9. Managing fertiliser – get more bang for your buck!

Clever management of available soil nutrients and prudent use of expensive fertilisers can directly impact milk production and encourage environmental sustainability. Making smarter use of available nutrients and minimising nutrient inputs was the aim of the Greener Pastures Project - a five year intensive farming systems project initiated by the WA Department of Agriculture and Food (DAFWA), Dairy Australia and Western Dairy.

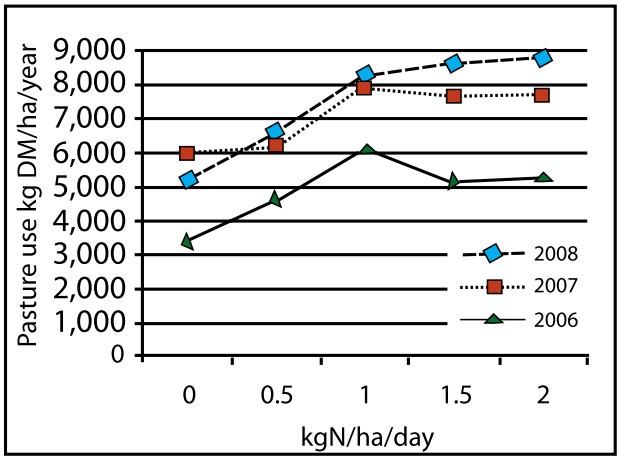
Key recommendations

- **Nitrogen** – apply Nitrogen fertiliser at 0.5 to 1.0kg N/ha/day post grazing. Aim to hold off grazing till 2.5 leaf stage since last grazing to maximize pasture response.
- **Soil pH** – regularly test soils to monitor soil pH and apply lime to paddocks that register below 5.5.
- **Phosphorus** – soil test to gauge critical phosphorus levels in soils. Only apply phosphorus when soil test indicates phosphorus levels are below critical.
- **Potassium** – Apply potassium fertiliser, post grazing when K levels are below 100mg/kg
- **Sulfur** – In a wet year, apply N:K:S fertiliser blend after each grazing or a spring dressing of gypsum or other sulfur application.

Phase I - nitrogen (N) response

The past 10 years have seen a six-fold increase in the application of N fertiliser in the Australian dairy industry. The subsequent increase in pasture growth has, however, not always been efficiently converted into milk as cattle are very inefficient users of nitrogen consumed from plants. Furthermore, much of the nitrogen ingested is passed out in urine and potentially lost, increasing the problem of diffuse pollution in waterways.As a result of this observation, the first phase of the Greener Pastures project investigated milk production response to five different rates of nitrogen fertiliser, applied after each grazing throughout the pasture growing season, on five farmlets at Vasse Research Centre.

Pasture utilisation results



The diagram indicates a late break and early finish in 2006 resulted in poor pasture use. 2007 and 2008 were good seasons and, together with nitrogen fertiliser application of 0.5, 1.0, 1.5 or 2.0 kg/ha/day, pasture use increased to around 8 tonne DM/ha compared to the average dryland pasture utilisation of 5.4 tonne DM/ha (07/08 Red Sky).

Grazing consistently at the three leaf stage milk solids production per cow is relatively unaffected by the rate of N fertiliser applied. Milk solids production per hectare increased in line with the higher stocking rates achievable from higher N rates.

However, results indicate that the increase in milk solids production/ha above 1.5 kg N/ha/day was almost entirely reliant on rapidly increasing the proportion of purchased feed, and thereby exposing the systems to increased risk.

Additionally, as more nitrogen fertiliser is applied, ryegrass thrives and tends to dominate the pasture. Given a delay in grazing till the ryegrass is at the three leaf stage, nitrogen treated ryegrass pastures showed significant potential to provide a more balanced feed for lactating cows and may also increase whole farm nitrogen efficiency.

Applying N fertiliser at 0.5-1.0 kg N/ha/day post-grazing, will help to optimise pasture utilisation and maintain a good nutrient balance. Hold off grazing till 2.5 leaf stage since last grazing, to maximise pasture response to N fertiliser and to provide balanced feed for lactating cows.

Increasing pasture utilisation and productivity through grazing management became a focus of phase two of the project.

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Phase II – soil pH (CaCl) & phosphorus, potassium & sulfur response

Lime

On the majority of dairy farms, soils are naturally acidic and become more acid over time. When soils become too acidic, productivity suffers due to lower availability of nutrients. The lower the soil pH, the more costly it is to reach the target pH of 5.5, which is required for optimum plant growth.

Monitor soil pH with regular soil testing and apply lime to paddocks registering a pH below 5.5. Expect to invest several years to raise the pH level, if it is originally below a pH of 4.5. As a rule of thumb, apply lime at 5.0 t/ha if the pH is below 5.0, apply 3.0 t/ha if pH is between 5.0 and 5.5 and apply 1.0 t/ha if the pH is between 5.5 and 6.0.

Phosphorus

By understanding critical phosphorus levels in soils, farmers can reduce the need to apply phosphorus fertiliser. On-farm trials examined the benefit of applying phosphorus fertiliser following each grazing. Results show that there is no benefit.

Determine the critical phosphorus levels in your soils – add a safety margin and apply phosphorus only when a soil test indicates proximity to this figure.

Potassium

Potassium levels are difficult to monitor through a soil test and pastures can respond unpredictably to applications of potassium fertiliser. A general guideline for potassium fertiliser application is as follows:

- Soil test shows less than 30 mg/kg – legumes will always respond
- Soil test shows above 100 mg/kg – legumes will almost never respond
- Soil test between 30 and 100 mg/kg – unpredictable legume response
- Grass pastures almost never respond to potassium fertiliser

When soil potassium levels are below 100 mg/kg, apply potassium fertiliser post grazing, or tissue test selected paddocks through the growing season and apply potassium fertiliser if the test drops below approximately two percent potassium.

Sulfur

Testing soils for sulfur is not particularly reliable on sandy soils in high rainfall areas as sulfur can quickly be leached below the plant root zone over the course of the growing season.

In a wet year, apply sulfur fertiliser as insurance, either as an N:K:S fertiliser blend after each grazing or as a spring dressing of gypsum or other sulfur application.

Conclusion

During the course of the five year project, participating farms were annually soil tested, providing an excellent database on which to base fertiliser decisions and track changes over time.

Using whole-farm soil testing and nutrient mapping, the Greener Pastures team developed a concise picture of nutrient distribution across each farm. Farmers that traditionally soil test part of the farm every year, are likely to gain from soil testing the whole farm every two years. The fertiliser supplier can then provide a more comprehensive nutrient map which more adequately caters to the whole farm requirements.

Further information:

Go to www.agric.wa.gov.au and type 'greener pastures' into the search box.

Grant Evans

Success Story

Peter, Sue and son Grant run a dairy enterprise at Jindong, 20 kilometres south of Busselton and milk 800 cows on a 1000 acre dairy platform.

"By increasing our lime application we have increased the pH level of our soils over the course of the project and now have adequate pH levels of 5.5, ensuring much better nutrient uptake, resulting in better pasture production. Increases in pasture productivity have led to an improved performance from the dairy herd and higher farm profitability."

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