

STUBBLE MANAGEMENT OF HAY AFTERMATH

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Abstract

Possible management strategies for areas of stubble left after hay had been harvested from a ryegrass/white clover pasture were studied in a trial on an irrigated Wakanui silt loam at Lincoln College, Canterbury. Following a hay crop cut in late December, the stubble was either trimmed to 2 cm (920 kg DM/ha) or left intact at 8-12 cm (2200 kg DM/ha) and spelled for either four or eight weeks. Subsequent regrowth herbage yield, botanical composition and digestibility were measured.

The highest live herbage mass of 5380 kg DM/ha resulted from leaving the stubble intact and cutting the regrowth at four weekly intervals. The other treatments gave herbage masses from 4120 kg DM/ha to 4350 kg DM/ha but did not significantly differ from one another. However while 1220 and 1650 kg DM/ha of dead material was present in the "stubble intact" treatments, only 470 and 880 kg DM/ha occurred where the stubble was trimmed to 2 cm. The amount of dead material was the main determinant of overall digestibility, as the digestibility of the green herbage was similar (79-80%) for all treatments. As a result of differing amounts of dead material therefore, the herbage mass from trimmed stubble was from 4 to 10% higher in digestibility than that from the stubble left intact treatment. Clover proportion was high throughout the treatments, ranging from 50% in the long spelled treatment to 70% in the short spelled treatment. The results of this trial suggest that hay stubble should be left intact but regrowth should be closely defoliated after four weeks to maximise production and return the sward to a leafy state as quickly as possible.

INTRODUCTION

Hay stubble has a high proportion of dead and stalky material and a low proportion of leaf. Although ruminant animals do actively select green leaf, the presence of large amounts of stalk or dead material does impair this and can reduce animal performance (Scales, 1981). Although correctly set and operated rotary hay mowers can cut very close to the ground, in practice use of these, and also of reciprocating mowers, generally leaves 8-12 cm of stubble. The conversion of this to a more productive leafy sward takes time yet it is important to regain this condition quickly, particularly in mid-summer when there is a demand for high quality pasture to finish weaned lambs and beef, or feed milking cows. The hypothesis was formulated that close trimming of this long stubble would accelerate this process. The experiment reported here examines the effect of trimming, or leaving the hay stubble intact, on the yield and quality of subsequent growth.

METHODS AND MATERIALS

A three year old sward of "Grasslands Nui" perennial ryegrass (*Lolium perenne*) and "Grasslands Huia" white clover (*Trifolium repens*) growing on a Wakanui silt loam soil at Lincoln College was intermittently grazed over the spring period and then spelled from the 9th October. A hay crop was cut on the 22nd December, when herbage mass (a cut to ground level) was estimated to be 9500 kg DM/ha. The experimental design was a 2 x 2 factorial with treatments randomised within four replications. Plot size was 5 m x 4 m. The following treatments were imposed on the hay stubble on the 24th December.

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1. Stubble trimmed, then cut twice at 4 week intervals.
 2. Stubble trimmed, then cut once at 8 weeks.
 3. Stubble initially left intact, and cut twice at 4 week intervals.
 4. Stubble left intact, and cut once at 8 weeks.

Young regrowth was not evident where the hay had been lying due to the hot dry weather and short time the hay was on the ground. The stubble was trimmed by mowing the plots to 2 cm with a rotary lawn mower. On the untrimmed treatments the stubble height ranged between 8 and 12 cm. The resulting residual herbage mass at the start of the experiment is given in Table 1.

Plots were irrigated every two weeks, with the first watering being given one day after treatment imposition. At the beginning of the trial and at each harvest two 0.25 m² quadrats per plots were cut to ground level; one for herbage yield measurement and the other for botanical composition and digestibility analysis. Only the harvested plots were sampled at four weeks. Following the sampling of the plots cut at four weeks, each whole plot area was mown at 2 cm and the clippings discarded. Digestibility was measured using the modified method of Tilley and Terry (1963).

Table 1: MEAN RESIDUAL HERBAGE MASS (kg DM/ha)

	Stubble intact	Stubble trimmed
green herbage	1186	485
dead herbage	1023	432
total :	2209	917
SEM	247	

RESULTS

Yield

Leaving the stubble intact and harvesting twice at four week intervals gave the highest green herbage mass over the eight week period (Table 2). The other three treatments all gave similar amounts of green herbage. There was much less dead material where stubble had been trimmed,

The residual herbage masses after cutting at four weeks were not measured, but were estimated from the initial residual herbage masses. These figures were then used to assess the net herbage accumulation over the eight week period. The results presented in Table 2 are therefore only estimates and no statistical analysis has been attempted. The greatest net green herbage accumulation was also obtained by leaving the stubble intact and harvesting at two four week intervals but the amount was similar to that obtained by trimming the stubble and harvesting only once at eight weeks. The other two treatments accumulated less green herbage.

There was very little difference between the amounts of net dead material at the end of the trial and that at the beginning, in the treatments which were harvested at four week intervals (Table 2). The larger amount of dead material in the eight week spelled treatments probably resulted from the prolonged shading of the lower canopy which occurred over that period.

Table 2: HERBAGE MASS ACCUMULATION (kg DM/ha) OVER EIGHT WEEKS

Spelling (weeks)	Live		Dead	
	Intact	Trimmed Mean	Intact	Trimmed Mean
a) Total				
2 x 4	5380	4350	4865	1220
	(445) ¹	(314) ²	(224) ¹	(158) ²
8	4120	4190	4155	1650
Mean	4750	(314) ²	4270	1435
			(158) ²	675
b) Net ³				
2 x 4	3740	3030	3385	250
8	2960	3650	3035	580
Mean	3350	3340	165	230

¹ SEM for interaction means.

² SEM for adjacent main effect means.

³ No statistical analysis.

The untrimmed treatment yielded greater total herbage mass at the end of the first four week period (Table 3). Both stubble treatments had similar net amounts of grass but the superiority of the intact stubble treatment was entirely due to a 30% greater weight of clover. There was no difference in the second four week totals of herbage mass.

Table 3: TOTAL HERBAGE MASS (kg DM/ha) FOR THE TWO FOUR WEEK PERIODS. A -GREEN HERBAGE, B -DEAD HERBAGE.

Period	Stubble	Intact	Stubble	Trimmed
A First 4 weeks	2960	**	1860	
Second 4 weeks	2410	ns	2490	
B First 4 weeks	770	**	120	
Second 4 weeks	440	ns	360	

ns not significant, ** significantly different at $P < 0.01$

Quality

The digestibilities of the grass and clover fractions were 78.7% and 79.6% respectively when measured at the end of the trial. The overall sward digestibility was increased between 4% and 10% by trimming the stubble (Table 4). Digestibility declined from the first to the second four weeks but the digestibilities for the second four weeks and the eight week spell were similar.

Composition

The proportion of clover in the green material was high at all harvests (Table 4). However in the second four weeks there was much more clover than in the first four weeks or the eight week treatments.

Table 4: SWARD QUALITY

Period	Overall digestibility Intact	digestibility **	(%DDM) Trimmed	Botanical Composition (%) ¹	
				Grass	Clover
First 4 weeks	73.9	**	84.1	48	52
Second 4 weeks	69.1	**	75.2	31	69
8 weeks	69.1	**	73.3	42	58
Mean	70.7	**	77.5	40	60

** significantly different at $P < 0.01$

¹ no statistical analysis.

DISCUSSION

The original hypothesis that stubble trimming or closer mowing would result in earlier reversion to a leafy sward was in fact correct. The gains in quality from this seem to be outweighed by the extra accumulation and availability of green material obtained when the stubble was left intact and harvested twice at four week intervals. The lower overall sward digestibility when the stubble was left intact was caused primarily by the amount of dead material present since the green sward components were of similar digestibility in all treatments. However animals would have little difficulty selecting their requirement from these pastures since the swards contained a maximum of only 25% dead material. For instance, Clark *et al.* (1981) has shown selection was possible even where up to 80% dead material was present in a hill country pasture stocked at 12 ee/ha both continuously and rotationally grazed.

The ability of the grazing animal to select a diet excluding dead material means that the other sward components have a very important influence on stock performance. Clover percentages become the most important feature of the sward in maintaining or improving stock performance (Marsh & Laidlaw, 1978, Ulyatt *et al.* 1976). The increase in clover content over the trial period can be attributed to the long release from grazing pressure coupled with the slower seasonal growth of the ryegrass. Southland farmers who have been rotationally grazing year round and taking no hay have found problems fattening lambs and have noted low amounts of clover in the sward (A.J. Harris. *pers. comm.*). Therefore the fact of spelling for hay may be important in increasing the clover content in summer.

The superiority of leaving the stubble intact over trimmed stubble may be due to a greater stubble reserve which is available to the ryegrass for respiration until new leaves become productive enough to restore reserves and growth (Woledge, 1973). This may be of prime importance to ryegrass but not as significant for clover as reserves for clover regrowth come primarily from the stolon.