The relationship between body condition score and body weight in Latxa ewes

Oregui L.M., Vicente M.S., Garro J., Bravo M.V.

in

Purroy A. (ed.).
Etat corporel des brebis et chèvres

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 13

1992
pages 109-112

The relationship between body condition score and body weight in Latxa ewes

L.M. OREGUI
M.S. VICENTE
J. GARRO
M.V. BRAVO.
GOBIERNO VASCO, DEPARTAMENTO
DE AGRICULTURA Y PESCA
SERVICIO DE INVESTIGACION Y MEJORA AGRARIA
48016 DERIO VIZCAYA (SPAIN)

SUMMARY - The relationship which exists between body condition score (BCS) and body weight (BW) has been studied in 14 commercial flocks containing the two varieties of Latxa ewes, Black Face and Brown Face. To study the relationship between these parameters, the data collected at four different times were used and corresponded to two years and two different physiological states. The BCS variable, together with the age of the ewes, physiological state, year, flock and ewe variety explain the 73% variance in BW. This explained variance increases to 87% when body size (BS) is included in the model. In both cases the regression between marginal averages for BW compared to BCS was adjusted to second degree equation (r=0.996 and r=0.990). Although both equations differ in the sign of the quadratic term, in both cases one BCS unit is equivalent to 5 kg of BW approximately. These results are compared with those described by other authors.

RESUME - On a utilisé des données de note d'état corporel (EC) et poids vif (PV) obtenues à 4 moments, 2 ans et 2 états physiologiques différents, et correspondant à 14 troupeaux pour étudier la relation entre ces deux paramètres. 73% de la variance du PV est expliquée lorsque âge, état physiologique, an, troupeau, race de brebis et EC sont considérés et elle augmente jusqu'à 87% quand le Volume Corporel (VC) est inclu dans le modèle comme covariable. Pour les deux cas la régression entre l'EC et les moyennes marginales du PV s'adaptent à une équation de deuxième degré avec coefficients de régression de R=0,990 et R=0,996 selon que le VC est considéré ou non. Bien que ces deux équations soient différentes dans le signe du terme quadratique, lequel est positif lorsque le VC est considéré comme covariable, on trouve que chaque point d'EC correspond à 5 kg de PV (9,8% PV). Les résultats sont comparés avec ceux obtenus par d'autres auteurs, ainsi que les relations trouvées entre l'EC et l'âge et état physiologique des animaux.

Introduction

A large number of factors affect the nutritional state of animals whose main source of feed is grazing and this makes an assessment of their nutritional state difficult. Body condition score (BCS) gives an indication of fat reserves and their variations over a period of time. Since its definition in the sixties (Russel *et al.*, 1969) this method has been very successful: it has been used at a management level (MLC, 1983) and in many research studies which have assessed its relationship with several production parameters. The ease of correlation and the simplicity of the method were deciding factors in the choice of BCS as one of the main study parameters for research into nutritional states during the productive cycle of «Latxa» ewes in the Basque Country. In this paper we analyse the relationships which exist between (BCS) and body weight (BW) and the effect which age and physiological condition have on the former in accordance with the conditions which prevail in this region.

Materials and methods

20% of ewes over 1 year old and representing the age pyramid of the flock, were selected from 14 commercial flocks in the Basque Country. Each flock was visited monthly and the BCS was determined by the joint agreement of two judges, with a precision of 0.25 points. Twice a year, coinciding with the beginning of the reproductive season and after lambing, ewes were weighed with an accuracy of 0.5 kg. During the second year of study, in addition to weight, an estimate was made of body size (BS) (Gunn *et al.,* 1986), as the result, expressed in dm^3, of the product of the body length, chest depth and hip width. These three measurements were determined with an accuracy of 0.5 cm.

The majority of the flocks analysed contained one of the two varieties of Latxa sheep: Brown Face Latxa or Black Face Latxa. Both varieties have similar morphological characteristics, differing only in the skin and hair colour of head and extremities, although the Black Face Latxa is smaller in size (Urarte, 1987).

The statistical analysis of data was made by means of the SAS statistical program (SAS Institute Inc., 1988).

Results and discussion

The body weight (BW) of the animals studied covered a wide range, from 31 to 79 kg, although 53% of these were between 45 and 55 kg (Fig. 1). The BCS of the animals as a whole varied from 0.75 to 4.25 although most of these (87%) had BCS of between 2.00 and 3.00. The differences in BCS between animals in different physiological states, 2.59±0.49 at mating and 2.25±0.45 after lambing, although being statistically significant, ($p<0.001$) were small. The slight difference in BCS between one year and another (2.47 *vs* 2.40) is due to the difference in post-lambing sampling (2.32 *vs* 2.15). In the same way we find that young animals tend to have a lower BCS than those of more than three years of age, especially at mating (2.43 vs 2.66).

Body size (BS) was found to range from 19.7 to 74.6 dm^3, with 50% of cases between 42 and 51 dm^3. The average BS of the animals as a whole was greater in post-lambing sampling (47.92±5.77 *vs* 44.83±8.12), possible due to the growth of one and two-year-old animals whose average sizes changed from 36.62 to 42.19 and from 42.41 to 47.59 dm^3, these differences being significant ($p<0.001$) in both cases.

In order to study the relationship which exists between BW and BCS an analysis of variance was made by considering BCS as a qualitative variable, as well as age, physiological state, flock and variety of sheep, which were also included in the model. Due to the fact that there is only one type of ewe in most flocks, flock was nested into variety. This model explains 73% of the BW variance and all the variables have a significant effect on same ($p<0.001$). This analysis allows us to obtain the least-squares means of the BW for each BCS. These would correspond to the averages for each BCS value which could be expected if the design were balanced, and are shown in Table 1. The regression between the marginal averages for BW and BCS, classes of less than 4 animals not being considered (i.e., BCS<1.25 and BCS>4.00), is adjusted to a second degree equation:

$$BW=37.46+7.09*BCS-0.36*BCS^2 \quad RSD=0.19 \quad r=0.996 \quad (1)$$

The inclusion of BS as a variable in the variance analysis model, which means the elimination of the year factor, improves the explained variance considerably which becomes 87%. This improvement can be expected given the influence that the size of the animals has on their weight (Guerra *et al.,* 1972). Table 1 shows marginal averages of BW with respect to BCS, obtained from this variance analysis, as well as the significance of their differences. The regression equation between both parameters is adjusted as in the previous case to a second degree equation:

$$BW=44.56+2.18*BCS+0.50*BCS^2 \quad RSD=0.45 \quad r=0.990 \quad (2)$$

Both equations are shown in Fig. 3. In both cases, one point of BCS is the equivalent of 5 kg approximately of BW, varying between 4 and 6 kg depending on the BCS range considered. Nevertheless, the shape of the curve is different due to the sign of the quadratic term.

In both models of variance analysis, the evolution of BW has been analyzed with respect to the age of the animals and BW marginal means were calculated for every age class. The results are shown in Table 2. It can be seen that the age effect on BW is considerable, especially up to three years of age during which time the differences are statistically different. Likewise, based on the same calculations as for the previous variables, we find that physiological state has a significant effect ($p<0.001$) on BW. At the beginning of mating, the animals have a lower BW than after lambing: 50.77 *vs.* 52.65 and 50.00 *vs.* 53.29 according to whether the BS is included in the model or not. This weight increase after lambing, when ewes have a lower BCS, may be due to the increase in water retention during the first stages of lactation when fatty mobilisation occurs (Cownan *et al.,* 1979), together with the increase in fleece weight, as weighing at mating was performed after shearing. On the other hand, an increase in the gastric content after lambing also occurred as a consequence of the increase in the intake capacity.

In Tables 1 and 2 it can be seen that the inclusion of BS in the analysis of variance made smaller the weight differences among classes. This will be due to the fact that the considerable growth of the animals between weighings and with the increase in their age, together with the lower BCS of younger animals, means that the effect of BS, when this is not included in the model, is assumed by the remaining variables.

The evolution of BW in accordance with BCS, taking BS into account, is non linear and whith a similar shape to that described by Teixeira *et al.,* (1989) in the Rasa Aragonesa, although in our case the differences in weight between the different BCS ranges are lower. Likewise, we find that one point of BCS corresponds to 9-10% of the BW, lower than the 12-14% considered by MLC (1983) for British breeds as a whole or to that described for the Rasa Aragonesa (Paramio *et al.*, 1985; Teixeira *et al.,* 1989), greater than 15%. These differences may be due to the conformation of the different breeds and it is necessary to take into account the milking aptitude of the Latxa sheep. On the other hand, the anatomical differences of the lumbar region of the different breeds may lead to modifications in the evaluation of BCS.

To sum up, in accordance with the conditions which prevail in our region, BCS is a good estimator of BW modifications in Latxa ewes. Consequently, given its simplicity, it would be the right method to choose in the management of commercial flocks. In the case of these breeds, one point of BCS is the equivalent of 5 kg approximately of BW, i.e. 9.8% of BW, lower than that described for other breeds.

References

MLC (1983). Feeding the Ewe. Ed. by MLC, Milton-Keynes, U.K. 78 pp.

COWAN R.T., ROBINSON J.J. and GREENHALGH J.F.D. (1979). Body composition changes in lactating ewes estimated by serial slaughter and deuterium dilution. Anim. Prod., *29*:81-90.

TEIXEIRA A., DELFA R. and COLOMER-ROCHER F. (1989). Relationships between fat depots an Body Condition Score or tail fatness in the Rasa Aragonesa breed. Anim. Prod., *49*:275-280.

GUERRA R.G., TWHAITES C.J. and EDEY T.N. (1972). Assessment of the proportion of chemical fat in the bodies of live sheep. J. Agric. Sci., Camb., *78*:147-149.

GUNN R.G., DONEY J.M., SMITH W.F. and SIM D.A. (1986). Effects of age and its relationship with body size on reproductive performance in Scottish Blackface ewes. Anim. Prod.. *43*:279-283

PARAMIO M.T. and FOLCH J. (1985). Puntuación de la condición corporal en oveja Rasa Aragonesa y su relación con las reservas energéticas y los parámetros reproductivos. ITEA, *58*:29-44.

RUSSEL A.J.F., DONEY J.M. and GUNN R.G. (1969). Subjective assessment of body fat in live sheep. J. Agric. Sci., Camb., *72*:451-454.

SAS Institute Inc. (1988). SAS/STAT Guide for personal computers, Release 6.03 Edition. SAS Inst. Inc. Cary, NC. 1028 pp

Table 1: Body weight (BW) least-squares means in relation to ewes body condition score (BCS). The means followed by the same letter do not differ significantly (p<0.01) within a given column.

BCS	BW_1	BW_2
0.75	31.86^{a}	34.14^{a}
1.00	33.15^{a}	39.79^{ab}
1.25	46.67^{bc}	47.55^{b}
1.50	46.80^{b}	48.65^{b}
1.75	48.72^{c}	51.25^{c}
2.00	50.23	51.15^{c}
2.25	51.82	52.22^{cd}
2.50	52.81	53.22^{d}
2.75	54.64^{d}	54.42^{e}
3.00	55.90^{de}	55.57^{ef}
3.25	57.46^{ef}	56.83^{f}
3.50	57.88^{ef}	57.36^{f}
3.75	58.89^{fg}	59.60^{fg}
4.00	60.18^{g}	62.24^{g}
4.25	67.66^{g}	

Table 2: Body weight (BW) least-squares means in relation with age classes. The means followed by the same letter do not differ significantly (p<0.01) within a given column.

AGE	BW_1	BW_2
1	43.26	46. 21
2	49.22	50.72^{a}
3	51.46^{a}	51.55^{ab}
4	52.68^{b}	52.74^{bc}
5	52.81^{b}	52.72^{bc}
6	53.28^{b}	52.43^{bc}
7	53.39^{b}	52.11^{abc}
8	53.63^{b}	53.09^{c}
9	55.09^{ab}	53.84^{abc}

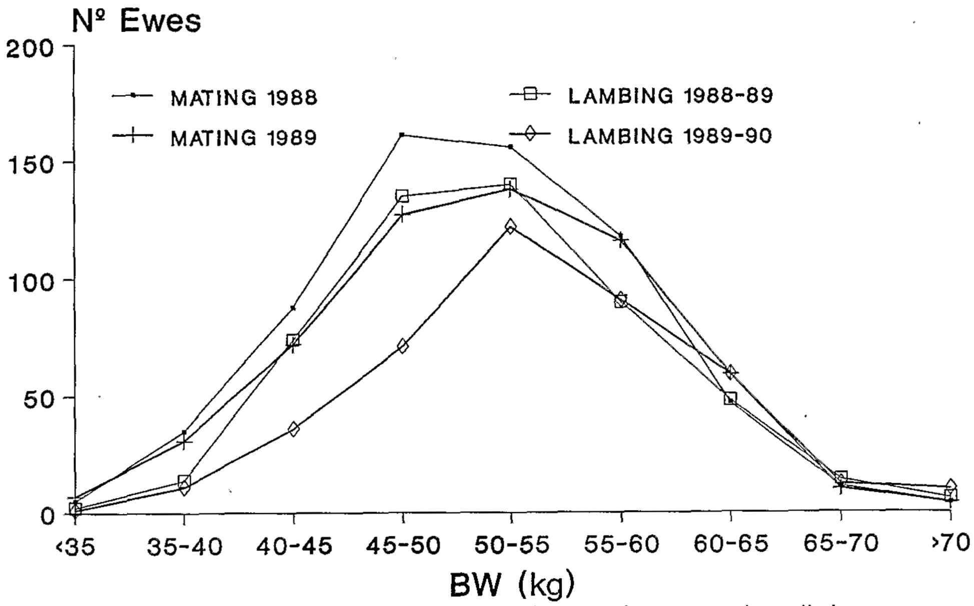

Fig. 1. Distribution of ewes body weight in each of four controls studied

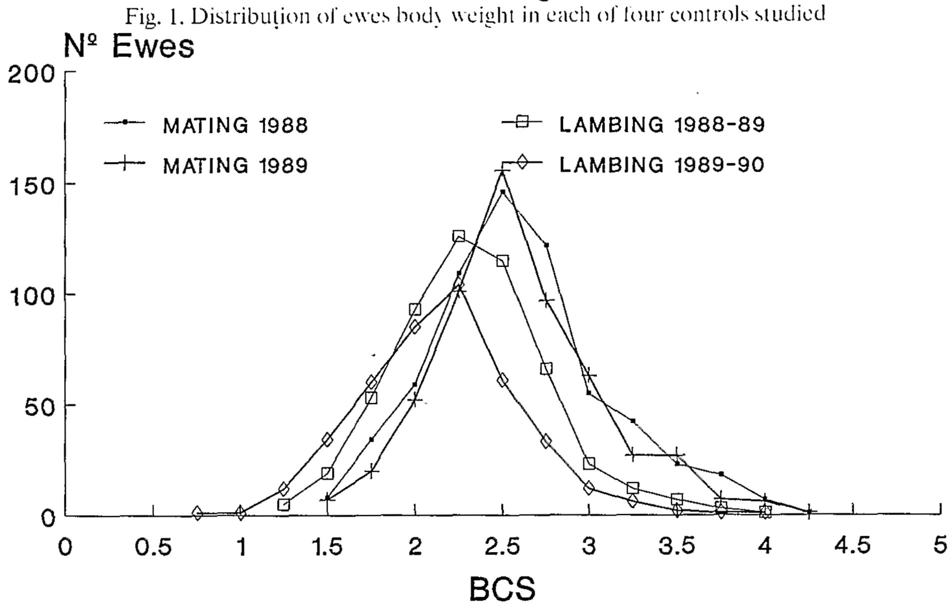

Fig. 2. Ewes body condition score distribution in the different controls

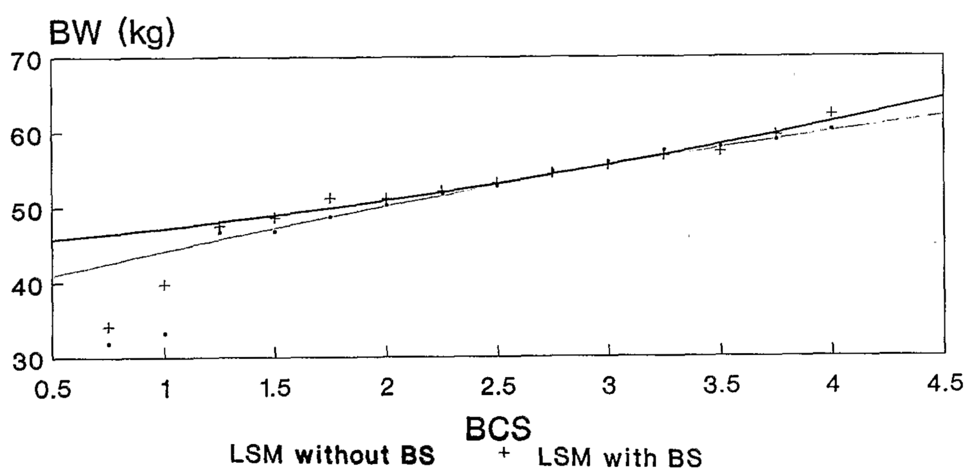

Fig. 3. Regression between BCS and least-squares means of BW. The pointed line represents the equation (1) and the continous line the equation (2)