DMYs), milk fat content (CF) and live weight (LW) by grazing regime and month.[1]

Variable	Grazing regime[2]			Month			
	FG	RG	*P*-value	April	May	June	*P*-value
DMY (ml d^{-1})	1,346±420	1,343±453	0.99	1,544±466[a]	1,229±401[b]	1,110±323[b]	0.001
DMYs (ml d^{-1})	1,193±351	1,218±382	0.39	1,334±383[a]	1,132±328[b]	1,081±324[b]	0.001
CF content (%)	6.63±0.9	6.50±1.0	0.12	6.21±0.9[a]	6.57±0.8[a]	7.32±0.8[b]	0.001
LW (kg)	60.8±7.6	61.7±8.8	0.19	60.0±8.0[a]	61.6±7.8[b]	63.3 ±7.6[c]	0.001

[1] Values in a row with different superscript letters are significantly different.

[2] FG = grazing and rest periods of 6-10 days and 15 days, respectively; RG grazing and rest periods of 2-3 days and 24 days, respectively.

bales on the RG grazing regime could increase the forage autonomy of farms and could reduce the carbon footprint of farms managed under this regime.

Finally, the longer resting time on the RG regime could benefit soil restoration and health and increase carbon fixation on the pasture. All these environmental parameters are being monitored in the project Life Regen Farming (http://www.regenfaming.eu) to evaluate different grazing regimes as a way to improve the sustainability of these dairy sheep production systems.

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