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WINTER GRAZING MANAGEMENT SYSTEMS BASED ON INCORRECT PASTURE GROWTH RATES

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Abstract

Comparisons were made between three winter grazing management systems based on different pasture growth rate predictions. Management systems were chosen to restrict ewes to their budgeted intakes while at the same time reaching a target of 1500 kg DM/ha average pasture cover at lambing. Two of the three farmlets failed to meet their planned objectives. Changes in average pasture cover were frequently the result of an interaction between pasture growth rate and herbage intake. It was concluded that rotation length alone gave insufficient control over the management system and for a farmer to be able to make appropriate adjustments a minimum level of monitoring would be to estimate animal intake rate and average pasture cover.

INTRODUCTION

Rotational grazing is used to allocate feed to breeding ewes (or cows) over the winter period so that the pasture supply can be manipulated to provide adequate feed supply in the post-lambing (calving) period. The management system used over the winter is usually designed by taking into account predicted pasture growth rates, animal requirements and a target pasture cover at lambing (calving). Feed flow is distributed by the length of rotation adopted.

In practice pasture growth rates are the most variable component of feed plans (Milligan *et al.* 1987) which then puts in doubt any management systems based on these estimates. Milligan et al. (1987) have suggested that feed plans can be formulated on the basis of high, low or average pasture growth rates and management options planned for each contingency. There is therefore a need for flexibility in the implementation of any grazing plan (Milligan *et al.* 1987, Sheath *et al.* 1987) and an associated need for a straightforward and reliable method of monitoring the management system.

A trial was conducted in the winter of 1986 in which comparisons were made between three winter grazing management plans based on different pasture growth rate predictions.

METHODS

The trial was located on the Pasture and Crop Research Unit at Massey University. The three farmlets used had been managed similarly over the previous five years. The pasture was predominantly perennial ryegrass (*Lolium perenne* L.) and white clover (*Trifolium repens* L.) in Tokomaru silt loam, a Yellow Grey Earth. The contour of the site was flat to easy rolling hills.

Three different winter grazing management systems for breeding ewes were established based on three separate sets of predicted pasture growth rates. These rates (see Table 1) were based on:

(1) the mean rate for 1981-1985 on Massey University's Number 4 dairy farm, adjacent to the Pasture and Crop Research Unit

(2) the mean rate plus 25% and

(3) the mean rate minus 25%

Three feed budgets were constructed on the basis of the predicted pasture growth rates using a starting average pasture cover of 1400 kg DM/ha on the 13th May, 1986 and a target cover at lambing on the 12th August, 1986 of 1500 kg DM/ha (Table 1). The target cover at lambing was designed to allow full feeding in early lactation. The high stocking rate meant

Table 1: Feed budgets for the 90 davs between 13 Mav and 12 Auqust. 1986.

	Farmlet S (Short Rotation)	Farmlet M (Medium Rotation)	Farmlet L (Long Rotation)
Pasture growth rate'	Mean + 25%	Mean	Mean - 25%
Feed supply (kg DM/ha)			
Supplements	0	0	0
Pasture grown	2220	1776	1332
Total feed supply	2220	1776	1332
Required increase in average cover	100	100	100
Pasture available for ewes*	2120	1676	1232
Resultant ewe intake (kg DM/ewe/day)	1.01	0.80	0.59
Rotation length (days)	36	60	120 (first 60 days) 60 (last 30 days)

'Feed budgets based on predicted pasture growth rates given in Table 2.

pasture cover was expected to fall a further 223 kg DM/ha in the eight weeks following lambing.

Rotations chosen to restrict ewes to their budgeted intakes and at the same time reach the target cover at lambing were randomly allocated to the three farmlets (Table 1). Rotation length was unchanged during the 90 day winter period on two farmlets while on the third a two step rotation length was used. This allowed a greater proportion of the pasture available to the ewes, on the low growth rate farm to be allocated in the last 30 days to offset possible stock health problems resulting from the low ewe intake rate budgeted. The grazing rotation was imposed by the use of electric fences. Rationing of the available feed was achieved through imposing rotations incorporating a shift once every two days.

Each farmlet was 0.6 ha with six 0.1 ha paddocks and was stocked with fourteen Romney ewes (23.3 ewes per ha). For each farmlet average pasture cover and the distribution of feed within the farmlet was similar at the start of the trial.

Average pasture cover was assessed by measuring the herbage mass in each paddock, or break where necessary, at the same time each week with a pasture probe (Design Electronics). Fifty readings were taken in each paddock. The standard Musgrave calibration curve was used for the first 60 days. The results were compared to both visual assessment and cut quadrats. Over the last 30 days the standard curve gave a poor estimation of herbage mass and was replaced by a calibration against a range of samples cut from within the farmlets. Pasture growth rates for each farmlet were determined each week by changes in herbage mass on all paddocks (or breaks) not grazed over this period.

Herbage intake rates per ewe were calculated each week by using pre and post grazing herbage mass directly in front of and behind the ewes. Unfasted ewe liveweights were measured every 30 days.

RESULTS

The measured average pasture cover was less than that predicted on both the short (S) and medium (M) rotation farmlets, but was greater than predicted on the long (L) rotation farmlet (Figure 1 a). The lower than predicted average pasture cover on both the S and M farmlets was not directly the result of the pasture growth rates being lower than predicted. Early in the trial measured growth rates were above those predicted (Table 2) but were still being exceeded by the measured ewe intake. For example, during the first 30 days on farmlet

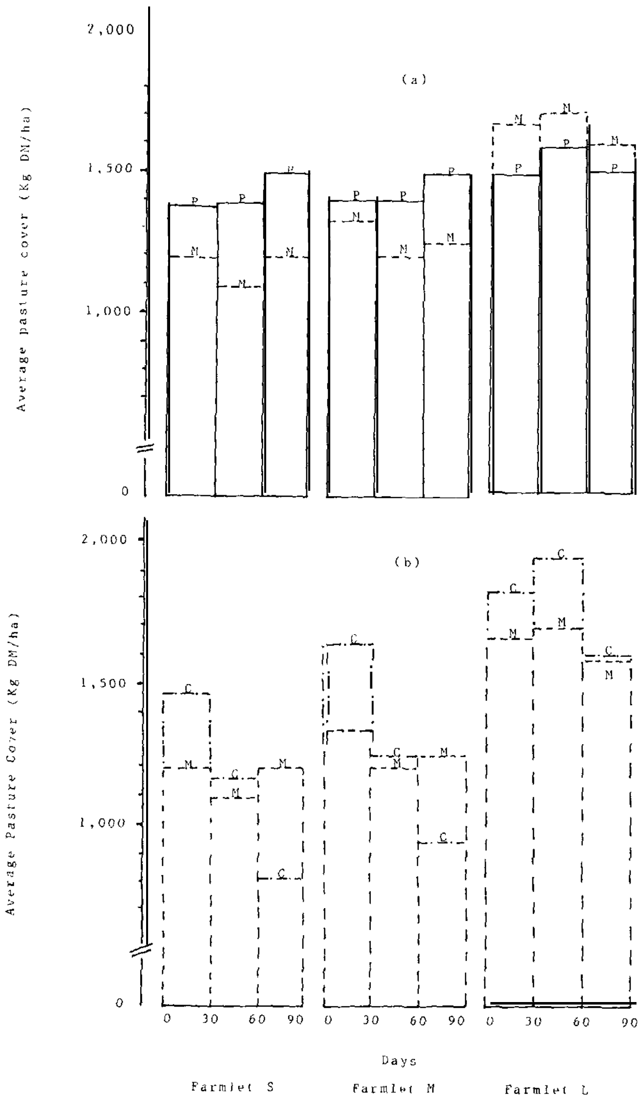

Figure 1: The measured average pasture cover (kg DM/ha) for 30 day periods over the winter compared with (a) the predicted average pasture cover and (b) the corrected pasture cover if ewe intake rate was assumed to be that budgeted.

S a measured pasture growth rate 6 kg DM/ha/day above that predicted was offset by increased ewe intakes of 1 Okg DM/ha/day. From 60 to 90 days the measured pasture growth rates on farmlets S and M were' less than predicted as were the ewe intake rates (Table 2) with the overall result that the measured average pasture cover increased in this period as predicted (Figure la).

Overall the pasture growth rate for the total 90 day period did not differ from the five year mean (Table 2). The distribution over time was different to that predicted. Although the

Table 2: Measured and predicted rates for pasture growth (mean ± SEM) and ewe intake over periods of thirty days during winter on the long (L), medium (M). and short (S), rotation length farmlets.

Treatment	Days			
	o-30	31.60	61-90	0-90
Pasture growth rates (kg DM/ha/day)				
Farmlet S:				
Measured	30 ± 5	20 ± 4	17 ± 3	22
Predicted	24	24	27	25
Farmlet M:				
Measured	29 ± 6	13 ± 4	12 ± 2	16
Predicted	19	19	21	20
Farmlet L:				
Measured	30 ± 5	20 ± 5	12 ± 3	21
Predicted	14	14	16	15
Ewe intake rates (kg DM/ha/day)				
Farmlet S:				
Measured	34 ± 4	261 1	11 ± 3	
Predicted	24	24	24	
Farmlet M:				
Measured	29 ± 2	20 ± 3	9 ± 1	
Predicted	19	19	19	
Farmlet L:				
Measured	17 ± 1	19 ± 1	19 ± 3	
Predicted	11	11	19	

Table 3: Ewe liveweight (mean ± SEM) and liveweight changes over the 90 days of winter on the long (L), medium (M), and short (S) rotation length farmlets. Ewe liveweights were adjusted by 4 and 7 kg in July and August respectively to adjust for foetal growth.

Treatment	Ewe liveweight (kg)		Liveweight change (gm/day)		
	Days		Days		
	0	90	0-30	31-60	61-90
Farmlet S	63.5 ± 1.6	61.0 ± 1.9	+ 62	-127	- 63
Farmlet M	60.7 ± 2.4	50.9 ± 2.7	- 69	- 39	- 229
Farmlet L	60.9 ± 1.5	57.2 ± 2.0	-127	+ 12	+ 29

measured and predicted average pasture covers on farmlet L were within 100 kg DM/ha of each other after 90 days this was the result of the inter-relationship between measured and predicted values of pasture growth rate, ewe intake rate and average pasture cover (Figure 1, Table 3). Over the 90 days the pasture growth rate, for example, of farmlet L was measured as 21 kg DM/ha/day compared with the predicted value of 15 kg DM/ha/day. Ewe intakes were measured as 18.3 DM/ha/day compared with the predicted value of 13.7 kg DM/ha/day.

The difference between the measured average pasture cover and the average pasture cover corrected for deviations from the budgeted ewe intake rates is shown in Figure 1 b. On all three farmlets there was a greater fluctuation in the corrected average pasture cover than the measured average pasture cover over time. The corrected average pasture cover after 90 days was 370 and 280 kg DM/ha less than the measured average pasture cover for farmlets S and M respectively. The ewe intake rates on farmlets S and M were about 45% of the budgeted intake rates from 60 to 90 days. A consequence of this decreased ewe intake rate over the last 30 days particularly for farmlet M, was a decrease in ewe liveweight (Table 3). Nevertheless, over the 90 days ewe liveweight was maintained on farmlets L and S (Table 3). On farmlet M, unlike on farmlets L and S, there was no period of weight gain and the ewe liveweight declined from 60.7 to 50.9 kg, allowing for the foetal weight, over the 90 days.

DISCUSSION

The grazing management systems used on the three farmlets resulted in average pasture covers of 1600, 1260 and 1200 kg DM/ha at lambing for farmlets L, M and S respectively compared with the target cover of 1500 kg DM/ha (Figure 1). Yet, even the reasonable result on farmlet L was fortuitous rather than the result of accurate prediction of pasture growth rate (Table 2). The management systems failed to cope with the variation in pasture growth rate over time. Only Farmlet L was able to buffer the extremely low growth rates, experienced immediately prior to lambing, through the development of higher than predicted average pasture cover and ewe liveweights in early winter. These results demonstrated that set rotation lengths based on predicted growth rates, were ineffective as a means of rationing pasture to ewes at the desired level. Also, the use of average pasture cover alone to monitor the farmlets would have been inadequate to manage the grazing systems because of the interrelationship between the systems components. The components being average pasture cover, pasture growth rate, ewe liveweight and ewe intake.

The relationships between pasture yield, animal intakes, and changes in animal weight have been widely researched; (Rattray et al. 1982, 1983) and their implication to grazing management discussed (Milligan et *al.* 1987, Sheath et *al.* 1987). Nevertheless, it is not always fully appreciated by farmers the ways in which these relationships can be used for practical control of a winter grazing system.

Diagram 1 summarises the relationships of some of the results reported here and illustrates why the estimation of average pasture cover alone will not provide satisfactory monitoring of a grazing system. Both pasture growth rate and ewe intake rate drive winter grazing systems and the effect of both these rates results in changes in the average pasture cover and ewe liveweight (Diagram 1). As'both pasture growth rate and ewe intake rate are in turn influenced by the quantity and quality of pasture available in a paddock (Rattray et al 1983) it can be seen that unless the grazing system is suitably monitored it will equilibrate to values other than those budgeted (Diagram 1). For example, the data presented in Diagram 1 show that although the average pasture cover decreased by 200 kg DM/ha over the first 30 days on farmlet S the pasture growth rate was greater than predicted (30 vs 24 kg DM/ha/day). To understand why the average pasture cover declined it is necessary to know

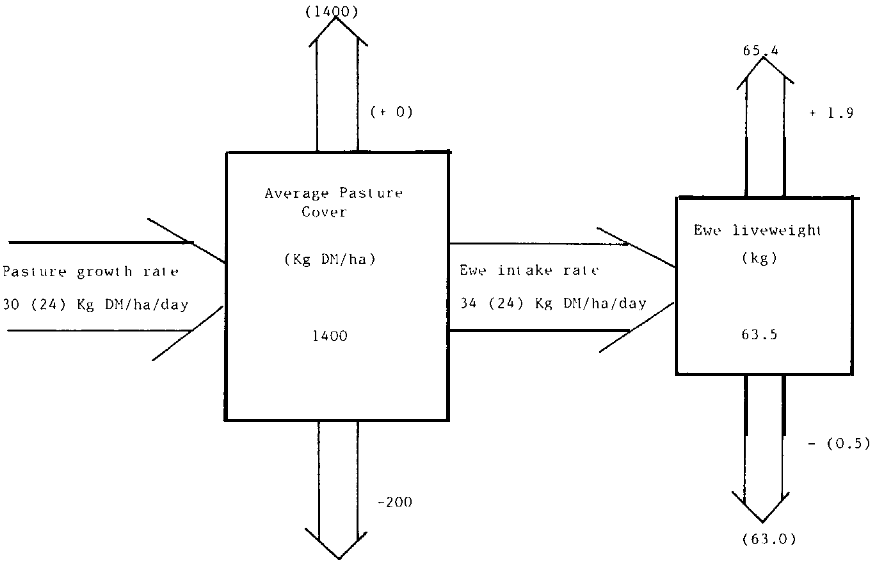

Diagram 1: Measured (predicted) changes in feedflow: Farmlet S (O-30 days)

that ewe intake rate exceeded pasture growth rate (34 vs 30 kg DM/ha/day) over this period. Finally, the decrease, rather than the predicted no change, in average pasture cover was partly offset by the increase in ewe liveweight (Diagram 1). Clearly, to be able to make appropriate adjustments to this grazing management system a minimum level of monitoring would be to measure two components from average pasture cover, ewe intake rate, and pasture growth rate. On the longer term ewe liveweight changes will reinforce short term monitoring.

No changes were made to the predetermined management plans in this experiment. It is recommended that a flexible approach be taken in implementing winter feeding systems to cope with unexpected variation (Milligan et a/. 1987). In this trial changes would have needed to involve a more rigid control of ewe intake for the first 60 days (Farmlets S and M) resulting in longer rotations being applied and average covers being increased to the required levels.

PRACTICAL IMPLICATIONS

In monitoring a winter grazing system, estimation of either animal intake rate or pasture growth is required if deviations in average pasture cover from that budgeted are to be correctly interpreted. The advantages of animal intake rates over pasture growth rates are that intake rate can be estimated at the same time as average pasture cover rather than requiring comparisons over time, and that animal intake rates appear to be less variable than pasture growth rates.

It is recommended that farmers should monitor herbage intake rates of animals, as well as average pasture cover, to maintain effective control of their winter grazing management systems.

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