

# The methane problem: we're facing it with you

**In the second article of four about climate change and agriculture in New Zealand Dr Harry Clark of the New Zealand Agricultural Greenhouse Gas Research Centre looks at the science and issues surrounding the most contentious and misunderstood greenhouse gas, methane.**

FARMERS are probably well and truly fed up with opinions being expressed about their contribution and response to climate change – and understandably so.

There's been much finger-pointing, yet no sector can single-handedly shoulder the blame for climate change just as no sector can single-handedly solve the problem.

Many commentators overlook the fact a lot of farmers are already doing great work trying to reduce their on-farm greenhouse gas emissions.

Climate change is a highly complex and emotionally charged issue and misunderstandings and misinformation have inevitably found their way into the debate about how we deal with it as a nation.

In this article I'll unpack some of the science and explore some of the issues around one of New Zealand's most contentious climate change topics: enteric methane.

Methane matters in climate change.

It is 28–34 times more effective at trapping heat than carbon dioxide over the first 100 years after an emission occurs.

Methane emissions have increased steadily since pre-industrial times.

Concentrations are now more than twice as high as they were in the late 1800s.

Altogether, methane emissions from human activities, known as anthropogenic emissions, have caused an estimated 40% of the warming since the industrial revolution.

There are several globally significant sources of anthropogenic methane, including fossil fuel extraction, landfills, rice production and ruminant livestock such as cows, sheep and goats.

Methane belched by ruminants, known as enteric methane, is responsible for close to a third of all global anthropogenic methane emissions.

Methane is less stable and breaks down relatively quickly compared to carbon dioxide.

More than 60% of the methane released today will have disappeared from the atmosphere after 12 years and 98% after 50 years.

By contrast, some of the carbon dioxide released today will still be in the atmosphere in 1000 years.

Despite its short life in the atmosphere, a tonne of methane emitted today will still cause more warming two centuries from now than a tonne of carbon dioxide emitted today, because methane is so much more effective at absorbing heat than carbon dioxide. So, the effects on the climate of today's methane emissions will percolate through the system for many decades after the methane itself has disappeared.

The upside of atmospheric methane's short lifespan is that any decrease in our emissions will help reduce our overall contribution to global warming relatively quickly.

NZ differs from most other developed countries in that agricultural emissions make up almost half of our anthropogenic greenhouse gas emissions. The Organisation for Economic Co-operation and Development average is about 12%.

Furthermore, enteric methane emissions make up over 70% of our total agricultural emissions.

That has fuelled the vigorous national debate about how much emphasis should be put on reducing methane, in addition to carbon dioxide and other long-lived gases like nitrous oxide, when it comes to reducing our overall emissions.

Internationally, there's no doubt halting global warming requires a large and urgent reduction in carbon dioxide emissions.

Carbon dioxide's long life means every new emission adds to previous emissions, compounding the warming.

The only way to prevent any further increase in warming is to reduce carbon dioxide emissions to net zero – that is, any remaining emissions have to be matched by removals.

However, that won't reduce the warming caused by historical emissions of carbon dioxide and there are currently no practical ways to remove remaining emissions of other gases such as nitrous oxide. Global modelling studies indicate that carbon dioxide emissions might need to fall below net zero if we're to achieve global temperature goals.

The same studies indicate reductions in methane emissions are also required if we want to have a reasonable chance of limiting warming to the level agreed by the international community. But they don't need to go to zero.

Methane's relatively short lifespan means new emissions today to some extent simply replace the breakdown of previous emissions.

So, as long as we keep emissions at a constant level the concentration in the atmosphere stabilises.

However, warming doesn't level off as soon as concentrations are stable.

That takes centuries to happen.

But it does mean if we reduce methane emissions to a point below current levels we can stop any additional warming; our emissions still have a warming effect, but it is the same in the future as in the past.

But does this mean that for NZ stopping additional warming is the national target we should aim for?

The science is complex and is being used to inform the establishment of national targets for emissions reductions.

However, science is not the only determinant.

Our response as a nation will also be influenced by socio-economics, the availability of cost-effective technologies, equity issues and the terms of the international agreements NZ has signed.

Science institutions in NZ continue to do extensive research aimed at identifying viable emissions-reduction technologies for farmers.

They are also working closely with farmers to identify operational steps that can be taken on-farm to reduce or mitigate emissions without compromising profitability.

Many farmers are already making a big effort and in the next issue I'll look at some of the ideas you might like to consider on your farm.