Greenhouse gas accounting

Australian Dairy Carbon Calculator

This fact sheet is part of the Profitable Dairying series - *Good business management reduces greenhouse gas emissions.*

The Australian dairy industry has committed to reducing greenhouse gas emissions intensity (emissions per litre of milk produced) by 30% by 2020.

Emissions intensity for agriculture is the amount of emissions per unit of product. For the dairy industry, this can be reported several ways such as kilogram of carbon dioxide equivalent per litre (kg CO_2e per L) of milk, per kg of milk solids (MS) or per kg of fat and protein corrected milk (FPCM).

What is the Australian Dairy Carbon Calculator?

The Australian dairy industry has developed a greenhouse gas accounting tool called the Australian Dairy Carbon Calculator (previously known as the Dairy Greenhouse gas Abatement Strategies – DGAS).

Following the input of farm data, the carbon calculator provides a breakdown of emissions sources, as well as information on the emissions intensity per litre of milk and potential abatement strategies.

Measuring actual emissions on farm is expensive and time consuming so the carbon calculator is used to estimate on farm emissions. It can also be used to estimate the impact of changes in management practices (e.g. using nitrous oxide inhibitors) on emissions intensity.

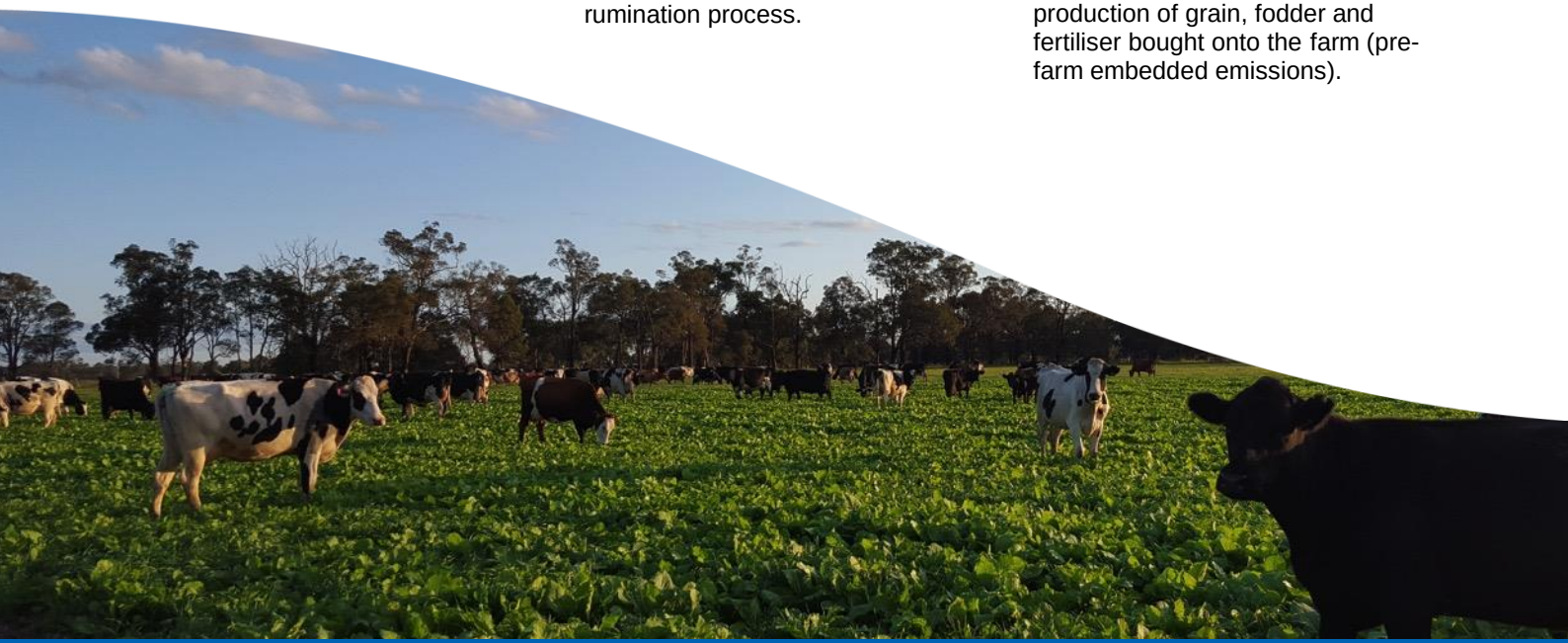
Emissions sources from dairy farms

The major source of greenhouse gas emissions on dairy farms is enteric methane (CH_4) produced by methanogen bacteria in the rumen (~55% of emissions). This methane is burped out by cows as part of the rumination process.

Karen Christie, Tasmanian Institute of Agriculture, co-developer of the dairy greenhouse gas accounting tool

Methane and nitrous oxide (N_2O) from animal manure is the second largest source of emissions. N_2O is emitted in the breakdown of nitrogen from dung and urine deposited in the paddock and N fertiliser applied to the paddock. N_2O and CH_4 are also produced from dairy effluent management systems.

Carbon dioxide (CO_2) is emitted from farm diesel consumption and coal-fired power stations used to generate electricity used on dairy farms. There are also emissions associated with production of grain, fodder and fertiliser bought onto the farm (pre-farm embedded emissions).



Emissions intensity

Emissions intensity for agriculture is the amount of emissions per unit of product. For the dairy industry, this can be reported several ways such as kilogram of carbon dioxide equivalent per litre (kg CO_2e per L) of milk, per kg of milk solids (MS) or per kg of fat and protein corrected milk (FPCM). Fat and protein corrected milk is used to compare milk with different components.

Average emissions for a pasture based, 400-500 cow dairy farm are around 2,500 t CO_2e per annum. This is roughly equivalent to the emissions from a jumbo jet flying Melbourne to London return. To compare farms producing differing amounts of milk, emissions intensity is calculated by dividing total emissions by the amount of fat and protein corrected milk (FPCM; standard of 4.0% fat and 3.3% protein). An average pasture based dairy farm with 400-500 cows has emissions intensity in the order of 1 kg CO_2e/ kg FPCM, which is similar to 1 kg CO_2e/ L milk or 13.5 kg CO_2e/ kg MS.

How to reduce emissions intensity on-farm

There are two options to greenhouse gas emissions intensity – either reduce the absolute emissions per unit of product or increase the amount of product produced from the same level of inputs (increased efficiency). For example increasing the percentage of renewable energy utilised will reduce absolute emissions per unit of product. Alternatively, increasing feed utilisation efficiency will increase milk production per hectare and/or per cow which will reduce the greenhouse gas emissions intensity per unit of product.

Some of the options for reducing on-farm greenhouse gas emissions include:

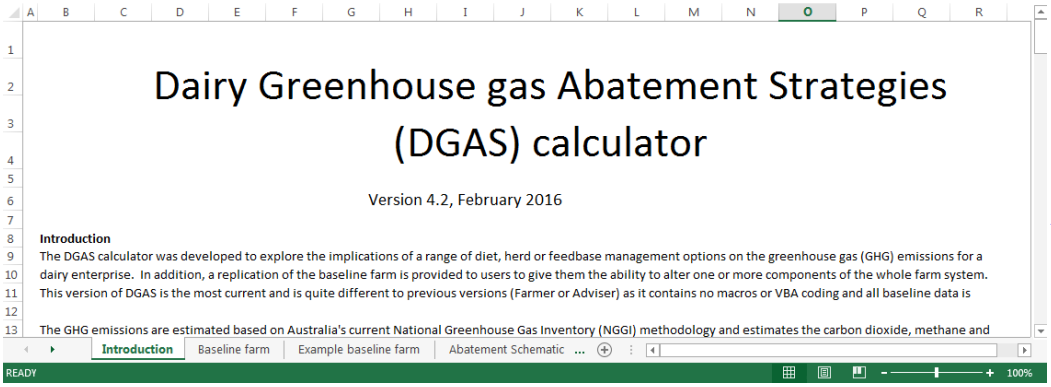
- Feeding high quality feed to increase milk production and reduce GHG emissions
- Applying nitrogen fertiliser at the right time and at a rate that is not in excess of plant/feed requirements
- Being efficient with irrigation by maximising forage utilised per mega litre of water
- Improving reproductive efficiency – which reduces the number of replacement heifers required
- Improving energy use efficiency in the dairy
- Selecting cow genetics for feed conversion efficiency.

Evaluating abatement strategies

The carbon calculator was developed to explore the implications of a range of diet, herd or feedbase management options on the greenhouse gas emissions of a dairy enterprise.

It can evaluate the potential emissions reduction opportunity for a number of proposed abatement strategies, including:

- Herd and breeding management for reducing enteric methane emissions and methane and nitrous oxide emissions from dung and urine, for example extending herd longevity to reduce replacement rates.
- Diet manipulation for reducing enteric methane, for example replacing supplements in the diet with a source of dietary fats/oils.
- Feed base management for reducing nitrous oxide emissions, for example coating of N fertiliser with N inhibitor.



Further reading:
Dairy Climate Toollkit
Australian Dairy Carbon Calculator

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