



Feed Planning

Nitrogen in autumn

How much does pasture cost to grow using nitrogen in autumn?

Pasture responses to N in autumn are often less than those in spring due to low soil moisture and high soil N, both as a consequence of the dry summer. For example, the pasture dry matter (DM) response to N fertiliser in west Gippsland, applied directly after the autumn break, showed N responses of 6:1 when applying 20kg N/ha in only 9 out of the past 18 years.

Nitrogen fertiliser can be applied when the pasture is actively growing to assist in filling feed gaps, but the potential response should always be compared to the cost of buying the same feed – this ensures that N fertiliser is only applied when it is more cost-effective than other options.

For example, applying N in February to dryland pasture in Victoria, may result in a pasture DM response of less than 5kg extra DM per kg N applied.

Table 1 shows that at this response rate, grain at \$260/tonne delivered would be more cost-effective than applying N, once spreading and delivery costs are included.

Another important consideration is the utilisation of the additional feed produced. If the pasture N response

is 5kg DM per kg N applied, but utilisation is only 75%, then the actual N response is 4:1 and alternative purchased feeds are commonly cheaper. The breakeven price at this response rate and utilisation is \$350/tonne. Therefore if grain prices are greater than this, nitrogen usage is cost effective.

Table 1 Variation in the cost of additional pasture consumed when urea is \$600/tonne. Utilisation column assumes this is the utilisation of the extra pasture produced. 100% utilisation of extra pasture produced is achievable.

Extra response kg DM/kg N	Utilisation (%)	Cost S/T DM
High response 20:1	100	65/T DM
	75	87/T DM
Average response 10:1	100	130/T DM
	75	175/T DM
Low response 5:1	100	260/T DM
	75	350/T DM
Very low response 3:1	100	435/T DM
	75	580/T DM

What influences response rate to nitrogen?

The amount of pasture grown in kg DM per kg N applied is the 'response rate'. For example, at a response rate of 10:1, 30kg N/ha produces an additional 300kg DM/ha of pasture.

The response rate is dependent on:

- › Amount of available N in the soil: In an autumn following a dry summer, there is likely a significant amount of N in the soil, mineralised from the organic matter over the summer, but remains unutilised because of low summer pasture growth. Additional N fertiliser at the autumn break may not achieve an N response, as the pasture is short of water not N
- › Soil moisture: Too much (i.e. water logged conditions) or too little (i.e. water stress conditions) will lower the response. The best response is from a soil moisture profile that is not limiting growth. At the autumn break, following a dry summer, there is commonly insufficient soil moisture to support high pasture growth rates. Wait for adequate rainfall, with additional rain predicted before applying N
- › Soil temperature: the warmer the soil, the greater and more immediate the N response. This is less of an issue in autumn but may be a limitation from applying N in late May
- › Plant growth: the higher the growth rate potential, the greater and more immediate the response to N fertiliser
- › Rate of N applied: there is a diminishing response at higher application rates, but also an unreliable response at lower (<20 kg N/ha) rates. Using a response rate (e.g. 10:1), and knowing the additional pasture required to fill the feed gap (e.g. 400 kg DM/ha), the rate of N required (40 kg N/ha) to be applied to an area can be determined
- › The availability of other plant nutrients and soil pH, species composition and soil compaction can affect N response. Get the basics of optimising plant growth first or only apply N together with the limiting nutrients
- › Nitrogen-fertilised pasture can be cheaper than purchased feeds, if applied under the right conditions and utilised well
- › Even at low response rates nitrogen application could be economical this season
- › Sufficient stored soil moisture is critical to achieving response rates to N fertiliser. Under dryland pastures in SE Australia there is commonly insufficient soil moisture at the autumn break to achieve an economic response to N fertiliser

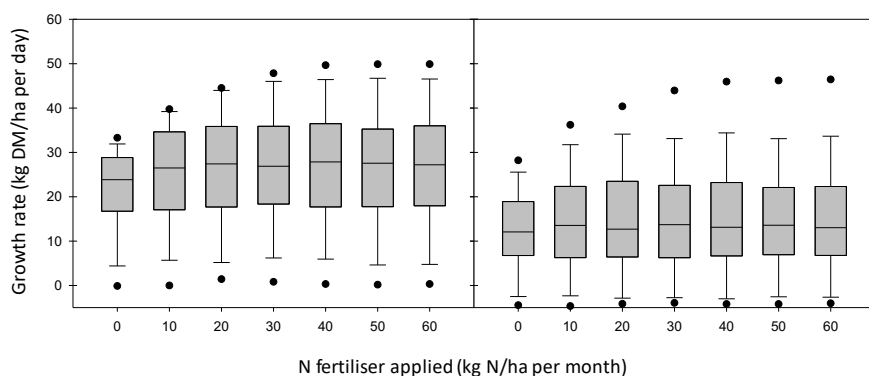
- › Apply N when the pasture is actively growing, has adequate soil moisture to sustain growth and can utilise the additional N
- › Apply N at rates of 20–50kg N/ha per application, no closer than 21–28 days apart
- › Do not graze perennial pasture for 7 to 14 days after N application.

Autumn response rates under rain fed conditions (case study)

The 'More Profit from Nitrogen' project examined the effect of a range of N fertiliser rates on pasture production under rain-fed conditions across two regions of Victoria. This modelling showed that soil moisture, rather than available soil N, was the major limitation to increased pasture production particularly at the autumn break, where economic pasture N responses (6:1) were achieved in 9 of the 18 years between 2000 and 2017 at Ellinbank (West Gippsland) and only 5 of the last 18 years at Terang (south-western Victoria) (Figure 1).

It is therefore critical to ensure soil moisture is adequate to sustain regrowth and N rates should be reduced if the likely response is limited.

Figure 1 Autumn pasture growth rate responses to N fertiliser at Ellinbank (left), West Gippsland and Terang (right), SW Victoria, in autumn (March, April, May) between 2000 and 2017. The middle line shows the average response, boxes show 25 and 75% of years, tails show 5% and 95% of years and dots show the extremes.



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