The association of ewe body condition score with weight of lamb weaned

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ABSTRACT

Data from 1,301 ewes lambing in 2009 were analysed to investigate the association of body condition score (BCS) with total lamb weaned (TLW). BCS was assessed on a scale of 0-5 at mating (BCSM), scanning (BCSS), pre-lambing (BCSL) and weaning (BCSW) and categorized as <3, 3-3.5 and >3.5. Ewe age, flock, live weight at mating (LWM) and date of lambing (DOB) had significant effects on TLW ($P < 0.05$). Ewes having triplets at birth with >3.5 and 3-3.5 BCSM had a higher TLW (63.2, 63.0 kg respectively; $P<0.05$) than ewes with triplets at birth and <3 BCSM (56.1 kg). Ewes with 3-3.5 BCSS had higher TLW than ewes with >3.5 BCSS for all birth ranks (49.8 kg, 47.2 kg respectively, $P < 0.05$). There was no association between BCSL and TLW. Ewes with <3 or 3-3.5 BCSW had a significantly higher TLW than ewes with >3.5 BCSW (>3.5 = 43.8 kg, 3-3.5 = 48.9 kg, <3 = 50.9 kg; $P < 0.001$). This study indicates ewes with 3-3.5 BCSS or <3 or 3-3.5 BCSW outperform ewes with >3.5 BCSS or >3.5 BCSW.

Keywords: body condition score; ewe weight of lamb weaned.

INTRODUCTION

The body condition profile of a ewe during gestation, lambing and weaning may be an indication of her reproductive performance, which could be utilised when making management decisions on farm to improve productivity. Body condition score is a trait that is relatively easily recorded. Live weight is dependent on the frame size of an animal as well as the body condition, making live weight less informative when determining the energy reserves available in a ewe. This has been demonstrated in mature ewes by Sanson et al. (1993). Previous studies by Borg et al. (2009) have shown a correlation between live weight and body condition score and relationships between the live weight profile of a ewe during gestation, lambing and weaning and her lambing results. Borg et al. (2009) also showed that ewes which lose weight during lactation and then compensate by gaining weight during mating and gestation the following season, have high genetic merit for lamb growth and maternal ability.

Nutrition around conception and during early foetal and placental growth is important. Under nutrition at these times disrupts the energy balance between foetal growth and maternal weight in twin pregnancies (MacLaughlin et al., 2005). In addition, in five year old twinning ewes it has been shown that ewes with >3.5 body condition scores at mating time had significantly lighter lambs at birth than ewes with lower body condition scores but that body condition score at mating time had no effect on weaning weight (Kenyon et al., 2004). This previous work indicates that there may be an optimal body condition score at mating and during early pregnancy that maximises reproductive performance. Selecting ewes of optimum body condition score could increase overall flock productivity and increase the productive life of the ewe.

The objective of this paper was to determine the optimal body condition score during gestation, lambing and weaning for the highest ewe production performance. Total weight of lamb weaned (TLW) was used as an indicator of ewe production performance and is a function of litter survival rate and lamb weaning weight.

MATERIALS AND METHODS

Animals

Performance records in the Sheep Improvement Ltd (SIL) database (Table 1) from the Ovita adult ewe traits study were used in this study. Data were from 1,301 ewes comprising three Southland flocks. The dataset was limited to ewes having up to three lambs that were not assisted or interfered with at birth, were not fostered, were not part of an embryo transfer programme and had all lambing records available.

Ewe data

Ewe data was recorded during the 2009 season and entered onto the SIL database. Lamb weaning weights were recorded and TLW was calculated as the sum of the weaning weights from a litter for a ewe. Ewe age, flock, litter date of birth (DOB) and ewe live weight at mating (LWM) were used to test for association with TLW where applicable. Ewe age was grouped as 2, 3, 4 and 5+ years. Body condition scores were recorded within 7-10 days of the introduction of the ram for mating (BCSM), within five days of pregnancy scanning to identify foetal number, at approximately 98 days after

TABLE 1: Number of ewes with body condition score records at mating (BCSM), pregnancy scanning (BCSS), prelamb (BCSL) and weaning (BCSW) by birth rank.

Birth rank	Total number of ewes	BCSM			BCSS			BCSL			BCSW		
		>3.5	3-3.5	<3	>3.5	3-3.5	<3	>3.5	3-3.5	<3	>3.5	3-3.5	<3
1	287	73	169	45	70	157	60	29	154	104	90	129	68
2	750	148	481	121	162	455	133	77	460	213	100	250	400
3	264	68	160	36	70	180	14	78	145	41	39	69	156
Total	1301												

TABLE 2: Total weight (kg) of lamb weaned (TLW) as log transformed least squares means ± standard errors according to birth rank and ewe age associated with body condition at mating (BCSM), pregnancy scanning (BCSS), prelamb (BCSL) and lamb weaning (BCSW) with back transformed least squares means in brackets. Means for the same birth rank and body condition score type with different superscript letters are significantly different (P <0.05).

Effect		BCSM	BCSS	BCSL	BCSW
Birth rank	1	3.81 ± 0.02 (35.0)^{a}	3.81 ± 0.01 (35.2)^{a}	3.81 ± 0.02 (35.2)^{a}	3.81 ± 0.01 (35.2)^{a}
	2	4.15 ± 0.01 (53.3)^{b}	4.13 ± 0.01 (52.5)^{b}	4.14 ± 0.01 (53.0)^{b}	4.12 ± 0.01 (51.4)^{b}
	3	4.26 ± 0.02 (60.7)^{c}	4.25 ± 0.02 (60.4)^{c}	4.28 ± 0.02 (62.2)^{c}	4.24 ± 0.02 (59.5)^{c}
Ewe age	2	4.04 ± 0.02 (46.8)^{a}	4.03 ± 0.02 (46.5)^{a}	4.04 ± 0.02 (46.8)^{a}	4.03 ± 0.02(46.3)^{a}
	3	4.09 ± 0.01 (49.6)^{b}	4.08 ± 0.01 (49.3)^{b}	4.10 ± 0.01 (50.1)^{b}	4.08 ± 0.01 (49.3)^{b}
	4	4.09 ± 0.01 (50.0)^{b}	4.09 ± 0.01 (49.5)^{b}	4.10 ± 0.01 (50.3)^{b}	4.08 ± 0.01 (49.2)^{b}
	5+	4.06 ± 0.02 (48.0)^{ab}	4.06 ± 0.02 (49.1)^{ab}	4.07 ± 0.02 (48.7)^{ab}	4.03 ± 0.02 (46.5)^{a}

mating (BCSS), within the two weeks before lambing (BCSL) and at weaning at approximately 85 days from birth (BCSW). The association of each BCS at mating, pregnancy scanning, pre-lambing and weaning with TLW were analysed. The body condition scores were based on a scale of 0 to 5 as described by Jeffries (1961), modified to include half scores, with 0 being an extremely emaciated ewe and 5 being an overweight ewe. Body condition scores were grouped into <3, 3- 3.5 and >3.5 for association analyses.

Statistical analyses

The analyses were carried out in SAS version 9.1 (SAS, 2010). The association of BCSM, BCSS, BCSL and BCSW on TLW were each investigated using the mixed model procedure in SAS. TLW was log transformed to normalise the data. The fixed effects of ewe age, birth rank, flock, LWM and DOB were tested and reported where significant at P <0.05. Least squares means and associated standard errors are reported on a log scale with back transformed means in brackets. Regression coefficients are reported on the log scale with associated standard errors.

RESULTS

Total lamb weaned was significantly affected by ewe age and birth rank in all models (Table 2). Total lamb weaned was lowest for two year old ewes and increased with birth rank. Date of birth and LWM had significant effects on TLW in all models where heavier ewes at mating and ewes with older litters at weaning had higher TLW (BCSM: β = -0.006 ± 0.0011 (standard error) log kg weaned/day, P <0.0001 and β = 0.003 ± 0.0012 log kg weaned/kg, P <0.05 respectively; BCSS: β = - 0.007 ± 0.0011 log kg weaned/day, P <0.0001 and β = 0.003 ± 0.0011 log kg weaned/kg, P <0.05 respectively; BCSL: β = -0.007 ± 0.0011 log kg weaned/day, P <0.0001 and β = 0.002 ± 0.0011 log kg weaned/kg, P <0.05 respectively; BCSW: β = - 0.007 ± 0.0011 log kg weaned/day, P <0.0001 and β = 0.005 ± 0.0011 log kg weaned/kg, P <0.0001 respectively, reported on the transformed scale).

Ewes that gave birth to triplets with 3-3.5 and >3.5 BCSM had a higher TLW (4.29 ± 0.019 (63.02 kg) and 4.29 ± 0.033 (63.19 kg) respectively, P <0.05) compared to ewes with <3 BCSM (4.19 ± 0.037 (56.07 kg)). Ewes with a 3-3.5 BCSS had higher TLW than ewes with >3.5 BCSS (4.09 ± 0.009 (49.84 kg); 4.05 ± 0.017 (47.22 kg)

TABLE 3: The association of body condition score at mating (BCSM), pregnancy scanning (BCSS), prelamb (BCSL) and weaning (BCSW) with total lamb weaned (TLW, kg) as log transformed least squares means ± standard errors by birth rank with back transformed least squares means in brackets. Means for the same birth rank and body condition score type with different superscript letters are significantly different (P<0.05).

Body condition score type		Birth rank			
		All	1	2	3
BCSM	<3	4.05 ± 0.02 (47.6)[a]	3.79 ± 0.03 (34.4)[a]	4.17 ± 0.02 (55.0)[a]	4.19 ± 0.04 (56.1)[a]
	3-3.5	4.08 ± 0.01 (49.3)[a]	3.82 ± 0.02 (35.5)[a]	4.14 ± 0.01 (52.8)[a]	4.29 ± 0.02 (63.0)[b]
	>3.5	4.08 ± 0.02 (48.9)[a]	3.81 ± 0.03 (35.0)[a]	4.13 ± 0.02 (52.1)[a]	4.29 ± 0.03 (63.2)[b]
BCSS	<3	4.06 ± 0.02 (48.0)[ab]	3.80 ± 0.03 (34.6)[a]	4.11 ± 0.02 (51.1)[a]	4.27 ± 0.06 (61.4)[ab]
	3-3.5	4.09 ± 0.01 (49.8)[b]	3.81 ± 0.02 (35.3)[a]	4.16 ± 0.01 (54.0)[a]	4.30 ± 0.02 (63.8)[b]
	>3.5	4.05 ± 0.02 (47.2)[a]	3.82 ± 0.03 (35.5)[a]	4.13 ± 0.02 (52.3)[a]	4.19 ± 0.03 (56.1)[a]
BCSL	<3	4.07 ± 0.02 (48.4)[a]	3.82 ± 0.02 (35.4)[a]	4.13 ± 0.02 (52.5)[a]	4.25 ± 0.03 (60.0)[a]
	3-3.5	4.07 ± 0.01 (48.8)[a]	3.81 ± 0.02 (35.1)[a]	4.15 ± 0.01 (53.3)[a]	4.27 ± 0.02 (61.4)[a]
	>3.5	4.09 ± 0.02 (49.7)[a]	3.81 ± 0.04 (34.9)[a]	4.14 ± 0.03 (53.1)[a]	4.32 ± 0.03 (65.2)[a]
BCSW	<3	4.11 ± 0.03 (50.9)[b]	3.84 ± 0.03 (36.6)[a]	4.18 ± 0.01 (55.2)[c]	4.31 ± 0.02 (64.4)[b]
	3-3.5	4.08 ± 0.01 (48.9)[b]	3.81 ± 0.02 (35.3)[a]	4.14 ± 0.01 (52.6)[b]	4.28 ± 0.03 (62.0)[b]
	>3.5	3.99 ± 0.02 (43.8)[a]	3.78 ± 0.02 (33.8)[a]	4.04 ± 0.02 (46.8)[a]	4.14 ± 0.04 (52.6)[a]

respectively, P <0.05). There was no significant difference in TLW between <3 BCSS and >3.5 or 3 - 3.5 BCSS. There was no association between BCSL and TLW. Ewes with a <3 or 3-3.5 BCSW had a significantly higher TLW than ewes with >3.5 BCSW (4.11 ± 0.013 (50.92 kg), 4.08 ± 0.012 (48.90 kg), 3.99 ± 0.019 (43.83 kg) respectively; P <0.0001) (Table 3).

DISCUSSION

The objective of this study was to identify the optimal body condition score range for a ewe at the different stages of gestation and lamb rearing in order to maximise production performance. Body condition scores at mating, during gestation, and weaning each had a significant effect on ewe production performance, as measured by TLW in this study.

In the studies of Kenyon et al. (2004), which included five year old ewes producing singles and twins, BCSM had no effect on weaning weight. Our results appear to be similar as the effect of BCSM on TLW was not significant for birth ranks lower than 3. Although in our data TLW incorporated survival rate by comparing the total weight weaned for ewes based on birth rank even when some lambs in the litter died at or after birth, and therefore is not directly comparable to weaning weight. However, our results do indicate that ewes which had a 3-3.5 body condition scores at scanning or weaning performed better than ewes which had >3.5 body condition scores at those times. In addition, triplet bearing ewes, that had >3.5 or 3-3.5 BCSM performed better than triplet bearing ewes with <3 BCSM, this effect was not observed in lower birth ranks. These results may indicate a similarity to those of Borg et al. (2009) whereby ewes which appear better able to utilise their body fat reserves during gestation and lactation, that is maintain condition in early gestation and then lose condition during lactation, perform better than other ewes. A similar phenomenon has also been observed by Schreurs et al. (2010) with ewe lambs but with live weight rather than BCS. Associations observed in this study appear to be most evident in ewes with triplets, possibly due to the higher energy demands of the litter, where ewes having a 3-3.5 or >3.5 BCSM performed better than ewes with a <3 BCSM.

Factors that increase the productivity of ewes having triplets are increasingly important to commercial farmers aiming to improve profitability as the number of triplet lambs born is increasing (Amer et al., 1999) and mortality is higher in triplets (Kerslake et al., 2005).

Identifying ewes which are not performing well and removing them from the flock or managing them to optimise BCS as shown in this study should result in an increase in flock productivity, particularly in the total lamb weaned from ewes scanned with triplets.

Further research is required investigating the relationship between body condition score changes throughout gestation and lactation, with and without feed resrictions, on ewe production to better identify the characteristics of top performing ewes and to extend their lifetime performance.

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