# The influence of sheep to cattle ratios on live-weight gain on pastures grazed to different levels in late spring-summer

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## ABSTRACT

Grazing yearling steers with ewes between November and March led to improved ewe and steer live-weight gains compared to grazing them in mobs by themselves. This occurred on both steep and easy land, and on each of 3 grazing pressures; residuals of either 1200, 1700 or 2300 kg DM/ha with pre-grazing masses 1200kg DM/ha greater than residuals.

Ewe live-weight gains were 56, 67 and 82 g/d where sheep/cattle ratios were 100/0, 80/20 and 60/40, on a stock unit basis. Steer live-weight gains were 0.65, 0.55 and 0.51 kg/d for the 80/20, 60/40 and 0/100 sheep/cattle ratio treatments.

Associated with improved ewe and steer performance under mixed grazing on steep country was a decrease in the area of pasture rejected at 40% cattle stock units compared to 0% and 20% cattle (26% *v* 32%). On easy country, the amount of clover in the pasture increased by 5 and 19 percentage units at 40% and 100% cattle stock units respectively.

The results suggested that between 20% and 40% cattle stock units in a mob may be needed to obtain high levels of ewe and steer live-weight gain in late spring-summer.

**Keywords** Mixed grazing; sheep/cattle ratio; late spring/summer; pasture control; live-weight gain; hill country; residual; pasture rejection

## INTRODUCTION

On hill country, the development of rank pasture in late spring-early summer reduces both stock performance and pasture growth (Smeaton *et al.*, 1984; Sheath *et al.*, 1984). the problem with maintaining pasture quality solely by ewes is that to avoid significant patch grazing (and hence loss of quality in rejection sites), pastures have to be grazed to a low residual (Arosteguy, 1982) and hence fleece weight and live-weight gain are reduced (Smeaton *et al.*, 1984).

Interest has therefore focused on possible advantages from integrating sheep and cattle grazing in late spring-early summer to take advantage of any complementary grazing habits (Nolan and Connolly, 1977; Boswell and Cranshaw, 1978).

This study defines effects on ewe and steer performance of different sheep/cattle ratios when grazed to control pastures at different levels during late spring and summer.

## EXPERIMENTAL

The experiment was run on both steep and easy land between 26 November 1984 and 13 March 1985 (110 days). Three levels of pasture control were used on easy land; pre-grazing masses of 2400, 2900 and 3500 kg DM/ha and residuals of 1200, 1700 and 2300kg DM/ha, respectively. Two levels of pasture control were used on the steep land; pre-graze masses of 2400 and 2900kg DM/ha and residuals of 1200 and 1700 kg DM/ha.

Four sheep/cattle ratios, 100/0, 80/20, 60/40 and 0/100% sheep/cattle stock units, were studied across the 5 treatments above. Stock unit equivalents were calculated as one 14 month steer, (start weight 240kg) equalled 4 ewes (start weight 45kg), based on theoretical feed requirements for live-weight gains of 1 and 0.1kg/d, respectively (Ulyatt *et al.*, 1980). Steers were Angus and Hereford—Freisian x Angus and the ewes, Romneys and Coopworths. Each breed made up half of the appropriate stock class.

Treatments were run in self contained areas comprising 6 paddocks and stock were shifted whenever residual reached the appropriate level. Core stocking rate was 16 su/ha and average grazing duration was 7 days per paddock. However, buffer animals in the appropriate ratio were introduced to reduce the grazing duration on a paddock when the next paddock in the rotation was at its nominal pre-grazing mass. This helped to achieve the pasture mass guidelines above, and hence maintain constant grazing pressure between treatments. Core cattle numbers ranged from 3 on "80/20" treatments to 5 on other treatments and core sheep numbers ranged from 30 to 48 per treatment.

Stock live weights were recorded after a 16-h fast and ewes were drenched with zinc to prevent facial eczema. Pre and post-grazing pasture mass and pre-grazing pasture composition were determined on each paddock using the method described by Smeaton *et al.*, (1983). Post-grazing composition and proportion of rejected pasture along 2 x 25 m transects (250 points) were taken in 2 representative paddocks/ treatment.

Mean residual and the increment between pre and post-grazing mass ranged by up to ± 150kg DM/ha around the nominal levels. The average pre-post increment was 1075kg DM/ha on steep, and 1240kg DM/ha on easy land. The latter parameter was fitted as a covariate in statistical models.

## RESULTS

### Animal Performance

Ewes

Ewe live-weight gains for each treatment through to mid-February (Fig. 1) showed no interaction between level of pasture control and sheep/cattle ratio. Therefore, ewes performed better under all levels of pasture control as the proportion of sheep in the mob decreased (Fig. 1). The relationship between pasture control and live-weight gain tended to vary between steep and easy country ($P<.$ 0.01), with a greater response to residual on steep country.

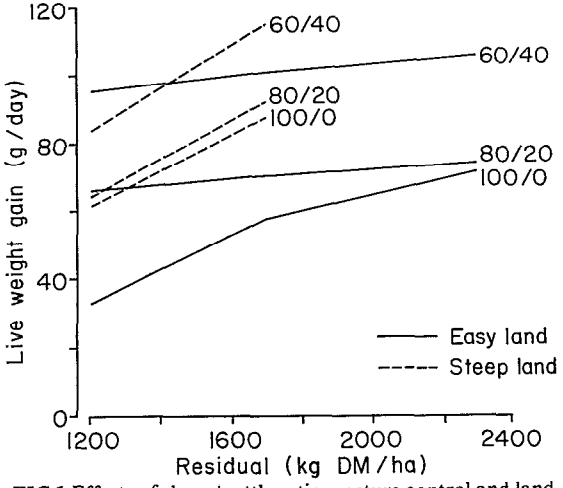


**FIG 1** Effects of sheep/ cattle ratio, pasture control and land class on ewe live-weight gain, 26/11 - 18/2.

Between February and mid-March, live-weight gains of ewes in all "steep 1700 residual" treatments dropped relative to those on the "steep 1200 residual" treatments. By mid-March, only main effects were significant for live-weight gain and fleece weight over the entire period (Table 1). Both live-weight gain and fleece weight remained higher as the proportion of sheep in the mob decreased and they both increased with residual and remained highest on steep country.

**TABLE 1** Treatment effects on ewe live-weight gain (g/d) November to March and fleece weight (kg).

| | Live-weight gain | Fleece weight |
|---|---|---|
| Sheep/cattle ratio | | |
| 100/0 | 56 | 2.75 |
| 80/20 | 67 | 2.83 |
| 60/40 | 82 | 2.92 |
| SED and significance | 3.5** | 0.045** |
| Pasture residual (nominal) | | |
| 1200 kg DM/ha | 59 | 2.76 |
| 1700 kg DM/ha | 69 | 2.84 |
| 2300 kg DM/ha | 77 | 2.90 |
| SED and significance | .3.6** | 0.045** |
| Land class | | |
| Easy | 65 | 2.83 |
| Steep | 72 | 2.84 |
| SED and significance | 3.0** | 0.045 |

Cattle

Cattle live-weight gains up until 31 January and over the whole trial are given in Table 2. Mean steer live-weight gain decreased greatly after 31 January from 0.88 to 0.09kg/d.

Little difference occurred between pasture control or easy and steep treatments. However, steer performance improved slightly where there were only 20% steer stock units in the mob.

**TABLE 2** Treatment effects on cattle live-weight gain (kg/d) November to January and November to March.

| | Live-weight gain | |
|---|---|---|
| | Nov — Jan | Nov — Mar |
| Sheep cattle ratio | | |
| 80/20 | 0.93 | 0.65 |
| 60/40 | 0.85 | 0.56 |
| 0/100 | 0.80 | 0.52 |
| SED and significance | 0.05* | 0.04* |
| Pasture residual (nominal) | | |
| 1200 kg DM/ha | 0.87 | 0.56 |
| 1700 kg DM/ha | 0.90 | 0.61 |
| 2300 kg DM/ha | 0.81 | 0.58 |
| SED and significance | 0.06 | 0.05 |
| Land class | | |
| Easy | 0.90 | 0.60 |
| Steep | 0.82 | 0.57 |
| SED and significance | 0.05 | 0.04 |

### Pastures

Green pre-grazing mass (Table 3) did not differ greatly between pasture control treatments, but green residual declined more in line with total residual treatment. Table 4 presents major pasture results as influenced by sheep/cattle ratio.

Sheep/cattle ratio did not influence total green dry matter percentage in a systematic manner on either steep or easy land. However, percentage clover increased on easy land from around 20% on the 0% and 20% cattle treatments up to 25 and 39% in the 40

and 100% cattle treatments, respectively. Percentage green in the residual also increased as proportion of cattle increased. This meant that approximately 97% of the feed removed by sheep only treatments was green dry matter compared to only 78% by the cattle only treatments. Green dry matter made up approximately 85% of the total feed removed by both sheep and cattle in the mixed sheep/cattle treatments.

The area of pasture rejected was lower under the 40 and 100% cattle treatments on steep land, but this did not occur on easy land.

**TABLE 3** Effects of land class and level of pasture control (nominal residual pasture mass) (kg DM/ha) on pre- and post-graze GDM (kg GDM/ha).

| | Level of pasture control | | |
|---|---|---|---|
| | 1200 | 1700 | 2300 |
| Easy | | | |
| Pre-graze | 1640 | 1600 | 1960 |
| Post-graze | 480 | 700 | 855 |
| Steep | | | |
| Pre-graze | 1340 | 1480 | — |
| Post-graze | 410 | 650 | — |

## DISCUSSION

Major gains in stock performance occur from the integration of cattle with ewes over late spring-summer. In contrast to the 6.1kg live-weight gain by ewes grazing alone, ewes grazing with 40% cattle stock units gained 9.1kg, and grew an extra 0.2kg wool over the 110-d period. These higher levels of production from sheep/cattle grazing make control of pastures beneficial as opposed to where ewes alone are used for pasture control (Smeaton *et al.,* 1984). Steer live-weight gains also appear to benefit from integrated sheep/cattle grazing where sheep and cattle are moved together (Table 2).

The above results were consistent for steep and easy land and for each of the pasture control treatments used in the experiment. Ewes did not have a competitive advantage over the steers in mixed grazing-low residual treatments, although numbers of steers/treatment were low.

Associated with improved ewe and steer performance under mixed grazing on steep country was a decrease in the area of pasture rejected under 40% cattle stock units. Hence there was a larger area of acceptable pasture on the paddocks in these treatments between January and March. The same effects did not occur on easy land. On easy land, pastures increased in white clover content under 40 and 100% cattle stock in units. Increased clover was initially most noticeable around cattle dung patches as reported by Nolan and Connolly (1977). By mid-January after 2 to 3 grazings, clover content had increased in both accepted and rejected sites as cattle treatments appeared to leave much higher numbers of clover stolons after grazing.

No similar increase in clover content occurred on steep country, presumably because the poorer environmental conditions for clover growth overrode any benefit cattle may have had in promoting clover content.

The final area of complementarity between sheep and cattle appeared to be in the composition of the diet selected. The very high green content of the diet apparently selected by the sheep (97%) is in agreement with Guy *et al.,* (1981) and contrasted with just 78% green in the diet of cattle.

The small effect of pasture residual on animal live-weight gains in this study, especially cattle live-weight gain, is surprising in view of other data (e.g. Bircham *et al.,* 1986). Also somewhat unexpected was the slightly better sheep performace on steep as opposed to easy country. Some, but not all, of the latter effect could possibly have been due to greater accessibility of pasture on steep land than suggested by the pasture masses, since the steep land included more bare ground (7.6 *v* 1.5%). Pasture quality could also have been slightly higher owing to the lower increment between pre-and post-grazing mass.

**TABLE 4** The influence of sheep/cattle ratio on pasture characteristics on steep and easy land.

| | Sheep/cattle ratio | | | | SED | Significance |
|---|---|---|---|---|---|---|
| | 100/0 | 80/20 | 60/40 | 0/100 | | |
| % Green DM[1] in pre-graze | | | | | | |
| Easy | 58 | 51 | 58 | 63 | | * |
| Steep | 53 | 50 | 54 | 49 | 4.5 | NS |
| % Clover in pre-graze | | | | | | |
| Easy | 20 | 18 | 25 | 39 | | ** |
| Steep | 22 | 14 | 20 | 15 | 3.4 | NS |
| % Green DM[1] in post-graze | | | | | | |
| Easy | 35 | 39 | 38 | 45 | | ** |
| Steep | 31 | 34 | 35 | 41 | 3.0 | ** |
| % Area rejected | | | | | | |
| Easy | 31 | 29 | 29 | 30 | | NS |
| Steep | 32 | 31 | 26 | 24 | 2.4 | ** |

[1] Green DM excludes green weeds and seed head stem.

## CONCLUSIONS

Integrated grazing of sheep and cattle over late spring-early summer clearly improved both ewe and steer performance, this occurred under a wide range of pasture conditions. However, between 20% and 40% of total stock units in a mob would need to be cattle to obtain significant practical advantages from mixed grazing. Where these ratios can not be achieved, grazing cattle alone over December/January on easy country could be used to generate high quality clover pastures for late summer.

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