Increasing lamb survival and lamb weaning weight through feeding high fecundity crossbred sheep

C. JOHNS[1], J. JOHNS[1] and D.R. STEVENS[2]
[1]*Glenthorne Station, Lake Coleridge, New Zealand*
[2]*AgResearch Invermay, Private Bag 50034 Mosgiel, New Zealand*
david.stevens@agresearch.co.nz

Abstract

The monitoring of a high fecundity ewe flock in the Te Anau basin demonstrates the process of improved feeding to improve lamb survival and growth to weaning. Feed budgeting was changed from traditional to tailored feed requirements based on measured ewe liveweight with wastage of 15% factored in. Feed allocation was changed from monthly to weekly increases during late pregnancy, and set stocking was delayed until the planned start of lambing. This increased late pregnancy feed allocation from 99 kg DM/ewe to 128 and 144 kg DM/ewe for twin and triplet bearing ewes, respectively. Ewe body condition score was maintained at between 3 and 3.5, with condition score loss between scanning and lambing being reduced to zero. Lamb survival and lamb liveweight gain to weaning increased in both twin and triplet bearing ewes. Pregnancy scanning increased from 200 to 222 lambs per 100 ewes, between 2007 and 2012, while lambing percentage (lambs weaned/ewe mated) rose from 132% to 165%, with more ewes rearing lambs and rearing multiples. Lamb wastage declined from 37% in 2007 and 2008, to 25% in 2011 and 2012, though scanning percentage rose by 20%. Lamb weights increased from 27.5 to 36 kg/lamb at 100 days of age. The increase in the liveweight of lambs and ewes at weaning reduced the calculated feed requirements over summer and autumn, potentially releasing 70 to 110 kg DM/ewe to provide feed to meet the extra winter feed requirements.

Keywords: ewe body condition score, feed allocation, lamb survival, lamb weaning weight

Key messages

- Lamb survival and weaning weight increased with improved winter feeding rather than lambing intervention for 4 years
- Increasing feed supply to the ewes by using known feed requirements and adding a 15% margin for field utilisation consistently weaned more lambs at heavier weights and resulted in greater potential revenue
- While many changes to farm policy and feed production can be made, the major gain in feed supply is through a reduction in summer and autumn feed demand, releasing feed that can be carried into winter.

Introduction

Feeding of the ewe flock has markedly improved over the past 25 years as the focus of production has gone from stocking rate to individual animal performance (McIvor & Aspin 2001). The advent of ultra-sound pregnancy scanning (Farmer & Davis 1999) has provided an important tool for increasing the precision of feeding and feed allocation (McCorkindale 1999) leading to increases in lambing percentage (McAtamney & McAtamney 1999). Research indicates that a condition score of 3 during pregnancy provides the optimum outcome for ewe survival (Morgan-Davies *et al.* 2008), lamb survival (Everett-Hincks *et al.* 2004) and lamb liveweight gain to weaning (Stevens *et al.* 2011). However, late pregnancy feeding of ewes is still less than adequate to maintain body condition with only 9% of farmers formally using condition scoring, with ewes having an average condition score of 2.36, 4 weeks before lambing (Casey *et al.* 2013).

Many of the management decisions such as removing light ewes from the mob or managing multiples and single bearing ewes differentially are made to improve flock performance, but often farmers do not collect the supporting physical data such as ewe liveweight and condition score to improve those decisions (Casey *et al.* 2013). Current feed budgeting techniques are often based on "gut feel" and necessity, or on outdated recommendations for feed requirements, without an adjustment for the increased size of the mature ewe (Casey *et al.* 2013). This, coupled with the potential for poor utilisation during winter means that ewes often lose condition during winter (Stevens *et al.* 2011). Even if condition is maintained on ewes, the practice of set stocking (continuous grazing) up to 1 month before lambing means that control of intake is lost and depends on feed supply. With less than 50% of farmers using pregnancy scanning to make feeding decisions to differentially manage multiple-bearing ewes, and only 35% actually knowing the weight of ewes in autumn (Casey *et al.* 2013), there is much room for improvement of ewe feeding during winter.

A major issue, however, is how to cost-effectively generate more feed in winter. This paper documents a case study of the process of increasing winter feeding, where data collection and an improved feeding regimen

ISSN 0110-8581 (Print) ISSN 2463-4751 (Online)

were implemented to improve lamb survival and lamb growth to weaning. It describes the importance of using appropriate energy requirements and management processes such as allowing for wastage in feed budgeting to achieve the aims of maintaining ewe condition score in late lactation. It also outlines the potential flow-on benefits of the increase in weaning weight on summer and autumn feed supply and provides some estimate of the relative costs and benefits of improving ewe feeding during late pregnancy.

Methods

The Freestone property, owned by Landcorp Farming Ltd is 628 ha and approximately 250 m a.s.l. in the Te Anau basin. The rolling topography has soil types (Freestone and Monowai) that are predominantly firm brown allophanic soils of moderate to high water holding capacity (75-100 mm AWHC), high P retention (75%), and are well drained. Soils have an Olsen P concentration of approximately 20, a pH of 5.8, and a potassium concentration of 4 ppm in the top 7.5 cm of the soil profile. Fertiliser was applied in September of each year, being approximately 20, 15, 24, 0, and 0 kg/ha of P, K, S, Mg and Ca, respectively. Annual rainfall ranges between 850 and 1150 mm, and average winter and summer temperatures are 3°C and 14°C, respectively. Snow falls can occur from April to November, and their presence may persist for up to 3 weeks (Paterson 1972).

At Freestone, the primary role was to produce maternal Landmark (a composite crossbred) rams and terminal Wapiti stags. The stocking rate using MPI-based stock units was 9 SU/ha with a sheep:cattle:deer ratio of 41:25:33. Ewe liveweight at mating was approximately 71 kg and planned start of lambing was 24 September. The ewe flock was monitored closely as part of the genetics programme. The scanning, lambing and survival information for the lamb was collected, and parentage attributed through DNA analysis. Additional monitoring of ewe liveweight, to determine how much the ewe should be fed, and body condition score (BCS), to gauge the success of the feed budget to meet those feed requirements, was added at mating, scanning, pre-lamb and at weaning, along with lamb liveweight at weaning.

To address feed requirements the farm changed from using traditional feed tables to a specifically developed feed requirement calculator using AFRC (1993) standards. Traditional feeding tables provide relatively coarse liveweight and time increments. The use of a feed calculator added two specific points of difference. The first was a standard adjustment for pasture loss during grazing of 15%, increasing allocations by that amount. The second was the opportunity to adjust feed requirements on a daily basis, and so provide a much more precise allocation of feed during late pregnancy and early lactation.

This approach was then matched to increased monitoring using body condition score (BCS) as the major tool to ensure that the feed budget was achieving the aims of maintaining the ewe, especially when pregnant with twins or triplets.

The budgeted aims for pasture covers at lambing were 1650 kg DM/ha for triplet-bearing ewes stocked at 7-8/ha, and 1500 kg DM/ha for twin-bearing ewes stocked at 8-10/ha. To meet this requirement approximately 50-60 ha of crop was required each year, approximately 8-9% of the farm area, at a yield of 15-17 tonnes DM/ha.

Results and Discussion

As scanning percentage increased (Figure 1), there was a replacement of twin with triplets (Figure 2) leading to a true scanning percentage lifting from 200% in 2007 to 222% in 2010. This shift is often ignored by farmers as multiple-bearing ewes, rather than twins and triplets are often recorded (Casey *et al.* 2013). Davis *et al.* (1983) reported that once scanning percentage rises above 170% there is a rapid transition as triplets begin to replace twins, with 20% of the flock expected to have triplets at 200% lambing. That is reflected here, but by 222% scanning the proportion of triplets has increased to nearly 50% of the ewes scanned. The calculated scanning percentage, if only multiples are counted, is also indicated in Figure 1 and shows that much of the genetic gain being realised in the flock would not be counted if farmers did not monitor triplet numbers. This may lead to a false sense of progress and an under-recognition of the real potential of the flock.

The lambing percentage (lambs weaned/ewe mated) was quite variable from 2007-2010, though a large snowfall during the lambing of 2008 exaggerated this, leading to lamb wastage (lambs lost/lambs scanned) as high as 40%.

The actual lambing percentage (Figure 1) rose from 132 to 165%, in line with the increases in proportion of ewes rearing lambs and rearing multiples. Lamb wastage (Figure 1) declined from an average of 37% in 2007 and 2008, to approximately 25% in 2011 and 2012, even though scanning percentage rose by 20%. When using the multiple scan approach, the calculated lamb wastage figures would have been approximately 28% in 2007/2008 declining to approximately 10% in 2011/2012.

An analysis of the twin-bearing ewes (Figure 3) indicated that the proportion of ewes weaning at least one lamb rose from 73 to 91% over the 5 years measured. The proportion of ewes rearing two lambs rose from approximately 50 to 70% while the proportion of ewes only rearing one lamb declined slightly.

The proportion of triplet-bearing ewes that weaned

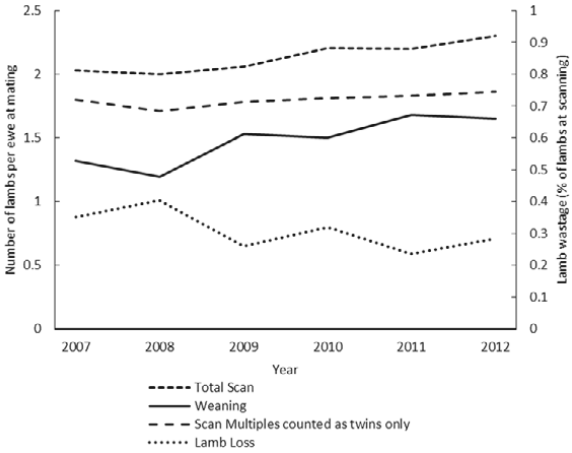

Figure 1 Improvements in the number of lambs present at pregnancy scanning and weaning, and the lamb wastage of a ewe flock over 6 years.

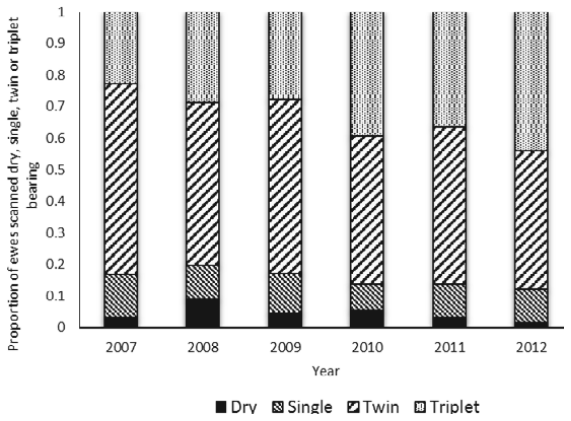

Figure 2 Changes in the proportion of ewes bearing singles, twins and triplet lambs identified at pregnancy scanning in a ewe flock over 6 years.

a lamb also increased over the 5 years (Figure 4). This rose from a low of 62% to over 80%. The proportion of ewes rearing both two and three lambs increased, while the proportion rearing one lamb declined slightly.

The weaning weights of lambs increased over the 5 years of recording (Figure 5). The gains in the final 3 years appear to be more stable than in previous years. This also coincided with the increase in the number of lambs weaned in the twin and triplet-bearing ewes.

Intensive monitoring over the 2010 and 2011 seasons provide an insight into the impacts of the feeding programme (Table 1). Before 2010 the feeding programme was a standard allowance of 1.65 kg DM/head/d to all ewes between scanning and lambing. This changed to a stepped approach in 2010, and was further refined in 2011. In each year crop and supplement was used from scanning to the end of August, though triplet-bearing ewes were returned to pasture one week

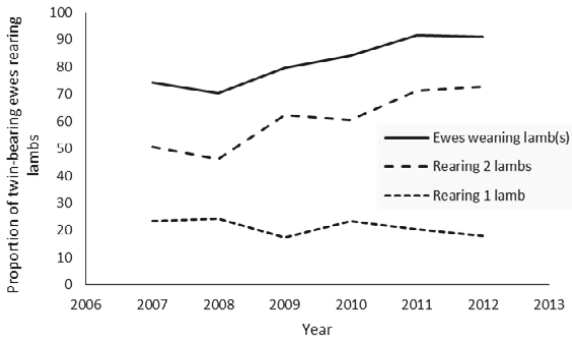

Figure 3 The proportion of twin-bearing ewes rearing one or two lambs and the proportion of ewes weaning at least one lamb from 2007 to 2012.

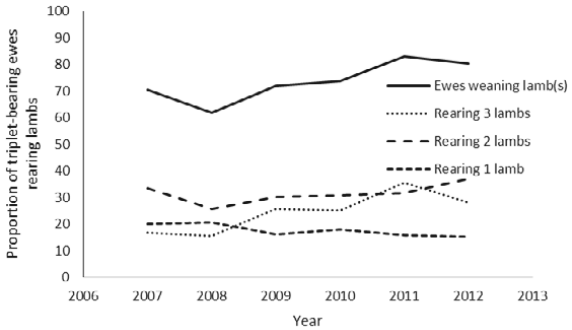

Figure 4 The proportion of triplet-bearing ewes rearing one, two and three lambs and the proportion of ewes weaning at least one lamb from 2007 to 2012.

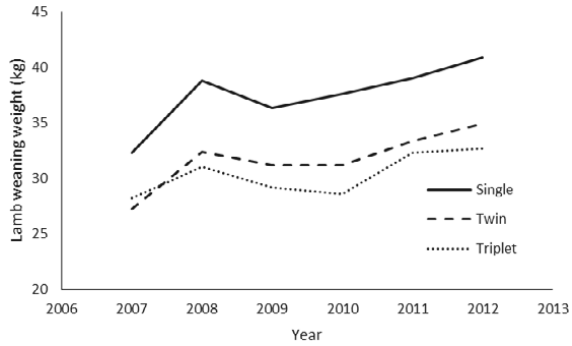

Figure 5 The weaning weight of lambs from single, twin or triplet-bearing ewes at approximately 100 days of age from 2007 to 2012.

before the twin-bearing ewes in 2011. Two major differences occurred between the years. The first was that allowances were adjusted each week during 2011, while they were only adjusted once in 2010. The second difference was the control of pasture intake. Once the ewes went back to grass in 2011, the pasture continued to be rationed at an increasing amount until the planned start of lambing.

The consequent body condition score profiles for scanning and pre-lambing (Figure 6) indicates the

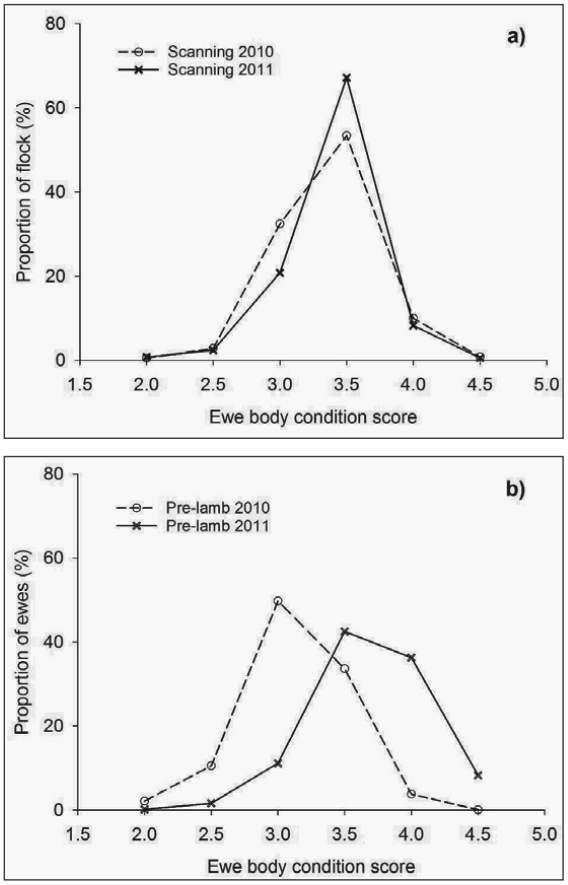

Figure 6 The body condition score of ewes at a) pregnancy scanning and b) pre-lambing of ewes scored in 2010 (dotted line) and 2011 (solid line).

effectiveness of the rationing programme in 2011 to weekly changes in allowance (Table 1). In 2010 the ewes on average lost condition from scanning to pre-lambing as is often the case (Stevens *et al.* 2011). In 2011 the ewes gained a small amount of condition with few being represented in the 2 and 2.5 category at pre-lambing. The average pasture cover at the end of August at set stocking was 1510 kg DM/ha, achieving the target cover. However, in 2011, the cover at that time was lower at 1360 kg DM/ha. This suggests then that the weekly increase in allowance and the tight control of the feed budget was able to achieve a more consistent result in retaining BCS than the set stocking approach, even though pasture covers appeared adequate, having met target in 2010.

Major factors that are most likely to be underlying these responses in both lamb survival and weaning weight are the potential increase in birth weight of the lambs and the buffering effect of ewe BCS to augment spring feed supply (Thomson *et al.* 2004; Kenyon *et al.* 2011). Both the increase in lamb birth weight and the maintenance of BCS were targeted in the feed budgeting process. Traditional feed requirement standards aim for a twin birth weight of 4 kg and a triplet birth weight of 3 kg (Beef + Lamb New Zealand 1994). Feed budgets were used to aim for a 5 kg twin and a 4 kg triplet lamb, meeting recent research findings to optimise lamb survival (Thomson *et al.* 2004; Everett-Hincks & Dodds 2008).

Several changes were made to target the achievement of the feeding goals. The first was to ensure that winter crop yields (mainly swedes) were as high as possible, using best management practices for sowing, weed control and fertiliser.

Flexibility was increased using the cattle policy.

Table 1 Feed allowances and feeding allocations and types in 2010 and 2011.

		2010				2011			
		Twins		Triplets		Twins		Triplets	
	Date	Allowance (kg DM/head/d)	Feed Type	Allowance (kg DM/head/d)	Feed Type	Allowance (kg DM/head/d)	Feed Type	Allowance (kg DM/head/d)	Feed Type
Scanning	18-Jul	1.5	Crop	1.6	Crop	1.5	Crop/supp	1.5	Crop/supp
	25-Jul	1.5	Crop	1.6	Crop	1.5	Crop/supp	1.6	Crop/supp
	1-Aug	1.5	Crop	1.6	Crop	1.6	Crop/supp	1.7	Crop/supp
	8-Aug	1.5	Crop	1.6	Crop	1.7	Crop/supp	1.9	Crop/supp
	15-Aug	1.5	Crop	1.6	Crop	1.9	Crop/supp	2	Crop/supp
	22-Aug	2.4	Crop/supp	2.4	Crop/supp	2	Crop/supp	2.2	Crop/supp
	29-Aug	2.4	Crop/supp	2.4	Crop/supp	2.2	Crop/supp	2.4	Grass
	5-Sep	Set stocked	Grass	Set stocked	Grass	2.4	Grass	2.6	Grass
	12-Sep	Set stocked	Grass	Set stocked	Grass	2.5	Grass	2.8	Grass
	19-Sep	Set stocked	Grass	Set stocked	Grass	2.7	Grass	3.1	Grass
Lambing	26-Sep	Set stocked	Grass	Set stocked	Grass	2.9	Grass	3.4	Grass

The number of breeding cows was reduced from approximately 125 to 70 to reduce the winter feed demand, the number of steer calves was maintained through purchase to better balance the spring feed surplus with demand.

A specialist forage (lucerne) was introduced to part of the farm to increase spring and summer liveweight gain in lambs and hoggets. This ensured that surplus lambs were able to be sold early in summer, allowing autumn pasture covers to build up, reducing autumn feed requirements for lambs and releasing feed for the ewe flock.

Finally, ewe liveweights were at mating weight by weaning, and lamb weaning weight was higher. The net effect of this is summarised in Table 2. Relative to 2007, a net 36 kg DM/ewe was released as ewe condition and weight did not need to be regained before mating. The increase in lamb weaning weight also meant that lambs were sold early, releasing large amounts of feed during the summer and autumn to support the ewe flock (Table 2).

Conclusions

This case study provides direct on-farm evidence that meeting BCS targets increases lamb survival and lamb liveweight gain to weaning. This research supporting this is not new, but this is one of the few cases that has documented how this can be achieved at farm scale.

Traditional feeding recommendations in the sheep and beef industry underestimate the feeding requirements of our current ewe flock. Most farmers still rely on those numbers, and few have an accurate measure of their ewe liveweight. The national lambing percentage (measured at weaning) is still only approximately 120%. This may be a reflection that many of the research findings relating to improved feeding and the maintenance of BCS, though known, are not being practiced.

The key outcomes of this case study provide some practical guides for farmers to make change and are:

- that relevant feeding standards must be used
- an allowance for pasture wastage must be added to feed allocation
- ewe liveweight must be known, while ewe BCS can be used to monitor the success of the feed budget
- feeding of the ewe in late pregnancy must be controlled until lambing
- feed intake must be adjusted regularly (weekly in this case) to ensure that ewe feed requirements are met
- and, while many changes to farm policy and feed production can be made, the major gain in feed supply is through a reduction in summer and autumn feed demands that releases feed that can be carried into winter.

ACKNOWLEDGEMENTS

Many thanks to Landcorp Farming Ltd for the opportunity to capture the data and report the findings.

REFERENCES

AFRC 1993. Energy and protein requirements of ruminants. CAB International, Wallingford, UK. 159 pp.

Beef + Lamb New Zealand 1994. A guide to feed planning for sheep farmers. Beef + Lamb New Zealand, Wellington. 57 pp.

Casey, M.J.; Scandrett, J.S.; Stevens, D.R. 2013. Ewe body condition: does farmer practice meet research guidelines? Proceedings of the 22nd International Grassland Congress. Pp. 1882-1883.

Davis G.H.; Kelly, R.W.; Hanrahan, J.P.; Rohloff, R.M. 1983. Distribution of litter size within flocks of different levels of fecundity. *Proceedings of the New Zealand Society of Animal Production 43*: 25-28.

Table 2 Summary of the productivity gains and the potential feed requirements of twin and triplet bearing ewes and their lambs under the feeding conditions of 2007 and 2012.

Attribute	2007		2012	
	Twins	Triplets	Twins	Triplets
Weaning %	128	140	164	177
Lamb weaning weight (kg)	27.0	28.3	35.3	32.5
Potential revenue per ewe [1]	$67.50	$79.24	$120.02	$121.06
Ewe weaning weight (kg)	65		71	
Winter feed (kg DM/ewe)	99		+29	+44
Spring feed (kg DM/ewe)			+74	+57
Summer feed (kg DM/ewe)	+36	+36		
Summer feed lamb (kg DM/head) [2]	116	113	41	80
Summer feed requirement relative to 2007	0	0	-111	-69

[1] Lambs valued at weaning for $2.50/kg liveweight store with 28% retained as replacements
[2] Lambs finished at 18 kg carcase weight

Everett-Hincks, J.M.; Blair, H.T.; Stafford, K.J.; Lopez-Villalobos, J. 2004. The effect of ewe nutrition on maternal behaviour score and litter survival. *Proceedings of the New Zealand Society of Animal Production 64*: 188-191.

Everett-Hincks, J.M.; Dodds, K.G. 2008. Management of maternal-offspring behaviour to improve lamb survival in easy care sheep systems. *Journal of Animal Science 86*: 259-270.

Farmer, R.J.; Davis, G.H. 1999. Experiences of a pioneer in the commercial sheep pregnancy scanning business. *Proceedings of the New Zealand Society of Animal Production 59*: 91-92.

Kenyon, P.R.; Morris, S.T.; Stafford, K.J.; West, D.M. 2011. Effect of ewe body condition and nutrition in late pregnancy on the performance of triplet-bearing ewes and their progeny. *Animal Production Science 51*: 557-564.

McAtamney, T.J.; McAtamney, S. 1999. Farmer use and experience of ultrasonic pregnancy scanning. *Proceedings of the New Zealand Society of Animal Production 59*: 97-98.

McCorkindale, A.B. 1999. Ultrasonic pregnancy scanning – a tool for change. *Proceedings of the New Zealand Society of Animal Production 59*: 95-96.

McIvor, S.D.; Aspin, M.D. 2001. R&D success stories and principles to practice. *Proceedings of the New Zealand Grassland Association 63*: 23-27.

Morgan-Davies, C.; Waterhouse, A.; Pollock, M.L.; Milner, J.M. 2008. Body condition score as an indicator of ewe survival under extensive conditions. *Animal Welfare 17*: 71-77.

Paterson, J.H. 1972. Intensive farming in the Te Anau basin. *Proceedings of the New Zealand Grassland Association 34*: 57-62.

Stevens, D.R.; Casey, M.J.; Scandrett, J.S.; Baxter, G.S. 2011. Winter feeding – changing labour requirements and productivity. *Proceedings of the New Zealand Grassland Association 73*: 51-56.

Thomson, B.C.; Muir, P.D.; Smith, N.B. 2004. Litter size, lamb survival, birth and twelve week weight in lambs born to cross-bred ewes. *Proceedings of the New Zealand Grassland Association 66*: 233-237.