Project sheet February 2008

Background:
Greenhouse emissions attributed to agriculture are predominantly sourced from biological processes during the consumption, burning or decay of living and dead biomass via farming activities. Agricultural emissions represented 16.8% of Australia’s total net greenhouse emissions in the 2005 National Greenhouse Gas Inventory, (NGGI).

The main greenhouse gases emitted from agriculture are methane (CH\textsubscript{4}) and nitrous oxide (N\textsubscript{2}O), both powerful gases with 21 and 310 times the global warming potential of carbon dioxide (CO\textsubscript{2}) respectively. Nationally, agriculture is the dominant source of both methane (60%) and nitrous oxide (84%).

Greenhouse in Agriculture (GIA):
The themes of DPI Victoria’s GIA program are to research, develop and communicate understanding of greenhouse gas emissions and cost-effective (win-win) options for the abatement of methane and nitrous oxide from Victorian agricultural systems and to support sound policy development for the representation and management of these emissions by government and the agriculture sector.

Research History: 2000 – ongoing
Initial focus:
- Develop the capability and capacity of DPI Victoria’s research skills in science area
- Define agriculture’s contribution and reduce uncertainty in estimates
- Position program, identify and establish relationships with next-users

Present focus:
- **Abatement**: on-farm technologies that deliver win-win abatement
  - Methane research: feeding, breeding and animal management
  - Nitrous oxide research: fertiliser and soil management
- **Utilisation**: research to support knowledge development and decision making

Currently GIA is working across six key project areas, including:

1. **GIA Nitrous Oxide: A whole farm systems perspective of greenhouse gas emissions from the temperate wheat/sheep zone in Southern Australia**

Using existing long term sites at DPI Horsham and DPI Hamilton this project is assessing and modeling a range of management practices that improve production efficiency while reducing nitrous oxide and carbon loss from mixed (crop/pasture/animal production) farms at a whole farm systems scale. The project will illustrate that managing farming systems to reduce greenhouse gases can lead to multiple benefits of productivity and environmental objectives.

**Project Leader:** John Graham, DPI Hamilton. Email: john.graham@dpi.vic.gov.au

**Researchers:** Dr Roger Armstrong and Dr Sally Officer, DPI Horsham, Kevin Kelly, DPI Kyabram

2. **GIA Methane: Dietary supplements to mitigate methane emissions from ruminant livestock**

Methane is a highly concentrated form of energy; its emission representing a significant loss of energy from dairy production systems that could be used in milk production. GIA Methane is investigating ways the lost energy can be efficiently re-directed back into production providing a win-win outcome of producing more milk while reducing greenhouse emissions. This work will evaluate a range of potential anti-methanogens and rumen modifiers for their ability to abate methane and quantify their effect on production.

**Project Leader:** Dr Chris Grainger, DPI Ellinbank. Email: chris.grainger@dpi.vic.gov.au

**Researchers:** Richard Williams and Tim Clarke, DPI Ellinbank
3. **GIA Genomics: Application of rumen genomics to climate change**
GIA’s Genomics team is undertaking a metagenomic analysis of the rumen microflora aiming to greatly expedite knowledge of the rumen composition and enable the development of research diagnostic tools for the analysis of rumen composition and its relationship to key issues that affect farming systems. The rumen metagenome information will directly enhance many ongoing projects in animal production within DPI Victoria, particularly those associated with the abatement of methane from dairy cattle.

**Project Leader:** Dr Dadna Hartman, DPI Attwood. Email: dadna.hartman@dpi.vic.gov.au

**Researchers:** Drs Carolyn Bath, Jennifer Sexton, Keith Savin, DPI Attwood and the DPI Ellinbank team

4. **GIA Modelling: Modelling methane emissions from different farming systems**
Using the GrassGro and DairyMod models and information from existing farming systems research, this GIA project is modeling methane outputs from livestock grazing across different production techniques to provide benchmarks for farming systems in Victoria relative to production and greenhouse gas emissions.

**Project Leader:** John Graham, DPI Hamilton. Email: john.graham@dpi.vic.gov.au

5. **GIA Breeding: Selection of dairy cows for future farming systems and reduction of methane production**
A DNA test is being developed to estimate the lifetime profitability of dairy cattle under different farming systems, particularly high and low levels of nutrition and temperature. The research team aims to develop a test that could then be used to predict whether a cow is a high or low emitter of methane.

**Project Leader:** Prof Mike Goddard, University of Melbourne and DPI, Attwood. Email: mike.goddard@dpi.vic.gov.au

**Researchers:** Drs Ben Hayes, Amanda Chamberlain, Keith Savin, Phil Bowman, Andrew Mather, Helen McPartlan, Jane Whitley, Jianhui Wang, DPI Attwood.

6. **GIA Communications and Utilisation**
Covering the whole GIA program, this work provides the interface for connecting GIA’s research with stakeholders (investors, partners and end-users) and provides inclusive planning and implementation of communication, engagement, utilisation and evaluation activities.

**Project Leader:** Traci Griffin, DPI Rutherglen. Email: traci.griffin@dpi.vic.gov.au

**Team:** Glenn Morrison, DPI Rutherglen and Sue Keirnan, Communications, DPI Ellinbank

Further Information:
The research web site – [www.greenhouse.unimelb.edu.au](http://www.greenhouse.unimelb.edu.au) for:

* Detailed project descriptions
* Best management practices
* Emission calculators
* Research newsletters

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