

# Whatman

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December 2005



**BEST-fed**

## Grazing Management - Finally, a Meeting of the Minds

By Les Sandles & Danny Donaghy

One of the greater challenges we face as farmers is the conflicting dialogue of the various "experts" enlisted to guide and help us in our businesses. As you are well aware, nowhere is opinion more diverse than when the conversation turns to grazing management of pasture. Why the subject is still up for debate defies logic – a solid body of science combined with almost two decades of dramatic results in the field galvanise the soundness of the art of grazing management. We hope that this article finally puts an end to the debate over this critical matter.

Fundamental to the success of dairying as we know it, pasture must be managed with a high level of understanding. The confusion appears to be somewhat "orchestrated" by the various elders of the "pasture for prophets" sect and promulgated by their various younger disciples. Surely commonsense must prevail in the end – er...now!!

But we sense a complication at grass roots level. We think part of the problem is that most of our service providers just don't get it: agronomists think pasture is the end point rather than milk, but many nutritionists fail to appreciate key aspects of the plant's life cycle so do not get milk from pasture for long!

Following is the guts of an ongoing conversation between two of the leading thinkers in the grazing management game, and should finally put the 3 v 2 leaf argument to rest.

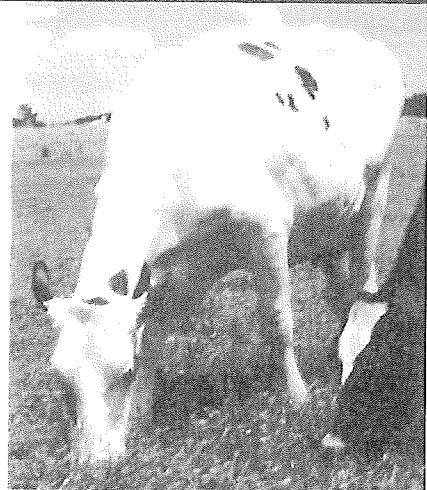
### GRAZING MANAGEMENT - WHY 3 LEAVES?

Leaf stage is a handy reflection of what's going on in the plant in terms of recovery from grazing (root and tiller growth), replenishment of plant energy reserves, increases in growth rates, build up of herbage mineral and soluble carbohydrate levels, and increases in herbage fibre levels. It's a great field-based indicator of when to graze paddocks.

For about 50-60 years, we've known that grass plants maintain a certain number of live leaves per tiller, after which the oldest leaf dies. Ryegrass plants have 3 live leaves, and so the concept of a 'leaf stage', by which we might be able to manage pastures, was born. The original concept, developed in Tasmania in the 1980s, was to graze plants before any leaves died and were wasted. This developed a focus on the 3-leaf stage, although in practice, most farmers still used *day length* based rotations, *height*, or *kilograms of dry matter per hectare* to determine when to graze.

In the last 20 or so years, scientists and farmers have proven that the leaf stage concept works, and is very practical in setting grazing rotations. In fact, moving from set stocking or other *ad hoc* "managements" of pasture gave a tremendous boost to productivity – of the pasture through manipulating the leaf stage to manage energy reserves and improve growth rates, and milk per hectare from pasture by ensuring continuity of feed throughout the season.

... continued page 2



In this issue...

Welcome

From the Ed

Grazing  
Management

GRAPH-ic changes  
in Gippsland

To the Back of  
Bourke and Back to  
Bamawm

Recent calvings

Weddings

Conference 2006

Whatnow  
for Whatman?

# Welcome



Welcome to the latest bulletin, an edition which we hope will have a significant impact on the dairy industry

with some high powered backing for our views on pasture management. I hope that this issue will now rest,

though somehow I doubt it! Apart from that, for many of us this has been a remarkable year with a combination of season, input costs and milk prices allowing those who have set their businesses up properly to make some significant money. Well done, and have a very Merry Christmas, and a Happy New year.

... from page 1

What we've noticed in the last 5-8 years, as more and more farmers have adopted leaf stage to manage grazing rotation with a focus on the upper limit (3 leaves), is that spring rotations have become longer and winter rotations shorter compared to the previous industry norm. The result has been a natural increase in pasture growth rates year round, and this success has encouraged many farmers to stay on a constant 3-leaf rotation

The 3-leaf stage management system *was* a significant improvement in pasture management and its adoption throughout the country, and indeed internationally, and its persistence as a management paradigm is testimonial to that.

## BUT BETTER THAN 3 LEAVES!

While there can be no doubting of the benefits of having higher pasture availability year round, the downside of higher growth rates is that pastures are more likely to *get out of control* resulting in poorer quality feed caused by an increase in fibre levels. For example, the higher growth rates – even of older ryegrass varieties – coupled with increased fertiliser use (vis. Target 10), have meant that *canopy closure* (severe shading of pasture) occurs both more often and earlier in the regrowth cycle than it previously did. This not only decreases feed quality through increased decay and fibre production, but the shading also causes pastures to thin out affecting long-term growth rates, and eventually, persistence.

This is particularly the case in the peak of spring where longer rotations will push growth rates into the triple figures causing massive feed surpluses to be commonplace. The issue is now feed quality, and thoughts inevitably turn to silage &/or hay. And while current recommendations for optimum quality silage making during peak growth periods is the 3 to 3½ leaf stage (where the decrease in ME is offset by an increase in the total amount of pasture)

## From the Editor

This is an extremely significant issue of the Bulletin. For the first time a highly respected member of the dairy industry research establishment has endorsed our views on pasture and grazing management. To those of us who have been doing it for years on our farms and getting the expected excellent results this should come as no real surprise, but it is a huge wake-up call for the rest of the industry, particularly the extension and field services sectors.

Dr Danny Donaghy is no wild eyed radical operating on the fringes of dairy respectability. He is a widely quoted and remarkably practical and sensible pasture specialist with the University of Tasmania, and a regular speaker at industry events. Abandoning the old "3-leaf" grazing model, is a significant paradigm shift and one which the rest of the Dairy production sector now is challenged to follow.

We (BEST-fed) have known for some years that the old "3-leaf" system was flawed – it may have been a good thing for the plants but as dairy farmers we are interested in **milk**. Grass is a means to an end, not the end in itself and for too long the industry has failed to grasp this pretty obvious point.

Where the "breakthrough" has now come is that Dr Donaghy has provided

a scientific rationale that supports this advanced practice system of sustainably grazing pastures at around 2 leaves – where lower NDF allows maximum intake, and so increased production, without compromising the sward. In fact our shorter rotations have consistently increased the amount of pasture consumed by the cows over the year – feed that was previously being wasted!

The genesis of Dr Donaghy's conversion is an interesting one. Several years ago we asked him to explain to the WDL audience why 3-leaves was the right way to go and he explained this to us, focusing on the health of the plant, its pattern of growth and so on. We then countered with the NDF argument illustrating the dramatic effects on intake of the apparently quite small increases in NDF as each day beyond 2 leaves goes by. (The effect of lowered intake and reduced quality is around 1.5 litres a day – see feature article). Accepting the overwhelming "anecdotal" evidence of the benefits of 2 leaves, Dr Donaghy has sought, and found, answers. To his enormous credit, Danny has listened, argued, thought and acted, displaying a degree of courage that his colleagues have a duty to emulate. That is of course unless they want to keep arguing that 3 leaves is best, that the earth is flat, and that the sun revolves around us.



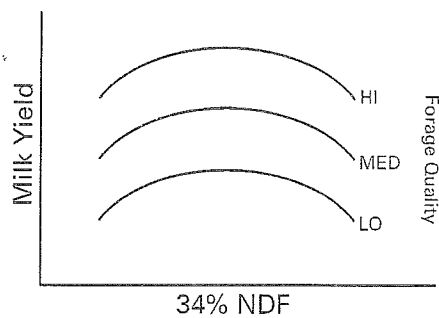
*Graze at 2 leaves says pasture expert.*

this feed is obviously not suitable feed for high-producing dairy cows.

In order to systematically generate the best outcomes from grazing management, the "system" must be suitably flexible in its application to maintain quality regardless of the growth rate of the pasture. [Remember, the aim of grazing management is to maximise the conversion of pasture into milk, and the key to maximising milk yield is pasture quality].

### MAXIMISING MILK YIELD

It's simple: in order to maximise milk yield, one must maximise the herd's dry matter intake (DMI), and to achieve this, one must be obsessed with maximising forage (pasture) quality. (Figure 1).



**Figure 1. Effect of forage quality and NDF on milk yield**

Figure 1 illustrates another very, very important point – correcting for NDF by adding more and more concentrate

can, and will, never compensate for high quality. [While adding concentrate can restore ideal NDF levels the ADF levels will always be higher decreasing digestibility and therefore ME content].

We have known since the late 60's that the primary determinant of diet quality is Neutral Detergent Fibre (NDF: the cell wall material - think straw as almost all NDF). And while this is not truly a nutrient, it is profoundly important effect as it fundamentally controls the amount of tucker the cow can consume in a day. Look at it this way - a cow's intake is a function of her gut capacity, which is more-or-less determined by her size times her genetic potential. When she has eaten a certain amount of NDF, she is full - it is as simple as that, vis.:

**Intake of NDF (kg/d) ~ 1.2% x liveweight**

So when a 600 kg cow has consumed 7.2 kg NDF (or 6 kg if a 500kg cow), she is full - can't fit another thing in! It matters not whether the diet is pasture-based, lucerne hay or corn silage-based, or whether she was fed a TMR in the US, or grazed lush pasture in Chile. When she has consumed 7.2 kg of Neutral Detergent Fibre in her ration, she is full.

When we rearrange this equation a tad, we come up with the so called "Merten's Equation" which neatly explains the need to minimise pasture NDF at the time of presenting it to the cow:

$$\text{DMI (kg/d)} = 120/\text{NDF} \times \text{LWT}/100$$

By applying this formula, you quickly get a sense that the challenge of the 3-leaf stage is one of intake. As a plant ages its fibre levels rise – and this is particularly rapid between 2 leaves and 3, - so throughout this period intake is severely compromised. Following is a quantitative example of the impact of this effect on intake and its production consequence:

Leaf Stage	ME (MJ/kg DM)	NDF (%)	DMI (%LWT)	DMI (kg/d)	MEI (MJ/d)	Yield (L/d)
3 leaves	10	50	2.4	14.4	144	14.8
2 leaves	11	40	3.0	18.0	198	25.6
Difference	10%	20%		3.6	54	10.8

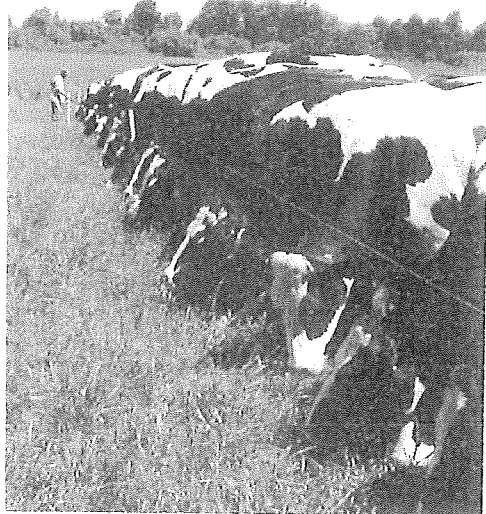
**Just waiting for this extra 1 leaf has cost us almost 11 litres of milk per cow per day.**

We recognise that the production difference between the 2- and 3-leaf stages may not always be this large; in times of slower growth, in cooler weather, or when cows have greater opportunity to select, it is likely to be less. Never-the-less, clear from this example, is that **we cannot afford to wait until 3 leaves to graze!** In terms of productivity, 2 leaves will always beat 3!

Nor are we saying it must be 2-leaf rotations either, however, typically, shortening the grazing rotation by just a week can have a massive effect on milk yield because of the increase in pasture consumed as shown. [In fact, for every day past optimum grazing, pasture NDF rises by over 1% unit, decreasing milk yield by almost 1½ litres per cow per day.] While this alone is often sufficient motivation for many to shift from 3-leaf to 2-leaf stages of growth, the key is to be flexible enough to change the rotation length to optimise the overall productivity and quality of pasture simultaneously. Then, the increased consumption means cheaper pasture and thus, milk at lower cost.

... continued on page 4





## MANAGING GRAZING TO MAXIMISE GROWTH AND QUALITY OF PASTURE

So is there an acceptable compromise? - or better still, an optimum? Longer rotations generally result in higher growth rates, better plant performance and persistence, and better balanced minerals and protein/carbohydrate ratios, but fibre levels can be too high to support high intake levels by grazing cows. On the other hand, shorter rotations will minimise fibre and maximise intake per cow, but are likely to result in lower growth rates, lower overall pasture production, - and if not managed carefully, poorer plant performance and persistence, and imbalanced mineral and protein/carbohydrate ratios.

Again, the emphasis is on flexibility. The key is a flexible grazing rotation that is based on leaf stage but respects the need for premium quality forage and preservation of plant energy reserves. When pastures are growing quickly (which when you have adequate irrigation and fertiliser application can be 7-9 months of the year), the rotation should be around the 2-leaf stage, (or canopy closure, whichever comes first). This will maximise quality and not prejudice plant performance (regrowth, total growth and survival). There is no benefit in (and numerous reasons not to) grazing faster than the 2-leaf stage, unless canopy closure occurs earlier than this, or your overall aim is to reduce pasture growth to prevent a spring surplus.

**Dryland pastures** - when growth slows in summer, you have 2 choices. You can maintain a 2-leaf rotation, which will ensure plant survival while minimising fibre, but growth will be slower. Alternatively you can lengthen the rotation towards 3 leaves which will improve plant survival and growth even more, but fibre levels will increase as plants are moisture stressed and so more grain needs to be fed to maintain diet quality.

When pasture growth slows in winter, the rotation can be extended towards 3 leaves without much compromise in quality because there is little or no lignification with increasing NDF. This will maximise pasture growth in this typically slow growth period.

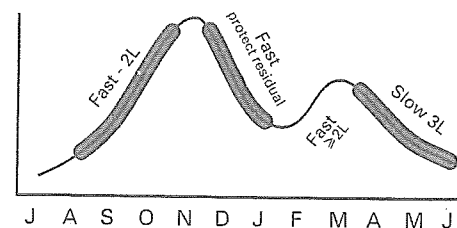


Figure 3. Illustrates a reasonable grazing management strategy.

**Rule of Thumb:** Graze at at least 2-leaves unless canopy closure occurs sooner, but protect the residual at all costs, particularly in the period just past peak growth rates.

Inevitably, there will be periods in which management is challenged and for one reason or another, things get out of hand and we end up with rotations either too short or too long. We'll now examine both situations in more detail and how to get back on track.

**Slow rotations** - The issues with slower rotations (>3 leaves) are shading, poor quality, rejection, and wastage.

In most pastures, shading becomes an issue close to, and certainly after, the 3-leaf stage. Slow rotations (>3 leaves) mean longer periods of shading, which causes death of grass tillers and companion legumes leading to pastures thinning out. This affects pasture growth rates and quality in subsequent rotations, and eventually affects persistence requiring more frequent resowing.

Because quality drops significantly after 3 leaves (higher fibre levels overall, and lower digestibility of protein, carbohydrates and minerals in shaded leaves), animal production suffers immediately. This leads to greater rejection by grazing stock, which means higher post-grazing residuals. These often need to be brought back under control by mechanical topping or slashing, or by using a leader-follower system of grazing, etc. Frequently, more concentrate is added as well, and with at least some degree of substitution, all adds up to greater wastage of pasture - it not only costs you to grow it, but you've missed the opportunity to harvest high quality pasture and you've wasted a large percentage of what you've grown - often as much as 60-70%. Seriously, often 1/3 of what is grown ends up rotting away in these situations,

... from page 3

### WHAT DOES THIS ALL MEAN IN TERMS OF GRAZING MANAGEMENT?

It's clear that 2-leaves massively improves pasture quality over 3. And since 2-leaves elevates farm productivity at lower cost through better utilisation of pasture directly by the herd, there are compelling reasons to shift away from 3. The critical issue here is one of correctly managing the pasture at less than 3-leaves to ensure the preservation of the productivity and persistency of the pastures.

As with pasture quality management flexibility in pasture management is the key to long term pasture productivity and persistency. While one seems obliged to adopt a particular stance - either 3 leaves or 2 - about 10 years ago, we learnt that from a plant's point of view, there is a window of opportunity between 2 and 3 leaves per tiller that could be utilised to better effect if management was flexible enough. If grazing occurs before the 2-leaf stage, plant energy levels decline which reduces regrowth and persistence, and mineral levels in the herbage are thrown out of balance for ruminant nutrition. Graze at, or after 2 leaves but before canopy closure and pasture quality and production can be optimised simultaneously. Graze after canopy closure or 3 leaves and quality drops dramatically, rejection by grazing animals increases, and more pasture is wasted.

and the opportunity to maximise milk production from pasture is lost.

In reality, there will be times when the odd paddock ends up being grazed too late with resultant poorer quality and higher post-grazing residuals. This is not a serious problem as long as it is brought back under control within the next rotation.

The best way to do this is to slash or top to a decent residual (5 cm) straight after grazing, or to make the rampaging feed into silage. If topping isn't possible (e.g. too wet) then the rotation needs to be speeded up the next time round (even to <2 leaves), so that the problem doesn't spiral endlessly out of control. The paddock may still need to be topped after this grazing.

If rotations are too slow for too long, shading will cause significant and rapid thinning out, and while quality of the upper, younger leaves in the canopy will still be high, overall quality of the paddock feed and particularly of the lower portion of the canopy, will be poor - milk again will suffer.

**Super Fast rotations** - The critical issues with faster rotations (<2 leaves) are low energy levels, slow regrowth, poor quality and low persistence.

Grazing on fast rotations (<2 leaves) reduces the plant's energy levels which acts to slow regrowth in the subsequent rotation. This means that although utilisation may be high on a percentage basis (i.e. most of what is grown is eaten), the total amount eaten in a year will be lower as you're simply not growing enough feed. For example, sustained super fast rotations may reduce the amount of pasture grown on an annual basis, to half of what you should expect.

Through lowering energy levels, fast rotations are also likely to retard the root system which means plants are under more stress in conditions of low soil moisture or low soil fertility. Not only that, but a smaller root system means that plants need more frequent applications of water, phosphorus and nitrogen in order to maintain high growth rates.

Curiously, quality is also likely to be poorer before the 2-leaf stage because although fibre levels are lower, mineral levels are usually out of balance (generally, too little

calcium and magnesium, and too much potassium), crude protein is high, and soluble carbohydrate levels in the leaves are low. This can generally be overcome with supplements and minerals, but this can be an expensive way to manage what could be achieved more naturally.

Then of course, if fast rotations are compromising the energy status of the pasture, there is less energy for tillering. Less energy for tillering means less dense pastures that cause reduced growth rates in subsequent rotations and eventually affect persistence, in turn, demanding more frequent resowing.

In reality, there will be times when the odd paddock ends up being grazed too early with resultant poorer quality and slower regrowth. One or 2 fast rotations aren't a problem as long as the rotation is extended immediately after this period. However, persisting with rotations that are too fast will significantly weaken plant root systems and tillering through reduced energy levels, and while plants will still survive and growth rates won't stop if water and nutrients are in full supply (e.g. irrigation is ideal, nutrients are being applied regularly), pasture won't grow anywhere near its potential (i.e. you'll only grow to 1/2 of what you could be growing). If growing conditions become stressful during this time (e.g. hot, dry), then pastures will really suffer and plants will die.

Inevitably we are going to get caught at times with a rotation that is too long or too short. The imperative is to correct this situation - pronto! The longer the rotation is inappropriate the more damage done to the milk production, pasture and quality, production and persistency. All of these result in less milk, so reduced income but at greater cost - certainly not what we are after.

#### **The rules of the game are simply:**

1. Greater than 3 leaves is out!
2. Later than canopy closure is out.
3. Less than 2 leaves is out unless canopy closure occurs first.

Graze at 2 leaves or as soon as possible after that most of the year, extending the rotation a little in the colder, wetter, slow growing months.

Dr Danny Donaghy is a Senior Researcher at The University of Tasmania. He is Australia's leading pasture researcher.

## Industry Alliances.

**B**EST-fed has been appointed as Agents for SWEP laboratories, and now can facilitate soil testing and fertiliser recommendations. SWEP is a laboratory focused on the soil triad - structure, nutrients and microbes.

BEST-fed has also taken on a distributorship for the very user-friendly Easy Dairy, a herd management programme that allows us to easily analyse reproductive performance of your herd. We believe that offering these services will compliment the nutritional and business consulting advantages which we bring to our clients' farms.

More on these initiatives in the next bulletin.

## Northern News...

**B**EST-fed is pleased to announce a radically improved service to our clients in Northern New South Wales.

Mr Jim Wade has been appointed **Northern Region Senior Consultant**. A very well known and respected nutritionist, Jim will service the client base in Northern NSW and QLD. Jim is a local and has an enormous amount of dairy experience and knowledge to share with our customers. We are extremely conscious that it has been hard for us to service that area as often as we should and this appointment will finally remedy the situation. Appointments for Jim should be requested through Shepparton office. Please ask for Melanie when requesting an appointment.

Finally our northern region has its very own BYPRO and this specially tailored mineral and protein pellet is now **available direct** from the Norco Mill in Lismore. This means that large freight costs for BASE and BASE PLUS, incurred when product has been transported from Shepparton, are a thing of the past.

Orders should still be placed with Barry or Duncan in the Shepparton office.