

The importance of feed quality to animal performance

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Management of pasture is critical if growth of animals and the efficiency of pasture utilisation are to be maximised. Fodder budgeting is only part of the story. Without proper attention to the quality of available pasture, animal performance targets will not be achieved and costs of feed per kg gain will increase.

Feed quality, the amount of digested nutrients per kg feed (the key digested nutrients are metabolisable energy and protein) more so than amount of pasture available, is the main driver of animal performance per head and per hectare. The key is to recognise the relationships between animal performance and pasture quality, and to manage the pasture to achieve quality as well as quantity targets.

By having appropriate pasture quality for each stock class it is easier to achieve production targets and market specifications. This paper briefly describes the principles needed to make the most of feed resources.

Some key terminology

- *Herbage mass or quantity of pasture available* is expressed as kg dry matter (DM) /ha.
- *Dry matter (DM) content* of a feed is the proportion of feed left after the water content is removed. For example, 10 kg of wet pasture with 30% dry matter contains 3 kg dry matter and 7 kg of water. Typically winter pastures may have 15-25% DM, i.e. they are 75-85% water.
- *Digestibility* is the proportion of ingested feed that is retained in the animal. For example, a cow might eat 10 kg of feed dry matter that is 60% digestible. In this case 6.0 kg of dry matter are used by the cow for maintenance and growth, while 4.0 kg of dry matter is lost to faeces. Pasture quality is reflected by its digestibility –the higher the digestibility, the higher the quality. The digestibility of pasture is directly influenced by stage of growth, with young actively growing pasture being most digestible.
- *Metabolisable energy content* of a feed (M/D) is directly related to digestibility. The units of metabolisable energy are Megajoules (MJ) and are expressed per kg of DM, that is MJ / kg DM. For example, a feed which is 60% digestible dry matter has 9 MJ ME / kg DM, a feed which is 75% digestible has 11.3 MJ ME / kg DM. These feeds are said to have an M/D of 9 and 11.3 respectively.

Pasture management directly influences pasture quality and quantity and through these intake of feed energy by livestock. Changes in metabolisable energy density (M/D) directly impact on livestock production, so managing feed to quality (M/D) targets is critical to ensure production and supply of quality meat products.

Animal Growth

What do you need to know about how feed quality affects animal growth?

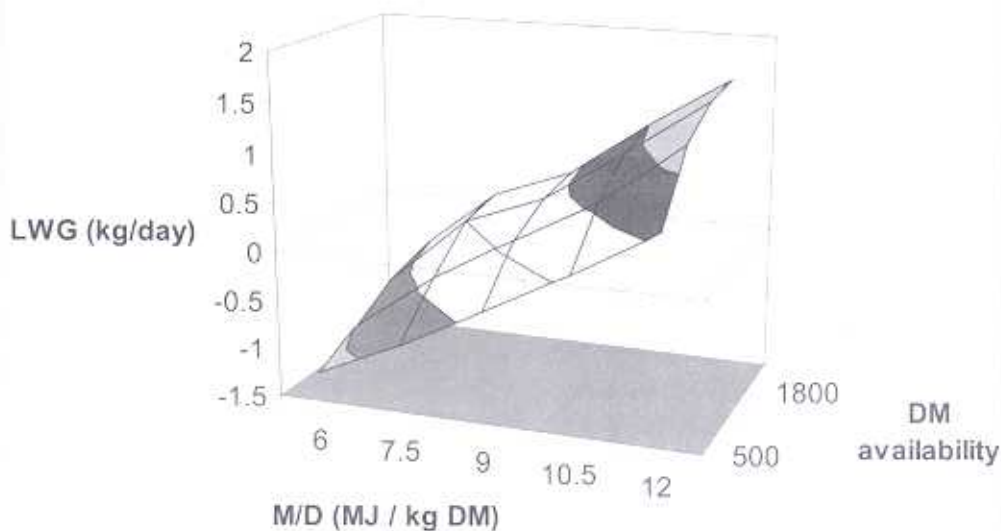
For animals of the same weight and genotype:

- at the same feed intake, as feed quality (metabolisable energy and protein content per kg dry matter) increases, so does liveweight gain
- as feed quality increases, so too does energy intake
- as feed quality increases, liveweight gain increases and the amount of feed eaten to achieve the liveweight gain decreases

From the point of view of the animal, the quality and quantity of pasture together set the feed intake and thus growth potential of the animal. This interaction should be considered in management decisions to ensure livestock production targets are achieved. For example, as availability of pasture increases, intake of feed of the same quality will increase to a plateau of around 1600kg DM/ha for sheep and 2300 kg DM/ha for cattle. However, at the same pasture availability, feed intake will increase when M/D increases. So for greatest

animal production, intake can be maximised by ensuring availability of around 1600 for sheep and 2300 kg DM/ha for cattle with as high M/D as possible (PROGRAZE, 2000). Figure 1 shows the relative effect of the amount of pasture available and the metabolisable energy content (M/D) of feed on liveweight gain of a domestic (360-440kg) steer. The slope of increase in liveweight gain is greater for M/D than for pasture availability. A 10% increase in M/D of pasture will have a greater impact on animal growth than a 10% increase in pasture availability.

Figure 1. The relationship between pasture availability (kg DM /ha), pasture quality (M/D) and liveweight gain of a domestic (Angus) steer (derived from GrazFeed)

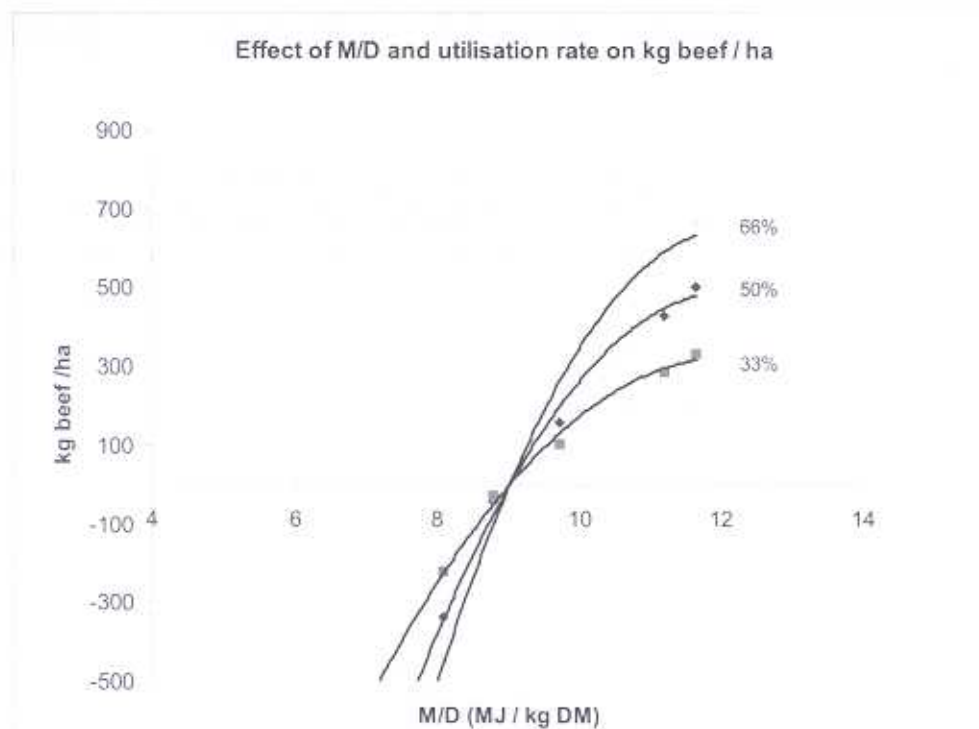


There are substantial benefits of growing animals having access to higher quality feed. Higher rates of gain increase both muscle (lean) and fat deposition in growing animals, while feeds with higher energy density (M/D) at the same rates of gain, tend to increase fat deposition relative to feeds with lower M/D. This provides options for finishing stock, it is comparatively easy to restrict access to pasture and maintain some muscle growth at the expense of fat deposition. It is more difficult to achieve fat specifications if feed quality is insufficient to achieve adequate growth rates even if there is abundant feed available.

In the Meat Standards Australia eating quality assurance scheme, higher growth is associated with an increased number of higher value cuts that can be obtained from a carcass. Higher growth, at the same carcass weight is manifest as reduced age, and in turn lower assessed ossification in the chiller, and increased assessed marbling score. The benefits of improved growth management are now being realised in practice where premiums for higher MSA scored animals are beginning to be paid.

Higher feed quality at the same pasture availability also results in more efficient feed conversion, i.e. the potential livestock growth per tonne of feed or per hectare, is greater when animals are able to eat higher quality feed than the same animals eating lower quality feed. This is shown in Figure 2, which illustrates the effect of pasture quality (M/D) on annual turn-off of liveweight of beef per ha at three different rates of pasture utilisation.

Figure 2. The effect of pasture quality (M/D) and utilisation rate (33, 50, 66% of total annual dry matter production) on kg liveweight produced per annum.



The simulation assumed an annual DM production of 8000kg DM/ha, yearling Angus steers of 360kg, and constant feed quality throughout the year (derived from GrazFeed).

These figures are provided as a guide because in practical production systems feed quality is not constant throughout the year, and amount of feed available may at times be limiting. Nonetheless they serve to show that as utilisation rate increases the effect of M/D on potential turn-off per ha increases. Moreover, as utilisation rate increases, the quality of feed available also increases due to the opportunity to graze regrowth earlier, and the potential amount of feed available per annum also increases.

What does this mean in practise?

Management of pasture to ensure enough feed DM is available is an important part of grazing management. But, as shown, in Figure 1, more is not necessarily better. What is critical is that for grazing livestock the pasture be managed to maintain as high a quality (principally metabolisable energy, and to a lesser extent protein, content) as possible, consistent with production system objectives. For production of steers and lambs:

- *quantity* is less important than *quality*
- managing pasture to deliver higher *quality* pastures uses some of the same grazing management practises as management of *quantity*
- for pastures such as perennial and annual ryegrass or phalaris the number of tillers may be used as a guide to frequency of re-grazing. By limiting the number of tillers, M/D will be maximised, without compromising pasture growth. In the case of ryegrass, limit plant growth to three tillers; for phalaris, avoid letting the plant develop more than 4 tillers.
- managing the plant to limit its ability to develop additional tillers may require substantial increases in short term stocking density. In practice this may mean short term stocking rates of at least 30 dse/ha.
- monitoring pasture quality and quantity is essential to make sure that nutrient (energy and protein) intake is maximised by growing livestock

Flexibility can be achieved by judicious use of different classes of stock. Mature or pregnant animals can achieve production targets with lower growth rates, and thus lower nutrient density feed. For example, cows (pregnant, but not lactating) and / or ewes in late pregnancy can achieve their production requirements with pastures of M/D some 1.5 to 2 units less than younger rapidly growing stock. Accordingly these stock classes

can be grazed on lower quality feed and / or higher pasture availability. However, if the objective is to achieve market specifications and to use feed with maximum efficiency to maximise profit, then improving feed quality is an important economic objective.

Conclusion

Pasture quality (in terms of metabolisable energy and protein content / kg dry matter) is an important determinant of animal performance on a per head and per ha basis. With pastures of higher quality it becomes relatively easier to achieve market supply and product specification targets. Grazing management is an effective option for ensuring pasture quality is maximised.

References

- PROGRAZE manual (2000), Fifth edition, NSW Agriculture.
- GrazFeed V4.1.5 Copyright CSIRO 1989 –1999.