



**METHANE TO MARKETS PARTNERSHIP
AGRICULTURE TASKFORCE**

**ANIMAL WASTE MANAGEMENT
COUNTRY SPECIFIC PROFILE**

AUSTRALIA

June 2008

**Methane to Markets – Agriculture Taskforce
Animal Waste Management**

Country Profile – Australia

**The Department of Agriculture, Fisheries and Forestry has prepared this document
in collaboration with the Department of Climate Change and the Department of
Resources, Energy and Tourism**

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COUNTRY PROFILE FOR ANIMAL WASTE MANAGEMENT

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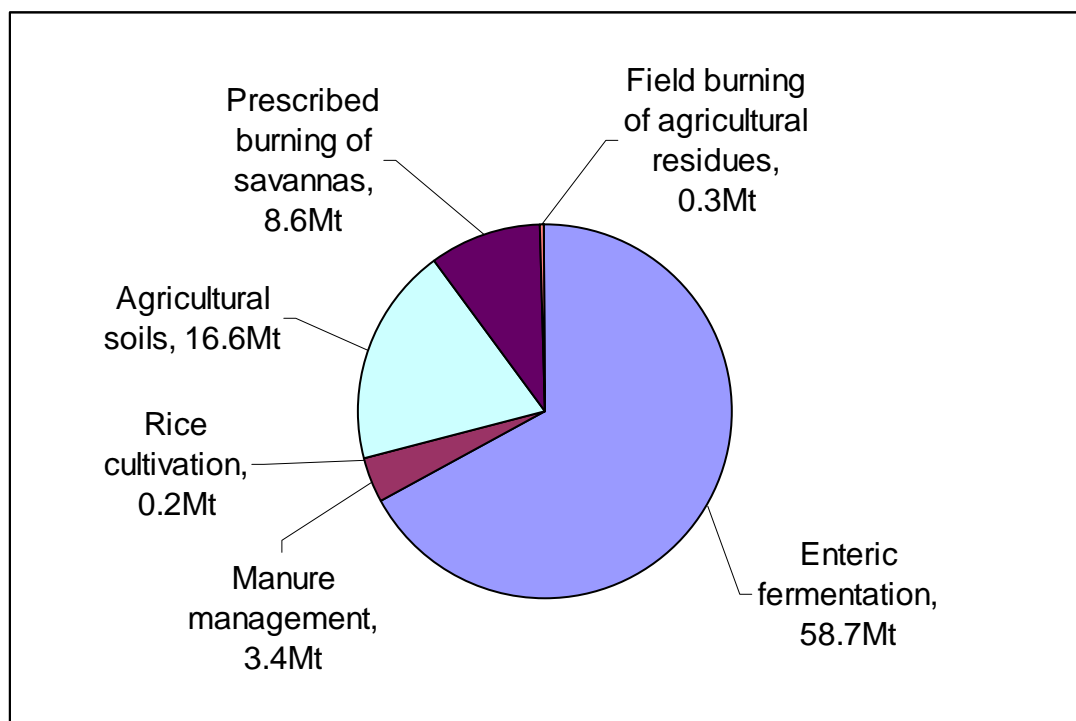
Introduction

On 22 June 2005 the Agriculture Taskforce decided to focus on the methane recovery potential offered by the management of livestock's waste. Members agreed to provide country profiles to describe current practices, relevant policies and programs, challenges and opportunities. In November 2005 the Steering Committee members in the Methane to Market Partnership agreed to formally upgrade the Agriculture Taskforce to Sub-committee status. The following document is an update of Australia's submission to the Agriculture Sub-committee.

1. Australia's Animal Waste Emissions

For 2005, Australia's net greenhouse gas emissions were estimated to be 559.1 million tonnes (Mt) carbon dioxide equivalent (CO₂-e). Australia's emissions from agriculture totaled 87.9 Mt CO₂-e, accounting for 15.7 per cent of total national greenhouse gas emissions¹.

Agriculture sector emissions in 2005
Total 87.9 Mt CO₂-e



¹ Latest emissions data at time of drafting from Australia's 2005 National Greenhouse Gas Inventory www.climatechange.gov.au/inventory/index.html

Greenhouse gas emissions from livestock activities are the sum of the enteric fermentation and manure management sub-sectors. Livestock emissions were 62.1 Mt CO₂-e in 2005, which represents 70.7 per cent of the agriculture sector's emissions and 11.1 per cent of net national emissions. The majority of these emissions are from enteric fermentation at 58.7 Mt.

Methane emissions from cattle and pig manure management represent a small percentage (less than 5 per cent) of the agricultural emissions profile.

Australia's Animal Waste Management Practices

Various animal waste management practices are used in Australia. These range from land application of treated manure, either as solid or as liquid fertiliser, to storage of dry matter or liquid effluent before their final disposal (including application onto land as fertilizer).

At feedlots, solid cattle manure is usually composted in open air facilities, and sold as fertiliser. This allows the enterprise to recover some of the manure handling costs. Some facilities have in place environmental management programs covering on-site waste management that include recycling water and runoff from the feedlot. Effluent is channeled to settling tanks where the water is then filtered off and pumped back to irrigate paddocks.

Waste from pig and dairy farms is typically lagooned. Large piggeries are implementing management systems of wet effluent that involve converting manure to methane, which is normally aerated, or flared to produce carbon dioxide.

Methane Recovery and Use

Methane recovery from animal waste is currently not widely practiced in Australia, due mainly to the large capital costs involved.

Currently, only one large Australian pig farm has an anaerobic digester from which methane gas is obtained as a heat source to generate electricity (see details in Box 1 at page 4). There are also a number of larger enterprises which capture and flare off the methane and strong interest to find cost effective applications for methane recovered from waste management systems. Various research projects with commercial potential are currently underway.

Key stakeholders are farmers, farm organizations, research groups, utilities and government agencies.

2. National Opportunities and Potential for Implementing Animal Waste Methane Recovery and Use Projects

There are over 120,000 rural enterprises in Australia with a mix of production systems that provide greenhouse gas sources. Effluent from pig farms, cattle feedlots and dairy farms appear to offer immediate potential to harvest methane to produce biogas for

electricity generation. Feedlots currently generate over 10 million tonnes of manure every year.

Methane recovery requires a high capital investment. The high cost of methane digesters is a major barrier to harnessing this potential with the conversion of waste into renewable energy not yet economically feasible for all but the largest facilities. In addition the relatively low cost of energy from traditional sources (fossil fuels) is a significant factor delaying the growth of competitive and sustainable bioenergy alternatives.

The Methane to Markets in Australian Agriculture program was established in 2007 by a collaboration of the Australian Government and Research and Development Corporations representing intensive livestock industries. The aim of the program is to encourage and enable development, adaptation and use of methane capture and use technology in Australia's intensive livestock industries through:

1. development and adaptation of methane capture and use technology for application in the Australian intensive livestock industry
2. reduction on uncertainty, risk and cost of installing methane capture and use systems
3. effective communication of project outcomes
4. facilitating the commercialisation of on-farm systems for methane capture and use technology.

Since its inception the program has commissioned three desk-top studies into:

- the current status of research in the field in Australia and NZ
- the technologies and models available and their suitability
- the regulations and costs of biogas flares in Australia.

These three research studies were identified as key background issues for the sector in Australia and a starting point for further research and program development. The final reports will be released by the Rural Industries Research and Development Corporation² for publication.

A series of monitoring studies/ demonstration sites are being established to study and pilot methane capture and use technology for broader application. The program has

- initiated a study monitoring the actual performance of an existing covered lagoon at a piggery in Victoria
- planned additional studies to use the actual performance data from the Victorian site plus a piggery in Western Australia to validate a model developed at the University of Queensland
- planned two additional demonstration sites, one dairy in Victoria and one piggery in Queensland
- sought research opportunities for methane capture and use in the cattle feedlot industry.

The Program is co-sponsoring a PhD student with the University of Queensland involving the development and fitting of biological and physical-chemical models to the anaerobic digestion of wastes from the study sites. These models will enable the sizing of

²www.rirdc.gov.au

digesters for various substrates; the prediction of biogas composition; and the sizing for biogas scrubbing equipment.

The Australian Government has also supported investigation into the technical and economic feasibility of converting pig waste to electricity. The report by Australian Pork Ltd seeks to provide the pig industry with an economic and financial framework to assess the commercial viability of investing in an electricity generating plant utilising biogas generated from pig farming. The report provides a simple model which can be used by piggeries of all sizes as a starting point in assessing the viability of introducing enhanced management of the piggery waste stream, focusing on using the waste for the generation of electricity. The study results are being promoted to Australian Pork members, electricity utilities and the financial sector.³

At present, while there is only one establishment in Australia producing biogas for electricity generation, the Berrybank Farm Piggery in Victoria (see details in Box 1 below), interest is growing.

Box 1: Berrybank Farm Piggery, Ballarat (Victoria)⁴

Berrybank Farm Piggery produces biogas from the anaerobic digestion of piggery effluent. This operation is part of a waste recycling system that cost \$2 million to install and was repaid in five years through sales of the products and efficiency savings. Products of the recycling system are electricity, water, solid organic matter and gritty matter.

Electricity is generated on the site from the conversion of biogas (from the breakdown of pig effluent) into heat. The electricity is used on the farm and sold to the national power grid.

Water is removed from the effluent at various points in the recycling process. Mineralised water is used to irrigate and fertilise the fields surrounding the pig farm. Cleaner water is used daily to flush out the pig pens. Gritty matter contained in the effluent is removed early in the recycling process and sold to a worm farm as worm food. The final product of the recycling process is solid organic matter resembling soil which is mixed with bark, minerals and other substances to be sold as garden products such as potting mix, fertiliser and compost mixture.

Australian Government Policies

The Australian Government has in place a range of policies and programs that can provide support, either directly or indirectly, for methane recovery and use activities. Some of these relating to climate change and renewable energy are outlined below.

Action in Australia

The Australian Government has embraced a comprehensive plan of action to reduce national emissions. Key elements include:

³ For a copy of the report see: www.australianpork.com.au

⁴ For more detail see www.ballarat.edu.au/projects/ensu/case_studies/piggery/

- **A commitment to reduce Australia's greenhouse gas emissions by 60 per cent on 2000 levels by 2050**

The Garnaut Climate Change Review is an independent study commissioned by Australia's State and Territory Governments with the confirmed participation of the Australian Government.

The Review will examine the impacts of climate change on the Australian economy, and recommend medium to long-term policies and policy frameworks to improve the prospects for sustainable prosperity.

Along with modeling undertaken by the Treasury and other analysis, this will support the government in determining short-term and medium-term targets to get to our 2050 goal.

- **Implementing a comprehensive emissions trading scheme by 2010**

The Australian government intends to implement emissions trading by 2010, however, the issue about whether the agricultural sector will be included and if so under what timeframe is being considered.

- **Setting a 20 per cent target for renewable energy by 2020 to dramatically expand the use of renewable energy**

Renewable energy sources such as wind and solar will be a key part of the global solution, and Australia has vast potential in these key areas.

- **Investing in research and development on low emissions technologies**

Tackling climate change will require a wide range of appropriate technologies, including clean fossil fuels, biofuels, hydrogen and energy efficiency.

The Government is investing heavily to tackle climate change through projects with a focus on productivity and innovation.

- **Managing our land to reduce emissions**

The Government will work with farmers to encourage sustainable farming practices that reduce emissions and develop carbon sinks.

An action plan for the agricultural sector has been developed to provide a focus for national efforts to mitigate greenhouse gas emissions, adapt to climate variability, protect the natural resources base and maintain/increase the sustainability and profitability of the agricultural sector.

The *National Agriculture and Climate Change Action Plan 2006-2009*⁵ was officially launched in August 2006 and specifically recognises the role that methane capture and use can play in reducing emissions from agricultural systems and advocates research and development into this discipline.

Climate change is an important issue for the agricultural sector: agriculture is a significant emitter with potential to achieve abatement and is also a sector most at risk to climate impacts. As part of developing cost-effective adaptation strategies, opportunities

⁵ www.daff.gov.au/natural-resources/climate

for sustainable development of new industries will also be fostered. The use of biomass for renewable energy/fuel production is one possible approach.

Due to the high costs of animal waste management and disposal, there is strong interest among livestock producers and abattoirs to find cost effective options. A number of commercially sensitive projects are currently being conducted for dairy, feedlots and piggeries.

Funding Programs

*Australia's Farming Future*⁶ was announced as part of the government's Plan for Primary Industries and will assist Australian primary industry sectors to adapt and respond to climate change. The initiative comprises three programs:

1. Climate Change Productivity and Research Program

The Climate Change and Productivity Research Program will fund research and development activities to assist the agriculture sector to manage emissions and encourage on-farm adaptation and adjustment to climate change. Funding will be provided for research projects and on-farm demonstration pilots that significantly contribute to reducing emissions and improving adaptive capacity and encourage collaboration across research organisations and jurisdictions to ensure cross sectoral application.

2. Climate Change Adaptation Partnerships Program

Through the Climate Change Adaptation Partnerships Program the Australian Government will work with research and development organisations, state governments and industry bodies to provide a framework for primary industries to adapt to climate change and manage their emissions. Funding will be provided for:

- Research, development and demonstration
- communications and awareness raising
- targeted training.

3. Climate Change Adjustment Program

The Climate Change Adjustment Program will assist Australia's primary producers adapt and adjust to the impacts of climate change. Assistance will be provided for:

- targeted training activities
- individually tailored adjustment advice
- assistance to farmers who decide to leave farming.

Measures will primarily be delivered under guidelines and eligibility criteria that link long term primary production viability to climate change.

Implementation of these programs will give practical expression to the government's election commitment to fast-track implementation of the *National Agriculture and Climate Change Action Plan 2006-2009*. Program funding will commence on 1 July 2008.

Other major funding programs relevant to agricultural waste methane recovery include:

⁶ www.daff.gov.au/agriculture-food/australias-farming-future

- The Methane to Markets Programme in Australian Agriculture is a collaborative research program that seeks to lower agricultural greenhouse gas emissions by capturing and using methane for energy generation. The program will adapt for Australian conditions technology already in use in intensive animal production systems in a number of other countries, including the United States, United Kingdom and Canada. The captured methane generated from the waste can be used for industrial heating and drying or, alternatively, for electricity generation to supply power grids. The Programme was launched in June 2007 with a \$1 million contribution from the Australian Government and a further \$1.25 million from a range of industry partners and forms part of Australia's commitment to the international Methane to Markets Partnership.
- Rural research and development corporations and companies (RDCs) which are partnerships between industry and the Government. There are currently 15 RDCs commissioning research and making the results available for adoption. This means primary industries R&D and innovation in Australia are largely driven by industry demand. The Government helps fund the RDCs by matching industry levies up to 0.5 per cent of a particular industry's gross value of production. For 2005-06, the combined industry and Australian Government investment is forecast to provide \$438 million for rural R&D, making it one of the largest programs in the agriculture portfolio.

Further information on Australian government programs and strategies to encourage renewable energy in Australia can be found at the Department of Climate Change⁷, Department of the Environment, Water, Heritage and the Arts⁸ and Department of Agriculture, Fisheries and Forestry web sites.⁹

3. Australia's Objectives in Developing New Methane Projects

Australia's objectives for developing methane capture and use projects are based on focus area two on the *National Agriculture and Climate Change Action Plan 2006-2009*:

Focus Area Two

Mitigation- to reduce greenhouse gas emissions from agriculture, particularly for multiple benefits.

Strategy 2.1

Reduce emissions from agricultural systems and explore further opportunities to promote improved efficiency.

Actions

2.1.1 Evaluate and promote current best management practices for methane and nitrogen management in agriculture, including capture and use for multiple benefits.

⁷ Australian Government Department of Climate Change www.climatechange.gov.au.

⁸ Australian Government Department of the Environment, Water, Heritage and the Arts www.environment.gov.au

⁹ Australian Government Department of Agriculture, Fisheries and Forestry www.daff.gov.au.

These objectives can be met through practical and concrete actions to deploy existing technologies leading to methane capture and use. The increased use of methane as an energy source has the additional benefit of diversifying Australia's energy supply.

As noted earlier, at present the high cost of converting animal waste into renewable energy is a barrier to additional projects in Australia.

Financing Options:

There are no financing options that are specific to methane recovery, however recovery and use of methane from animal waste management may be eligible for funding under the Australian programs listed above.

Current cooperation among countries or non-governmental organizations

Australia is actively involved in a number of international fora to promote the uptake of renewable energy and increase exports, including international bilateral meetings and the Asia Pacific Economic Cooperation (APEC). Industry and government also collaborate through the Australian Renewable Energy Export Network, to increase Australia's success in exporting renewable energy technologies and services abroad. Australia is a member of the Renewable Energy and Energy Efficiency Partnership (REEEP), a global partnership that structures policy initiatives for clean energy markets and facilitates financing for energy projects.

Australia participates in the International Energy Agency Implementing Agreement on Bioenergy, through Bioenergy Australia. One of IEA's 40 Implementing Agreements, IEA Bioenergy¹⁰ aims to develop cost-effective and sustainable opportunities to increase the use of biomass with the potential to meet 50 per cent of global energy demand this century.

Australia is a signatory, together with the USA, South Korea, China, India, Japan and Canada to the Asia-Pacific Partnership on Clean Development and Climate initiative. This partnership supports action to reduce emissions through technology development and innovation.

Australia also has a number of bilateral climate change partnerships (with the United States, China, New Zealand, the European Union, Japan and South Africa) and bilateral energy partnerships (with the United States, China, Japan, Korea, Taiwan, Indonesia, the Philippines, India and Mexico), which may provide opportunities to pursue joint animal waste projects in the future.¹¹

Country Priorities

Through the Partnership Australia is seeking:

¹⁰ www.ieabioenergy.com/IEABioenergy.php.

¹¹ For more information on Australia's greenhouse-related partnerships, see: www.climatechange.gov.au/international/partnerships/index.html

- Access to state-of-the-art methane recovery technology to improve the efficiency and profitability of farming operations and contribute to the abatement of methane gas emissions.
- Development opportunities for the Australian renewable energy industry to participate in methane projects in other countries, thereby transferring expertise and technology built up through practical experience in Australia.

As noted previously, there are a number of technological and economic barriers to the implementation and uptake of increased methane capture and use in Australia. We are looking forward to working with M2M Partners to:

- Improve economies of scale and reduce operating costs to make methane projects more competitive with conventional energy generation. Achieving lower prices is a key objective of the Australian renewable energy industry through targeted innovation, achieving economies of scale and managing raw material and processing costs.
- Develop more effective technologies and practices for capturing methane.
- Attract additional foreign investment in methane projects. Foreign direct investment would enhance Australia's renewable energy industry by stimulating growth and development, financing capital needs, boosting jobs, and enabling technology transfer.

4. Conclusions and Observations

Currently methane harvesting for power generation is not widely practiced by Australia's livestock sector. The industry is nevertheless keen to find novel and cost effective approaches to animal waste management, as methane recovery has the potential to be part of efficient and profitable waste management systems. Major impediments are the high capital investment required and the availability of low cost energy from traditional sources.

In addition to industry's interest, there is also world class research capability and significant Government support to promote renewable energy's uptake and to advance sustainable and profitable agricultural activities.