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Creep grazing, a method for investigating pre-weaned lamb diets?

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ABSTRACT

Creep grazing as an experimental method offers potential as a research tool for investigating the diet of the pre-weaned lamb, without the confounding associated with both the ewe and lamb sharing the same pasture during lactation. Eighty-four Romney x Poll Dorset ewes with single or twin lambs were set stocked in a randomised block design (wooden gates used to create creep areas) at 15.2 ewes/ha, 4 weeks after lambing. Subterranean clover was established in four creep, and 2 shared areas in autumn. Herbage mass and composition were measured weekly in the creep and shared pasture areas. Lambs were observed for their use and activity (grazing, active, inactive) of the creep areas at 5-minute intervals, over 4 hours, weekly, from 4 to 12 weeks of age. Individual lamb live weights were taken fortnightly. At 4 weeks of age, lambs grazed in the creep area for 4% of the time and for an average time interval of 16 minutes compared to 20% and 32 minutes at 12 weeks of age. Lamb herbage intakes from the creep areas ranged from 0.21 – 0.53 kg DM/lamb/day. There was no significant difference in the liveweight gain of lambs with the creep area or without, over all treatments. The creep grazing method is a feasible, non-invasive tool to study the foraging habits and diet of the pre-weaned lamb, but further refinements are required.

Keywords: creep grazing method; diet; pre-weaned lamb.

INTRODUCTION

The forage diet of the pre-weaned lamb as an individual is not clearly defined because of the inherent problems of confounding associated with the ewe and lamb sharing the same pasture, and each competing for specific components of that pasture (Gibb & Treacher, 1978). Past work to determine pre-weaned lamb forage intake has concentrated on measuring cut herbage fed to housed animals (Hodge, 1966; Joyce & Rattray, 1970; Penning & Gibb, 1979), theoretical estimation of lamb pasture intake based on the sum of the difference of measured milk energy subtracted from the total energy required for growth (Geenty & Sykes 1983; Muir *et al.*, 2000), and the contents of oesophageally fistulated ewes and/or lambs on pasture (Penning & Gibb, 1979; Dove *et al.* 2000). Each method has complications in measuring either intake, quality, quantity, or preference of forage when compared to what takes place in reality in the pastoral situation. Weaning early has also been used as a method to determine young lamb forage intakes, growth rates and preferences. Penning and Gibb (1979) removed lambs from their dam at 1 day old and artificially reared them on different combinations of milk and forage to 12 weeks of age. Fennessy *et al.* (1972) weaned lambs from milk at 5 weeks of age and then introduced them to swards of high quality lucerne and ryegrass /white clover. Both methods involved the parent/offspring bond being broken prematurely that has been shown to affect lamb behaviour (Zito *et al.* 1977).

Creep grazing systems allow the lamb to preferentially access pasture by physically preventing the ewe from entering. Partial forage intake of the lamb can, therefore, be manipulated, with lambs showing greater intakes, particularly when ewes are restricted to low allowance levels (Adandedjan *et al.* 1987). In order to achieve a high level of predictability of lamb meat production, it is critical that all factors involved in lamb liveweight gain are accurately parameterised. Methods need to be found that can accurately measure the diet of the pre-weaned lamb in the pasture situation, and any manipulations of that diet, such as

quantity, quality and forage type. This preliminary study set out to investigate the potential of the creep grazing method as a research tool to study the forage diet of the pre-weaned lamb from 4 to 12 weeks of age.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at AgResearch Poukawa Research Station, Hastings, New Zealand (39° 45 min S), which is flat to gently rolling hill country with a sandy loam soil type of pH 5.7, phosphorus 25 mg/ml, and an average 10-year rainfall of 771 mm. Summers are predominantly dry, with drought conditions every three to four years.

Trial design, animals and management

Mixed-aged Romney x Poll Dorset ewes (84) with one or two lambs at foot (15 per plot, 30 per treatment) were set stocked in eight 0.72 ha (54 m x 133 m) plots (six with creep areas) at 15.2 ewes/ha, four weeks after lambing. Subterranean clover (cv. Wootenellup) was oversown on 29/3/00 at 20 kg/ha in four creep, and two shared areas. Creep treatments were allocated in a randomised block design with two replicates and consisted of subterranean clover in the creep area and no subterranean clover in the share area (low subterranean clover treatment), subterranean clover in the creep area and the shared area (high subterranean clover treatment), no subterranean clover in the creep or shared area (no subterranean clover treatment), and the control (no creep and no subterranean clover). Wooden creep gates with a bottom gap of 370mm were used to divide 1/5 of each plot area (0.14 ha, 11 m x 133 m) for creep grazing, with the creep gates put in place 24 hr before the animals were introduced. Pegs (300mm long) were placed in the control plots where the creep fences would have been, so lambs could be observed in these areas. All plots and creep areas were pre-grazed to achieve a common herbage mass of 1500 kg DM/ha at the introduction of the animals on 12/8/00. No other animals were added or removed from the trial, which was completed on 14/10/00.

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Measurements

All lambs from one replicate of each treatment were side numbered with a spray marker so they could be individually identified using binoculars from 500 metres. Two, 2-hour observation periods (8 – 10 a.m. and 2 – 4 p.m. respectively) were conducted at weekly intervals from age 4 to 12 weeks (a total of 595 recorded time periods away). Within each observation period, lambs were observed at 5-minute intervals for their use and activity (grazing, active, inactive) of the creep areas.

Pasture cuts (kg DM/ha) were taken weekly by cutting to ground level eight randomly selected, 0.18 m² quadrats per plot (four in a cage and four outside) in the shared grazing areas and in the creep grazing areas. Cages were then moved to a new location after cutting. Dissection samples were cut to ground level from eight sites across each plot (four in the creep area and four outside) at weekly intervals with sub-samples dissected into grass leaf, grass stem, clover, weed and dead matter. All samples were oven dried for 12 hours at 80° C for dry matter determination

Unfasted individual lamb live weights were taken fortnightly between 8 a.m. and 10 a.m. when the lambs were between 4 and 12 weeks of age.

Statistical analyses

The time individual lambs spent away grazing in the creep areas and the percentage of time the creep areas were occupied by grazing lambs (Figures 1 and 2) were analysed by multiple regression analysis using SAS (SAS Institute Inc. 1990). Lamb live weight gain and lamb herbage intake (Figures 3 and 4) were analysed by analysis of variance using the General Linear Models procedure of SAS (SAS Institute Inc. 1990) for a balanced randomised block design.

RESULTS

Lambs spent up to 1.5 hours grazing continuously in the creep areas (away from their dam) by 12 weeks of age. As the lamb matured, the mean time period spent grazing in the creep areas during the 4 hr measurement period increased from 16 minutes at 4 weeks old to 30 minutes at 12 weeks (see Figure 1). Lambs in the control plots (no creep) did not spend more time in the pegged areas as they aged. There was no significant difference between the time periods spent in the three different creep treatments, so these data were combined. Lambs spent only a small proportion of the 4-hour observation period grazing in the creep areas (see Figure 2), however, there was an increasing trend in the total use of the creep area for grazing as the lambs matured, 4% and 20% of the time at 4 and 12 weeks old respectively. At 11 weeks old a decrease in time spent grazing was recorded which coincided with poor weather conditions. No clear relationship was apparent in the control.

There was no significant difference in the 12-week-old live weight of the four treatments of lambs, or at any weighing date over the trial period (see Figure 3).

Lamb herbage intake data while in the creep areas ranged from 0.2 to 0.5 kg DM/lamb/day and was not significantly different from the control, except at 11 weeks of age, when significantly more herbage was consumed in the creep areas than the control. Large standard errors of the mean were produced (see Figure 4). From field

FIGURE 1: The time periods (min) individual lambs spent grazing in creep areas and the control over a 4 hour observation period when lambs were from 4 to 12 weeks of age.

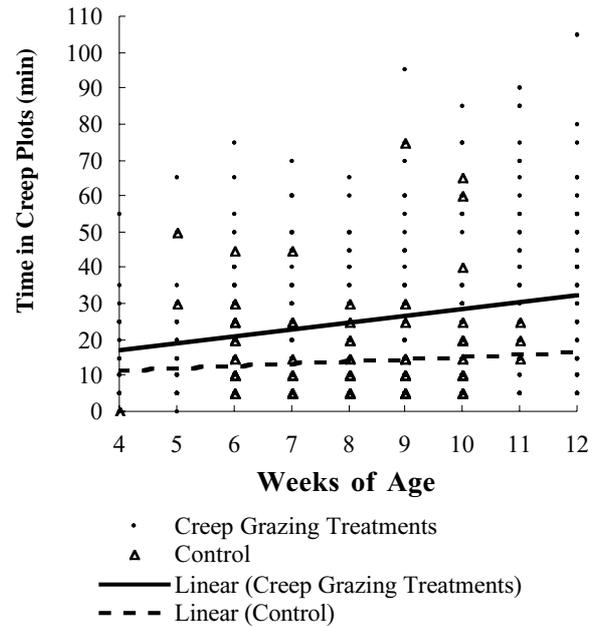


FIGURE 2: The percentage of time individual lambs spent grazing in creep areas and the control over a 4 hour observation period when lambs were between 4 to 12 weeks of age.

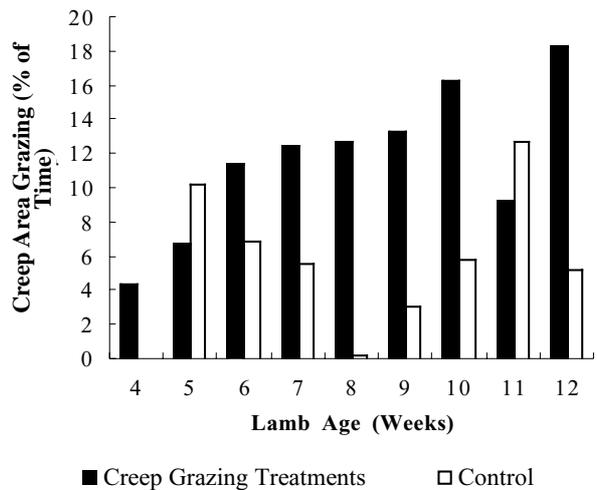
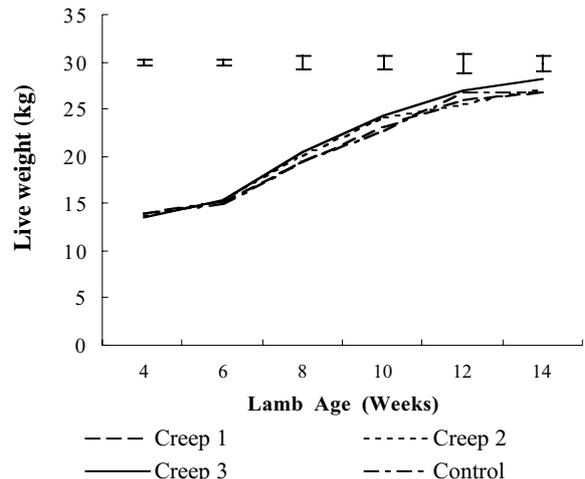
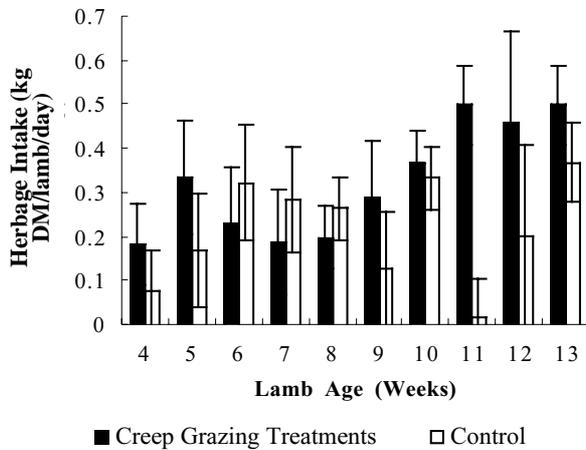


FIGURE 3: Un-fasted live weight (kg) of lambs grazing creep areas (Creep 1 = no clover, Creep 2 = low clover, Creep 3 = high clover) and the control from 4 to 14 weeks of age



observation (when taking herbage samples), lambs did preferentially consume the legume component of the sward in the creep areas, but this was not clear in the botanical data, which has not been presented.

FIGURE 4: Herbage intakes of lambs (kg DM/lamb/day) grazing in creep areas and the control from 4 to 13 weeks of age.



DISCUSSION

Creep grazing as an experimental method to measure pre-weaned lamb forage diets in the field offers some positive benefits compared to earlier, more invasive or theoretical methods. However, lambs still spent time and did a proportion of their foraging on the shared areas with their dams. The amount of time spent on these shared areas decreased if a creep area was present (see Figure 2), and if the forage available in the creep area was of greater quantity. Lambs did spend longer periods away (see Figure 1) from their dams as they matured (Fisher, pers. com.), but did not spend any more time in the pegged areas of the control treatment. This proved that they did spend proportionally more time in the creep areas as they matured because of the foraging incentive to go through to their own pasture. This, however, did not result in a difference in live weight gain between treatments, which is in contrast to the results of Adandedjan *et al.*, (1987). However, in the present study there was no difference in live weight gain between the control and creep treatments, but this may have been buffered by dam milk supply (Joyce & Rattray, 1970; Geenty & Sykes, 1983), or been apparent with a greater number of replicates in a more detailed study.

Pasture covers increased in the creep areas over time with a loss in quality partly due to severe patch grazing (hence large errors in Figure 4), and from lambs not being able to keep up with pasture growth rates. Herbage intakes were up to 1/3 lower than those previously measured (Penning & Gibb, 1979), which may indicate the proportion of the diet prehended in the shared areas. Areas fenced for the creep (0.14 ha) were kept the same from 4 weeks of age, where as they should have been smaller at the start and increased as the lambs matured. Large numbers of forage samples ($n = 20$) need to be taken in any area that is grazed by lambs to help counteract the problems of patch grazing, pasture growth rate and low levels of daily herbage intake, particularly when lambs are 4 – 7 weeks of age.

In conclusion, results suggest that the creep grazing method is a feasible, non-invasive way to study the foraging

habits and diet of the pre-weaned lamb without the confounding effect of the ewe sharing the same pasture, with little change from the “natural” situation. However, refining of the method is required so that lambs do not graze on any shared pasture, so their total forage intake can be measured, with careful attention paid to creep area size, design and management.

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