



Left to Right Soybeans, Adzuki beans, fallow strip

Photograph courtesy of Prof Phil Brown, Central Queensland University

CARBON FARMING CASE STUDY

CROPPING SYSTEMS - GRAIN

CROPPERS TRIAL SOIL AMENDMENTS AND PULSE ROTATIONS TO REDUCE NITROUS OXIDE EMISSIONS

LOCATION

Monto is a small rural town in Queensland, located 190 kilometres inland in the Burnett Mary Region. It is fertile cropping grounds in the Three Moon Creek catchment, which forms part of the headwaters of the Burnett River. Historically, Monto had a strong dairy industry, however as small family run dairies have disappeared, fodder and grain cropping activities have expanded to support larger dairy, piggery and beef enterprises. Agriculture is an intrinsic part of the economic and social fabric of the Monto community.

THE PROJECT

Action on the Ground is an Australian Government funded program supporting advances in emissions reduction technologies and techniques and improved productivity in agriculture. It is designed to assist on-farm trials and demonstration of practices to reduce greenhouse gas emissions and/or carbon stored in the soil.

The trial in Monto is using legume crop rotations and composts to reduce nitrous oxide emissions from grain cropping systems. It incorporates on-farm practices and technologies to improve soil structure, reduce nitrogen fertiliser application, and maintain productivity.

Practices such as

- Integration of legumes such as soy beans, mung beans and adzuki beans
- Using compost
- Minimum tillage practices such as strip tillage
- Using nitrification inhibitors
- Improved irrigation management
- Modifying timing of fertiliser and compost applications

TRIAL DESIGN DETAILS

The trial design of this project allows the project technical panel to assess four key practices.

1. Integrating legume crops into a cereal rotation; Two groups of legume crops are in the trial; a high N fixing crop (soybean) and low N fixing crops (adzuki beans and mung beans).
2. Using nitrification inhibitors; 3,4-dimethyl pyrazole phosphate (DMPP) is being used in this trial applied in a commercial nitrogen fertiliser mix at an application rate either equivalent to the nitrogen fertiliser rate and timing used in the BMP treatments or reduced by 25% from BMP rate.
3. Strip tillage; method where only a small zone or strip is cultivated to prepare the soil for seeding, leaving most of the soil uncultivated and therefore less prone to erosion and loss of soil organic matter. Assessment of emissions from strip tillage will add to the database of N₂O emissions under minimal cultivation practices.
4. Compost additions - compost will be applied prior to planting of the summer legume crop. Compost will be broadcast onto the site prior to planting at a rate of 5 tonnes/hectare.



Left to Right Adzuki bean, Soybean, Adzuki bean. Foreground fallow strip showing nitrous oxide chamber placement
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INTENDED OUTCOMES – INFORMATION, PARTNERSHIPS, OPPORTUNITY

Monto is geographically isolated from large rural centres such as Toowoomba and Bundaberg where agricultural trials have been traditionally held. The Action on the Ground program created an opportunity for local landholders, catchment groups, tertiary institutions and industry stakeholders to become involved in a practical, scientific trial specific to their soil type, rainfall and climate, in their very own backyard.

The project aims to provide local croppers with tangible data and agronomic advice on:

- Dynamics of daily N_2O emissions and cumulative N_2O emissions under different management practices over the fallow and cropping season
- Comparison of annual or seasonal N_2O emissions between the new farming techniques and the conventional management practices (e.g. bare fallow vs. soybean fallow, different soybean residue management practices, displacement of fertiliser N with biologically fixed N, conventional tillage vs. no-till and with/out use of nitrification inhibitor in urea)
- Identification of the best farming system that results in the lowest N_2O emissions without sacrifice of cropping yield
- Analysis of daily N_2O fluxes in relation to major driving factors such as soil mineral N, water content and climatic conditions

This project also lays the foundations for discussions amongst landholders, scientists, agronomists, and natural resource management organisations on sustainable and productive cropping practices.

Project partners include; cropping landholders, the Burnett Catchment Care Association, Central Queensland University, the Department of Science, Information Technology, Innovation and the Arts, the Department of Agriculture Fisheries and Forestry (Qld), the Queensland Alliance for Agriculture and Food Innovation, local agribusinesses – FarmStuff and Wide Bay Composts - and the Burnett Mary Regional Group.

If you are interested further information on the Action on the Ground cropping trial, please contact the **Burnett Mary Regional Group**, PO Box 501 Bundaberg QLD 4670

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