

THE PASTURE/ANIMAL SYSTEM:

PASTURE BENCHMARKS FOR SHEEP AND CATTLE PRODUCTION

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Abstract: Pasture benchmarks, sometimes called residual dry matter, are being used to introduce objectivity into grazing management. The benchmarks aim to increase the efficiency of grazing enterprises through providing managers with greater control over the nutritional status of their flocks and herds. This paper lists pasture benchmarks for various categories of sheep and cattle and examines the technical basis from which the benchmarks have been derived. It also emphasises the need for managers of grazing systems to attain pasture assessment skills to enable benchmarks and other advances in grazing management to be implemented.

INTRODUCTION

Declining terms of trade increases pressure on sheep and cattle producers to optimise the quantity of price competitive product produced from pasture, *ie.* "value adding" their pasture resource. This has implications for the farm's financial, animal and pasture management and has to be achieved while maintaining and in many instances, improving the resource.

Peart (1992), claimed that under current farm management planning, an average 5% is devoted to pasture/grazing management, the remainder being spread between financial (70%) and animal management (25%). If the efficiency of the grazing system is to be improved this imbalance requires addressing.

To achieve increased efficiencies, managers will need to exercise greater control over their pasture/animal system and that will require a package of knowledge and skills that do not commonly exist but can be readily acquired. Such knowledge and skills will include:-

- Recognition of pasture species.
- Knowledge of how pasture species respond to grazing and fertiliser, enabling the implementation of management procedures to encourage the desirable species and

discourage the undesirable.

- Skills at assessing pasture characteristics influencing livestock productivity.
- Knowledge of how the assessed pasture characteristics influence livestock performance and to integrate this knowledge with pasture assessment skills to achieve livestock production goals.
- The managerial skills to bring together the above into grazing plans. Plans which are flexible to account for changing circumstances such as seasonal conditions or market circumstances and may include techniques such as fodder budgeting and controlled grazing.

WHY PASTURE BENCHMARKS?

NSW Agriculture introduced the concept of pasture benchmarks to assist graziers with the initial adoption of objectivity in grazing management (Bell, 1991; Graham *et. al.*, 1992).

These benchmarks describe the pasture characteristics required to meet the nutritional requirements of the major categories of livestock. Characteristics that can be readily assessed by graziers following limited training.

At any point in time, the level of productivity achieved by healthy un-supplemented livestock grazing pasture is determined primarily by the amount of herbage they are able to consume or harvest from that pasture. This is usually described as *intake* and is expressed as the amount of pasture an animal consumes per day. The characteristics described within the pasture benchmarks have a major influence on pasture intake and are both quantitative and qualitative in nature.

PASTURE BENCHMARKS.

The quantity of pasture available is usually described as herbage mass. Alternative descriptions being pasture mass, yield or availability. Herbage mass is measured in kilograms of dry matter per hectare (kg DM/ha). It is an estimate of the total quantity of pasture available assuming a cut taken at ground level.

At any given herbage mass, intake varies according to animal live weight and physiological state, that is whether they are dry, growing, pregnant or lactating. However, the pattern within animal species is similar (Figures 1 and 2).

Intake of sheep rises sharply as herbage mass increases to around 800 kg DM/ha. From there the rate of increase declines so that once herbage mass has increased above 1600 kg DM/ha, only relatively small increases in intake will occur. With cattle, the sharp rises in intake occur as herbage mass increases to about 1600 kg DM/ha tapering off until only small increases occur above 3200 kg DM/ha. The level of intake is directly reflected in live weight change (Figures 1 & 2).

From data of this nature it is possible to develop pasture benchmarks for various class of livestock (Table 1). Pasture benchmarks are not dissimilar in concept to residual dry matter which are often quoted in the literature pertaining to grazing management.

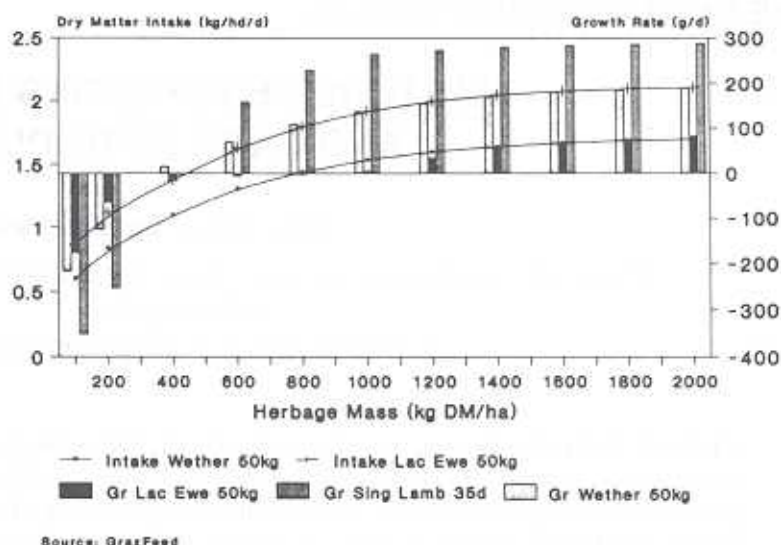


Figure 1: Relationship between green herbage mass, pasture intake and growth of sheep.

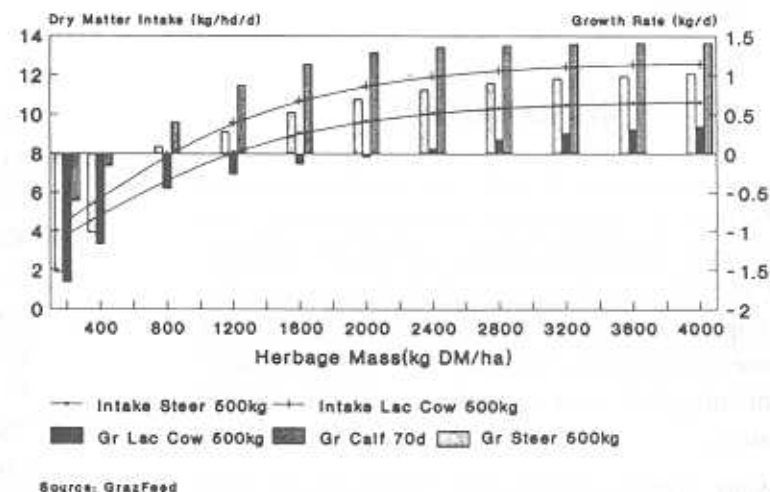


Figure 2: Relationship between green herbage mass, pasture intake and growth of cattle.

QUALITATIVE FACTORS INFLUENCING THE BENCHMARKS.

Digestibility

Digestibility is a commonly used measure to describe pasture quality. Digestibility, has a significant influence on pasture intake but digestibility alone does not fully explain the variation that can occur due to quality factors. Such variation can be due to low protein content, the concentration of soluble carbohydrates, mineral and vitamin content, leaf to stem ratio, dry matter content, the presence of deleterious or toxic substances and species composition.

From a practical point of view, digestibility and

Table 1: Pasture benchmarks for sheep and cattle.

Category	Minimum herbage mass Kg DM/ha
SHEEP	
Dry sheep	400 - 500
Pregnant ewes - mid	500 - 600
- last month	800 - 1000
Lactating ewes - singles	1000 - 1200
- twins	1400 - 1600
Growing stock	
Percent of Potential Growth Rate ¹	
30% (90 g/d) ²	500 - 600
50% (150 g/d)	700 - 800
70% (190 g/d)	900 - 1000
90% (250 g/d)	1500 - 1600
CATTLE	
Dry cow	1200 - 1300
Pregnant cow (7-8 months/not lactating)	1500 - 1600
Lactating cow (calf 1-2 months old)	2300 - 2500
Growing stock	
Percent of Potential Growth Rate ¹	
30% (0.41 kg/d) ²	1000 - 1200
50% (0.78 kg/d)	1400 - 1600
70% (1.03 kg/d)	1800 - 2000
90% (1.31 kg/d)	2800 - 3000

Notes: ¹The potential growth rate of sheep and cattle varies according to breed, age, sex and weight. These percentages are a prediction of that proportion of the potential growth rate likely to be achieved at the specific herbage mass; ²By way of example, figures in parenthesis represent the predicted growth rate of weaned 4 month old crossbred lambs of approximately 32 kg and 13 month old steers weighing 320 kg, respectively, at the specific herbage mass.

Table 2: Energy values predicted from dry matter digestibility (DMD).

DMD (%)	Predicted M/D ¹
40	4.8
45	5.7
50	6.3
55	7.4
60	8.2
65	9.1
70	9.9
75	10.8
80	11.6
85	12.5

Notes: ¹M/D = Megajoules of metabolisable energy per kilogram of feed dry mater

Source: Feeding Standards for Australian Livestock - Ruminants (1990)

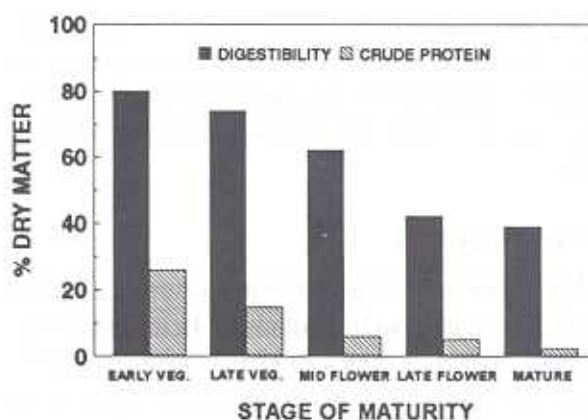


Figure 3: Effect of maturity on the digestibility and protein content of phalaris

the proportion of legume in the pasture are the most useful measure of pasture quality. However when discussing quality aspect of pasture, it is important to recognise the effect of animal selectivity. Cattle, and more so sheep, will select a better quality diet than the average of the available pasture. In general, leaf is preferred to stem, green pasture to dead pasture and legume to grass. While the analysis of a bulk pasture sample will provide a useful guide, it will underestimate the digestibility of the diet of livestock.

Digestibility is directly and positively related to energy content (Table 2), positively related to protein content (Figure 3) and negatively related to fibre content. As digestibility of pasture declines fibre content increases having the effect of slowing digestion and reducing pasture intake.

Plant species and their cultivars will differ in digestibility and environmental factors can also have an influence, however for practical purposes, the stage of pasture maturity is the most critical influencing digestibility (Figure 3).

The herbage mass benchmarks included in the paper only apply where there is that amount of pasture in the vegetative stage, *ie.* above 70% digestibility. As digestibility drops below 70% herbage mass needs to increase above the benchmark figures to achieve satisfactory levels of intake.

There is a limit, as indicated earlier, to the extent that additional herbage mass can compensate for lower digestibility due to the small increases that occur to intake once herbage mass increases above 1600 kg DM/ha for sheep and 3200 kg DM/ha for

cattle. Once digestibility drops below 55% it does not matter how much herbage is on offer, the pasture is unlikely to maintain the weight of dry stock. That is, those animals with the lowest nutritional requirements.

Legume Content

The importance of legumes in pasture as a source of soil nitrogen, is well recognised. In terms of live-stock production, legumes also have a significant role. Sheep and cattle will generally select legumes in preference to grasses and the intake of legumes will be greater than for grasses when digestibility is similar. While recognising the potential animal health problems particularly bloat, animal production will usually benefit from an increased proportion of legume.

The herbage mass benchmarks published in this paper assumes a legume content of approximately 30%. Should a pasture differ markedly from this figure then it is more likely the production target for each benchmark will be met closer to the lower end of the range when the percentage is significantly higher than 30% and at the higher end when the percentage is significantly lower.

CONCLUSION

Pasture benchmarks can be used to achieve efficiencies in animal production efficiency through grazing management. To implement pasture benchmarks into grazing management, it is essential managers of grazing systems have pasture assessment skills.

The acquiring by managers of pasture assessment skills, provides the opportunity to implement more advanced grazing management techniques such as fodder budgeting and control grazing, more cost efficient supplementary feeding programs and more efficient grazing management strategies to maintain or improve long term pasture productivity.

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