

Should native pastures be fertilised?

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Introduction

Considerable research has been conducted in recent years demonstrating the ongoing benefits of phosphorus (P) fertiliser in achieving and maintaining higher levels of production from native pastures (Graham 2006; Garden *et al.* 2003; Lodge *et al.* 2003; Michalk *et al.* 2003). However Garden *et al.* (2003), Hill *et al.* (2004) and Dorrrough *et al.* (2008) all question the sustainability of this practice by highlighting changes in species composition of these pastures with regard to increasing the introduced annual grass and broadleaf weed components at the expense of the native grasses and forbs but in most cases, these trends have been based on short term replicated data or based on qualitative survey data incapable of establishing causal relationships.

In the Monaro region of NSW, 70% of pastures are based on native species and are the cornerstone of livestock production. The Monaro Research, Development and Demonstration of Sustainable Grassland Management Project (MGP) was designed to determine if productivity could be increased without compromising the composition and biodiversity values of these pastures.

Methods

The MGP research ran over 6 years from 2004 -10 and was conducted on two representative but distinct soil types at Berridale and Bungarby in southern NSW. Each site had

nine, 5 hectare paddocks arranged as 3 replicates of 3 treatments. The treatments were Nil (control), Low (minimum input) or High (rapid fertiliser input to reach nutrient targets) fertiliser, with treatments differing by each site depending on local soil conditions. Detailed methodologies used in the MGP are described in Pope *et al.* (2012).

Results and Discussion

Pasture & Animal Production

There was no significant difference in herbage mass between treatments, although the trend was toward higher herbage mass on the fertilised plots. From 2006 onwards all paddocks receiving fertiliser treatment were able to carry significantly more DSE/ha than unfertilised plots. The MGP data also showed a very rapid, treatment based divergence in animal performance which occurred after the application of fertiliser at each site in March 2005 and after the introduction of each new cohort of animals (Fig. 1).

Stability of species composition

At Berridale, the changing presence and production of the native grasses was found to be driven by seasonal changes rather than by treatment. The presence (mean frequency value) of the naturalised legumes was higher ($P < 0.05$) on the fertilised Low (0.691) and High (0.7505) treatments

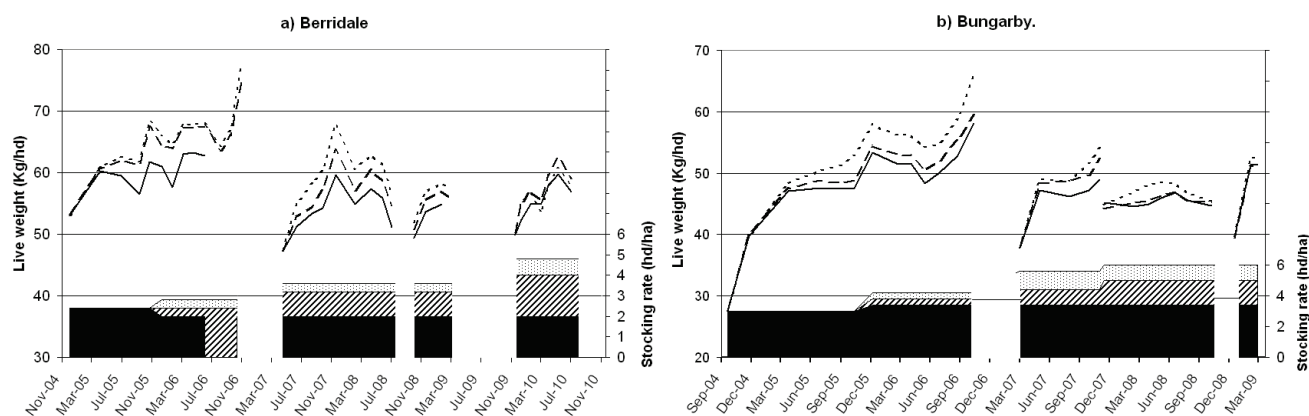


Figure 1. Sheep Live weight and stocking rate for each MGP research site. Nil (solid lines and shading), Low (dashed lines and hatching) and High treatment (dotted lines and stippling). Breaks in the data indicate drought destocking periods and changes in animal cohorts.

relative to the Nil treatment (0.4953). The presence of sorrel (*Acetosella vulgaris*) remained significantly higher on the Nil treatment (0.4788) throughout the experiment than in the Low (0.3521) or High (0.3184) treatments and no significant changes in annual grasses or the presence of native forb species recorded.

At Bungarby there were no treatment effects on the herbage mass of the dominant native perennial grasses. The High and Low treatments had more naturalised annual legume present with the High treatment also recording significantly higher annual grass herbage mass. This was not reflected in species frequency counts which largely showed no significant difference between treatments. Frequency of native forbs was also similarly unaffected by treatment except for Fuzzy New Holland Daisies (*Vittadinia cuneata*) which had a significantly higher presence in the Nil treatment (0.0131) than in the High treatment (0.0034).

Conclusions

Results of the MGP research are consistent with other trials and research in NSW showing increases in carrying capacity of greater than 80% when P and S deficiencies in native pasture systems are corrected. The economic success of this enterprise decision is determined by the actual increase in carrying capacity (DSE/ha), the time-frame taken to raise stocking rates in line with that capacity along with fertiliser prices, market and seasonal conditions.

While it is often stated that applying P is a destabilising factor in the composition of native pastures, findings from the MGP and of research and trials in NSW suggest the impacts are either minor or seasonally transient and that strategic rest from grazing can substantially offset this risk. The Monaro research has shown that the composition of the native pasture systems in that environment is considerably robust. The use of fertilisers on native pastures should be managed in context of the potential of the whole farm, its natural resources and with regard to seasonal variability and production targets.

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