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Herbage quality and growth rate of single and twin lambs at foot

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ABSTRACT

Single and twin lamb growth rates, herbage mass and quality were monitored 3-5 times from birth to weaning on 6 farms in the southern North Island. Lambs ($n = 50-80/\text{farm}$) were tagged and weighed at birth, and ewes ($n = 20-50/\text{farm}$) grazing with the monitored lambs were tagged and weighed from docking. The average live weight gain (LWG) from birth to weaning was 273 g/d (229-311) and 220 g/d (152-279) for single and twin lambs respectively ($P < 0.001$). Single-pregnant ewes maintained their weight over lactation while twin-pregnant ewes lost 41 g/d ($P < 0.002$) and were 4.6 kg lighter ($P < 0.002$) at weaning. The mean herbage mass in paddocks grazed by single or twin-pregnant ewes during lactation was 1120 and 1450 kg DM/ha respectively ($P < 0.001$) and remained relatively static over the lactation period. Mean herbage energy concentration averaged 10.5 MJME/kg DM during the first two months of lactation but had declined to 8.9 by weaning ($P < 0.001$). In conclusion, twin lamb growth rates on hill country are considerably lower than those of single lambs.

Keywords: lamb growth, single, twin, pasture quality, hill country.

INTRODUCTION

A group of progressive farmers interested in increasing breeding ewe performance (Lambmax Group) set ambitious live weight gain (LWG) targets of 300 g/d and 350 g/d for suckled twin and single lambs as part of their annual business plan. Discussions revealed few of the farmers had recorded lamb birth weights and lambing dates for individual lambs and, therefore, lacked definitive data on lamb LWG. Many of these farmers had substantially increased lambing percentages, and as a consequence, had delayed lambing dates to more closely align feed demands of multiple-pregnant ewes with spring increases in pasture growth rate. However, pasture quality declines in late spring and summer due to an accumulation of less digestible material (e.g. reproductive stem and dead matter) following lax grazing (Butler and Chu, 1987) and a decline in digestibility of green grass fractions due to increasing temperature (Buxton and Fales, 1994).

The objective of this study was to provide definitive data on single and twin lamb LWG and pasture quality over the lactation period in order to identify constraints in growth of twin lambs. Factors associated with high lamb LWG were noted and possible ways of improving twin lamb growth are discussed.

MATERIALS AND METHODS

A random sample ($n = 50-80$) of lambs born to single- or twin-pregnant ewes were tagged and weighed around birth on a single day during peak lambing (24 August – 12 October 1998) on each of 6 (1 farm had twins only) commercial farms in the lower North Island (Dannevirke (3), Makuri, Akitio, Palmerston North). Single and twin pregnant ewes were separated prior to lambing. Ewes were predominantly Romney or Finn x Romney and both black face and white face rams were used. Five of the farms were hill country properties and one was flat. At docking, ewes ($n = 20-50$) from the same paddocks as the lambs were also tagged. Lambs and ewes were weighed at approximately monthly intervals from birth to weaning (4 farms) or at docking and weaning (2 farms). The sheep

were managed as part of larger mobs using normal farm practises.

Herbage mass was measured on the weighing day using a rising plate meter. The plate reading was converted to dry matter using a standard equation ($\text{kg DM ha}^{-1} = 200 + 158 * \text{plate reading}$). Herbage representative of the sheep's diet was clipped and herbage quality was determined by NIR analysis (FeedTECH, AgResearch, Grasslands). The green, clover and reproductive stem percentages were estimated by eye by the same operator on all farms. Data were averaged for each farm and then analysed using analysis of variance using general linear models regression analysis (SAS, 1990).

RESULTS

Herbage

The mean \pm se herbage mass in paddocks during lactation was 1120 ± 70 and 1450 ± 50 kg DM/ha ($P < 0.001$) in paddocks grazed by single- or twin-pregnant ewes respectively, and remained relatively static over the lactation period (Table 1). Herbage energy, protein and green percentage of the pasture declined and non-digestible fibre increased from early November (Figure 1). Mean herbage energy concentration averaged 10.5 ± 0.1 MJME/kg DM over the first two months of lactation but had declined to 8.9 ± 0.3 by weaning ($P < 0.001$). Pasture quality overall was similar in single and twin paddocks (10.2 ± 0.3 vs 10.0 ± 0.2 MJME/kg DM), though herbage energy and green percentage dropped to a greater extent towards the end of lactation (Time * rearing rank $P < 0.002$) in twin paddocks (Table 1). Eye-assessed clover content was 5% lower ($P < 0.05$) overall on twin compared to single paddocks.

For each 10% decrease in eye assessed green dry matter percentage, herbage energy declined by 0.7 ($P < 0.01$) and ME further declined by 0.18 MJME/kg DM ($P < 0.05$) for each month past August. As mean herbage phosphate increased by 0.1%, feed quality improved by 0.8 MJME ($P < 0.001$) and pastures contained 8% more clover ($P < 0.05$).

Live weight gain

Mean birth weight was higher in single (6.4 kg) than twin (5.1 kg) lambs ($P<0.01$). The average LWG (individual farm range) from birth to weaning was 273 ± 7 g/d (229-311) and 220 ± 5 g/d (152-279) for single and twin lambs respectively ($P<0.001$), and twin lambs were 3 kg lighter at weaning. On farms with weights collected at all sample times, twins grew slower than singles from birth to docking (397 ± 9 vs 297 ± 6 g/d $P<0.0001$) and in the last month preceding weaning (267 ± 6 vs 177 ± 5 g/d, $P<0.0001$). In mid lactation, the difference (16 g/d) between single and twin lambs was not significant. Ram lambs were 1 kg heavier at weaning but this difference was not significant. Single-pregnant ewes maintained their weight during lactation while twin-pregnant ewes lost 41 ± 7 g/d ($P<0.002$) and were 4.6 ± 0.8 kg lighter ($P<0.002$) than single-pregnant ewes at weaning.

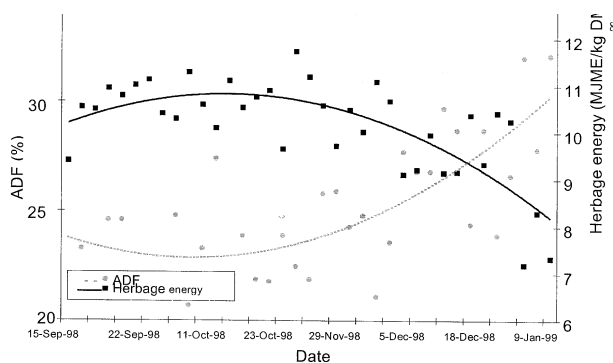
Regression analysis ($r^2>0.80$) showed that an increase of 260 kg DM/ha in mean herbage mass during lactation ($P<0.01$) or 8% clover in the pasture or 0.7 MJ/kg DM in pasture ME ($P<0.01$) or 6 kg ewe weight at lamb docking ($P<0.05$) increased twin lambs growth rates by 50 g/day. As there were only six data points for each rearing rank it was not possible to carry out a multiple regression analysis on this data.

TABLE 1: Herbage quality and mass during lactation in paddocks grazed by single and twin pregnant ewes.

	Herbage Mass (kg DM/ha)		Metabolisable Energy (MJ/kg DM)		Green (%)		Clover (%)	
	Single	Twin	Single	Twin	Single	Twin	Single	Twin
Lambing	1110	1430*	10.1	10.5	88	95*	15	14
Docking	1100	1330	10.7	10.6	92	86	18	13
Weight 3 ¹	1275	1500	10.8	10.5	92	86	22	12*
Weaning	1150	1470	9.1	8.5	80	75	13	8

¹ Does not include data from all farms. * Indicates twin differs from singles $P<0.05$.

FIGURE 1: Relationship between herbage energy content and acid detergent fibre content from September to January on farms in the southern North Island.



DISCUSSION

Lamb growth rates were much lower (273 g/d for single, 220 g/d for twin lambs) than the targets set by the farmers (350 g/d for single, 300 g/d for twins). These low growth rates for twin lambs were comparable to those measured on 6 other commercial farms in the preceding year (220 g/d; Litherland *et al.*, 1999) and to those recorded on hill

country research farms in the North Island (220-236 g/d. McCall *et al.*, 1986; Parker and McCutcheon, 1992; Morris *et al.*, 1994). Low growth rate of twins reduced the proportion of lambs weighing more than 31 kg at weaning (at 14 weeks of age) to 26% compared to 53% in single lambs. There is potential to improve profit and efficiency (saleable meat/MJME eaten) by increasing growth rates of twin lambs. High growth rates are more efficient in converting pasture into saleable meat because of the lower ratio of maintenance to total feed requirements (Ratray, 1981).

Using the comparison between single and twin lambs to identify the limitations in growth of twin lambs, the periods from birth to docking (20-30 days of age) and the last month of lactation were identified as being critical to achieving high weaning weights. Lamb growth over the first month of life depends largely on milk production from the ewe. Arguably the simplest way to improve milking ability of ewes is by cross breeding with a high milk-producing breed (e.g. Poll Dorset, East Friesian) (Geenty *et al.*, 1985; Muir *et al.*, 1998). However, an improvement in milk production is advantageous only when the fecundity level of the flock is high as single lambs do not have the capacity to consume all the additional milk (Muir *et al.*, 1998).

Milk production of the ewe over the first month of lactation is highly responsive to increasing mammary gland nutrient supply (Ratray, 1982; McCall *et al.*, 1986). The farmers in this study differentially fed ewes suckling twins by set stocking them at lower rates on higher herbage masses (1400 vs 1100 kg DM/ha - 8 and 6 cm respectively estimated sward height (Parker and McCutcheon, 1992)). Farms with higher herbage masses (1100 vs. 1650 kg DM/ha) grew twin lambs faster though the many co-correlated factors (phosphate level, clover content, herbage quality) make it difficult to separate individual effects. Ewe intakes and milk production reach maximum levels over the first 3 to 7 weeks of lactation (Parker and McCutcheon, 1992; Muir *et al.*, 1998). Over early lactation, ewe *ad libitum* intakes increase up to sward heights of 8-9 cm (Orr *et al.*, 1990; Chestnutt, 1992 - 2600 kg DM/ha) but over the latter half of lactation ewe intakes are maximised on pastures of only 4 cm (Orr *et al.*, 1990; Morris *et al.*, 1994). In late spring, it has been shown that swards continuously grazed at 4 cm have higher clover and lower dead matter contents than those more laxly grazed (Curll, 1982; Sheath *et al.*, 1983; Chestnutt, 1992; Parker and McCutcheon, 1992) particularly in swards of low-fertility tolerant grass species (Butler and Chu, 1987). In addition, green grass declines in quality at a greater rate with age as the temperature rises over late lactation (Buxton and Fales, 1994) as shown by the 0.18 MJME/month decline in quality of green matter with advancing season found in this study. Higher herbage masses are likely to increase average leaf age. Studies confirmed that increases in herbage mass over the latter part of lactation had either no effect (McEwan *et al.*, 1983) or a negative effect (Lewis and Cullen, 1973; Ratray, 1977; Thomson *et al.*, 1985) on lamb growth. In our study, single and twin lambs grew similarly in the second month of lactation but over the last month of lactation LWGs of twin lambs fell more than those of single lambs, probably due

to an inability of twins to fully substitute pasture for low milk intake, due to the poorer pasture quality on twin compared to single lamb pastures.

When lamb growth rates are low (<150 g/d on 3 of 6 farms) over weeks 10 to 14 of lactation, early weaning is an option that could be considered. Lambs consume 2 MJME from milk (less in slower growing lambs) in late lactation (440 ml x 4.7 MJME/l) and consume approximately 1 kg DM/d, therefore the diet offered post-weaning to lambs would have to be 2 MJME/kg DM higher to be assured of improving lamb LWG. However if abundant (>2000 kg DM/ha) feed is offered post-weaning, then the increase in *ad libitum* intake due to increasing pasture quality is 8% per MJME and the increase in diet quality required to improve lamb LWG would only be around 1.7 MJME/kg DM (Feeding Standards for Australian Livestock, 1994). In late spring such an improvement is likely only when specialist crops (e.g. clover, lucerne) are offered.

Mean lambing dates of the farms in this experiment ranged from mid August (1 farm), mid September (4 farms), and mid October (1 farm). As lambing percentages increase some farmers have been pushing back lambing dates into late September and, in some cases, October, in order to offer ewes and lambs more dry matter. However farmers may have failed to fully consider the impact of the sharp decline in pasture quality from late November.

CONCLUSIONS

The growth rate of twin lambs on hill country was limited by poor milk production of ewes in early lactation and poor pasture quality in late lactation. Substantial changes in soil fertility, grazing management and/or sheep genetics will be required for farmers to reach target LWGs of 300 g/d in twin lambs on hill country.

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