# The dilemma of using sward height as a management tool for intensively grazed sheep pasture in spring

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**Keywords:** Continuous grazing, defoliation, pasture, residual, spring.

## Introduction

Sward height is often used as a tool for both animal and pasture management, especially when continuously grazing pasture. For example, sward height has been used to define the conditions for optimal feed intake of multiple-bearing ewes, both before and after lambing (Everett-Hincks *et al.*2005; Morris and Kenyon 2004). Sward height is easily applied by the grazier and so becomes an effective tool. However, changes in the leaf distribution and relative species makeup of the sward both seasonally (Thomson *et al.* 2001) and in response to grazing management (Webby and Pengelly 1986) mean that the amount of pasture per unit height will change. When these changes occur a dilemma is presented to the grazier. How do they manage the trade-off between a simple indicator for management decisions and the lost opportunity of harvesting pasture mass that may be accumulating below the assigned sward height?

This paper presents data from an experiment that investigated the impacts of defoliation strategies on sward of differing starting masses, with defoliation management based on height rather than mass. The paper quantifies the accumulation of herbage below defoliation height and highlights the dilemma of using sward height as a management tool when aiming to maximise the utilisation of our pasture resource.

## Methods

The experiment was sited at the Invermay Research Centre in Otago, New Zealand (45.89°S; 170.50°E) on a hill slope of approximately 10°. Soil fertility was moderate (Olsen P 16.5; pH 6.1; Organic Matter 5.8%, C:N ratio 14.4:1; Quick test K 2.6; Sulphate S 4.2). The predominantly ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) pasture received an annual fertiliser input of 250kg/ha superphosphate, with lime applied every 4 to 6 years to maintain a pH between 5.8 and 6.2. The experiment began in late winter on 25 August 2011 and continued until early summer on 7 December 2011. Treatments were applied from 15 September onwards which coincided with the planned start of lambing. Defoliation was achieved using a reel mower with sward defoliation weekly during the first 4 weeks and two-weekly thereafter.

### *Experimental design*

The experiment was a complete randomized block defoliation experiment in a 2x3 factorial design with 6 replications coinciding with a soil fertility gradient down the slope. The design, illustrated in Figure 1a, had two starting heights (3 and 5 cm) by 3 defoliation intensities (increasing, maintaining or reducing sward height). Defoliation intensity was applied over four weeks from September 15 to October 5, and remained constant thereafter until the end of the experiment on December 7.

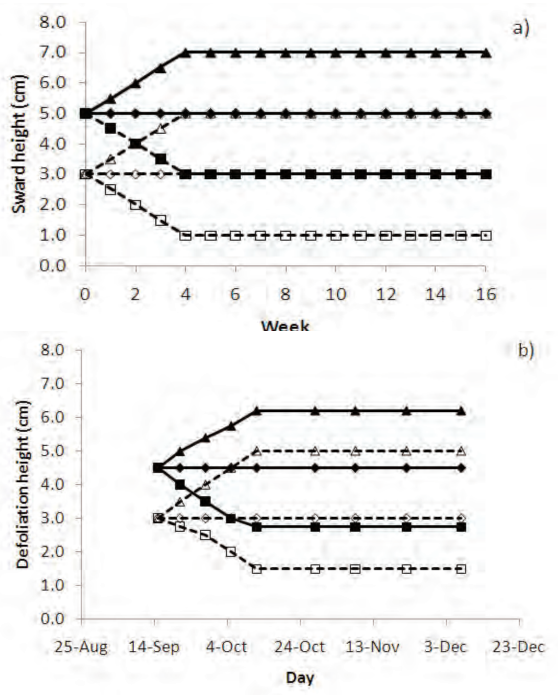


**Figure 1. (a) The experimental design illustrating the starting sward heights (5cm solid line; 3 cm dotted line) and defoliation intensities (Δ increasing; ◊ maintaining; □ reducing sward height) over time; (b) the final sward heights achieved during the experimental period.**

### *Measurements and analysis*

Sward height, pasture harvested by the defoliation treatment and pasture left below the defoliation height (to ground level) were measured at each harvest. Pasture quality (MJME/kg) was determined at the end of the experimental period.

## Results

Figure 1b illustrates the actual sward heights achieved

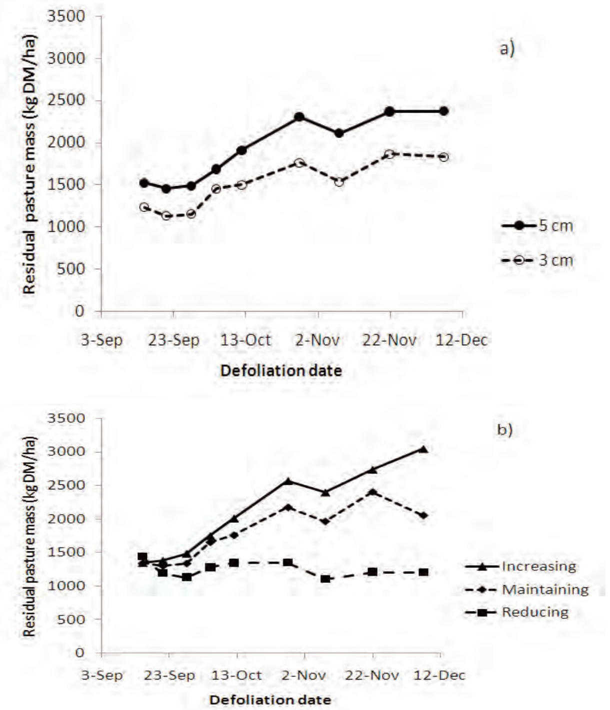


**Figure 2. (a) Pasture mass accumulation below defoliation height from starting sward heights of 3 and 5 cm during spring; (b) The effect of early spring defoliation intensity (Δ increasing; ◊ maintaining; □ reducing sward height) on pasture mass accumulation below defoliation height during spring.**

during the experiment. The residual pasture mass below the defoliation height increased for both of the initial starting sward heights, and were significantly different throughout (Fig. 2a; $P$<0.01; sed = 103). Pasture mass below defoliation height was significantly different between defoliation treatments (Fig. 2b; $P$<0.01; sed = 112) except at the first two dates. The pasture mass of swards that had a reducing pasture mass during the first four weeks remained similar and low throughout the spring. Pasture mass of swards that were maintained or increased during the first four weeks of spring both increased the amount of pasture below defoliation height (Fig. 2b). Feed quality below defoliation height at the end of the experimental period was highest when sward height was reduced in the first four weeks, intermediate in the maintained swards and lowest in the increased swards (11.3, 10.9 and 10.5 MJME/kg DM; $P$=0.01; sed=0.226).

## Discussion

The use of sward height was not a good indicator of the pasture mass below defoliation height except when defoliation intensity during the first 4 weeks was intense resulting in a reduction in sward height. This reflects changes in leaf production and tiller dynamics in early spring as individual plants respond to the frequent defoliation and the increasing temperature and day length. This accumulation of herbage below defoliation height represents a significant lost opportunity as using a sward height indicator as the guide ignores the accumulation of pasture below grazing height that is available for the grazing animal.

## Conclusion

Using sward height as a guide to pasture management during spring results in an accumulation of herbage below defoliation height. This presents the grazier with the dilemma of losing the opportunity of consuming valuable spring feed with grazing livestock when using a single sward height as a management indicator.

## Acknowledgements

Funding from Ministry of Business, Innovation and Employment, Dairy NZ, Fonterra, Beef + Lamb New Zealand and DCANZ; advice on farmer needs from Beef + Lamb New Zealand.

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