



Optimising nutrient management for improved productivity and fruit quality in mangoes

This project is led by the Northern Territory Government Department of Primary Industry and Resources in partnership with Queensland University of Technology (QUT). It will use an integrated approach to quantify plant nitrogen (N) demand and cycling through the soil-plant-atmosphere system of mango crops. Management strategies to increase the quantity and quality of mango yields, whilst effectively mitigating loss of N to the environment, will be developed.

Mangoes are a significant tree crop grown in tropical and subtropical climates of Australia. N is essential for mango tree development, fruit production and quality. Presently, only limited data is available for Australian mango growing regions on the relative importance of soil N processes, total N loss from current management practices and profitable use of N in the plant.

The research will use stable isotopes to quantify plant N demand, soil supply and current practice N use efficiency (NUE) to develop best management practices for optimising N fertiliser use, including enhanced efficiency fertilisers (EEF). The project aims to maximise NUE in the Australian mango industry to increase productivity, profitability and good environmental management.

The Research Questions

- What is the dynamic of N concentrations in the different parts of the tree crop plant-soil-atmosphere system across multiple seasons? Where does the applied N go, how can we reduce losses and use N to drive profitable outcomes for mango growers?
- What is the measured utilisation, availability and timing of N released from crop residues and soil organic matter mineralisation? What's the contribution of N mineralisation to the total N demands of mangoes? How does this impact overall mango nutrition? How does this differ between the regions and soils?
- What technologies can growers use to access better information regarding N dynamics and seasonal availability to inform their decisions for a better economic outcome?
- What is the cost effectiveness of EEFs for NT mango soils under a range of temperature and moisture conditions?



Methodology

The project activities are primarily field research based, located at the Coastal Plains Research Station outside Darwin and a number of commercial orchards across the Darwin and Katherine growing regions of the Northern Territory.

1. ¹⁵N and plant residue field trials:
 - Labelled fertiliser ¹⁵N will be used to quantify the inter-annual dynamics of N through the different parts of the mango tree and soil profile including uptake, storage, and remobilisation.
 - ¹⁵N will also be used to determine plant residue N contribution to mineralisation.
 - Loss pathways will be measured with semi-automated chambers to collect ¹⁵N-N₂O, CH₄ and CO₂ produced from the residues and comparison analysis undertaken with a zero residue treatments to determine nitrification, denitrification and decomposition rates in the soil.
2. Field performance of EEFs and laboratory research:
 - Soils from mango orchards across Darwin and Katherine regions will be sampled.
 - Incubation experiments will test the performance of a range of EEF's for these soils under controlled laboratory conditions at QUT's Institute for Future Environments, located in Brisbane.

Extending the outcomes

- The project will work directly through a steering committee comprised of commercial growers which will host annual project partner forums.
- Project activities and outcomes will be promoted and extended at events including regional and national conferences, industry workshops, seminars and farmer focused field days.
- Research findings will be communicated in scientific journals, industry magazines and agricultural media.



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