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Managing dairy calves using continuous stocking and sward surface height – a review

S. J. BLUETT AND K. A. MACDONALD

Dexcel, Private Bag 3221, Hamilton, New Zealand.

ABSTRACT

The objectives of this review are (i) to examine the role of continuous stocking management in grazing experiments and on farm; (ii) to discuss the measurement of sward surface height; (iii) and to present experimental liveweight gain data obtained from calves continuously stocked from weaning to nine months of age. Sward height can be used as a guide in cultivar evaluations to maintain equal sward conditions between plots and treatments using put-and-take and continuous stocking management. Continuous stocking management can also be used on farm to achieve the recommended liveweight targets for dairy calves. However, further research is needed to determine the optimum sward height for calves. Weaned Friesian dairy heifers continuously stocked from November 2000 to April 2001 at Dexcel, Hamilton, and grazed to a mean sward height of 5 cm, steadily gained 0.8 kg/day, reaching a final mean of live weight of 226 kg at 9 months of age. The average stocking rate over this period was 7.1 calves/ha and the total liveweight gain was 822 kg/ha. These calves achieved the recommended liveweight targets set for replacement dairy heifers.

Keywords: forage evaluation; liveweight gain; pasture management; sward stick.

INTRODUCTION

In a continuously stocked system, animals remain on the same pasture for long periods of time. An extreme form of continuous stocking is set stocking, in which no adjustments to stock numbers are made despite changes in pasture conditions (Matthews et al., 1999). In contrast, animals in a rotational-grazing system graze paddocks in sequence, each for a short period of time (varying from hours to days). Sward surface height can be used as a guide for grazing management, particularly in continuously stocked systems, because of its influence on sward structure, pasture growth and utilisation, and on the intake and performance of individual animals (Hodgson et al., 1986; Swift et al., 1989; Wright & Whyte, 1989).

Experimental data suggest that, under continuous stocking management, pasture intake and animal performance increases at a progressively declining rate towards a maximum value as sward height increases (Hodgson & Brookes, 1999). The critical height for grazing cattle is about 8-10 cm and 6-7 cm for sheep under continuous stocking management (Hodgson & Brookes, 1999). There is little value in providing feed above this critical height as no further improvement in performance will be achieved and herbage production will eventually decline (Hodgson & Brookes, 1999).

In perennial ryegrass-dominant pastures, the surface horizon is predominantly green leaf and the lower horizons contain pseudostem or dead material (Poppi et al., 1987). When sward height is increasing, animals are consuming a high proportion of young, highly digestible leaf. When sward height is falling, an increased proportion of the intake will be older leaf and stem of lower digestibility (Swift et al., 1989). Patchy grazing and seedhead production on cattle swards is usually minimised when sward height is kept below 8 cm (Hodgson et al., 1986). Since pasture growth rates vary within season, and from year to year, stocking rate must change to maintain a target sward height (Swift et al., 1989). Target heights must be chosen to meet the production objectives of the particular enterprise (Hodgson et al., 1986).

Effect of sward height on liveweight gain

Little work has been published on the relationship between cattle performance and sward height under continuous stocking management in New Zealand. Morris et al. (1993) reported that the liveweight gain of continuously stocked finishing cattle increased with sward height up to a maximum of 8-10 cm in spring pasture, while in autumn, heights of 12-15 cm were required to achieve maximum animal performance. Realini et al. (1999) also found that a sward height of 10 cm from November to April increased the liveweight gain of two-year-old steers compared with those managed to 5 cm (111 versus 32 kg/head). Despite the decreased stocking rate when sward height was maintained at 10 cm, output per hectare was greater than when pastures were grazed to 5 cm (Realini et al., 1999). However, both these studies were conducted with mature cattle, and calves may be better suited to grazing shorter pastures than larger cattle because of their smaller mouth size (Poppi et al., 1987). Further research is therefore needed to determine the optimum sward height for calves under New Zealand grazing conditions.

Liveweight targets

The recommended liveweight targets for young Friesian dairy heifers (500 kg mature live weight) are: 100 kg at ten weeks (weaning); 150 kg at six months; 200 kg at nine months; and 300 kg at 15 months of age (Dexcel, 2001). It is important that replacement heifers meet all of these liveweight targets to ensure that they are cycling before the start of mating at 13 to 15 months of age and get in calf quickly (Penno et al., 1995).

Experimental data

An experiment designed to examine the effects of a novel ryegrass endophyte on dairy calf performance was conducted on No 5 Dairy, Dexcel, Hamilton from 8 November 2000 to 3 April 2001. The effects of endophyte...
on calf performance will be reported elsewhere, with the mean of three treatments presented in this paper.

Fifteen plots (each 0.5 ha) were cut for silage in late October 2000 to a mean stubble height of 7 cm. Six weaned Friesian heifer calves (born between mid-July and early August 2000) were initially allocated to each plot in a stratified manner according to live weight. However, one week after the start of the experiment, the stocking rate was reduced to four calves per plot (8 calves/ha). Calves were continuously stocked on plots from 8 November 2000 to 3 April 2001, and grazed to a mean sward height of 5 cm to maintain uniform levels of grazing pressure between plots. Sward height was measured weekly and was maintained using a put-and-take system by adding or removing calves using methods published by Hodgson et al. (1986: Table 1). Calves received eprinomectin pour-on every six weeks to control internal and external parasites, a clostridial vaccine in November 2000, a vitamin B12 injection in January 2001, a leptospirosis vaccine in February 2001 and were given a zinc oxide intra-ruminal bolus in February 2001 to minimise facial eczema.

Mean sward height in each plot was measured weekly using an automated sward stick (Model SS400M: Jenquip, Fielding, New Zealand). On each occasion, 100 measurements per plot were recorded (50 per diagonal) when the plastic tongue of the sward stick was lowered onto green leaf (Hodgson et al., 1986). Pasture quality of herbage on offer was determined monthly from 10 strips of herbage cut to ground level and bulked for each plot. A sub-sample of herbage was frozen at −20°C, freeze-dried and ground to pass a 1 mm sieve, before being analysed for organic matter digestibility using near infrared spectroscopy (NIRS) (Corson et al. 1999). Unfasted live weight and body condition score was recorded for each calf every three weeks. Mean liveweight gain was calculated from the calves present for the total experimental period. Stocking rate was the mean over the experimental period and the number of grazing days identified (Matches, 1969: Table 2). Using this technique, individual animal performance data, number of grazing days, animal carrying capacity and total production per hectare can be determined for each treatment (Wheeler & Hedges, 1972). Adjustments to stocking rate can be guided according to decision rules (Hodgson et al., 1986: Table 1) to reduce the subjectivity of decision-making. For example, if sward height is increasing, stocking rate is increased to maintain the target sward height and vice versa. Another powerful advantage of the put-and-take method is that when grazing pressure is maintained at definable levels throughout the year, the quality and quantity time trends of the sward can be identified (Matches, 1969: Table 2).

**Use on farm**

Penno (1994) recommended that young heifers should be regularly shifted onto ample high-quality pasture to...
TABLE 1: A guide to making stocking rate (calves/ha) adjustments to compensate for changes in sward height under continuous stocking management (reproduced from Hodgson et al., 1986).

<table>
<thead>
<tr>
<th>Changes in height over previous week</th>
<th>Decrease stocking rate</th>
<th>No change</th>
<th>Increase stocking rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current height</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>- 10</td>
<td>+ 10</td>
<td>+ 10</td>
</tr>
<tr>
<td>On target</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>- 20</td>
<td>- 10</td>
<td>- 20</td>
</tr>
</tbody>
</table>

TABLE 2: Reasons presented for and against using a put-and-take system of pasture experimentation (adapted from Matches, 1969).

<table>
<thead>
<tr>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing pressure is maintained at a uniform level between and within treatments</td>
<td>Not practical on a farm basis</td>
</tr>
<tr>
<td>Grazing pressure can be defined throughout the season, and the quality and quantity time trends of the sward can be identified</td>
<td>Subjective judgements in adjusting the stocking rate of individual pastures according to the amount of forage which appears to be available</td>
</tr>
<tr>
<td>Can predict carrying capacity of pastures</td>
<td>Possibility that the larger number of animals in some pastures may lead to greater or smaller intake of herbage due to competition between animals</td>
</tr>
<tr>
<td>Can describe sward conditions and relate them to animal responses</td>
<td></td>
</tr>
</tbody>
</table>

achieve high levels of performance. However, the experimental data recorded at Dexcel and reported above, indicate that good liveweight gains can also be obtained using a continuous-stocking management system. Sward height needs to be monitored weekly to detect changes in height to enable adjustments to be made as early as possible. The measurement of sward height is simple, inexpensive and fast, and can be carried out with minimal training (Burnham et al., 1986). Sward height targets must be maintained to ensure sufficient pasture is available to calves or herbage intake will decline and liveweight gain will be adversely affected. McMeekan (1954) clearly showed how non-adjustment of stocking rate in a continuously stocked system during times of pasture deficit resulted in poorly grown calves compared to their rotationally grazed counterparts.

On most farms it will be easier to maintain the target sward height by altering the grazing area than by adjusting stock numbers (put-and-take management). If sward height increases above target, areas can be shut up as deferred grazing or harvested for silage or hay. If height drops below target the grazing area can be increased or supplementary feed provided (Matches, 1969). Farmers who monitor their sward height and calf live weight should after a few years have sufficient information to produce sward height guidelines specific for their own situations (Burnham et al., 1986). Calves managed under continuous stocking may also have a lower labour requirement than rotationally grazed calves by eliminating the regular shifting of mobs and break fencing.

Although regular measurements of calf live weight can provide a good general guide to the well-being of young stock, appraisal by eye is also important in detecting signs of ill thrift before any major drops in liveweight gain occur. This is particularly important under continuous stocking management because stock may not be seen as often as animals moved regularly. Generally, a healthy, thrifty animal will have a glossy, well-kept coat (McMeekan, 1954). Heifers must be kept free of parasites and disease, and their mineral status must be maintained, and preventative measures for facial eczema taken (Penno, 1994). Animals must also have access to good quality drinking water at all times.

CONCLUSIONS

Continuous stocking management using sward height as a guide can be used in research for cultivar evaluations and on farm to achieve target liveweights. However, further research is needed to determine the optimum sward height for calves. Dairy heifers managed under continuous stocking management and grazed to a mean sward height of 5 cm at Dexcel, gained 0.8 kg/calf/day from weaning to nine months of age, and achieved the recommended liveweight targets for replacement calves.

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