Soil Health Focus March 2023

PLAN TO BOOST AUTUMN FEED WITH STRATEGIC NITROGEN

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Following a delayed wet harvest, reserves of quality fodder are low and hay is expensive. Nitrogen application to increase pasture growth and avoid feed gaps into autumn and winter, and boost silage or hay yields is a consideration of many livestock producers.

In southern Australia, pasture growth is often negligible in late autumn and winter and feed demand can often exceed growth. For example, perennial ryegrass is most productive at ambient temperatures of 18-25˚C while soil temperatures below 10˚C also minimise growth.

Strategic applications of nitrogen at key times a more efficient way to manage feed deficits than a fixed rate of nitrogen, but there are some things to consider before applying N:

- Is the pasture actively growing?
- Can excess growth be conserved as hay or silage?
- Are there other nutrients or soil constraints that will limit pasture growth?
- What is the return from the additional feed grown?

Economics of N application

Return on nitrogen investment is influenced by moisture, pasture composition and density, soil fertility, grazing management, application rate and the fertiliser product itself.

The IPF Feed Cost Calculator can help determine the return on nitrogen investment. Trial work at Boorowa in 2022, showed applications of both 60 and 90 kg/ha nitrogen to annual ryegrass pasture produced more dry matter than the control (Figure 1).

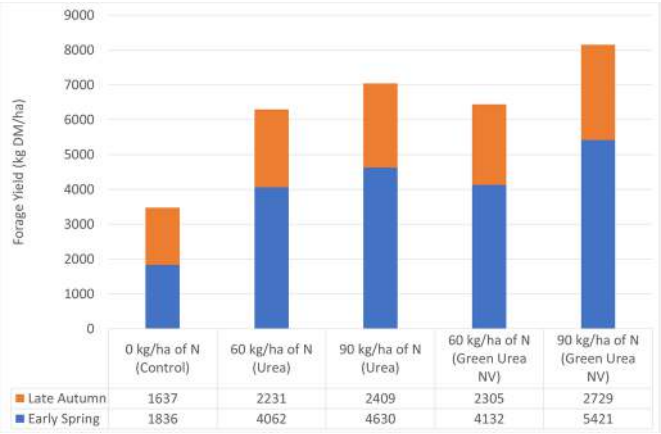

Figure 1: Nitrogen response (kg DM per kg N) of annual ryegrass in a dryland trial at Boorowa. Source: Incitec Pivot Fertilisers 2022.But an early spring application of Green Urea NV®, at both 60 and 90 kg/ha of nitrogen, produced significantly more dry matter than urea.

When the cost per tonne of dry matter was calculated (Table 1), even at $900+ per tonne, urea and Green Urea NV are still an economical way to produce additional feed.

In early spring, when the potential for nitrogen loss is greater, the additional investment in Green Urea NV of $40/tonne produced more feed at a lower cost. Green Urea NV also provides additional logistical flexibility.

Table 1: Cost per tonne of dry matter based on a urea cost of $900/t and Green Urea NV cost of $940/t.

	$/tonne DM	
	late autumn	early spring
60 kg/ha of N (Urea)	$594	$158
90 kg/ha of N (Urea)	$685	$189
60 kg/ha of N (Green Urea)	$550	$160
90 kg/ha of N (Green Urea)	$713	$154

Right Product

Urea 46% N w/w

Urea is the most widely used high analysis granular nitrogen fertiliser. However, spring applications are prone to ammonia loss through volatilisation. Losses of up to 30% have been recorded where:

- limited moisture has dissolved but not moved the urea into the soil
- the soil temperature is over 15ºC
- daytime temperatures are warm to hot
- the soil surface is drying out
- moderate to strong wind conditions are likely at the soil surface

Green Urea NV® 46% N w/w

Green Urea NV is granular urea coated with the urease inhibitor NBPT (N-(n-Butyl)-thiophosphoric triamide).

As temperatures increase in spring, 20 to 30% of N applied to pastures can be lost through volatisation. Green Urea NV can reduce potential volatilisation loss by 70%. Green Urea NV inhibits the activity of the urease enzyme, delaying the hydrolysis process and extending the time for incorporating before rainfall for a period of up to 14 days. This allows more time for the fertiliser to be safely spread or incorporated into the soil by rainfall or irrigation, where it can be used by pastures without delaying dry matter production. This also means a larger area can be treated ahead of each rain event. The

wider application window reduces the risk that an application will be missed.

EASY N® 42.5% w/v

Easy N® is a high analysis liquid fertiliser present as urea ammonium nitrate (urea 50%, 25% ammonium, and 25% nitrate-nitrogen).

Easy N offers several advantages compared with urea. The presence of nitrate-nitrogen means a faster response on cold soils. It can be applied by fertigation or surface application through streaming and flat fan nozzles.

Application of Easy N to pastures should occur immediately after grazing to maximise dry matter production and avoid leaf burn to new growth. Easy N is still subject to volatilisation losses so a rain event of 10 mm or more is required to minimise nitrogen losses.

A minimum of 50 L/ha should be applied to actively growing pasture using flat fan nozzles while streaming nozzles should be considered when applying >50 L/ha of Easy N. Table 2 shows the rate comparison between urea / Green Urea NV and Easy N.

Table 2: Comparison of the rate of Urea and Easy N required to achieve different N rates.

Nitrogen rate (kg/ha)	Urea / Green Urea rate (46% N w/w)	EASY N rate (42.5% N w/w)
25	54	60
50	109	119
75	163	179
100	217	238
125	272	298
150	326	357
175	380	417
200	435	476

Right Timing

Pastures are most nitrogen deficient from late autumn to early spring when less nitrogen is being mineralised by the soil. Strategic applications in late autumn, before soil temperatures fall can provide additional winter feed. Similarly, late winter to early spring applications can produce additional feed for spring if supported by the right conditions.

Nitrogen applied soon after grazing is more efficient than an application onto a regrown pasture. Nitrogen responses decrease by 1% for every day the application is delayed, i.e., delaying nitrogen application for 10 days after the sheep or cattle come out of the paddock will reduce the potential nitrogen response by 10%.

Right Rate

The best dry matter response is generally to applications of between 25 and 50 kg N/ha. In this range, dry matter will accumulate as nitrogen rate increases. However, beyond 50 kg N/ha, there is a point at which a positive economic outcome is unlikely. Each individual needs to consider their situation, input costs, response rate and conversion rate, to find that point.

The response curve (Figure 2) shows that low rates of nitrogen are often insufficient to provide a response while high rates are not used as efficiently and don't always produce more dry matter. Excessive rates can lead to losses through leaching, denitrification and volatilisation.

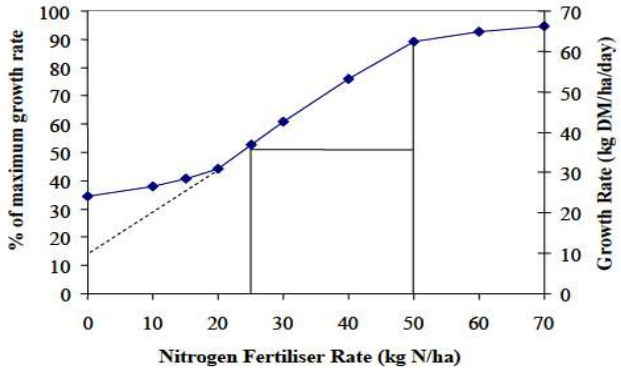

Figure 2: The pasture response to N fertiliser, both as the percentage of the maximum growth rate that can be achieved, and as the daily growth rate change for a single grazing rotation for a well fertilised perennial ryegrass pasture in late winter. Source: Eckard, 2010.

Right Agronomy

Pasture condition

Pasture condition is key to the success of nitrogen applications. The pasture must be actively growing for nitrogen to produce additional dry matter. If the pasture is moisture stressed, the response to nitrogen will be significantly reduced. As a rule, a minimum of 50 mm of plant-available water is needed to support nitrogen responses.

Other growth-limiting factors must also be considered, such as phosphorus levels (Olsen P <15 mg/kg Colwell P <30 mg/kg 0-10 cm), sulphur levels (KCl40 <8 mg/kg 0-10 cm), or acidity.

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Animal health

Nitrate poisoning in livestock can occur after applying high rates of nitrogen fertilisers – particularly combined with low temperatures and periods of moisture stress. Nitrate poisoning can also be related to pasture composition. It is recommended that pasture not be grazed for 21 days after nitrogen application.

Further Information

For more information or advice about staying on boosting spring pasture growth, feel free to contact:

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