

# Phosphorus fertiliser boosts grass-legume pasture yields up to 4 years after application.

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## Introduction

Legumes can significantly boost animal diet quality and supply nitrogen for companion grasses. However sufficient numbers of well grown legumes are needed to obtain these benefits. A moderate to high soil phosphorus (P) supply is required to obtain the productivity potential of legumes suitable for clay soils (e.g. desmanthus and Caatinga stylo) (Peck *et al* 2015). However there is a lack of experimental data on the biomass responses of these legumes to fertiliser on low P soils.

## Methods

Two fully fenced trials were set up in existing long-term grass-legume pastures on low P status soils (~5 mg/kg Colwell P at 0-10 cm): Site 1 near Moura with buffel grass (*Pennisetum ciliare*) and Caatinga stylo (*Stylosanthes seabrana*); Site 2 near Wandoan with buffel grass and desmanthus (*Desmanthus spp.*).

At both sites, five rates of P (0, 10, 20, 50 and 100 kg P/ha) were applied during September 2012 and replicated 4 times. These treatments also received a basal rate of potassium (K), sulfur (S) and zinc (Zn) to eliminate other potential soil nutrient deficiencies. A sixth treatment of 100 kg P/ha without K, S, Zn was applied to investigate the responses without these nutrients.

Pasture biomass (grass, legume and total) was measured annually. After each biomass assessment, both trials were reset (by slashing) for the following summer growth season.

## Results

Large increases in pasture biomass with increasing P rates were recorded at both trial sites, peaking at 50kg P/ha. The responses were measured in most, but not all years across the two sites. Legume biomass increased with applied fertiliser by approximately 4 fold at Wandoan and 2 fold at Moura in the first year. At Moura, the high legume growth in the early years resulted in greater grass growth in subsequent years, but to date this effect has not been observed at Wandoan. Pasture biomass was higher with K, S and Zn at Wandoan, but no response was recorded at Moura.

## Conclusion

Desmanthus and Caatinga stylo are highly responsive to P fertiliser on soils with low P supply resulting in higher total pasture productivity. Higher short term legume yield from applied fertiliser resulted in increased grass biomass at Moura in the third and fourth years following application. This is likely to have been due to increased N supply from the legume component of the pasture. Further research is required to identify how often P fertiliser should be applied to maintain pasture responses and to determine whether fertiliser should be broadcast on the surface, drilled or banded into the soil.

## References

Peck G, Chudleigh F, Guppy C, Johnson B and Lawrence D. (2015). Use of phosphorus fertiliser for increased productivity of legume-based sown pastures in the Brigalow Belt region – a review. Meat and Livestock Australia. Sydney, Australia.

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