Preliminary investigation into factors affecting lamb growth from birth to weaning on Taranaki hill country

N.A. THOMSON

Taranaki Agricultural Research Station
Ministry of Agriculture and Fisheries, Normanby

M.J. MACE, L.A. WRIGHT AND S.M. BISHELL

Advisory Services Division
Ministry of Agriculture and Fisheries, Taranaki

ABSTRACT

On 6 Taranaki hill country farms, the effect of herbage mass and composition on the growth of lambs from birth to weaning was studied. On each farm 2 representative paddocks were selected and set-stocked with ewes from before lambing to weaning. Ewes and lambs were weighed at docking (early October), mid-November and at weaning in mid-December. Pastures were assessed fortnightly for herbage mass and composition.

From docking to mid-November, no association between herbage mass and live-weight gain was found. The only factor influencing live-weight gain of ewes and lambs over this period was the percentage of green leaf material in the pasture. However, the live-weight gains of ewes and lambs from mid-November to weaning were negatively correlated with total herbage mass at lambing. Also over this period, live-weight gains of ewes were positively correlated with percentage of green, and negatively correlated with the percentage of stem, in pasture. With increasing levels of herbage mass at lambing there was an associated decline in the percentage of green and increase in the percentage of stem in pastures over the mid-November to weaning period.

Despite a large variation in stocking rate (11 to 26 su/ha) no relationship between stocking rate and live-weight gain of ewes or lambs was found. However, the total live-weight of lambs weaned/ha was correlated with stocking rate.

The relationships established between pasture parameters and animal performance and between live weight of lambs weaned/ha and stocking rate indicate that higher spring stocking rates in Taranaki hill country than are presently adopted may decrease herbage mass at lambing thereby increasing the proportion of green herbage which will improve lamb growth and overall production/ha.

Keywords Herbage mass; pasture composition; lamb live weight; ewe live weight; live-weight gain; stocking rate

INTRODUCTION

In a recent survey of farming in the wet (average annual rainfall, 2000mm) Taranaki hill country (Thomson *et al.*, 1983) there was general agreement by farmers that the major factor affecting production was a lack of pasture in spring resulting in poor lamb weights at weaning. This observation is supported by recent trial results from Ruakura and Whatawhata (Rattray *et al.*, 1982; Smeaton *et al.*, 1983) which have identified the importance of feeding ewes well after lambing to obtain heavy lambs at weaning. To achieve this a high herbage mass at the commencement of lambing is recommended.

The information presented in the survey conflicts with the results of Thomson *et al.* (1985) who concluded that the major factors reducing lamb growth in Taranaki hill country were a high herbage mass (up to 3000kg DM/ha) and low pasture quality (50% green leaf) over summer and autumn.

The conflicting aspects of wet hill country management, i.e., too little pasture in spring and too much in summer, required further investigation. In spring 1984 a selection of farms was monitored over the lambing to weaning period to measure the mass and composition of pastures and determine their effects on ewe and lamb performance.

METHODS

On each of 6 Taranaki hill country properties, 2 paddocks were selected, 1 representing steep and the other representing easier areas found on the farm.

Ewes were set-stocked in the selected paddocks from before lambing (late August) until weaning of the lambs in mid-December except at Toko where a relatively large mob of ewes was set-stocked over 5 paddocks of which 2 were selected for monitoring. Stocking rates were determined by the farmer and occasional adjustments were made according to the farmer's assessment of the feed situation. All stock changes were recorded and an average stocking rate for each paddock established.

All paddocks were assessed fortnightly for herbage mass and pasture composition. Herbage mass was estimated using the single probe capacitance meter ("pasture probe") by taking 30 to 40 readings/ha (100 to 250/paddock) along a transect representative of paddock topography. Herbage mass (kg DM/ha) was calculated from monthly calibration data

established the previous spring for Taranaki hill country pastures. Pasture samples for dissection into green grass leaf, legume (white clover + lotus species), weeds, green stem, dead stem and dead leaf, were taken along the same transect using an electric shearing hand-piece by cutting to ground level. Approximately 15 samples/ha, each 0.02m², were collected and bulked to represent the composition of the paddock.

For analysis, the pasture data were averaged over 3 periods: P1, August to the mean date of docking (early October); P2, docking to mid-November; and P3, mid-November to weaning in December. All ewes and lambs grazing each paddock were weighed at docking, in mid-November and at weaning in mid-December, and live-weight gains calculated for P2 and P3.

Stocking rates of the selected farms, ranging from 11 to 18 su/ha (average = 13.5 su/ha), were above average for their respective districts and the monitored paddocks, at 11 to 26 su/ha (average = 17.5 su/ha), were generally higher than the average for the farm. Size of paddock varied from 3.5 to 7.9 ha.

The breed of sheep (Coopworth, Romney or Perendale) and pasture control policy varied between farms. To maintain pasture control in the monitored paddocks some farmers added additional ewes and lambs, and others used a "flying" mob of around 15 young cattle for 2 to 3 days.

All properties had been grazed on a long (60 to 90 d) rotation through winter to ensure sufficient pasture for lambing in late-August or early September and at the commencement of the programme in August the farmers were satisfied with the feed situation.

The objective to monitor 12 paddocks from August to December was not fully met because of early weaning and misadventure. However, in the final analysis the amount of information available was:

i 11 complete data sets for comparison of pasture parameters in P1 and P2 with animal performance in P2.

ii 8 complete data sets to compare the pasture parameters in P1, P2 and P3 with animal performance in P3.

RESULTS

Animal Performance

Regression analysis showed no significant correlation between stocking rate and live-weight or live-weight gain from docking to weaning (Table 1). The live weight of lambs weaned/ha was, however, significantly correlated (0.87) with stocking rate (SR). Multiple regression using additional functions of stocking rate did not improve the correlation of the simple linear regression:

weaning weight of lambs/ha (kg) = 5.4 + 22.6 x SR (n = 11).

TABLE 1 Mean live weights and live-weight gains of ewes and lambs in each paddock.

District	Stocking rate (su/ha)	Docking: Live weight (kg) Ewe	Docking: Live weight (kg) Lamb	Live-weight gain (g/d): Ewe P2	Lambs P2	Ewes P3	Lambs P3	Lamb weaning weight (kg)
Ohangai	26	56 (51)	11.0 (75)	82	235	-61	45	23.5
	14	50 (62)	9.1 (70)	-30	185	—	—	—
Mangamingi	11	52 (49)	9.6 (67)	-150	195	-1	135	24.0
	13	51 (55)	9.7 (77)	-30	195	20	115	23.7
Toko	17	53 (471)	9.9 (664)	-55	200	200	158	22.1
Midhurst	14	53 (91)	10.1 (116)	26	236	114	261	26.6
	17	51 (76)	9.8 (96)	78	235	150	268	26.3
Kaimata	22	51 (131)	10.6 (165)	-49	185	—	—	—
	14	48 (65)	10.2 (80)	-25	174	—	—	—
Tarata	21	44 (66)	8.2 (76)	69	227	-38	126	24.4
	22	47 (71)	8.2 (75)	-22	200	41	124	23.1

( ) = number of ewes and lambs in paddocks.

Live weight of ewes changed little over the monitoring period and farm mean live weight at docking (n = 11) was correlated with live weight in mid-November (0.77, $P < 0.001$) and at weaning (0.83, $P < 0.01$).

At docking there was a positive correlation between ewe live weight and lamb live weight (0.80, $P < 0.01$) which did not occur at subsequent weighings.

In P2 and P3, live-weight gains of ewes and lambs were positively correlated (Table 2) and additional analysis showed (data not presented) these associations were not influenced by live-weight or live-weight gain of ewes or lambs in the preceding period. From this information it was assumed that the variation recorded in animal performance was not associated with a carry-over effect from earlier management but was due to characteristics of pasture within each paddock at the time of grazing.

TABLE 2 Correlations (r) between paddock mean rates of gain of ewes and lambs in periods P2 and P3; ( ) = number of observations.

	Lamb live-weight gain	
	P2	P3
Ewe live-weight gain		
P2	0.74** (11)	0.12 (8)
P3	0.04 (8)	0.73* (8)

Herbage Mass and Pasture Composition

The variability between paddocks and the seasonal changes in mean total herbage mass recorded are presented in Fig 1. The increase in variability in November-December was due to a proportionately greater increase in herbage mass on the lower stocked farms. Over the lambing period a distinct trend in mean herbage mass was apparent (Fig. 1) with an average herbage mass of 2300kg DM/ha at the end of August declining to less than 2000kg DM/ha in October before increasing to 2900kg DM/ha by mid-December. The increase in herbage mass in P3 was positively correlated with the herbage mass present in P1 (r = 0.83) but did not appear to be associated with a decline in pasture quality, such as an increase in stems, and a decrease in legume and the total green leaf (grass + legume) content of the pasture (Fig. 2). Over the entire trial period, the content of green leaf declined from 62% to 52% and the proportion of legume increased from 8% to 12%. Only a small proportion of green and dead stem was present throughout. The proportions of dead stems gradually declined (7 to 2%) whereas green stems increased, especially in December. These changes in pasture composition were small and visually they were detectable only in December.

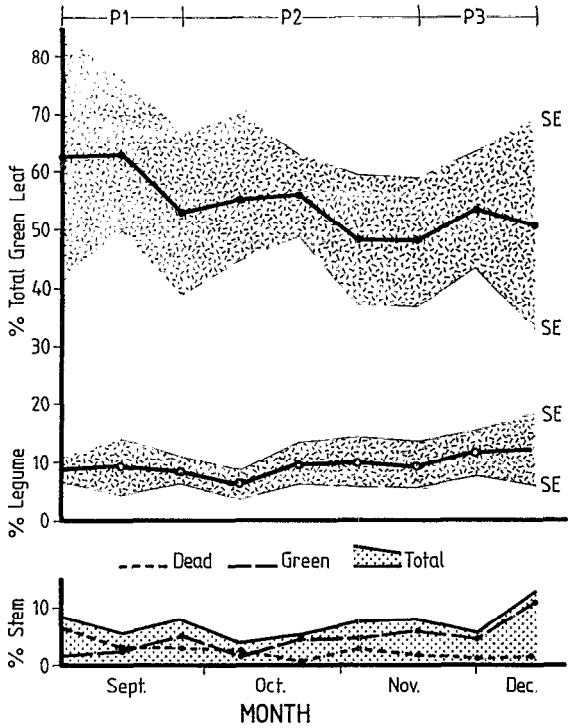

FIG. 1 The variation in mean total herbage mass (± SE) recorded over spring on 11 pastures grazed by sheep.

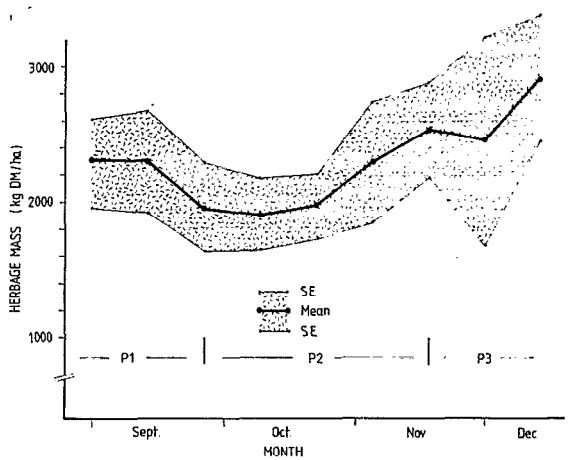

FIG. 2 Changes from lambing to weaning in the mean composition of pastures (± SE).

Relationships Between Animal Performance and Pasture Parameters

Correlation coefficients between pasture parameters and live-weight gain of ewes and lambs from docking to weaning (Tables 3, 4, 5) indicated that total herbage mass in P2 and P3 had no influence on the live-weight gain of lambs but, as shown in Table 3, herbage mass in P1 was negatively correlated with lamb live-weight gain in P3. The live-weight gain of ewes in P3 was similarly influenced by total herbage mass in P1. No significant association between green herbage mass and live-weight gain in any period was found but the percentage of green leaf in pastures in P1 had a positive influence on live-weight gain of ewes in P2 (Table 4). A similar effect was observed in P3 between the proportion of green leaf in pastures and the live-weight gain of ewes. The proportion of stem in pasture was negatively associated with ewe live-weight gain in P3.

It was not possible to determine the single most important factor affecting animal performance as the pasture components were correlated with each other and with herbage mass (Table 5). High levels of herbage mass were associated with reduced green leaf and legume contents but a higher content of stem.

TABLE 3 Correlations (r) of paddock mean rates of gain of ewes and lambs in period P3 with pasture parameters; number of observations = 8.

		Live-weight gain	
		Lambs	Ewes
Total herbage mass			
	P1	-0.84**	-0.87**
	P2	-0.47	-0.70
	P3	-0.48	-0.70
% Green Leaf			
	P1	-0.02	0.80
	P2	0.48	0.62
	P3	0.67	0.85**
% Stem			
	P1	-0.60	-0.66
	P2	-0.66	-0.61
	P3	-0.67	-0.74*
% Legume			
	P1	-0.34	-0.14
	P2	0.68	0.82*
	P3	0.45	0.59

TABLE 4 Correlations (r) of paddock mean rates of gain of ewes and lambs in period P2 with % green leaf; number of observations = 11.

		Live-weight gain	
		Lambs	Ewes
% Green leaf			
	P1	0.80**	0.61*
	P2	0.35	0.07

TABLE 5 Correlations (r) between herbage mass in P1 and pasture parameters in P2 and P3.

		Herbage mass (P1)	
Herbage mass			
	P2	0.80**	(11)
	P3	0.76*	(8)
% Green leaf			
	P2	-0.45	(11)
	P3	-0.77*	(8)
% Legume			
	P2	-0.71*	(11)
	P3	-0.45	(8)
% Stem			
	P2	0.81**	(11)
	P3	0.71*	(8)

DISCUSSION

The results obtained from monitoring pastures and animals under practical conditions have provided evidence which, in part, is contrary to that published by Rattray *et al.* (1982) and Smeaton *et al.* (1983) on the effects of herbage mass at lambing on lamb weaning weights. These authors clearly showed under trial conditions that a high herbage mass at lambing was associated with high live-weight gains in lambs and superior weaning weights. However, there was evidence indicating that a very high herbage mass (3300kg DM/ha), resulting from rotational grazing over lambing to weaning, had a detrimental effect on weaning weights (Smeaton and Rattray, 1984). Rattray (1977), Thomson (1980) and McEwan *et al.* (1983) all found that with later lambing, herbage mass (or herbage allowance) increased but in the later period (weeks 6 to 12) of lactation, this had either no effect (McEwan *et al.*, 1983) or a negative effect (Rattray, 1977; Thomson, 1980) on lamb growth. This effect was attributed to a decline in pasture quality (percentage of green and percentage of DOM) that occurs in late spring. However, the poorer growth recorded in the later lambs could not be directly associated with herbage mass as seasonal effects would confound the association between mass and quality.

The average live weight of ewes and lambs at docking, and the live-weight gain of lambs from docking to mid-November, were similar to those reported by Smeaton *et al.* (1983) for trial animals on a medium to high level of feeding after lambing.

The work published has identified the importance of adequately feeding ewes after lambing but the consequence of having a higher herbage mass (greater than 2000kg DM/ha) has not been fully investigated. Smeaton (1983) recommended to farmers that the herbage mass at lambing should be as high as possible

(1000 to 1200kg DM/ha or higher) and from this information advisors have encouraged farmers to carefully ration pastures over late autumn and winter by mob stocking and rotational grazing to ensure sufficient pasture for lambing.

The farmers cooperating in this monitoring programme had adopted such a management system and were satisfied with the amount of pasture cover on their farms at lambing (average herbage mass in P1 was 2140kg DM/ha). This level of herbage mass recorded on relatively highly stocked hill country farms is much higher than that reported as "ideal" (1000 to 1200 kg DM/ha) by Smeaton *et al.* (1983), Smeaton (1983), and Smeaton and Rattray (1984).

The reasons for the higher herbage mass recorded in Taranaki are not known but it is assumed that it is partly due to:

i Summer wet hill country carrying a high mass of dead herbage (Thomson *et al.*, 1985) from summer into autumn and winter which apparently remains through until spring (Fig. 2).

ii Predominace of low fertility species such as browntop, sweet vernal, Yorkshire fog and lotus in Taranaki hill country pastures may influence the ability of animals to graze such pastures to similar levels as ryegrass/white clover pastures and maintain similar live-weight gains.

Evidence in support of the high levels of herbage mass found in Taranaki hill country, is provided by Litherland (personal communication) who reports that sheep could only graze spring pastures of similar compostion in the Wanganui hill country to 1700kg DM/ha.

These differences between regions in the estimate of herbage mass may be identifying real differences in pastures due to climate, soil fertility and pasture species and so guidelines for grazing management recommended from one region may not apply to other regions.

However, to avoid confusion it is necessary that this matter be clarified either through a better understanding of grazing different pasture types or by standardising herbage mass estimates and their expression. If pasture composition and height were defined in addition to herbage mass, then a better interpretation of trial data may be possible. This, however, should not detract from the main finding that herbage mass at lambing was negatively associated with aspects of pasture quality and with the level of animal performance over the period from mid-November to mid-December.

CONCLUSIONS

A 5-month monitoring programme on 6 farms in the Taranaki hill country has shown that live-weight gains of both ewes and lambs from mid-November to mid-December were negatively associated with the herbage mass recorded at lambing (r = -0.87 and -0.84 for ewes and lambs).

This association most likely resulted from the negative relationship found between herbage mass and pasture quality. Pastures of a high herbage mass contained a lower proportion of green leaf and legume but a higher level of stem than pastures of lower herbage mass.

The level of herbage mass recorded in Taranaki hill country in spring was very much higher (by nearly 1000kg DM/ha) than that recommended elsewhere for spring grazing hill country pastures. It is assumed that the disparity resulted from a regional difference in climate, soil fertility and pasture species. However, it does highlight that a more precise way of expressing herbage mass is necessary to avoid confusion and to enable a better interpretation of trials conducted in different localities.

Although the farms monitored were more highly stocked that the average for their respective districts it is concluded that in Taranaki hill country there is a definite potential to carry a higher number of animals into spring, reducing the herbage mass at lambing, and increasing the proportion of green herbage to improve lamb weaning weights and increase production/ha.

ACKNOWLEDGEMENTS

To the farmers; H. & A. Patterson, R. Hamlin, J. Thomson, B. Parsons, C. & J. Hainsworth and N. Kirk for their cooperation and assistance.

REFERENCES

McEwan J.C.; Mathieson C.; Hawker H. 1983. Date of lambing and sheep production in Southland. *Proceedings of the New Zealand Society of Animal Production.* **43:** 45-48.

Rattray P.V. 1977. Effect of lambing date on production from breeding ewes and on pasture allowance and intake. *Proceedings of the New Zealand Grassland Association* **39:** 98-107.

Rattray P.V.; Jagusch K.T.; Duganzich D.M.; McLean K.S.; Lynch R.J. 1982. Influence of feeding post-lambing on ewe and lamb performance at grazing. *Proceedings of the New Zealand Society of Animal Production* **42:** 179-182.

Smeaton D.C. 1983. Sheep Management. *Proceedings of the Ruakura Farmers' Conference* **35:** 47-53.

Smeaton D.C.; Rattray P.V.; Mackisack B.; Heath S.; Hockey H-U.P. 1983. Nutrition and management of ewes before and after lambing. *Proceedings of the New Zealand Society of Animal Production* **43:** 37-40.

Smeaton D.C.; Rattray P.V. 1984. Winter-spring nutrition and management effects on ewe and lamb performance. *Proceedings of the New Zealand Grassland Association* **45:** 190-198.

Thomson N.A. 1980. Lambing date and its effect on the production and utilisation of grass-clover and lucerne pastures. M. Agr. Sc. Thesis, Lincoln College.

Thomson N.A.; Popay A.I.; Smith R.G.; Wright D.F.; Darwin R.K. 1983. Report of the Taranaki/Wanganui hill country task force. Internal Report, New Zealand Ministry of Agriculture and Fisheries, Southern North Island. 23p.

Thomson N.A.; Brown W.B.; Mace M.J. 1985. A preliminary investigation into factors affecting lamb growth on Taranaki hill country. *Proceedings of the New Zealand Society of Animal Production* **45:** 190-198.