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A STUDY OF ENVIRONMENTAL AND MANAGEMENT DRIVERS OF NITROUS OXIDE EMISSIONS IN AUSTRALIAN AGRO-ECOSYSTEMS

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Australian climate, soils and agricultural management practices are significantly different from those of the northern hemisphere nations. Consequently, experimental data on greenhouse gas production from European and North American agricultural soils and its interpretation are unlikely to be directly applicable to Australian systems.

A program of studies at five sites of nitrous oxide greenhouse gas emissions from agriculture has been established by the Co-operative Research Centre for Greenhouse Accounting. The study is designed to reduce uncertainty of non-CO_2 greenhouse gas emissions in the Australian National Greenhouse Gas Inventory and provide outputs that will enable better on-farm management practices for reducing nitrous oxide greenhouse gas emissions.

As part of this study are experiments with both chamber and micrometeorological emission measurement techniques which focus on process based studies of emissions and paddock scale emissions respectively. As well there are parallel studies on emission modelling and good practice.

The systems being examined and their locations are irrigated pasture (Kyabram Victoria), irrigated cotton (Narrabri, NSW), irrigated maize (Griffith, NSW), rain-fed wheat (Rutherglen, Victoria) and rain-fed wheat (Cunderdin, WA).

The field studies include treatments with and without fertilizer addition, stubble burning versus stubble retention, conventional cultivation vs direct drilling and crop rotation to determine emission factors and treatment possibilities for best management options.

The data to date indicate that nitrous oxide emission factors (the nitrogen lost as nitrous oxide as a fraction of the fixed nitrogen applied) for inorganic nitrogen fertiliser and urine from animals are profoundly affected by the climatic variations in soil water status and soil temperature. The emission factors are much lower than previously used for rain-fed wheat and significantly higher for irrigated maize with stubble burning. Application of nitrogen fertilizer at different rates to irrigated cotton indicates the non-linear growth in nitrous oxide emissions when nitrogen application exceeds plant uptake requirements. The application of these new emission factors will substantially change the current knowledge of the spatial distribution of nitrous oxide emissions in Australia.

The good practice management options that have been identified so far include stubble retention (in maize), crop rotation in cotton, and matching the nitrogen applied to the crop nitrogen requirements.