Dairy Australia
Your Levy at Work

Profitable dairy farming:
Good business management reduces greenhouse gases

Emissions management for dairy farmers – frequently asked questions

There are many options for managing farm greenhouse gas emissions as part of a profitable dairy business. However, there is also a lot of complex information and some confusion. In this series of fact sheets we explain the various options for and benefits of reducing dairy emissions, for profitability, productivity and environmental gains.

This Frequently Asked Questions publication introduces concepts and definitions as background knowledge for the remainder of the fact sheets.

Why reduce dairy farm greenhouse gas emissions?

Greenhouse gas emissions represent an inefficiency in dairy systems. The loss of methane and nitrous oxide gases into the atmosphere means that energy and nitrogen which could be directed towards production are being lost. Some level of emissions is expected, but there are many opportunities within a typical dairy system to reduce greenhouse gases and achieve efficiency and profitability gains.

Although the carbon footprint of Australian dairying is one of the lowest internationally, there is still scope to improve efficiency. The Australian dairy industry has made a commitment to minimising its environmental footprint, including reducing greenhouse gas emissions intensity by 30% by 2020.

What is the difference between net emissions and emissions intensity?

'Net emissions' is a measure of whole farm emissions less carbon sequestration in soil or trees, whereas 'emissions intensity' describes emissions per unit of product (often expressed as 'emissions per kg of milk solids' in the dairy industry). This is an important distinction for the Australian dairy industry, where growing demand globally for dairy products means that production and therefore net emissions may increase in the future.

Many strategies that reduce dairy emissions intensity will increase whole farm emissions. For example, increasing grain supplementation will increase production but will also decrease per cow pasture intake, meaning stocking rate can be increased leading to a rise in production and total farm emissions.

The Australian dairy industry is focused on reducing emissions intensity rather than net emissions, allowing farmers to contribute to meeting the demands of a growing world population. Since the 1970s the industry has achieved a decade-on-decade decrease in emissions intensity, largely thanks to efficiency improvements.

Are there financial incentives to reduce dairy emissions?

The Emissions Reduction Fund (ERF) allows farmers to earn carbon credits by reducing their greenhouse gas emissions using an approved ERF methodology.

There are currently four methodologies that apply to dairy systems: sequestering carbon in soils in grazing systems; destruction of methane from dairy manure ponds; reducing emissions through feeding fats and oils to milking cows; and removal of carbon dioxide through environmental plantings.

For most dairy businesses, the scale of the operation combined with the costs in implementing or monitoring the ERF project make it economically unviable to implement farm abatement activities on the basis of carbon credit income alone.

Changes to on-farm activity will only be worth making if they bring productivity and profitability gains in their own right. Fortunately, many activities that increase on-farm efficiency also increase farm profits while reducing emissions intensity. Dairy farmers should focus on efficiency improvements that will lead to profitable productivity improvements as this will give reduced emissions intensity as a by-product. An example from current industry modelling is presented in the diet management fact sheet in this series, where feeding a high fat supplement over summer caused a net increase in farm profit due to increased milk production of $8,676. ERF income would increase this to $8,876 at a $5 / t carbon price, and to $9476 at a $20 / t carbon price.

Which greenhouse gases come from dairy farms?

Most dairy farm emissions are from methane (CH4) and nitrous oxide (N2O). Both of these gases are significantly more potent than carbon dioxide in their ability to trap heat in the atmosphere. To make measuring and accounting easier, all greenhouse gases are converted to a common unit called carbon dioxide equivalent or CO2e.

Methane on dairy farms is largely emitted through enteric fermentation in the gut of cows – that is, the digestive process through which gut microbes break down carbohydrates. It is released into the atmosphere when cows belch, and is 25 times more potent than carbon dioxide. Much smaller amounts of methane come from manure as a by-product of the process of microbial fermentation of organic matter.

Nitrous oxide on dairy farms comes from nitrogen inputs – mostly dung, urine and nitrogen-based fertilisers. Nitrous oxide is 298 times more potent than carbon dioxide, and the dairy industry is the largest contributor to nitrous oxide emissions (47%) in south eastern Australia. The largest contributor to dairy nitrous oxide emissions is excess dietary nitrogen excreted in the urine. Emissions from fertiliser application occur when the nitrogen applied is converted to nitrous oxide, either directly through the processes of nitrification and denitrification, or indirectly via ammonia gas which is redeposited onto soil, or leached off-site.

Which parts of the dairy farm are responsible for emissions?

Methane from enteric fermentation is the biggest source of emissions from dairy farms (average Australian dairy farm: 57% of emissions; Figure 1), followed by methane and nitrous oxide from urine and dung (18%). Nitrogen fertilisers cause emissions (8%) through both their production and application in dairy systems. Other emissions sources are on-farm energy use (electricity and fuel; 8%), and purchased feeds and concentrates (9%).

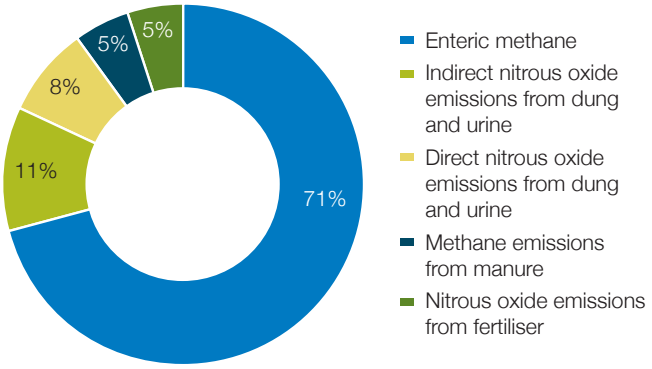

Figure 1: Figure 1: Breakdown of greenhouse gas emissions generated on farm (Christie, K.J; Gourley, C.J.P; Rawnsley, R.P; Eckard, R.J; Awty, I.M. 2012).

How much emissions are dairy farms responsible for?

Agriculture accounts for about 15% of Australia's greenhouse gas emissions, making it the fourth largest emitter by sector after electricity, stationary energy and transport (Dept. of Environment, 2013).

The dairy industry contributes around 10% of all agricultural emissions, or 2% of total national emissions.

The dairy industry emits considerably more greenhouse gases per unit area than the broadacre sheep beef and grains industries (Figure 2). However, on an emission intensity basis (i.e. emissions per tonne of product) dairy farms are relatively low emitters (Figure 3; Browne et al., 2011).

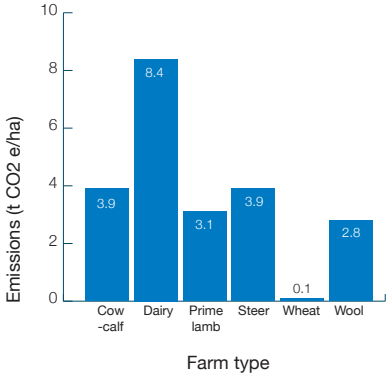

Figure 2: Average emissions per unit area (ha) for Australian farm types (Browne et al., 2011).

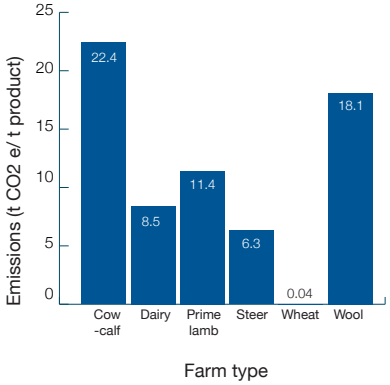

Figure 3: Average emissions per unit of product for Australian farm types (Browne et al., 2011).

Further information

Dairy Climate Toolkit: http://www.dairyaustralia.com.au/Environment-and-resources/Climate/MicroSite1/Home.aspx

Approved ERF methodologies: bit.ly/1nG2mPV

Christie, K.J; Gourley, C.J.P; Rawnsley, R.P; Eckard, R.J; Awty, I.M. 2012, Whole-farm systems analysis of Australian dairy farm greenhouse gas emissions. Animal Production Science, 52, 998-1011.

Browne N, Eckard R, Behrendt R, Kingwell R (2011). A comparative analysis of on-farm greenhouse gas emissions from agricultural enterprises in south eastern Australia. Animal Feed Science and Technology 166-167, 641–652.

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Eckard, RJ, Grainger C, and de Klein CAM (2008) Options for the abatement of methane and nitrous oxide from ruminant production – a review.

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