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Herbage allowance - intake - production relationships in continuously stocked winter- and spring-lambing ewes.

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ABSTRACT

In a series of studies, relationships between herbage allowance (as measured by sward surface height (SSH)), herbage intake (measured by intraruminal chromium controlled release capsule) and production were assessed in continuously stocked winter (June)- and spring (August)-lambing pregnant and lactating ewes. At SSHs of 2.8, 4.0, 7.1 and 8.5 cm, organic matter intakes (OMI) of winter-lambing ewes in the last month of pregnancy were 1.4, 1.7, 1.6 and 1.9 (Pooled SE = 0.1) kg/d ($P < 0.05$), respectively. Ewe liveweight gain over the last month of pregnancy increased with SSH but there was no effect of SSH on lamb birthweight or ewe midside wool growth. Similarly, pregnant spring-lambing ewes had OMI of 1.4, 1.7, 1.8 and 1.9 (PSE = 0.1) kg/d ($P < 0.05$) at SSHs of 2.7, 4.0, 5.9 and 7.8 cm, respectively and ewe liveweight gain increased with SSH but there was no effect of SSH on ewe wool growth or lamb birthweight. Results suggest that both winter- and spring-lambing ewes can tolerate SSH below 3 cm during late pregnancy without detrimental effects on lamb or wool production.

Winter-lambing lactating ewes (first two months of lactation) had OMI of 1.8, 2.3 and 2.5 (PSE = 0.1) kg/d ($P < 0.05$) at SSHs of 2.6, 4.4 and 7.8 cm respectively. Sward height did not influence ewe wool production or lamb growth but ewes on the 2.6 cm sward lost 8-10 kg more liveweight during lactation than those on the 4.4 and 7.8 cm swards. Spring-lambing ewes had OMI of 1.8, 2.0, 1.9, 2.0 and 2.0 (PSE = 0.3) kg/d ($P < 0.1$) at SSHs of 3.5, 5.0, 6.0, 7.0 and 8.5 cm, respectively. There were no effects of SSH on ewe wool growth or lamb growth but ewe liveweight loss was greatest at low SSH. Results are discussed in the context of feeding recommendations for winter- and spring-lambing ewes.

Keywords: winter- and spring-lambing, continuously stocked, herbage intake, ewe liveweight, wool production, lamb birth weight.

INTRODUCTION

Sheep farming in New Zealand is normally a seasonal activity in which lambing date is determined largely by the pattern of pasture production and the inherent seasonality of sheep reproductive activity. The seasonal nature of the grassland cycle dictates that pasture-fed lambs reach slaughter age during the 6-month period December to May. In the 1990/91 season, for example, 80% of all lambs were slaughtered during the months December to March (NZMPB 1992). This highly seasonal slaughter pattern creates marketing difficulties. The requirements for a year-round supply of lamb are further highlighted by the increasing importance of the European chilled lamb trade. Furthermore, out-of-season lamb production systems are likely to become more attractive to farmers if predicted changes in pattern of pasture production due to warmer weather conditions become a reality (Butler *et al.* 1993). Lambing in autumn or early winter would allow farmers to cope with likely climatic changes, act as a protection against summer drought conditions, and help to create a year-round supply of lamb.

Widespread adoption of autumn/winter-lambing policies will require that farmers are provided with pasture allowance/intake/production relationships that are clearly defined for pregnant and lactating ewes under these policies. Until

now it has generally been assumed that the relationships derived for spring-lambing ewes also hold for autumn/winter-lambing ewes. However, this assumption may not be valid because of the altered pattern of feed demand relative to pasture production in winter-lambing ewes, and the well established inequality of autumn/winter and spring pasture for livestock production. Furthermore, most of the existing relationships, for spring-lambing ewes have been derived from rotational stocking experiments rather than continuous stocking, the grazing system adopted on most farms during late pregnancy and lactation. With the exception of Parker *et al.*, (1991) and Parker & McCutcheon (1992) there are no published New Zealand estimates of herbage intake by continuously stocked spring- or autumn/winter-lambing ewes over a range of sward surface heights.

The paper reports on a series of studies undertaken to examine the relationship between sward surface height, ewe intake and productivity in pregnant and lactating winter- and spring-lambing ewes. These studies were designed to generate data which would provide recommendations of appropriate sward surface heights for continuously stocked June-lambing ewes and a revision of recommendations for August-lambing ewes under the same form of management.

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MATERIALS AND METHODS

Three experiments were carried out on 10-year-old pastures consisting of predominantly ryegrass (*L. perenne*)/white clover (*T. repens*) swards. Details of each experiment were:

Experiment 1: Forty-eight winter (May)- and spring (August)-lambing pregnant Border Leicester x Romney ewes were randomly allocated (within age and litter size) on pregnancy day 115 (P115) to one of four sward surface heights (SSH) of nominally 2.0, 4.0, 6.0 or 8.0 cm replicated twice (six ewes/1 ha replicated paddock). The ewes grazed these paddocks from P115 to P140.

Experiment 2: Thirty-six winter (June)-lambing ewes comprising three ewe crosses (Border Leicester x Romney (BR), Poll Dorset x BR and Suffolk x BR) and their lambs were assigned to three SSH treatments (nominally 3.0, 6.0 and 9.0 cm) replicated twice. The ewes (balanced for ewe cross and litter size) were continuously stocked on their assigned paddocks from 29 June (lactation day (L6)) until L60.

Experiment 3: Sixty Border Leicester x Romney spring (August)-lambing ewes and their lambs were assigned on the basis of ewe age and litter size to five unreplicated sward height treatments of nominally 3.5, 5.0, 6.0, 7.0 and 8.5 cm, respectively. The ewes (12 ewes/ha) grazed their respective paddocks from L6 (26 August) until L60.

Measurements: Sward height was measured every 5 days in each experiment using a sward stick (Barthram 1986) and an Ellinbank Pasture Meter (Earle & McGowan 1979). Herbage mass was estimated by cutting twelve 0.18cm² quadrats to ground level in each paddock.

Ewe and lamb liveweights were recorded within 1 hour of removal of ewes from pasture. Lamb birth weights were also recorded. Ewe midside wool growth rates were estimated from samples taken on the right midside (Bigham 1974). Herbage intake were estimated using intraruminal controlled release capsules (CRC, Captec (NZ) Ltd) to deliver the indigestible faecal marker chromic oxide (Cr₂O₃). Faecal samples were collected daily between days 7-10 and 19-22 of CRC life, oven dried at 70°C to a constant weight and then bulked within ewes over the 4 day sampling period on an equal weight basis (0.5 g DM/d). The chromium concentration in the faeces was assessed by atomic absorption spectrophotometry (Parker *et al.* 1989). The rate of chromium release from the CRC was assumed to be 139 mg/d as derived by serial slaughter by Parker (1990). Extrusa from four mixed-age oesophageal fistulated wethers rotated through the different SSH treatments in each experiment, was collected for *in vitro* herbage digestibility determination using the cellulase incubation method of Roughan & Holland (1977). Faecal output, expressed in terms of organic matter (OM) was divided by the indigestibility of the herbage to determine organic matter intake (OMI, g OM/d). The metabolisable energy intake was estimated from dry matter intake multiplied by the organic matter digestibility of the dry matter multiplied by the constant 16.3 (Geenty & Sykes 1987). The SSH treatment x replicate mean square was used to test for the effect of SSH on ewe intake, liveweight change, midside wool growth and lamb birth and weaning weight in

experiment 1 and 2. For the non-replicated design in experiment 3 a regression approach was used where the effect of SSH on ewe and lamb performance was tested by fitting linear and quadratic terms in the regression (Parker & McCutcheon 1992). The error mean square was used to test for the effects of lambing policy on ewe and lamb performance in experiment 1. Data were analysed using the Statistical Analysis System computer package (SAS 1985). Results are reported graphically using actual average SSHs during the course of each study rather than the nominal (target) SSHs described above.

RESULTS AND DISCUSSION

At SSHs of 2.8, 4.0, 7.1 and 8.5 cm, the organic matter intakes (OMI) of winter-lambing ewes in the last month of pregnancy were 1.4, 1.7, 1.6 and 1.9 (Pooled SE = 0.1) kg/d ($P < 0.05$), respectively. Similarly, pregnant spring-lambing ewes had OMI of 1.4, 1.7, 1.8 and 1.9 (PSE = 0.1) kg/d ($P < 0.05$) at SSHs of 2.7, 4.0, 5.9 and 7.8 cm respectively. The relationships between sward surface height over the last month of pregnancy and ewe metabolisable energy (ME) intake, liveweight change, midside wool growth rate and lamb birth weight derived in this study for June- and August-lambing ewes are shown in Fig. 1. Ewe ME intake and liveweight gain increased as SSH increased, relationships which were generally consistent between June- and August-lambing ewes. Ewe midside wool growth was not significantly influenced by SSH or lambing policy (June vs August), although the trend was for wool growth to increase as SSH increased and for June-lambing ewes to grow more wool than August-lambing ewes over the final month of pregnancy. Likewise, lamb birth weights were not markedly influenced by SSH. Of particular note was the large difference in lamb birth weights between June- and August-lambing ewes. The June-born lambs were consistently 10-35% lighter than their August-born counterparts across all of the SSH treatments. While some of the increase in lamb birth weight can be explained by the increased liveweight gain of August-lambing ewes and their slightly longer gestation period (150.6 ± 0.4 v 149.2 ± 0.4 days, $P < 0.05$), other seasonal factors are also likely to be responsible for the difference. Further investigations are needed to explain this difference.

Winter-lambing ewes in the first two months of lactation had OMI of 1.8, 2.3 and 2.5 (PSE = 0.1) kg/d ($P < 0.05$) at SSHs of 2.6, 4.4 and 7.8 cm, respectively. Spring-lambing ewes had OMI of 1.8, 2.0, 1.9, 2.0 and 2.0 (PSE = 0.3) kg/d ($P < 0.1$) at SSHs of 3.5, 5.0, 6.0, 7.0 and 8.5 cm, respectively. Although the data for the August-lambing ewes are not strictly comparable with those for the June-lambing ewes, because the experiments were conducted one year apart, the results apply to the same paddocks and over a similar range of SSHs. The effects of SSH during lactation on ewe intake, liveweight change, midside wool growth rate and lamb liveweight taken on lactation day 60 are shown in Fig. 2 for June- and August-lambing ewes.

FIGURE 1: The effect of sward surface height on ewe metabolisable energy (ME) intake, liveweight change, midside wool growth rate and lamb birth weight in pregnant June-(x) and August-(♦) lambing ewes. ME

intakes are the means±SEM of two intake periods P122-P125 and P135-P139 where P122 refers to pregnancy d122 (for June-lambing ewes P122 = 7 May while for August-lambing ewes P122 = 24 July).

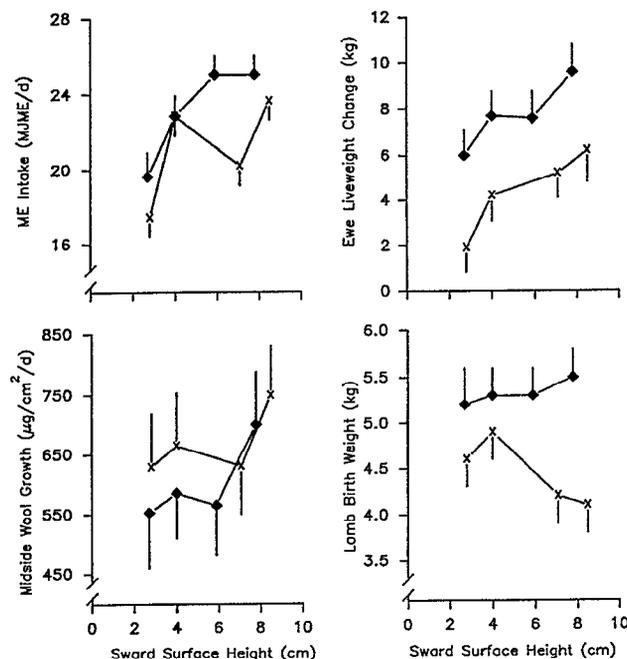
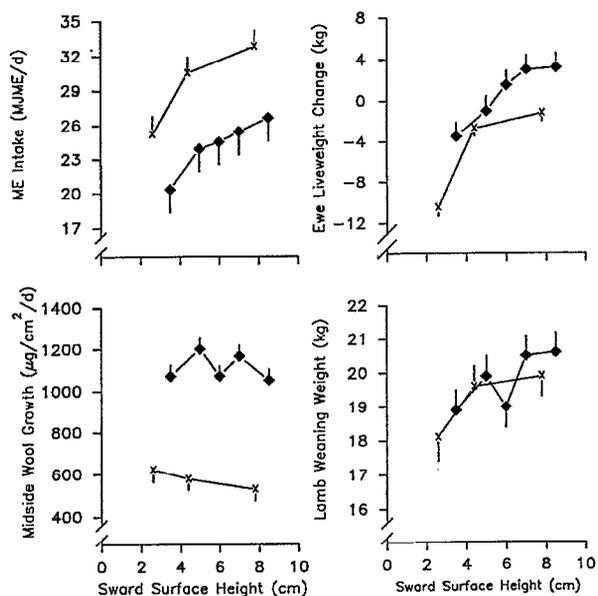


FIGURE 2: The effect of sward surface height on ewe metabolisable energy (ME) intake, liveweight change, midside wool growth rate and lamb weaning weight in lactating June-(x) or August-(♦) lambing ewes. ME intakes for June-lambing ewes are the means±SEM of four intake periods L13-L18, L25-L28, L41-L44 and L50-L55 where L13 refers to lactation day 13 (23 June). For August-lambing ewes ME intakes are the mean ± SEM of two intake periods L27-L32 and L59-L62 where L27 = 16 September.



As SSH increased, ewe ME intake increased but at a diminishing rate. Once a SSH of around 6.0 cm is reached, ewes are probably physically unable to harvest the extra available dry matter to further increase intake. Other researchers have also noted that ewe intake during lactation is maximised at a SSH of around 6 cm (Penning & Hooper 1985; Foot *et al.* 1987; Orr *et al.* 1990; Penning *et al.* 1991;

Chestnutt 1992). Lamb liveweights at day 60 of lactation increased marginally as SSH increased, but most of the extra energy available to ewes was diverted to liveweight gain or, in the case of June-lambing ewes, to the prevention of liveweight loss. In contrast to these results several researchers have noted that lamb growth increases with increasing herbage allowance during lactation (Rattray *et al.* 1982). There is also good evidence from United Kingdom research institutions that growth rates of spring-born lambs increase as SSH increases from 3 cm to 6 cm (Penning *et al.* 1991). Orr *et al.*, (1990) and Chestnutt (1992), however, noted that the performance of suckling lambs is sensitive to changes in SSH up to 9.0 cm, possibly because of a greater opportunity to select a more highly digestible herbage at the higher SSH. There was no effect of SSH on ewe midside wool growth in either lambing policy which is consistent with the findings of Geenty & Sykes (1986) and Parker & McCutcheon (1992).

CONCLUSIONS

The results of these studies indicate that ewes continuously stocked on swards of 3.0 cm can achieve lamb birth weights and wool growth rates over the last month of pregnancy comparable to those of ewes stocked on longer pastures. These same ewes can be stocked on to relatively short swards (2.6 cm) during lactation without penalising lamb or wool production. However, at these very low SSHs, ewes will lose up to 10 kg in liveweight by weaning at day 60-70 of lactation. This loss in liveweight may not be detrimental to long term production in June-lambing ewes as they generally have the opportunity to regain liveweight after weaning during the spring when maximum herbage growth and quality normally occurs. This scenario does not apply to August-lambing ewes which need to regain liveweight over the summer months when herbage growth and quality are lower than in the spring.

As a result, different SSH recommendations are appropriate for June- and August-lambing ewes that commence lactation with an average liveweight of 60 kg. A SSH of 4-6 cm is appropriate for August-lambing ewes but June-lambing ewes can achieve acceptable lamb growth rates at SSH as low as 2.6 cm, provided that generous feeding of ewes is possible in late spring.

However, in terms of the overall efficiency of sheep production, allowing ewes to lose and then regain liveweight may be less efficient than maintaining ewes at a constant liveweight. The SSH data reported here support the case for differential stocking management of out-of-season lambing ewes during lactation (ie the use of high stocking rates in early lactation but lower stocking rates as ewe and lamb intakes increase in later lactation). The opportunity to utilise ewe liveweight change may require a reconsideration of previous management guidelines that suggested a decreased stocking rate for ewes in out-of-season lamb production systems based on herbage allowance trials with spring-lambing ewes.

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REFERENCES

- Barthram, G.T. 1986: Experimental techniques. The HFRO sward stick. Pp 29-30 in : Biennial Report 1984-85, Hill Farming Research Organisation, Penicuik.
- Bigham, M.L. 1974: Effects of shearing interval on fleece weight and wool growth on a delineated midside patch. *New Zealand journal of agricultural research* 17: 407-410.
- Butler, B.M.; Morris, S.T.; Morris, R.S. 1993: Changes in sheep grazing systems in response to climatic change. *Proceedings of the XVII International Grassland Conference* (in press).
- Chestnutt, D.M.B. 1992: Effect of sward surface height on the performance of ewes and lambs continuously grazed on grass/clover and nitrogen-fertilized grass swards. *Grass and forage science* 47: 70-80.
- Earle, D.F.; McGowan, A.A. 1979: Evaluation and calibration of an automated rising plate meter for estimating dry matter yield of pasture. *Australian journal of experimental agriculture and animal husbandry* 19: 337-343.
- Foot, J.Z.; Maxwell, T.J.; Heazlewood, P.G. 1987: Effects of pasture availability on herbage intake by autumn-lambing ewes. Pp 335-337 in : Temperate pastures, their production, use and management. J.L. Wheeler, C.J. Pearson, G.E. Robards ed. Australian Wool Corporation, CSIRO.
- Geenty, K.G.; Sykes, A.R. 1986: Effect of herbage allowance during pregnancy and lactation on feed intake, milk production, body composition and energy utilisation of ewes at pasture. *Journal of agricultural science, Cambridge* 106: 351-367.
- Geenty, K.G.; Rattray, P.V. 1987: The energy requirements of grazing sheep and cattle. Pp 39-53. in: Livestock feeding on pasture. A.M. Nicol ed. New Zealand Society of Animal Production Occasional Publication No. 10.
- NZMPB 1992: New Zealand Meat Producers Board Slaughter Statistics, Wellington, New Zealand.
- Orr, R.J.; Parsons, A.J.; Penning, P.D.; Treacher, T.T. 1990: Sward composition, animal performance and the potential production of grass/white clover swards continuously stocked with sheep. *Grass and forage science* 45: 325-326.
- Parker, W.J. 1990: Application of intraruminal chromium controlled release capsules to the measurement of herbage intake of sheep at pasture. Ph.D. thesis, Massey University, Palmerston North, New Zealand.
- Parker, W.J.; McCutcheon, S.N. 1992: Effect of sward height on herbage intake and production of ewes of different rearing rank during lactation. *Journal of agricultural science, Cambridge* 118: 383-395.
- Parker, W.J.; McCutcheon, S.N.; Carr, D.H. 1989: Effect of herbage type and level of intake on the release of chromic oxide from intraruminal controlled release capsules in sheep. *New Zealand journal of agricultural research* 32: 537-546.
- Parker, W.J.; Morris, S.T.; McCutcheon, S.N. 1991: Wool production and feed intake in unmated and mated Border Leicester x Romney crossbred ewes shorn in July or November. *New Zealand journal of agricultural research* 34: 427-437.
- Penning, P.D.; Hooper, G.E. 1985: An evaluation of the use of short-term weight changes in grazing sheep for estimating herbage intake. *Grass and forage science* 40: 79-84.
- Penning, P.D.; Parsons, A.J.; Orr, R.J.; Treacher, T.T. 1991: Intake and behaviour responses by sheep to changes in sward characteristics under continuous stocking. *Grass and forage science* 46: 15-28.
- Rattray, P.V.; Jagusch, K.T.; Duganzich, D.M.; MacLean, 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.
- Roughan, P.G.; Holland, R. 1977: Predicting in-vivo digestibilities of herbage by exhaustive enzymic hydrolysis of cell walls. *Journal of the science of food and agriculture* 28: 1057-1064.
- SAS. 1985: SAS User's guide, Version 5 edition, SAS Institute Inc. Cary, N.C. USA.