Dairy Australia
Your Levy at Work

Winter nitrogen

Effective use of nitrogen can be a relatively cheap source of additional winter feed. Pasture responses to N in autumn/winter are less than you would usually expect in spring due to decreasing soil temperatures. However, strategic N applications can boost winter pasture covers and assist in setting up a pasture wedge for the following spring.

Nitrogen should be used when plants will respond to extra nutrition and when extra feed is needed. Strategic nitrogen use also means considering whether purchased feed will be a cheaper means of filling the feed gap than buying the nitrogen fertiliser required to grow the additional pasture. Decisions concerning feed sources (home grown vs purchased) need to be considered in a whole farm context in conjunction with your feed budget and expected feed requirements.

Quick tips

- Best responses occur on actively growing pastures
- Urea will be the cheapest source of N and there is no difference in yield for the same amount of nitrogen applied unless another nutrient is limiting production eg. (Phosphorus)
- Application rates should be between 25 and 50 kg N/ha per grazing rotation. (0.8 -1.5 kg N/ha/day depending on rotation length.)
- Nitrogen should be applied 2–3 days either side of grazing
- Nitrogen should be applied where the greatest response will be seen. Consider: Pasture quality, temperature, slope, soil moisture levels.

Situations to avoid

- Low soil temperatures – (below 4 degrees C): very low responses to N
- Not enough soil moisture for growth (usually not a problem after the autumn break until October in Victoria)
- Waterlogged soils - where the excess water is actively running off the paddock it can move both dissolved urea and nitrate with it.
- Blanket applying nitrogen to the whole farm at once – rather double the rate (within the guidelines below) on half the area if it is warmer, or more productive.

What application rate should I apply Nitrogen?

The most efficient pasture growth responses occur when nitrogen fertiliser is applied at rates of between 25-50 kg N/ha at any one time. Above this rate, losses will be high and pastures will be unable to utilise the extra nitrogen. Below this rate, growth rates are less predictable, reducing production and return on the cost of fertiliser application.

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How much does nitrogen grown grass cost?

This will depend on the cost of urea, the response rate and the utilisation (how much of the extra growth is wasted). Table 1 shows, even at average response rates e.g. 10:1, providing wastage rates are minimised additional pasture grown compares favourably with purchased feeds (particularly purchased hay and silage).

Table 1 Variation in the cost of additional pasture consumed when urea is around $500/T

Extra Response kg DM/kg N	Utilisation	Cost of Extra Pasture Consumed
High response 15:1	75%	$100/T DM
	50%	$150/T DM
Average response 10:1	75%	$150/T DM
	50%	$220/T DM
Low response 5:1	75%	$300/T DM
	50%	$440/T DM

What influences the response rate to nitrogen?

The amount of pasture grown in kg DM/kg N applied is the 'response rate'. For example where 30 kg N/ha is applied and an additional 300 kg DM/ha of pasture is grown the response rate is 10 kg DM/kg N applied. The response rate is dependent on:

1. the amount of available N in the soil – the greater the deficit, the higher the response
2. soil temperature – the warmer the soil, the greater and more immediate the response i.e. target north facing slopes in mid-winter
3. plant growth – the higher the growth rate potential, the greater and more immediate the response. Also better species composition means better responses.
4. moisture – too much or too little water will lower the response
5. rate of N applied per application – there is a diminishing response at high application rates
6. the availability of other plant nutrients and soil pH

Table 2 (below) shows that the best response to N fertiliser occurs on fast growing pasture, and highlights some factors which can influence pasture growth.

Where to apply Nitrogen?

Nitrogen will have the greatest response when there are few other limiting factors. Avoid areas with low soil nutrients (P, K or S), low soil pH, conditions that are too dry/hot/cold for plant growth, poor ground cover, high density of weeds, overgrazed pastures and compacted soil. Application under these conditions means plant response will be low, fertiliser will be wasted and N losses will be high.

Fertiliser should be placed where conditions will be most conducive to plant growth. This means the warmer northern slopes in winter, and in paddocks with good species composition and nutrient profile. For example, 40 kg N/ha spread on 1 ha of a north facing paddock would grow more grass in mid-winter than 20 kg N/ha spread on 2 ha of a south facing slope. The reverse may be true in the hotter months. A similar principle applies to areas with good and poor species composition.

Areas already high in nitrogen – such as around gateways, water troughs and shelter belts where urine and dung tend to be deposited – don't need fertiliser. Avoiding these areas saves money and reduces nitrogen loss.

Table 2 Estimated pasture response to N based on existing growth rate

Pasture growth rate	Pasture growth (kg DM/ha/day)	Response (kg DM/kg N)	Pasture quality	Climate
Slow	10	5–8	Poor/open sward/high weed content	Cold/moisture limited/ waterlogged
Moderate	20–40	10–15	Ryegrass pasture	Typical late winter/early spring
Fast	50–70	15–20	Well managed ryegrass pasture	Typical mid spring

For regionally specific nitrogen response rates please see:
Gippsland Western Victoria Northern Irrigation Region Tasmania

Some practical references on nitrogen are:

Fert$mart Nitrogen Information

GippsDairy Nitrogen Use on Dairy Farms Fact Sheet, prepared by John Mulvany, OMJ Consulting.

Summary of Best Management Practices for N on pastures, by Richard Eckard, University of Melbourne.

Greener Pastures Project Nitrogen for intensively grazed dairy pastures.

Dairy NZ. (2012) Seasonal nitrogen use (7-11). Factsheet

Using Nitrogen: what is best practice? SIDE 2005

Nitrate poisoning information DPI NSW

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