Grains Research Project:
Nitrous Oxide Emissions from Grain Production Systems

This is a research module within the Greenhouse & Climate Change in Agriculture (GCCA) project. GCCA forms a major part of the Non-CO₂ emissions program within the national Cooperative Research Centre for Greenhouse Accounting.

Greenhouse Emissions from Australian Agriculture
Agriculture contributes around 18% of Australia's total net greenhouse emissions. Nitrous oxide and methane are the main gases lost from agricultural systems, being the source of 80% and 60% of the total of these gases, respectively. Nitrous oxide and methane are powerful greenhouse gasse with global warming potentials of 310 and 21 times that of carbon dioxide respectively.

Source of Nitrous Oxide Emissions
In Victoria, sources of nitrous oxide emissions can be traced back to animal excreta (38%), soil disturbance of pastures (28%), N fertiliser addition to soil (20%) and soil disturbance due to cropping (14%). These emissions through the application of N fertiliser are predominantly sourced from the dairy (±54%) and grains (±28%) industries, with horticulture contributing the least (±18%). Emissions of nitrous oxide from dung and urine are again predominantly from the dairy industry (±47%), then the sheep (±30%) and beef sectors (±22%).

In terms of changes between 1990 and 1999, nitrous oxide emissions from N fertiliser in Victoria have increased by 41%, largely driven by the dairy and grains industries, whilst emissions from soil disturbance due to cropping have also increased by 24%.

What Will This Project Deliver To Farmers?
This project aims to provide information on actual nitrous oxide losses from soil, subject to cropping practices that include a range of tillage practices and fertiliser N applications, thus reducing the current uncertainty regarding actual losses.

Information from these investigations will then be used to develop best management practices that improve on-farm efficiency, while reducing nitrous oxide losses. A range of decision support tools will be developed to assist farmers with the implementation of these best management practices. The research will also aim to identify future research needs for the grains industries and ensure that government policy is supported by strong science.
The Research Work
The research site at the Institute of DPI Kyabram involves the use of high tech micro-meteorological equipment capable of real-time measurement of nitrous oxide emissions from larger areas; typically over 300 m in radius. As the equipment is capable highly accurate measurements of continuous losses, this site will allow a greater understanding of the losses following various management strategies, i.e. nitrogen fertiliser application and/or rainfall and irrigation events.

At the DPI Rutherglen Research Institute, automatic chambers will continuously measure small changes in gaseous losses from tillage and fertiliser N treatments.

The data from the two sites will be used to refine and test a number of computer models that will allow the results to be more widely applied to other districts and properties. These computer models will then be used to develop best management practices, tested and proven by the field sites, that can be used by farmers with a high degree of confidence. These best management practices will aim to provide improved nitrogen fertiliser efficiency for farmers, whilst reducing the losses of nitrous oxide to the environment.

Project Delivery to Industry
This GCCA Grains Research Project will deliver strategies for the management of soil and fertiliser applications in the grains industry as part of the Victorian State Government's commitment to 'Greenhouse and Climate Change' referred to in the Victorian Greenhouse Strategy.

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