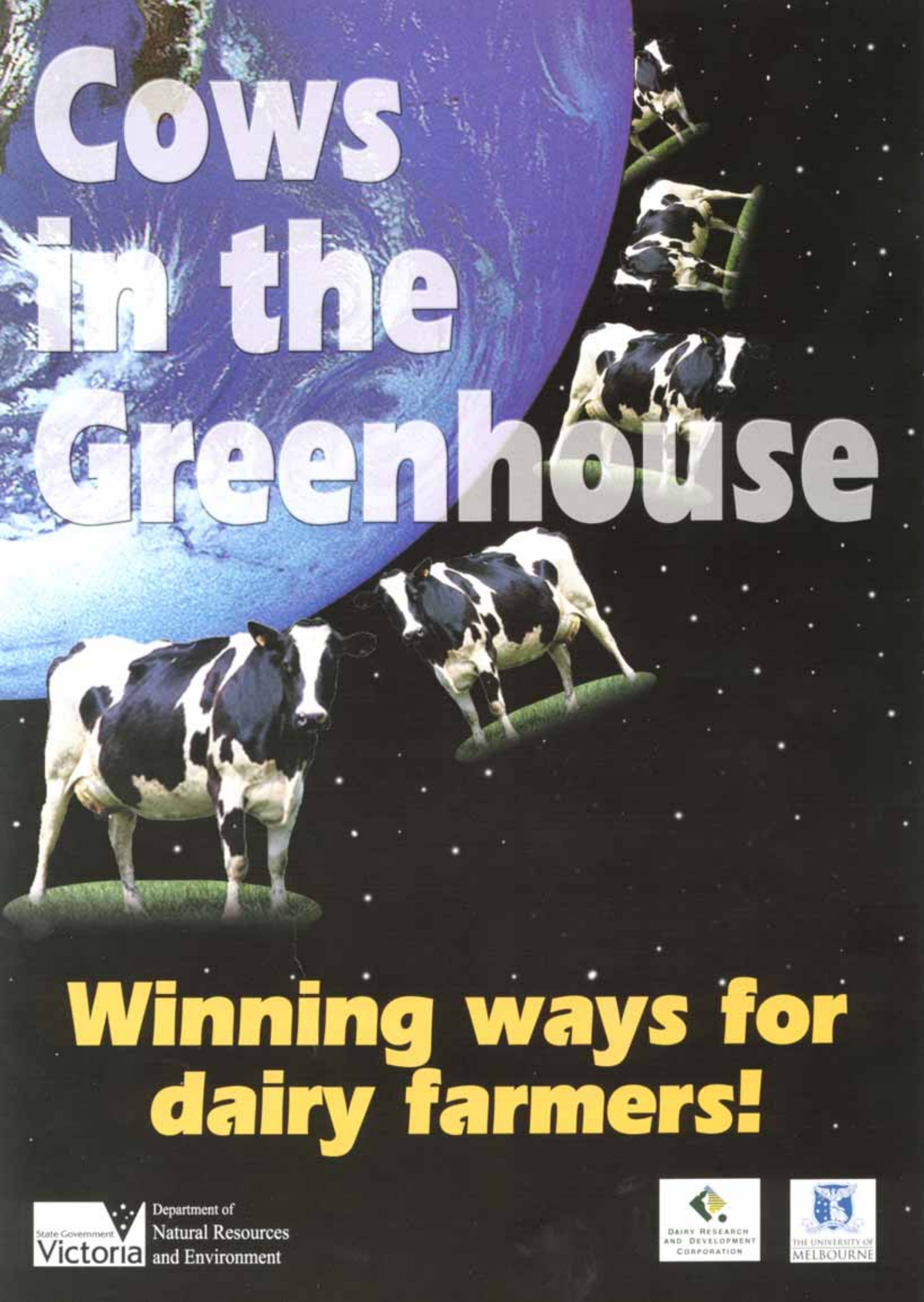


State Government Victoria
Department of Natural Resources and Environment
Dairy Research and Development Corporation
The University of Melbourne

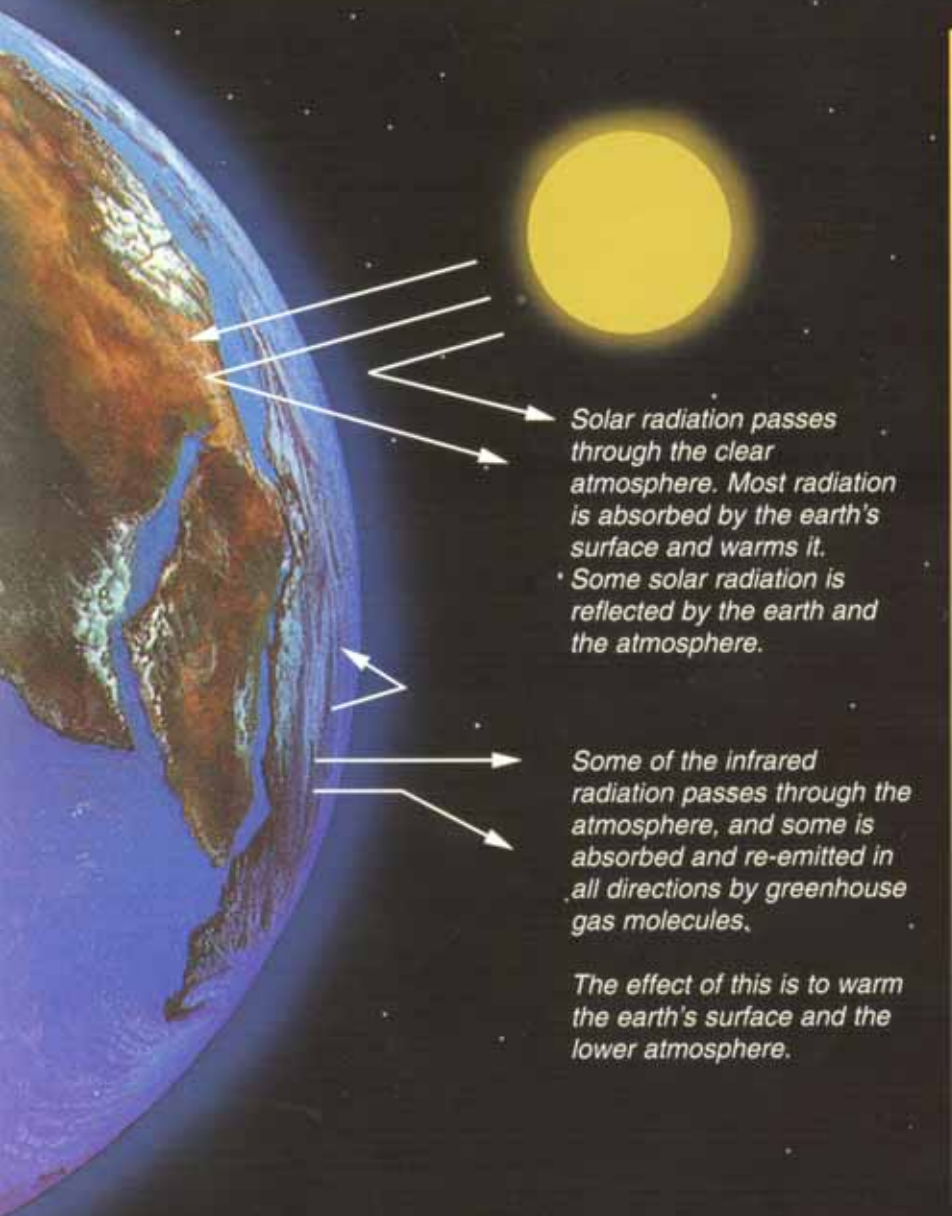
Most dairy farmers will have heard of global warming, greenhouse gas emissions and, closer to home, 'burp taxes' for cows belching methane. While it is still too early to predict exactly how policies to reduce greenhouse gas emissions may affect our future, it is clear that we all need to play our part to minimise our impacts on the environment.

The implications of greenhouse mean that we have to start thinking about ways to ensure that we leave a viable agricultural industry for the next generation that is economically, socially and environmentally sustainable.

If we do not act on global warming, climate change could impact on the viability of farming in many areas of Australia.

What is Greenhouse?

Greenhouse gases act to absorb the sun's heat and thus warm the atmosphere. If we increase the concentration of these heat-absorbing gases, the atmosphere then warms up which results in global warming, hence the term "Greenhouse".



Solar radiation passes through the clear atmosphere. Most radiation is absorbed by the earth's surface and warms it. Some solar radiation is reflected by the earth and the atmosphere.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules.

The effect of this is to warm the earth's surface and the lower atmosphere.

The two main sources of greenhouse gas on dairy farms are:

1. Enteric Methane Gas
This is generated by a group of microbes in cow rumens called *methanogens* and is "burped out" by cows.

Methane losses increase when cows are fed poor quality diets. Cows need to be fed high quality pasture, balanced with high-energy supplements to minimise the production of methane.

2. Nitrous Oxide from soils
More commonly known as *happy gas*, this gas is released when soil microbes convert soil nitrogen into nitrous oxide. This soil nitrogen can come from fertiliser, legumes, soil organic matter and animal excreta.

Nitrous oxide emissions increase through poor nitrogen fertiliser management. Farmers need to avoid high rates of nitrogen fertiliser and high stocking rates on water logged soils, especially when soil temperatures are above 10°C.

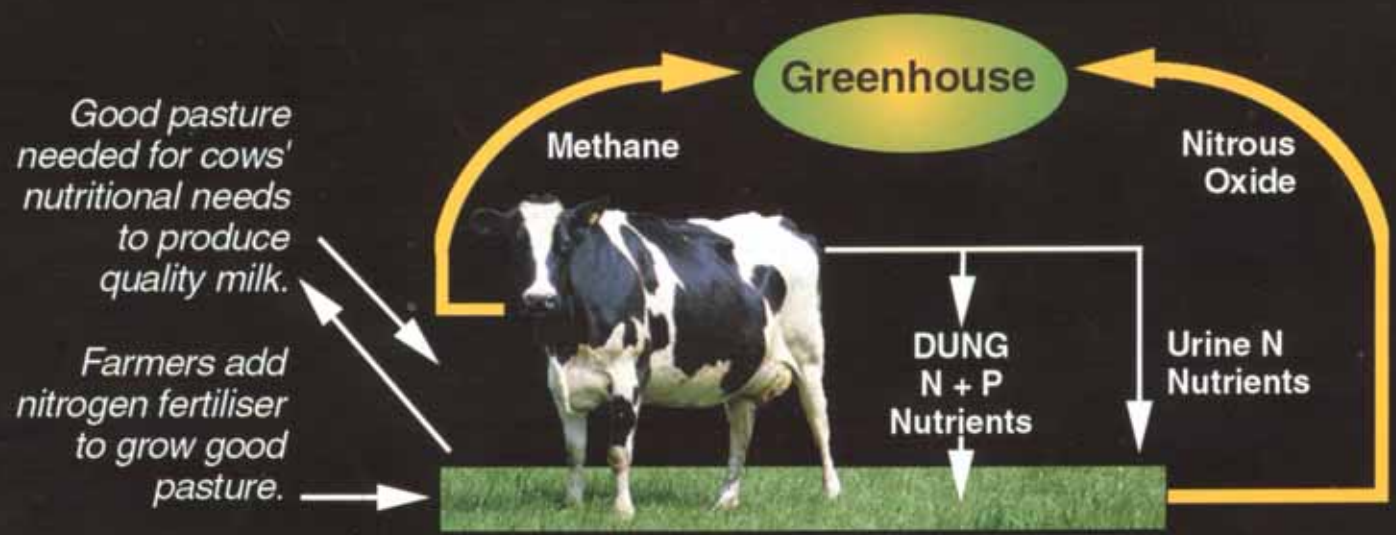
"By applying current best management practices for grazing management, balanced dairy cow nutrition and best practice for nitrogen fertiliser management, we can reduce both methane and nitrous oxide losses and improve the efficiency of dairy production."

Why does the Australian dairy industry need to act on reducing greenhouse gas emissions?

More than 30% of Australia's total greenhouse emissions are due to methane and nitrous oxide originating largely from agriculture.

The Australian Dairy Industry contributes around 12% of all greenhouse gas emissions from agriculture in Australia. Although this is only 2 to 3% of national greenhouse gas emissions, the dairy industry is the largest source of both methane (± 40%) and nitrous oxide (± 47%) in south eastern Australia.

Greenhouse gas emissions have not grown in most agricultural industries. However, emissions from the dairy industry have increased by 22% since 1990 - an increase that will not escape notice on local or international markets. Increasingly, global markets will be seeking evidence of "green" production systems and "greenhouse friendly" produce.



Greenhouse Gas: Winning ways for dairy farmers

You've heard about the possible implications of the Kyoto Protocol, so how can farmers still come out as winners here? By viewing "methane losses" as an opportunity instead of a threat means that dairy farmers can potentially:

- plug an inefficiency in our current production system, and
- make more milk (at a minimum, by just being more efficient in converting feed to milk).

The Win-Win opportunities

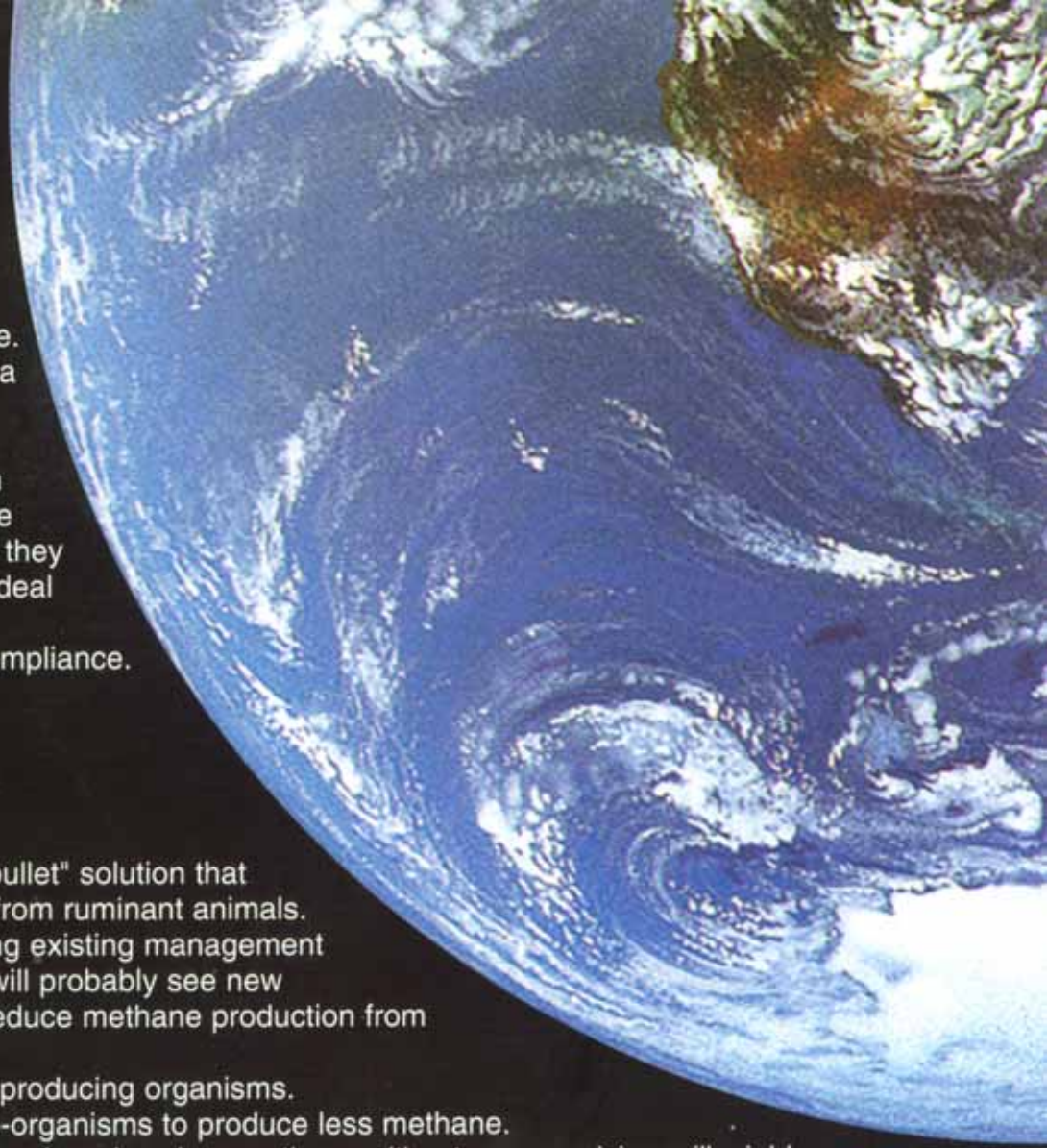
Methane is a very concentrated form of energy - just light it and find out! It stands to reason that if we can reduce the amount of methane released by cows, we should be able to redirect that energy back into extra milk, or at least less wasted forage. The result is an efficiency gain.

If, in the future, cost of production is affected by greenhouse gas emissions, action taken now to reduce nitrous oxide, methane and carbon dioxide emissions from farm enterprises, will position farmers to easily minimise these possible future costs and at the same time maximise productivity now.

These are Win-Win opportunities for dairy farmers!

Accepting the challenge

If we accept the challenge, our Australian Dairy industry will be able to position itself as a preferred supplier of "greenhouse friendly" produce. Although this does not seem a big advantage right now, it's worth considering that New Zealand, the European Union and Japan have all ratified the Kyoto Protocol, meaning that they may choose to preferentially deal with markets that have also demonstrated greenhouse compliance.



The hi-tech future

Currently, there is no "silver bullet" solution that reduces methane emissions from ruminant animals. However, as well as optimising existing management practices, the next 10 years will probably see new technological solutions that reduce methane production from dairy cows, for example:

- A vaccine against methane producing organisms.
- Modification of rumen micro-organisms to produce less methane.
- Breeding cows that eat less and produce less methane without compromising milk yield.

Over the next few years, researchers will be measuring greenhouse gas emissions from dairy farming systems and developing the tools and technologies farmers will need to reduce these losses without threatening profitability.

Contacts and more information

For more information on what you can do now, see our article on Best Management Practices for Reducing Greenhouse Gas Emissions from Dairy Farms under "On-line Articles" at www.nitrogen.landfood.unimelb.edu.au. See also the Target 10 website - Greenhouse Accounting Decision Support Framework on www.target10.com.au/greenhousesite

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Best management practices for reducing greenhouse gas emissions from dairy farms

Try to avoid excess nitrogen in the soil

- Do you need to apply nitrogen fertiliser? Before each nitrogen application, compare the cost of the extra pasture produced to the cost of other feed options.
- Only apply nitrogen when pasture is actively growing and can utilise the nitrogen.
- Avoid heavy stock numbers on a single paddock when soils are waterlogged, as this will result in significant urinary deposition in a small area, with pugged soils being typically anaerobic thus losing more nitrous oxide.
- Avoid high nitrogen fertiliser rates. Do not apply above 50 to 60 kg nitrogen/ha in any single application and do not apply nitrogen closer than 21 (30 kg nitrogen/ha in spring) to 28 (50 kg nitrogen/ha) days apart, as this will increase nitrogen losses dramatically.

Nitrous oxide losses are highest on warm and water logged soils, so:

- Avoid high nitrogen rates on waterlogged soils, particularly if soil temperatures are above 10°C, as this will increase losses.
- When soils are near field capacity (July to September), avoid applying nitrogen fertiliser before heavy rainfall and for at least two to five days after heavy rains depending on how readily the soils drain. If nitrogen must be applied, then apply lighter rates of nitrogen.

Avoid applying nitrate sources of nitrogen to wet soils

- Currently, the cheapest straight source of nitrogen is urea and DAP is the cheapest mixed source of nitrogen. These sources should result in less denitrification and leaching in cold, wet and waterlogged soils.

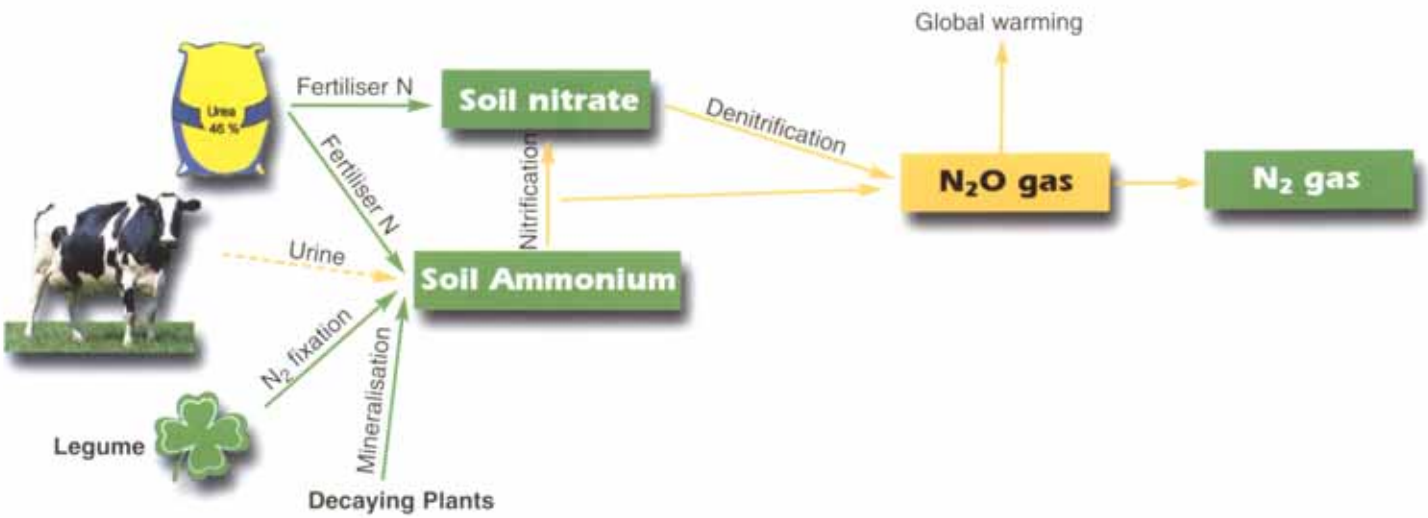
Nitrification inhibitors

- A number of coatings can be applied to nitrogen fertilisers that will eliminate nitrous oxide losses directly from fertiliser. It is likely that these coatings will become common practice in the future. However, these coatings have no effect on losses from legumes and urine.

Nitrous oxide

The following Best Management Practices were developed to both minimise the environmental impact and optimise the economic response to nitrogen fertiliser:

Sources of soil nitrogen and the loss of nitrous oxide from dairy pasture

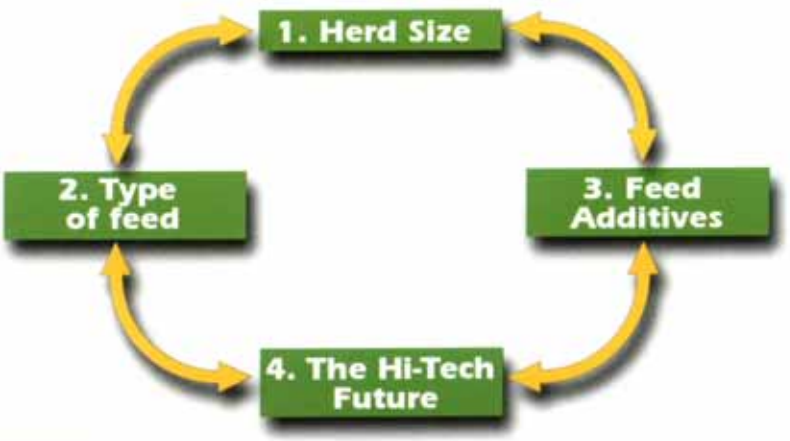


Best management practices for reducing greenhouse gas emissions from dairy farms

Dairy farmers can minimise greenhouse gas emissions by improving the overall efficiency of their current system; this is entirely consistent with all current best management practices available for increasing milk production efficiency.

Methane

Methane is a very high form of energy; thus, any loss of methane from dairy cows represents a loss in potential production. As a rule, methane emissions are reduced as digestibility and the protein/energy balance of the diet is improved.



Feed your cows well

Offering higher quality pasture (ie Ryegrass rather than Setaria or Paspalum) will result in higher milk production and more methane per cow, but less methane per litre of milk. Adding a low protein, high-energy cereal grain to this diet acidifies the rumen, restricting methane producing rumen microbes further, while producing more milk.

Feed additives or rumen modifiers

Until further research is done, it is too early to endorse any specific feed additives or rumen modifiers that could reduce methane. However, it is highly likely that such agents will be commonly available in the near future.

Need more information?

See our project web site www.nitrogen.landfood.unimelb.edu.au for articles and decision support tools for both nitrogen fertiliser and Greenhouse Accounting.

For general information on greenhouse issues, and to find out what action the Victorian Government is taking to reduce emissions and deal with climate change, visit the Government's greenhouse website at: **www.greenhouse.vic.gov.au**

ISBN 1 74106 325 6