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# RRRD020: Mineralisation of N within the sugarcane cropping system following legume fallows and its effect on water quality

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## Summary of Issue

- 'New' sugarcane farming system includes a legume crop in a break-year between sugarcane crop cycles
- Legume either as a fallow or harvested for grain
- 'State' of the legume will determine N contribution
- Mineralisation enables the release of N (reduced need for inorganic fertiliser (plant crop)), excess is of concern
- Previous investigations suggest some carry-over to the ratoon crop(s), but availability not well understood
- Quantification of the different N pools has been identified as a research priority (productivity, profitability and environmental implications)





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## Project objectives

1. Review current information / data to establish the current understanding of the N from legume fallow crops within the sugarcane production system
2. Quantify more precisely the amounts of N (organic and mineral) in soil and fallow crop residues found in field trials and in pot experiments
3. Assess the productivity, profitability and environmental implications of using legume-derived N in sugarcane
4. Develop a set of guidelines for managing legume residues and associated sources of N in the sugarcane / legume cropping system and incorporate into the SIX EASY STEPS package





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## Approach: Team, Methods

- Collaborative project: BSES Limited/Queensland DERM
  - 1.4 FTSE: 5 researchers, 1 extension agronomist, 3 technicians
- Desk-top study (current information and recent data)
- Field trials, pot experiments, laboratory investigations
- Field trials: legume 'fallow' crops followed by N rates applied to sugarcane various crops, zero N and un-cropped plots, soil analyses (soil mineral N to depth, carbon fractions), sugarcane/sugar yields, N removal
- Pot experiments:  $^{15}\text{N}$ -labelled fertiliser, fate of legume N
- Incubation studies: N mineralisation / mineralisation potential

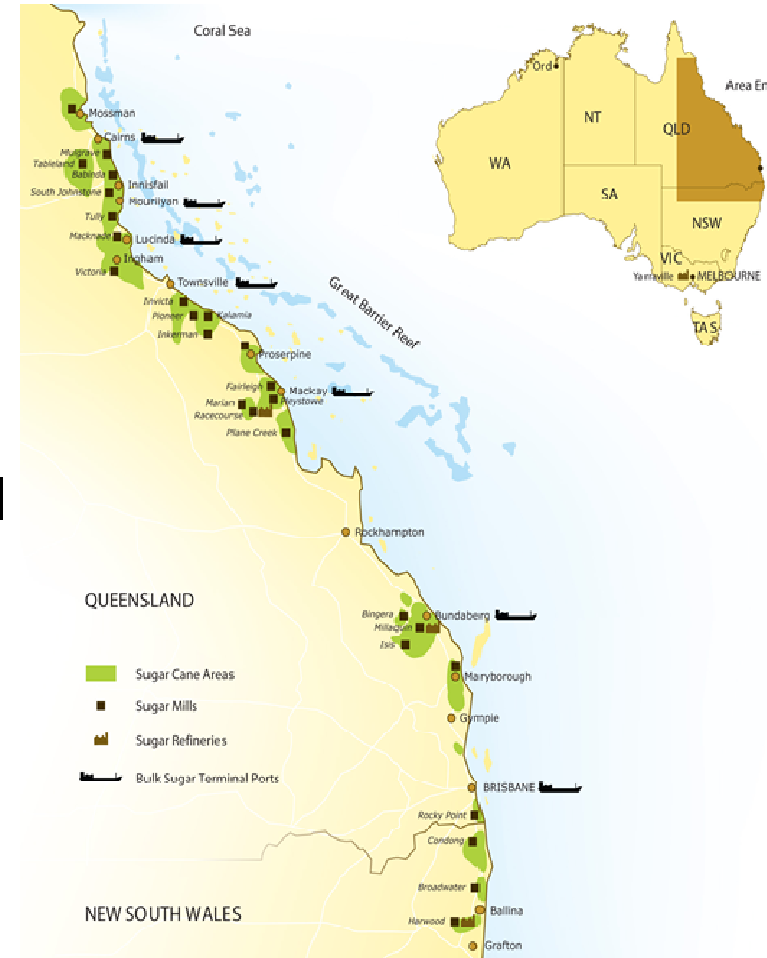




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# Geographic scope

- Relevant to the entire sugarcane industry
- Project will utilise existing field trial sites in the Herbert, Bundaberg and Mackay districts
- Glasshouse pot experiments will be conducted at the BSES Southern Experiments station in Bundaberg
- Appropriate laboratory investigations will be done at the DERM facilities at Dutton Park





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## Outputs

- Knowledge: Improved understanding of N from legume break crops and the potential supply to sugarcane crops (plant, ratoons)
- Products: A set of modified guidelines for managing legume residues / associated sources of N within the sugarcane / legume system; revision of the discounts to fertiliser N inputs; incorporation into the SIX EASY STEPS package
- Skills: Informed decisions by growers and recommendations from advisors when accounting for N from legumes
- Practices: N inputs according to specific to on-farm circumstances





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# Synergies – Reef Rescue & external

- REEF RESCUE:
  - RRRD039 (Integrated assessment of BMP cost-effectiveness and decision tool for regions and landholders)
  - RRRD056 (Evaluating and improving A-class practices to control nutrient losses from sugarcane)
- BSES:
  - Appropriate nutrient management for new farming systems
  - BSS329 (SRDC): Understanding water quality in sugarcane farming systems
- DERM:
  - Reef Regulations
  - Reducing nitrous oxide gas emissions from sugarcane lands
- DEEDI / QAAFI:
  - Impact of management practices on productivity and off-site water quality





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# Management Implications

- More informed decisions on-farm that relate to use of N fertiliser in sugarcane (plant and ratoon crops) following legume fallow crops.
- Contribution to farm productivity (yields) and profitability (partial net returns) - rationalisation of inorganic N fertiliser inputs to subsequent sugarcane crops.
- Environmental implications: appropriate management of N from legumes and potential N losses
- Inputs into SafeGauge for Nutrients (SfN) to enable assessment of the risk of N loss by drainage and/or run-off.





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## End user engagement & delivery

- Sugarcane growers and their advisors
- Industry stakeholders: CANEGROWERS, Australian Sugar Milling Council (ASMC), Australian Cane Farmers Association (ACFA), NRM groups, Queensland and Australian governments
- Communication with, and reports to, industry stakeholders / grower groups / local shed meetings
- Industry-targeted publications: BSES Bulletin, Australian Canegrower
- BSES SIX EASY STEPS package, NutriCalc™, ReefWiseFarming website

