The Effect Of Grazing Management on Pasture And Animal Production In Late Autumn To Early Spring Period In A One Year Bull Beef Grazing System

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ABSTRACT

The aim of this trial was to improve pasture growth rate and animal liveweight gains in the late autumn and early spring on a one year bull beef production system. The trial was conducted at the Tuapaka bull unit, Massey University, from 1 April to 30 September 1997. It compared three contrasting managements, operating on a total of 165 bulls stocked at 2.6 bull/ha. Treatment 1 followed a grazing plan based on the average pasture growth rate for the region, the animal requirements needed to achieve performance targets, and pasture mass targets (2700-2800 kg DM/ha and 1500-1600 kg DM/ha for late autumn and early spring, and 3000-3200 kg DM/ha and 1100-1200 kg DM/ha for winter for pre-grazing and post-grazing, respectively). Treatment 2 was managed according to the same pre-grazing and post-grazing targets. In this treatment the pasture targets were monitored daily, and bulls were shifted when the post-grazing targets were achieved. No supplement was used in Treatments 1 and 2. Treatment 3 followed traditional Tuapaka management, based on a 50 day rotation over the late autumn and winter, a 30 day rotation in August, and set stocking in September. Supplement was fed to this treatment as required in the winter. The overall liveweight gain (0.84 ± 0.02, 0.87 ± 0.02, 0.74 ± 0.01 kg LW/head/day for Treatments 1, 2, and 3 respectively) and final liveweight (354.7 ± 3.54, 359.8 ± 3.65, and 335.6 ± 3.27) were similar for Treatments 1 and 2 which were both significantly higher ($P<0.001$) than Treatment 3. Net herbage accumulation was significantly different ($P<0.01$) between Treatment 1 (6147 ± 369.3 kg DM/ha), Treatment 2 (7062 ± 319.9 kg DM/ha), and Treatment 3 (5277 ± 334.08 kg DM/ha). It was concluded that it is possible to improve both pasture production and bull beef performance when grazing is based on the management of prescribed sward conditions.

Keywords: Grazing management, sward targets, pre-grazing, post-grazing, net herbage accumulation

INTRODUCTION

Traditionally at Massey University Tuapaka bull unit, grazing management has been based on animal intakes to reach the targeted liveweight gains. During late autumn, the bulls have been restricted to save pasture for the winter. This has not been achieved with both hay and forage crop inputs required to maintain a liveweight gain around 0.5 kg LW/head/day at a stocking of 2.6 to 2.7 bulls/ha. In spite of this management by the end of the winter pasture cover is on average around 1200 kg DM/ha. Such pasture cover leads to low animal performance in early spring (September), compromising the system outcomes. Based on dairy farmers grazing management as outlined by Phillips and Matthews (1995) and Matthews (1997), this grazing management trial aimed to establish sward target conditions in order to improve both pasture and animal production over the autumn leading to heavier bulls at the start of winter. Over the winter period grazing management focussed on achieving the desired sward conditions for early spring rather than improving liveweight gains in winter. If early spring grazing management starts at the prescribed sward target (Table 1), then the grazing management could again focus on both pasture and animal performance.

MATERIALS AND METHODS

Three treatments were tested in an experiment conducted at Tuapaka bull beef farm, Massey University from 3 April to 31 September. Treatments were run as self-contained farmlets over the experimental period.

Treatment 1 was based on the pasture targets presented in Table 1 and was managed strictly according to grazing plans based on target sward conditions and average

TABLE 1: Target sward conditions and animal performance for each season

	Pre-grazing (kg DM/ha)	Post-grazing (kg DM/ha)	Pasture cover (kg DM/ha)	ADG (kg LW/day)	Final Weight (kg LW)
Autumn (3 Apr/30 Jun)	2700-2800	1500-1600	1800-2000 (Jun 1)	1.2	280
Winter (1 Jul/1 Sept)	2800-3000	1100-1200	1700-1800 (Sept 1)	0.5	325
Early Spring (1 Sept/1 Oct)	2700-2800	1500-1600		1.5	370

net herbage accumulation for the Manawatu region (Anon, 1992). Autumn and spring average net accumulation rates were increased by 15%, since Matthew *et al*. (1996) suggested that between 1200 and 2000 kg DM/ha average pasture cover the net herbage accumulation increases by 2 kg DM/ha/day for every 100 kg DM/ha increase in average pasture cover. Bulls feed requirements were based on the metabolic energy (ME) requirements' table presented by Journeaux (1987). The pasture requirements were then calculated by dividing these metabolic energy values by the ME (MJ/kg DM) content in the forage, assumed to be 10.8 MJ/kg DM (McRae and Morris, 1984). The grazing plans were prepared in the beginning of each period and reassessed once a month according to current bull liveweight and farm average pasture cover. No supplementation was considered for this treatment.

Treatment 2 was based on the same sward targets as Treatment 1 (Table 1), but shifts were done when post-grazing targets were achieved. Rotation length, in this case, was dependent on current pasture growth rate. As it was considered important to maintain target sward conditions supplementation with hay would be considered when these sward conditions were not being achieved.

Treatment 3 was based on a traditional Tuapaka grazing plan, which is based on animal weight targets and not specific sward targets. The grazing management is basically implemented by dividing each paddock (bigger than 3 ha) into two and, giving a 4 or 5 day grazing period per break (depending on the area). In addition, 6 kg of hay per head is offered in the last grazing day (4 day break) or in the last two grazing days (5 day break). This management gives a rotation length of 50 days, which is normally applied from the beginning of April, until when bulls were often set stocked due to low pasture cover in late August.

The experiment design applied was a modified randomised block. Since the Tuapaka bull unit was divided in three blocks by natural barriers, the distribution of paddocks had to be carefully monitored in order to have all treatments evenly distributed around the farm. The sixty three hectares area available for the trial was divided into three farmlets. Paddocks were allocated so as to avoid assigning adjacent paddocks to the same treatment, as well as attaining an even distribution across each land type. The variation in individual paddock sizes resulted in the total area for each farmlet being slightly different. Bull numbers were used to balance this difference in area.

One hundred and sixty five rising 1 year bulls purchased on November 1996 were used in this trial. These bulls were mixed, weighed (fasted for 12 hours) and randomly regrouped on a liveweight basis to have the initial stocking rate as similar as possible. This resulted in the following treatment distribution:

(i) Treatment 1 - 20.1 ha and 53 bulls (2.63 bulls/ha)
(ii) Treatment 2 - 19.9 ha and 51 bulls (2.56 bulls/ha)
(iii) Treatment 3 - 23.5 ha and 61 bulls (2.59 bulls/ha)

In order to calculate the grazing plan, a computerised spreadsheet was developed using Microsoft Excel (Coutinho, 1998). According to the model, the rotation length for each period (or season) for Treatment 1 was:

(i) Two rotations of 30 days for the months of April and May (late autumn).
(ii) One rotation of 100 days over the winter (from 1 June to 10 September).
(iii) One rotation at the rate of 30 days from 10 September until 10 October.

Data were analysed using the ANOVA analyses (SAS, 1988). Average pasture cover, pre-grazing and post-grazing herbage mass were analysed using time as replication. For net herbage accumulation rates, paddocks were used as replicates, and liveweight data analysis was carried out using individual bulls as replicates.

RESULTS AND DISCUSSION

There were no differences in final liveweights or average liveweight gain over the trial between bulls in Treatment 1 and Treatment 2. Both these treatments were, however, significantly higher than Treatment 3 (Table 2). The average increase in final liveweight was 21.6 kg and 0.115 kg liveweight gain per bull per day; a 3.0% and 15.5% increase respectively.

The total net herbage accumulation during the trial is presented in Table 3. Total net herbage accumulation was significantly different ($P<0.01$) between Treatment 1 (6147 ± 389), Treatment 2 (7062 ± 319) and Treatment 3 (5277 ± 334) kg DM/ha. The difference in total accumulation between Treatments 1 and 3, and Treatments 2 and 3 were 870 and 1785 kg DM/ha respectively.

In the first three months of the trial no differences in net herbage accumulation were detected (Figure 1). From July onwards as pasture cover in Treatment 3 started to drop, Treatments 1 and 2 had higher net accumulation rates than Treatment 3. As the winter grazing progressed, the average pasture cover on Treatment 3 reduced to a low of 1286 kg DM/ha (Figure 1). Over the trial period the average increase (over Treatment 3) in net herbage accumulation rate was 4.83 kg DM/ha/day for Treatment 1 and 9.91 kg DM/ha/day for Treatment 2. Overall the average pasture cover for Treatments 1 and 2 was 293 kg DM/ha higher than Treatment 3 giving an average increase over the trial period of 1.64 kg DM/ha/day for each 100 kg increase in average pasture cover for Treatment 1 and 3.38

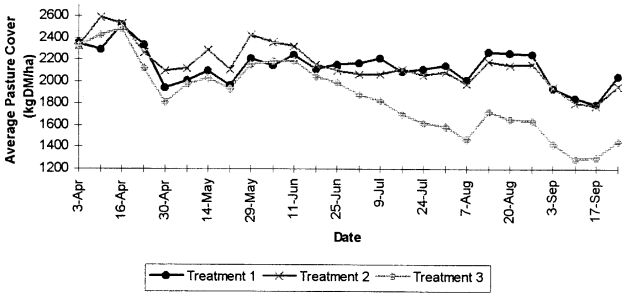
TABLE 2: Initial and final Bull fasted liveweight (kg) and liveweight gain (kg LW/head/day).

	Treatment 1	SEM	Treatment 2	SEM	Treatment 3	SEM
Apr-03 (kg LW)	201.75 [a]	2.2	200.97 [a]	2.2	200.4 [a]	2.03
Oct-01 (kg LW)	359.79 [a]	3.54	354.75 [a]	3.64	335.59 [b]	3.27
ADG (kg LW/head/day)	0.84 [a]	0.02	0.87 [a]	0.02	0.74 [b]	0.01

TABLE 3: Pasture balance throughout the grazing management trial at Tuapaka bull unit.

	Treatment 1	Treatment 2	Treatment 3
Net pasture increase (kg DM/ha)	6147 a	7062 b	5277 c
Supplement added (kg DM/ha)	0	0	120
Drop in pasture cover (kg DM/ha)	-281	-348	-844
Estimated DM consumed (kg DM/ha)	6428	7410	6241

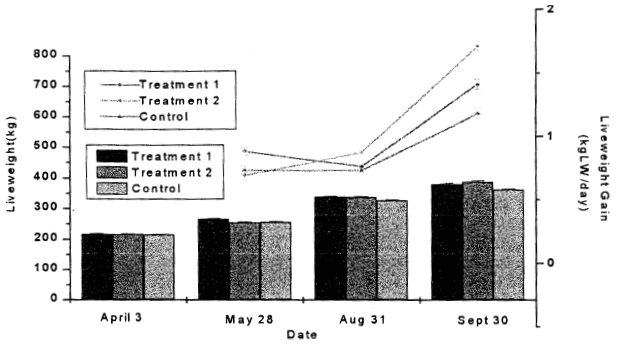
FIGURE 1: Average pasture cover change over the trial period.



kg DM/ha/day for Treatment 2. This supports the conclusion by Matthew *et al*. (1996) that net herbage accumulation rate will increase as average pasture is increased from 1200 to 2000 kg DM/ha although the response in Treatment 2 was 69% higher than they suggested.

The extra net herbage production in Treatment 1 and 2 (Table 3) over the winter resulted in higher pasture covers than higher liveweight gains. The higher pasture cover in early spring allowed pre-grazing and post-grazing pasture targets to be achieved, increasing pasture allowance, dry matter intake, and consequently average daily gains (Figure 2) in both Treatments 1 and 2. The pasture balance over the trial period shows that the large drop in average pasture cover and supplement fed in Treatment 3 suggests that total dry matter disappearance was similar for Treatment 1 and Treatment 3 despite significant differences in liveweight gain between the two treatments. It is suggested that the higher pasture cover in Treatment 1 would allow bulls to harvest pasture more efficiently than on Treatment 3.

FIGURE 2: Liveweight (kg) and liveweight gain (kg DM/head/day) progress throughout the grazing management experiment at Tuapaka bull unit.



CONCLUSION

This trial showed that grazing management based on sward target conditions increased the net herbage accumulation over the late autumn to early spring period compared to the normal Tuapaka management system.

Although the implementation of a fixed plan for Treatment 1 was successful, the initial plan did not adequately take into account the start situation and the transition between fixed plans. This meant that Treatment 2 adjusted better to the current situation of sward conditions due to its flexible grazing plan. This led to better performance over the trial. If this grazing management is to be tested again it is recommended that grazing plans should be calculated per season and re-evaluated on a weekly basis, according to the actual average pasture cover and net herbage accumulation to maintain management targets.

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