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The role of milk production in dryland lamb production systems

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ABSTRACT

A farmlet study was carried out over 2 years to examine the role of milk production in dryland lamb production systems. Poll Dorset and Romney ewes were used to represent high and low levels of milk production and mated to produce reciprocal cross lambs. High and low fecundity treatments were included in replicated farmlets of 2.9 ha and stocked at 15 ewes/ha. Mean lambing dates were 5th and 8th August with lambs drafted for slaughter from mid October.

In Year 1, Poll Dorset ewes produced 44% (singles) and 88% (twins) more milk in peak lactation than their Romney counterparts. In late lactation, Poll Dorsets produced 41% (singles) and 169% (twins) more milk. In Year 2, the advantages were 19% (singles) and 18% (twins) in peak lactation and 78% (singles) and 67% (twins) in late lactation.

Increased milk production had small effects on lamb growth rates in the low fecundity treatments (Year 1: 338 vs 328 g/d; Year 2: 317 vs 300 g/d for the respective high and low milk treatments). In the high fecundity farmlets, dam breed differences were larger (Year 1 :280 vs 244g/d ; Year 2: 307 vs 283 g/d, respectively). Number of lambs drafted by the 2nd December were also similar in low fecundity groups (Year 1: 93% vs 95%; Year 2: 90% vs 93%, respectively). Greater numbers of lambs were drafted off high fecundity Poll Dorsets than Romney dams (56% vs 23%) in Year 1 but not in Year 2 (85% vs 81%).

The greater effect of milk on lamb growth in high fecundity treatments in Year 1 was attributed to poor spring feed conditions and the buffering ability of high milk producing ewes.

Keywords: sheep; ewes; dryland; milk production; pre-weaning growth; breed; fecundity; farming systems.

INTRODUCTION

In dryland environments, early lambing dates and high lamb growth rates help to ensure that lambs reach target slaughter weights ahead of the decline in the supply of high quality pasture. Early slaughter dates are also favoured because of the premiums available for early chilled lamb contracts.

There has recently been renewed interest in the role of ewe breeds in lamb production systems, particularly highly fertile breeds and breeds with increased milk production and mothering ability.

A farmlet study was undertaken over two years to test the hypothesis that high milking ability is an essential component of high lamb production systems in dryland conditions given a goal of producing 14 to 16 kg M grade lamb carcasses before Christmas.

MATERIALS AND METHODS

High and normal milk production was simulated using Poll Dorset and Romney ewes. Maiden two tooth ewes were used in 1996 (Year 1) and remated in 1997 (Year 2). Poll Dorset ewes were mated to Romney rams and Romney ewes mated to Poll Dorset rams to give lambs of a similar genotype. Treatments consisted of ewes at two levels of milk production and two levels of fecundity. Each treatment was replicated.

Each farmlet comprised 2.9 ha and was stocked at 15 ewes/ha (43 ewes/group). Ewe or lamb deaths during the study were replaced with "spare" animals so that the similar grazing pressures were maintained across treatments. Synchronised matings were achieved using CIDR's with matings in early March. Ewes remained on their farmlets until scanning in early May after which they were allocated to fecundity treatment groups on foetus number and liveweight.

Decision rules were followed to ensure ewes had similar mating weights and pasture cover levels on all farmlets in early winter and at the start of lambing. Mean lambing dates were August 5th 1996 (Year 1) August 8th 1997 (Year 2). Lambs were drafted off ewes at two weekly intervals from mid October. Lambs were drafted to fixed liveweight criteria (34 kg for ram lambs and 32 kg for ewe lambs). Once feed quality had deteriorated to the point where clover was no longer present, remaining lambs on the farmlets were removed and treated as store lambs. In both years this occurred in early December.

In Year 1, 10 ewes rearing single lambs and 10 ewes rearing twin lambs were selected from each treatment (one replicate only). Milk production was measured 5 and 10 weeks after lambing using oxytocin and following the method of McCance (1959) and Corbett (1968). In Year 2, 10 ewes were selected from each treatment (both replicates) and milked at 3, 6, 9 and 12 weeks after lambing.

Pasture mass was measured on each paddock monthly by visual assessment with calibration cuts using an electric shearing handpiece (double visual technique). Sixteen pasture quadrats (0.125 m2) were selected for use in calibration. These represented the range of pasture mass present.

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A minimum of 30 visual pasture mass estimates were recorded in each paddock.

Ryegrass/white clover/subterranean clover pastures were established over all the farmlets 12 months prior to commencement of the experiment. All farmlets were soil tested annually and fertiliser applied to ensure that nutrients were not limiting to production. Pasture cover and ewe bodyweights were controlled across farmlets at critical times to ensure results were interpretable (Sibbald and Maxwell, 1990). The minimum target pasture cover was 1200 kg DM/ha on the May 1. Ewes were rotational grazed through the winter with the aim of having minimum covers of 1200 kg DM/ha at lambing. At lambing ewes were set stocked. Pasture management practices were adopted to resemble farm practice such that on the farmlets with surplus spring growth silage was harvested. Supplements were introduced post weaning to preferentially feed groups which had lost excessive amounts of bodyweight. A comprehensive animal health programme included preventative treatments and monitoring for internal and external parasites and vaccination against common ewe and lamb diseases.

Statistical levels of significance for dam breed, fecundity and ewe liveweight effects on lamb production were determined using least squares analysis. "Spare" ewes and lambs were excluded from the analysis.

RESULTS

Pasture growth rates were high in both years (Figure 1) reflecting the relatively new pastures and high soil fertility levels. The average pasture production over all farmlets was 12572 kg DM/ha in Year 1 and 12198 kg DM/ha in Year 2. Contrasting climatic conditions meant that seasonal feed supplies differed between years. For example early spring feed covers were noticeably higher in Year 1 but late spring feed covers were higher in Year 2 (Figure 2). Early onset of dry conditions in spring was followed by unseasonal rain over summer in Year 1. Extreme dry conditions after the main lamb drafting period resulting in very low pasture covers in Year 2.

Ewes had high bodyweights for New Zealand conditions with mating weights for Poll Dorsets and Romneys

FIGURE 1: Mean daily pasture growth (kg DM/ha/day) on trial farmlets

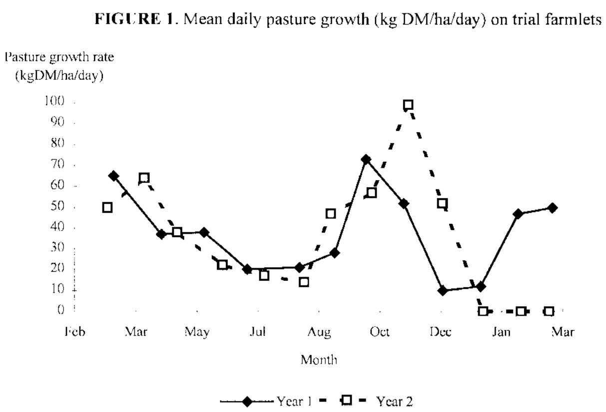
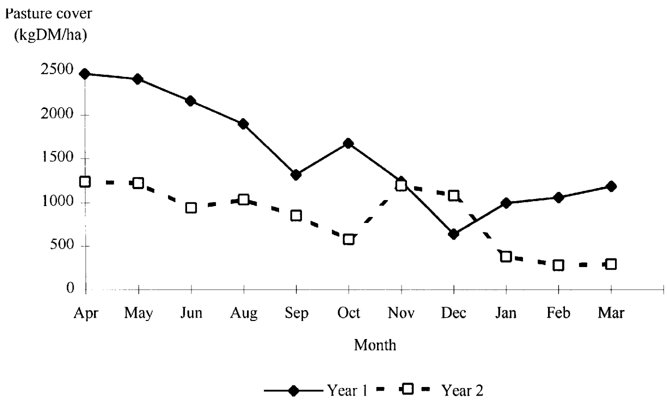


FIGURE 2: Mean pasture cover levels (kg DM/ha) on trial farmlets



of 69.0 kg and 62.8 kg in Year 1 and 83.5 kg and 76.3 kg in Year 2, respectively. High fecundity ewes were lighter at weaning than their counterparts rearing singles and had to be offered greater amounts of supplements post weaning (Table 1).

Table 2 indicates the numbers of lambs reared per ewe in the various farmlets. There were large differences

TABLE 1: Mean ewe liveweights (±SEM) by breed and fecundity groups. Numbers of observations are in parentheses.

Year 1	Pre-mating LW (kg) (5 Mar 1996)	December LW (kg) (5 Dec 1996)	Pre-mating LW (kg) (18 Feb 1997)
Low fecundity			
Dorset	68.6±0.6 (76)	70.2±1.2 (75)	85.1±1.1 (75)
Romney	62.8±0.4 (78)	64.9±0.7 (79)	79.0±0.7 (78)
High fecundity			
Dorset	69.4±0.5 (77)	65.1±0.8 (75)	81.1±0.8 (75)
Romney	62.9±0.4 (75)	58.4±0.7 (75)	70.2±0.7 (75)
Year 2	Pre-mating LW (kg) (5 Mar 1997)	December LW (kg) (4 Dec 1997)	Pre-mating LW (kg) (20 Feb 1998)
Low fecundity			
Dorset	85.1±1.1 (75)	82.4±0.9 (75)	78.6±0.8 (75)
Romney	79.0±0.7 (78)	79.7±0.8 (81)	72.1±0.8 (81)
High fecundity			
Dorset	81.8±1.0 (77)	78.6±1.0 (85)	80.2±0.9 (83)
Romney	73.6±0.7 (85)	77.5±0.9 (84)	71.2±0.7 (84)

TABLE 2: Mean numbers of lambs reared by Poll Dorset and Romney ewes

	Low fecundity	High fecundity
Year 1		
Poll Dorset	1.09 (1.09)	1.92 (1.83)
Romney	1.04 (1.05)	1.72 (1.77)
Year 2		
Poll Dorset	1.32 (1.30)	1.93 (1.93)
Romney	1.26 (l.26)	1.77 (1.77)

Figures in parentheses indicate total numbers of lambs reared per ewe when spares are included (i.e. they indicate the spring grazing pressure on each farmlet)

TABLE 3: Mean milk production (litres/ewe/day) of Dorset and Romney ewes rearing either single or twin lambs.

	Single				Twin			
Year 1								
Week of lactation	5		10		5		10	
Poll Dorset	2.15		1.11		2.99		2.02	
Romney	1.49		0.79		1.59		0.75	
Significance[a]	ns		ns		**		***	
Year 2								
Week of lactation	3	6	9	12	3	6	9	12
Poll Dorset	2.12	2.21	1.89	1.47	2.85	2.70	2.52	1.84
Romney	1.97	1.68	1.18	0.71	2.65	2.04	1.73	0.88
Significance[a]	ns	ns	***	***	ns	*	***	***

[a] Significance of the dam breed effects. ns: not significant, $p>0.05$; *: $p<0.05$; **: $p<0.01$***: $p<0.001$

TABLE 4: Least square means for liveweight gains from birth to weaning (± SEM) of lambs reared by low and high fecundity Poll Dorset and Romney ewes.

	Low fecundity (g/day)	High fecundity (g/day)
Year 1		
Poll Dorset	338±5.3	280±4.0
Romney	328±5.3	244±4.4
Significance[a]	*	***
Year 2		
Poll Dorset	317±4.3	307±3.3
Romney	300±4.2	283±3.5
Significance[a]	*	***

[a] Significance of the dam breed effects. ns:not significant, $p>0.05$; *: $p<0.05$; ***: $p<0.001$

between the high and low fecundity groups in Year 1 but the differences were reduced in Year 2 because the heavy ewe bodyweights at tupping meant insufficient ewes had single lambs to generate “low” fecundity treatments.

In the high fecundity treatments, Poll Dorset ewes out-performed Romney ewes for milk production from at least week 5 of lactation (Table 3). In low fecundity treatments, Poll Dorset ewes had a significant lactation advantage in late lactation but only in Year 2.

In both years lambs reared by Poll Dorset ewes grew faster than lambs reared by Romney ewes, particularly in the high fecundity groups ($P<0.001$; Table 4). Lambs in the low fecundity groups grew significantly faster than those in high fecundity groups in both Year 1 ($P<0.001$) and Year 2 ($P<0.05$). Ewe bodyweights recorded at weaning in December were significantly related to lamb growth in both years ($P<0.001$) and were included in the statistical models to estimate the treatment means.

A higher proportion of lambs had been drafted by October 30 in Year 1 (23%) than in Year 2 (14%). However, by early December, only 59% of lambs had been drafted in Year 1 compared to 86% in Year 2. All of the lambs drafted by the end of October in Year 1 were from the low fecundity groups (Table 5). Tests of significance using chi-squared analysis showed drafting patterns were significantly different between dam breeds in the high fecundity farmlets (Year 1: $P<0.001$; Year 2: $P<0.05$) but were non-significant in low fecundity farmlets (Year 1 and 2). The higher milking ability of the Poll Dorsets enabled more lambs in the high fecundity groups to be slaughtered by early December. Good pasture growth rates in late spring of Year 2 meant that most lambs in all groups reached slaughter weights.

There were no significant differences between dam breeds (within a fecundity group) in average liveweights of lambs drafted for slaughter or as stores (Table 6).

TABLE 5: Drafting patterns of lambs reared by Poll Dorset and Romney ewes (cumulative %).

	Low fecundity (%)		High fecundity (%)	
Year 1				
Date	Oct 30	Dec 2	Oct 30	Dec 2
Poll Dorset	63	93	0	56
Romney	65	95	0	23
Year 2				
Date	Oct 30	Dec 2	Oct 30	Dec 2
Poll Dorset	22	90	14	85
Romney	18	93	5	81

TABLE 6: Least square means for liveweights of lambs drafted for slaughter or as store lambs (± SEM) following rearing by low and high fecundity Poll Dorset and Romney ewes (numbers of lambs are in parentheses).

	Low fecundity		High fecundity	
	Slaughter LW (kg)	Store LW (kg)	Slaughter LW (kg)	Store LW (kg)
Year 1				
Poll Dorset	35.8±0.26 (74)	31.4±1.14(7)	33.9±0.25(77)	27.8±0.41(54)
Romney	35.0±0.27 (69)	31.9±1.35(5)	33.4±0.40(30)	27.2±0.30(99)
Significance[a]	ns	ns	ns	ns
Year 2				
Poll Dorset	35.1±0.21 (93)	29.8±1.26(5)	35.0±0.17(145)	29.5±0.68(17)
Romney	35.0±0.21 (97)	31.9±1.40(4)	34.7±0.18(133)	31.0±0.78(13)
Significance[a]	ns	ns	ns	ns

[a] Significance of the dam breed effects. ns: not significant, $p>0.05$; *: $p<0.05$; **: $p<0.01$; ***: $p<0.001$

TABLE 7: Least square means for carcass weights and GR fat depths of lambs slaughtered (±SEM) following rearing by low and high fecundity Poll Dorset and Romney ewes (numbers of lambs are in parentheses).

	Low fecundity			High fecundity		
	Carcass weight (kg)	GR (mm)	Number lambs	Carcass weight (kg)	GR (mm)	Number lambs
Year 1						
Poll Dorset	17.0±0.15	11.2±0.42	74	15.4±0.15	8.3±0.41	77
Romney	16.2±0.16	8.6±0.44	69	14.5±0.24	6.1±0.66	30
Significance[a]	**	***		*	*	
Year 2						
Poll Dorset	16.0±0.14	9.8±0.33	93	15.4±0.11	8.5±0.26	145
Romney	15.4±0.13	7.7±0.32	97	14.8±0.11	6.3±0.27	133
Significance[a]	*	***		***	***	

[a] Significance of the dam breed effects. ns: not significant, $p>0.05$; *: $p<0.05$; **: $p<0.01$; ***: $p<0.001$

Average slaughter liveweights tended to be higher in the low fecundity groups in both years. This reflected a number of lambs which were well in excess of the drafting criteria when drafting commenced and the higher growth rates of low fecundity lambs between fixed interval drafts.

Although there were no significant differences in slaughter liveweight, lamb carcass weights differed significantly between dam breeds for both fecundity groups in both years (Table 7). These differences in carcass weight reflected differences in dressing out percentages. Similarly there were significant dam effects on carcass fatness. Lambs reared by Poll Dorset ewes were heavier and fatter than lambs reared by Romney ewes.

DISCUSSION

Poll Dorset ewes produced more milk than Romney ewes, confirming the advantage of the breed noted by Geenty (1979). The biggest advantage of the Poll Dorset ewes was in maintaining a high level of milk production in late lactation. However the increased milking ability did not confer any substantial lamb growth rate advantage at low fecundity levels and suggests that single lambs were unable to harvest the extra milk produced by well fed Poll Dorset ewes. Lambs reared by high fecundity Poll Dorset ewes had a larger growth rate advantage in Year 1 than Year 2 and may well reflect the different feed supply patterns in the two years. Pasture covers were lower in mid to late spring in Year 1 than Year 2 and the high winter pasture covers may have led to lower quality spring pastures in Year 1. The improved pasture covers and/or quality levels in Year 2 may have meant that lambs in the high fecundity Romney groups were able to substitute sufficient pasture for a declining milk supply and maintain relatively high growth rates. This fits with the hypothesis of Geenty (1979) that the supply of good quality pasture during lactation can even out the influence that small differences in milk supply may have on lamb growth rates.

In spite of similar liveweights at drafting, the differences in fatness at slaughter led to higher carcass weights. The growth rate of lambs has been shown to be positively associated with carcass fatness (Geenty *et al*., 1979) and the present study highlights the ability of higher milk producing ewes to produce heavier carcass weights in lambs drafted to a target liveweight. Conversely, lambs reared by ewes with higher milking ability are more likely to be overfat when drafted at a set liveweight, particularly those reared as singles.

High milk producing ewes may enable more lambs to be finished under adverse conditions and result in significant feed savings through preventing the need to carry as many store lambs into dry summers. This will also assist the sale of more lambs pre-Christmas when schedule values are often higher. However the exploitation of more highly productive animals is frequently only possible with a more carefully planned management system. In this study it is apparent that high milk producing ewes rearing twins are more likely to be subject to greater body weight loss during the lactation period. Separation of these animals from less productive ewes would be advantageous to help ensure they are fed at a higher intake after weaning to reach target mating weights and repeat their performance. Other relevant factors affecting profitability include ewe longevity, fleece production, replacement cost and the ewes carcass value when culled from the flock.

Its is concluded that use of high milk producing ewes may assist in improving lamb production in dryland farming conditions encountered on the East Coast of the North Island. Greatest advantage will occur at high fecundity levels but variable production advantages can be expected with changes in seasonal feed conditions. Full farmlet economic appraisal will assist in making recommendations to farmers.

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