

NITROGEN ON HILL COUNTRY

Why use nitrogen on hill country?

Nitrogen (N) offers farmers a relatively cheap and effective way of growing high-quality feed for livestock. It has been used extensively in the dairy industry and is starting to gain acceptance in other farming sectors.

Nitrogen is a growth promoter and used well offers a cheap source of high-quality supplementary feed; in many situations it is a viable alternative to buying in silage or other feeds.

Research into nitrogen on hill country

To investigate the potential pasture growth on hill country, AgResearch scientists conducted a two-year trial that involved applying 50 kg N/ha on eight occasions each year (Lambert et al., 2003). Figure 1 shows that even when soil fertility was low (Olsen P 6) applying nitrogen resulted in a 22.3 to 1 response. Where soil fertility was better, the nitrogen response was lower (18.2 to 1 in the high-fertility soil), but the actual amount of pasture grown was higher.

Clearly, 400 kg N/ha/year is far in excess of normal and acceptable nitrogen use. However, this experiment was

designed to see what could be achieved under extreme conditions. More work was needed to evaluate the practical use of nitrogen in hill country situations.

In an experiment designed to further evaluate the use of nitrogen in hill country, AgResearch scientists applied one of four treatments (0, 20, 40 or 80 kg N/ha) to trial plots on sunny and shady faces of South Island hill country in early spring (Smith et al., 2004). The two faces were both semi-arid, Otematata hill soils, but some of the properties differed. For example, on the shady face total nitrogen was 0.29%, whereas on the sunny face it was lower (0.18%) due to less clover growth. The Olsen P on the sunny face was 15, and on the shady face it was just 8. Results are shown in Figures 2 and 3.

As can be seen in Figure 2, the total amount of pasture growth on the sunny face was less than on the shady face. However, when the response to nitrogen is examined (Figure 3), we can see that the effect was more marked on the sunny face, with a 22 to 1 response seen when 80 kg N/ha was applied. In contrast, the same rate applied to the shady face produced a response of 15 to 1 (see Table 1).

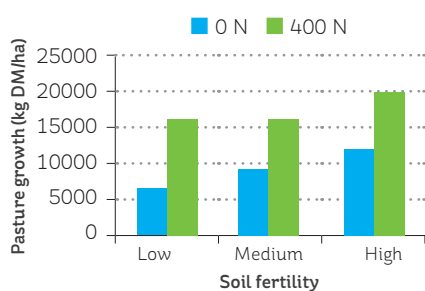


FIGURE 1
Pasture growth (kg DM/ha) on hill country with no nitrogen fertiliser (control) or 400 kg N/ha applied

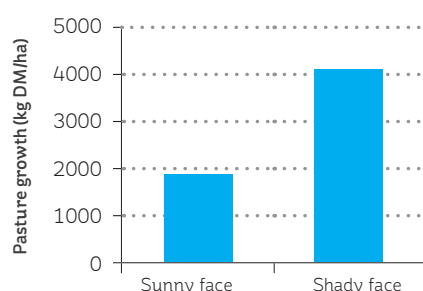


FIGURE 2
Pasture growth (kg DM/ha) on sunny and shady faces of hill country

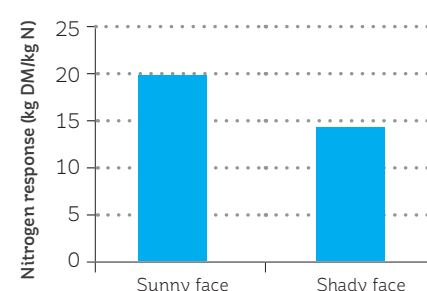


FIGURE 3
Nitrogen response (kg DM/kg N) on sunny and shady faces of hill country

Analysis of herbage samples taken from the trial sites showed that plant tissue nitrogen concentrations decreased as the season went on. This indicates that soil nitrogen was being exhausted by the pasture growth and that further large dry matter (DM) responses would likely have occurred had further applications of nitrogen fertiliser been made.

When to use nitrogen on hill country

As nitrogen is a growth promoter, it works best when the conditions for pasture growth are optimal. Cool soil temperatures will slow grass growth and so the extra growth resulting from nitrogen application will be lower.

On easy country, the response rate to nitrogen applications is typically given as 10 kg DM grown per kg N applied. However, in most summer-dry hill country conditions, it would be safe to expect a minimum response of 15 kg DM per kg N applied. As the research here shows, even higher responses may be attainable if the conditions are right.

How to use nitrogen on hill country

The principles that govern good practice for nitrogen application are equally valid on easy and hill country. Attention to some key points will help to ensure that the nitrogen is used effectively and efficiently.

- Construct a feed budget so that you know when shortfalls are likely to occur. This planning will help you time nitrogen applications for best effect
- If trialling nitrogen use for the first time, consider whether you have sufficient stock to eat the extra pasture
- Until research shows otherwise, it is recommended that nitrogen applications on hill country be made at a moderate

rate, e.g. no one application in excess of 50 kg N/ha and no more than 200 kg N/h/year

- Avoid applying nitrogen near vulnerable ecosystems such as streams and rivers
- Using nitrogen fertiliser has only a minimal effect on clover unless the pasture is allowed to get too long. If this occurs the grass will shade out the clover, reducing its competitiveness
- To prevent overgrowth of clover by grasses, graze the pasture regularly
- Where hill country paddocks are extensive, it may be advisable to increase subdivision and water supply in order to improve grazing efficiency

References

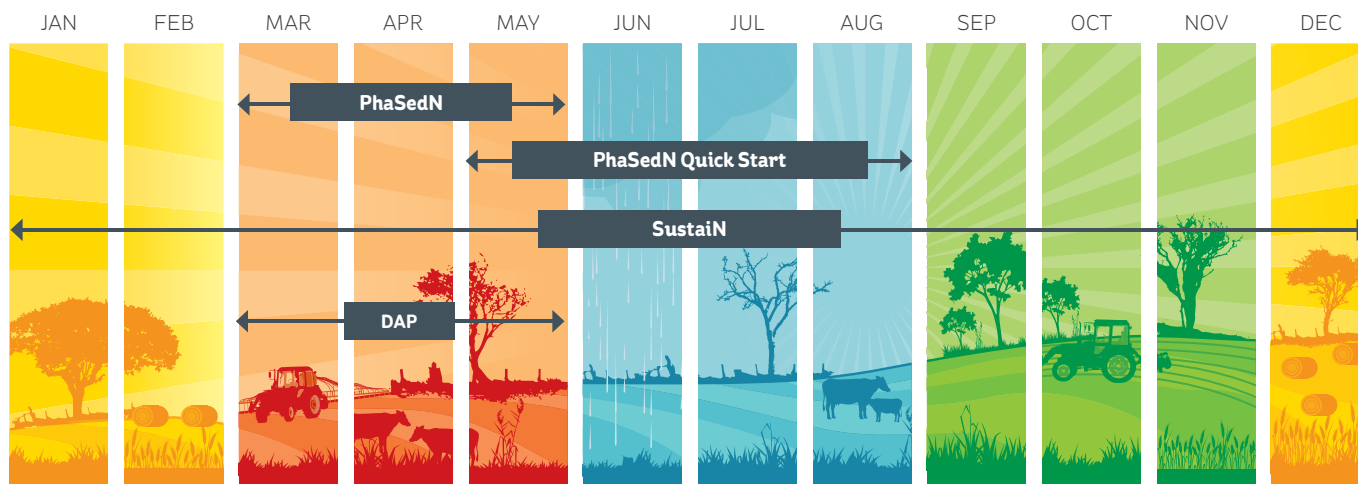
Lambert, MG, Mackay, AD, Devantier, BP, McDougall, DB, Barker, DJ & Park-Ng, ZA (2003), Redefining the production potential of hill pastures using fertiliser nitrogen, *Proceedings of the New Zealand Grassland Association*, 65: 35-40

Smith, LC, Morton, JD & Trainor, KD (2004), Evaluation of the effects of uniform or differential fertiliser application on pasture production on sunny versus shady slopes in the Mackenzie basin, *Confidential report prepared for Ballance Agri-Nutrients*

Growth rate	Growth rate (kg DM/day)	N response (kg DM/kg N)	Response time
Moderate	20-40	10 to 1	6-8 weeks
Fast	50-70	15 to 1	4-6 weeks

TABLE 1

Response efficiencies to nitrogen are affected by growth rate



PhaSedN
- use in situations where it's not economic to apply phosphorus, but where applying nitrogen and sulphur will improve pasture yields. Suitable for all soil types except ash soils with sulphate-sulphur levels consistently greater than 10 ppm

DAP - less likely to be a first-choice nitrogen for use on hill country unless it is combined with elemental sulphur, e.g. Sulphurgain Pure or similar. However, if a single application of phosphorus, sulphur and nitrogen is required, a DAP blend may be suitable, depending on product prices at the time of use

PhaSedN Quick Start
- apply from late autumn through winter on finishing areas with a high ryegrass content

SustaiN - use on land that already receives sufficient annual sulphur (20-30 kg S/ha) from other sources. Also suitable for use in hill country that contains low-fertility grass species. Suitable for use year-round, provided conditions allow grass growth