Centre for Agricultural Engineering

Farming Systems Innovation

Vision

To develop integrated solutions that utilise emerging tools and technologies which solve complex challenges and increase farm profitability and productivity.

Overview

The team delivers outcomes by combining agricultural sciences, agricultural inputs and practices, agronomic production databases and precision agriculture technologies to efficiently manage agronomic and livestock production systems.

Our researchers are involved in investigating soil and crop nutrient management efficiencies and effects of fertilisers, treated water from the resource sector and controlled traffic farming on soils and catchments.

Information collected is used to prescribe and deliver site and enterprise specific application of agricultural inputs and management practices in agricultural production systems.

Research Highlights

- We have played a pivotal role in providing ongoing input into the SIX EASY STEPS nutrient management program that is recognised as the basis for best practice nutrient management in the Australian sugar industry. This has included fine tuning nitrogen management guidelines for sugarcane production with the aim of improved productivity and profitability in combination with environmental responsibility. Advances are being sought to incorporate variable rate fertiliser applications as an option for farmers.
- The research team have contributed to the understanding and management of soil health by our involvement in collaborative projects that aim at chemical, biological and physical amelioration of soils that have undergone long-term cropping.
- Through the support of our research partners, we have delivered assessment of controlled traffic farming systems that have identified minimum till farming has the potential to reduce nitrous oxide emissions by 30%, informing carbon farming initiatives.

Research Projects

Funding bodies include industry groups, government entities and private enterprise.

Sugar Research Australia in collaboration with other parties fund a large part of our work with research topics covering:

- Assessment of new management strategies for marginal soils.
- Unravelling the impacts of climate and harvest time on nitrogen fertilizer requirements in partnership with James Cook University and CSIRO.
- SIX EASY STEPS - continuing perspectives in time and space – this program is an integrated nutrient management tool that enables the adoption of best practice nutrient management on-farm.
- Measuring soil health, setting benchmarks and driving practice change in the sugar industry.
- Decision support for informed nitrogen (N) management: Soil mineralisation tests and assessment of soil N contribution to crop requirements inconjuction with Department of Environment and Science.
- How big will that crop be? Incorporating climate forecasting to improve nitrogen (N) management in the wet tropics in partnership with James Cook University.
- Improving nitrogen use efficiency (NUE) for sugarcane with constrained yield potential.

Projects from other funding partners include:

- Optimising nitrogen and water interactions in cotton, funded through Cotton Research and Development Corporation under the Rural R & D for Profit program.
- Macadamia harvest improvement review in partnership with Colere Group and Hort Innovation Australia.
- Modelling/simulation analyses for the Acland cattle grazing trial funded through Outcross/New Hope Group.
- Increasing profitability through improved nitrogen use efficiency and reducing losses of nitrogen in collaboration with Queensland University of Technology and Cotton Research and Development Corporation.
- Development and implementation of site specific tools to reduce herbicide use and herbicide resistance in weeds funded by Department of Agriculture and Water Resources.
- Automated Small Plot Cotton Trial Picker funded through CSIRO.

Research Impact

The impact of research is through facilitation, development and promotion of innovations in farming systems to enhance sustainable production/best management practices (BMPs) at, or with, enterprise scales, particularly in relation to the concept of precision agriculture (PA).

Stagnated productivity and reduced quality of natural resources need to be addressed to ensure agricultural industry viability/expansion. This is dependent on each farming enterprise maintaining/improving its own on-farm resources, using inputs/practices efficiently and minimizing off-site effects. This is only possible with recognition that each enterprise is unique, but with needs for access to new and improved systems, practices and/or technologies. R&D-based solutions and opportunities must adhere to sound principles for adoption at a range of scales.

The team targets a range of agricultural industries: grains, cotton, sugar, horticulture and livestock. It provides a mechanism for researchers to interact and communicate, and encourages collaborative work inclusive of USQ staff and external colleagues/ stakeholders. It aims to deliver realised value from R&D by seeking funding and undertaking work that is in line with best scientific practices that includes multi-facetted analyses (agronomic, economic, social, environmental and cultural).

Want to know more?

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