

## Mountain pasture utilization by free-ranging beef-cattle in the Natural Park of Gorbeia (Basque Country)

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### SUMMARY

A significant proportion of beef-cattle farms in the Basque Country are managed in a mountain-valley system, ranging mountain pastures between spring and autumn. Livestock use this pastures by a free-ranging system which difficult their feeding management during this period. The use of indicators as live weight (LW) allows estimating nutritive state of cows during this period. The objective of the current work was to study free-ranging beef-cattle LW performances during mountain grazing period and discuss the management implications of this sub-system in the general production system.

According to the data, cows maintained LW during mountain grazing season, although this maintenance was a result of LW gain during summer ( $140 \pm 370$  g/day) and loose during autumn ( $-56 \pm 480$  g/day). On the other hand, there was a high heterogeneity in LW evolution depending on grazing area, year and productive schedule.

Cows with higher energetic needs (last gestation and suckling) loose LW in both, summer and autumn, while lower needs ones (dry cows) maintain or gain it. Results indicate that both, spring and autumn calving cows have similar performances, but mountain grazing period contribute a 56% of estimated annual energetic needs in spring calving cows while only 40% in autumn calving ones. This high performance variability opens a multiple management possibilities which are discussed in the paper.

**Key words:** free-ranging, beef-cattle, mountain pastures, performances, calving season.

### INTRODUCTION

A significant proportion of beef-cattle farms in the Basque Country are managed in a mountain-valley system. Livestock graze on mountain ranges between spring and autumn and stay indoors during winter (Mandaluniz, 2003). Mountain period could have a great incidence on animal performances (Gibon *et al.*, 1985; Short & Adams, 1988) and conditions their valley management. This influence would be more important when animals are free ranging managed. The use of indicators as live weight (LW) allows estimating nutritive state of cows during this period and could be used as management tools to balance animal needs at different productive stages.

Data about the effect of this mountain-valley system in the Basque Country are limited. Studies carried out in similar mountain areas in the north of Spain show a low LW recuperation during mountain period in cattle, with a high heterogeneity depending on productive circumstances (Osoro *et al.*, 1992; Revilla *et al.*, 1993; Villalba *et al.*, 1997).

Considering these factors, the objective of the current work was to study free-ranging beef cattle LW performances during mountain grazing period, to analyse the effect of different calving calendars and discuss its management implications.

### MATERIAL AND METHODS

Study was carried out in the Atlantic watershed of the Natural Park of Gorbeia (Northern Spain). Data were collected from herds grazing in 4 management units (MU), Aldamiñape, Egiriñao, Atxulaur y Auztigargin, during 1997-1999 grazing seasons (Table 1).

**Table 1.** Number of cows monitored during the study period (1997-1999) in 4 grazing areas of the Natural Park of Gorbeia.

Grazing area	1997	1998	1999
Aldamiñape	13	20	14
Atxulaur	16	18	0
Auztigarmin	0	30	27
Egiriñao	10	12	0
<b>Total</b>	<b>39</b>	<b>80</b>	<b>41</b>

*Data collection*

Live weight data were recorded in 3 moments along the grazing period; LW1 in spring (May) when accessing to pastures; LW2 in late summer (September) when calves and bulls are taking out from pastures; and LW3 in autumn (November) when cows go back to the valley. It was estimated by an electronic bascule (precision 1 kg) and data were corrected by gestation (foetal growth) in each measurement (INRA, 1978).

Four cow groups were made according to their calving season:

- Dry cows (dry), animals which did not have calf in the study year or were weaned before mountain period,
- Late winter and early spring calving cows (spri), which were sucking calves during mountain period.
- Summer calving cows (sum), animals which went pregnant and delivery in mountain pastures, and,
- Autumn calving cows (aut), animals which stay pregnant during all the grazing season and delivery in autumn when going back to farm.

*Data analyses*

Two grazing periods were determined, summer and autumn. Summer performances were estimated as the difference of May and September data (LW2-LW1) and autumn performances as the difference of September and November data (LW3-LW2). Moreover, daily live weight gains (DLG) of both periods were estimated, as the difference of kg divided by the number of days (g/day).

Data were analysed by using a general lineal model of covariance (SAS, 2001), separating summer and autumn periods:

$$DLG = a + b * LW_i + CS_i + MU_j + Y_k$$

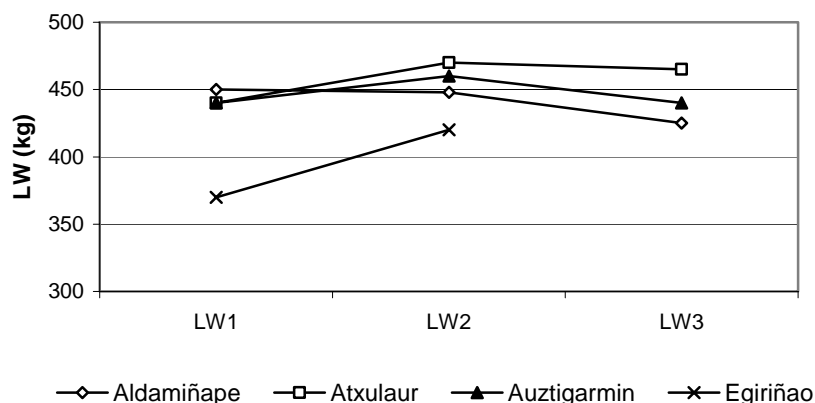
being DLG: the daily live weight gain (summer or autumn); LW<sub>i</sub>: the initial LW of cows in each period (LW1 in summer and LW2 in autumn); CS: the calving season (i=4; spring, summer, autumn and dry animals); MU: corresponds to the management unit (j=4; Aldamiñape (Al), Atxulaur (At), Auztigarmin (Au) and Egiriñao (Eg)); and Y: to the year of control (k=3; 1997, 1998 and 1999).

**RESULTS***Cows LW evolution during mountain grazing period*

Mountain grazing period lasts in 197±22 days (μ±s.d.), divided in 106±22 days in summer and 91±20 days in autumn. Cows LW1 was 433±74 Kg (μ±s.d.) (n=157) and cows grazing in Egiriñao were significantly smaller than the rest (P<0.05).

Cows maintained live weight during mountain grazing season, with an average increase of 10 kg in LW. But LW evolution had different tendencies depending on the grazing

period, summer or autumn (Figure 1). In summer animals gained 17 kg ( $140 \pm 370$  g/day;  $\mu \pm s.d.$ ), whereas in autumn lost on average 7 kg ( $-56 \pm 480$  g/day) was observed.



**Figure 1.** Lsmeans of cows' live weight (LW) during mountain grazing season (LW1: May, LW2: September y LW3: November) in the different grazing areas (Aldaminape, Atxulaur, Auztigargin and Egirinao).

In summer, DLG was affected significantly by the covariable LW<sub>i</sub> ( $P < 0.001$ ), with a negative value ( $-1.6 \pm 0.4$  g/d) of the regression coefficient. DLG was also significantly affected by the different fixed effects, calving season ( $P < 0.001$ ), study area ( $P < 0.01$ ) and year ( $P < 0.05$ ) (Tabla 2). The highest performances, with DLG higher than 400g/d, were observed in dry and autumn calving cows, while the lowest ones were in summer calving ones (Table 2). Moreover, cows which grazed in Aldaminape had significantly ( $P < 0.05$ ) worse performances than the rest ( $-15 \pm 68$  g/d).

**Tabla 2.** Lsmeans ( $X \pm e.s.$ ) of summer daily live weight gains (DLG) of cows and P level of the different fixed effects. (Spri: spring; Sum: summer; Aut: autumn; Al: Aldamiñape; Eg: Egirinao; At: Atxulaur; Au: Auztigargin).

Summer-DLG (g/day)								
Calving season			Study area			Year		
***			**			*		
Level	X	e.s.	Level	X	e.s.	Level	X	e.s.
Spri	32 <sup>b</sup>	41	Al	-15 <sup>a</sup>	68	97	175 <sup>ab</sup>	76
Sum	-150 <sup>b</sup>	116	Eg	284 <sup>b</sup>	98	98	294 <sup>a</sup>	57
Aut	449 <sup>a</sup>	134	At	241 <sup>b</sup>	76	99	88 <sup>b</sup>	81
Dry	412 <sup>a</sup>	66	Au	232 <sup>b</sup>	71			

\*\*\*  $P < 0.001$ ; \*\*  $P < 0.01$ ; \*  $P < 0.05$ ; n.s.  $P > 0.05$ . Values with different superscripts denote significant difference ( $P < 0.05$ ) between means within column.

DLG in autumn was affected by the covariable LW<sub>i</sub> ( $P < 0.01$ ), calving season ( $P < 0.001$ ) and year ( $P < 0.01$ ), but not the grazing area ( $P > 0.05$ ) (Tabla 3). The regression coefficient was negative and similar of the observed in summer ( $-1.7 \pm 0.5$  g/d). In this grazing period, autumn and summer calving cows lost significantly LW ( $480 \pm 151$  and  $432 \pm 179$  g/d, respectively) comparing to spring calving and dry ones, which maintain or have an increase of LW ( $63 \pm 52$  y  $104 \pm 74$  g/d, respectively).

**Tabla 3.** Lsmeans (X±e.s.) of autumn daily live weight gains (DLG) of cows and P level of the different fixed effects. (Spri: spring; Sum: summer; Aut: autumn; Al: Aldamiñape; Eg: Egiriñao; At: Atxulaur; Au: Auztigargin).

Autumn-DLG (g/day)								
Calving season			Study area			Year		
***			n.s.			**		
Level	X	e.s.	Level	X	e.s.	Level	X	e.s.
Spri	63 <sup>b</sup>	52	Al	-268 <sup>a</sup>	104	97	83 <sup>a</sup>	131
Sum	-432 <sup>a</sup>	179	At	-102 <sup>a</sup>	84	98	-327 <sup>b</sup>	65
Aut	-480 <sup>a</sup>	151	Au	-187 <sup>a</sup>	94	99	-314 <sup>b</sup>	94
Dry	104 <sup>b</sup>	74						

\*\*\* P<0,001; \*\* P<0,01; \* P<0,05; n.s. P>0,05.

Values with different superscripts denote significant difference (P<0.05) between means within column.

## DISCUSSION

### *Animal performance during mountain grazing season*

According to the results, cows maintained LW in a similar way as it has been described in other mountain pastures (Casasus, 1998; Jarrige, 1974; Osoro *et al.*, 2000; Petit *et al.*, 1995; Wright *et al.*, 1994). Anyway, two grazing periods can be identified with different tendencies; summer period, with LW gain and autumn period, with loose of LW. A similar behaviour has been observed in Pyrenean Mountains (Blanch *et al.*, 1995) and it could be associated to food availability changes along the grazing season. Changes of feeding strategies observed in autumn with increase of shrubs and low quality graminoids in the diet (Mandaluniz, 2003), would be not enough to compensate pasture quantity and quality reduction in this period.

Differences between grazing areas could be due to both, animal (Osoro *et al.*, 2000; Casasus, 1998) and vegetal (Albizu, 1996) characteristics. Parameters like stocking rate, which relates animal and vegetal parameters, have not been established in the present work and they could affect significantly animal performances (Osoro *et al.*, 1992).

### *Effect of calving season in cow performance*

According to the results, calving season is the parameter that most affect animal performance. This is due to the different energetic needs of cows depending on their productive schedule. Animals in late pregnancy and/or suckling have higher energetic needs, so that summer calving cows are the ones that fewer suit to this mountain system (lose 55 kg of LW). On the opposite, dry cows, with lower energetic needs, had the best performance during mountain grazing season (gain 53 kg of LW).

Spring and autumn calving systems were in an intermediate situation with similar LW performances (9 kg and 4 kg gain, respectively). The contribution of mountain period to the annual energetic needs in these two systems is 56 and 40%, to spring and autumn calving cows, respectively (Mandaluniz, 2003). These values are between the 40-70% cited in the literature (Casasus 1998; D'Hour *et al.*, 1998). The higher mountain pastures contribution on spring calving system could be explained because this period contributes to the cows' suckling needs.

This work is a first approximation of beef-cattle mountain sub-system in the Basque Country. According to the results, mountain pastures utilization show a high heterogeneity so it could be interesting to continue with these studies, including longer temporal series and adjusting winter feeding management according to the results of each year. It would be also interesting to analyse animal productive and reproductive responses in short-medium terms to these management.

## ACKNOWLEDGEMENTS

Authors would like to thanks all farmers which have collaborated in the study. Research was funded by the Basque Government fellowship given to Nerea Mandaluniz.

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