# Natural Capital Fact Sheet 1

## Greenhouse Gas reduction targets and the role of methane and nitrous oxide on farms

At BNZ, we understand that natural resources, like water, soil, climate, biodiversity and ecology, are the fundamentals of food production. We also know that our New Zealand Agribusinesses are highly attuned to the harnessing of these natural resources. To help you manage and grow your farms natural resources to the next level of efficiency and health, we've set up the BNZ Agribusiness Natural Capital team, dedicated to supporting farmers on this journey.

To better understand the effects of climate change on New Zealand Agribusinesses operations, we've partnered with AgFirst Consulting to help answer some of the key questions about the current environmental topics and their on-farm affects. Together, we've developed a series of Natural Capital fact sheets to help support our clients as they navigate changing requirements.

Please use this resource as a quick fact check as to why these topics are important to the future of your agribusiness, and what practical steps you could take on your farm to help you stay ahead of the curve.

This fact sheet looks at the New Zealand Agricultural Greenhouse Gases, the role of methane and nitrous oxide, and practical steps to address your on-farm emissions.

## Why is knowing about your Greenhouse Gas Emissions important for your agribusiness?

Strong scientific evidence says our climate is changing. Warmer temperatures and changes to rainfall will have a big impact the world over.

Our Government has committed to doing its part to support the reduction of global emissions, by targeting New Zealand's Greenhouse Gas (GHG) emissions, including those from agriculture. Currently, the pastoral agricultural sector makes up around 48% of total New Zealand GHG emissions.

In early November 2019, New Zealand passed the Climate Change Response (Zero Carbon) Amendment Act into law, creating strategies to reduce all GHG emissions, which means that farmers need to be aware of the opportunities to mitigate their onfarm GHG emissions.

## What are the New Zealand Greenhouse Gas Reduction targets exactly?

There are some key features of the Zero Carbon Act which the Agricultural sector, in particular, need to be aware of, including:

1. Biological methane ($CH_4$) emissions will be reduced by 10% from 2017 levels by 2030 and reduced by between 24-47% by 2050.
2. Net carbon dioxide ($CO_2$) and nitrous oxide ($N_2O$) emissions reduce to net zero by 2050.
3. Forestry cannot be used to offset methane emissions.

In line with passing the Zero Carbon Act into law, the Government and the Agricultural sector have agreed that:

- The sector will develop a 'pricing scheme', providing practical and cost-effective ways to measure and price emissions at the farm level, by 2025.
- In 2022, The Climate Change Commission will check on the progress made and if commitments aren't being met, the Government has the option to bring the sector into the Emissions Trading Scheme (ETS) before 2025. The point of obligation will be at processor level.
- If the 'pricing scheme' is not ready for implementation by 2025, agriculture will come into the ETS, with the point of obligation at the processor level.

This industry-led partnership with Government 'He Waka Eke Noa', involves a 5-year plan to achieve:

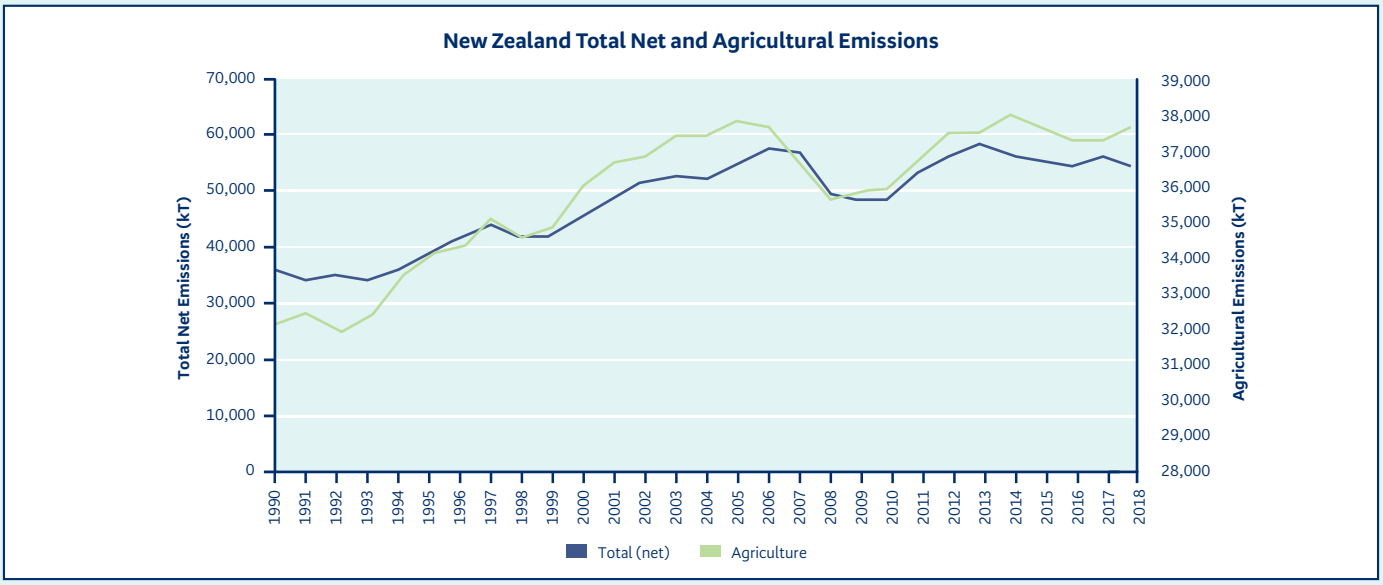
- Improved tools for estimating and benchmarking emissions on farms
- Integrated farm plans, that include a Climate module
- Investment in research, development and commercialisation
- Increased farm advisory capacity and capability
- Incentives for early adopters
- Recognition of on-farm mitigation such as small plantings, riparian areas and natural cover

## Where are we on the journey to reach 2050 Agricultural Emissions Targets?

There are two key stats worth knowing about when it comes to understanding what New Zealand's Agricultural emissions profile currently looks like; how many GHG emissions do we currently emit (1), and what are the key contributing factors (2).

### 1. Total (Net) and agricultural emissions

It is important to note the difference between total emissions (net) and total emissions from agriculture. Total net GHG emissions are the focus of our global reduction commitments. Total net emissions are defined as the total of GHG emissions within New Zealand (across all sectors), less the sequestration of carbon by forestry. The latest summary from 2018, outlined in the graph below, shows total net emissions are 55,468kT, or 57.2% above 1990 levels. The graph also shows total agriculture emissions are 37,697 kT or 17.1% above 1990 levels.




**Source: AgFirst based on Ministry for the Environment data**

## 2. Agricultural GHG emissions

The below table helps outline the key contributors which, through developing new sectors, have inadvertently become the largest emitters of GHG emissions within New Zealand agriculture:

| | Emissions (kt $CO_2$-e) | | |
|---|---|---|---|
| | **1990** | **2018** | **Difference** |
| Dairy cattle | 7,139 | 16,141 | 126% |
| Beef cattle | 6,467 | 6,086 | -6% |
| Sheep | 15,060 | 8,933 | -41% |
| Deer | 481 | 536 | 11% |
| Minor animal species | 330 | 67 | -80% |
| Manure management | 723 | 1,610 | 123% |
| Fertiliser | 267 | 1,490 | 458% |
| Other | 1,717 | 2,834 | 65% |
| **Total agricultural emissions** | **32,182** | **37,697** | **17%** |

**Source: New Zealand's Greenhouse Gas Inventory 1990-2018 (Ministry for the Environment)**

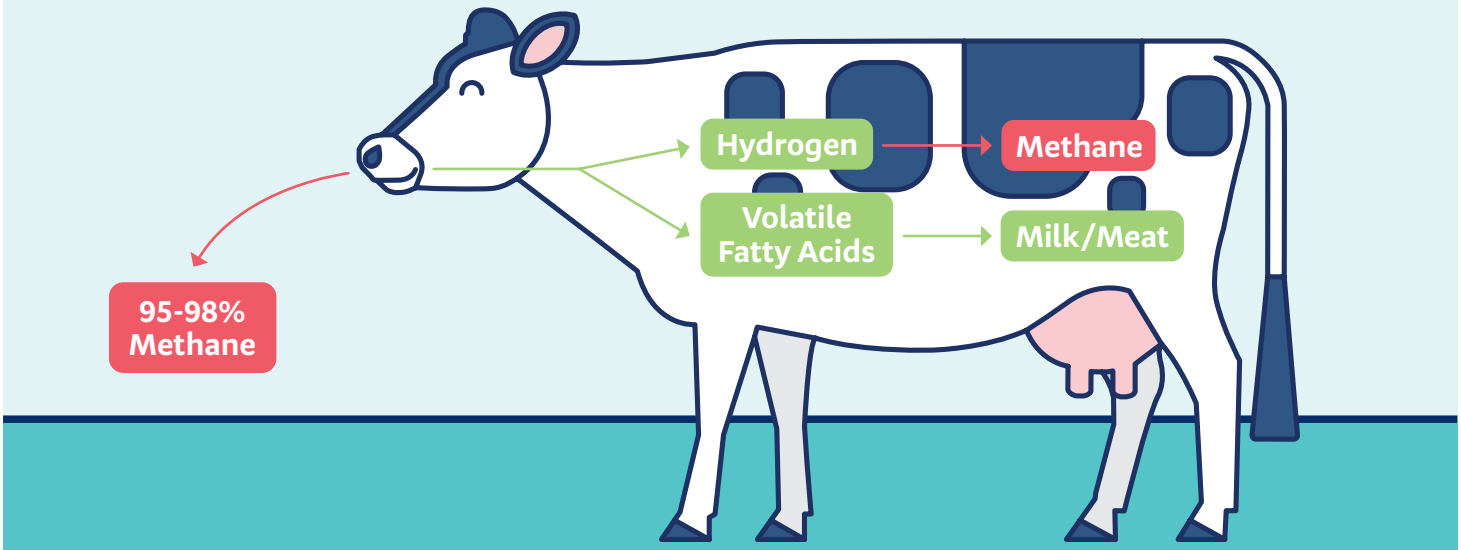
### So, we know about New Zealand Agricultural GHG Emissions levels and tragets; how exactly are the gases released on-farm and what can you do about it?

Of the two biological GHGs discussed within NZ Agriculture, methane makes up 78%, and nitrous oxide 22%. Ruminant animals are neither a net source nor sink of carbon dioxide ($CO_2$). They are, however, a source of methane ($CH_4$) and nitrous oxide ($N_2O$).

### How is biological methane created?

When ruminants eat pasture it is digested in the rumen by a range of microbes. This process produces hydrogen gas and other microbes convert this into methane, of which 95-98% is belched from the animal's mouth.

There is a direct relationship between the dry matter eaten by a ruminant and the amount of methane it produces; 21.6grams of methane per kilogram of dry matter eaten. This relationship can vary between animals, and the type, and quantity of forage they consume. For instance, forage rape and fodder beet crops have been shown to reduce methane production if fed at high levels.

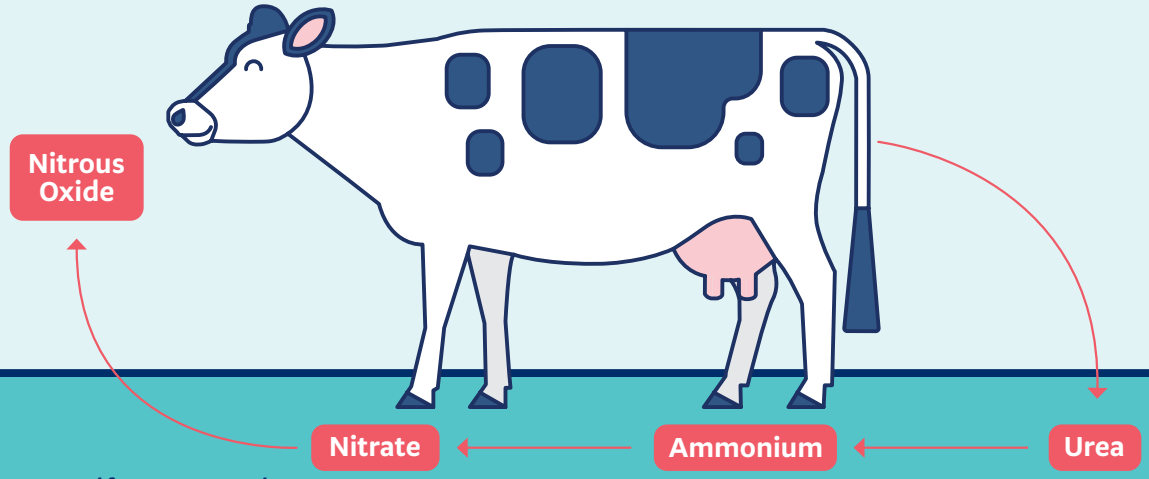



**Original image sourced from Agresearch**

## How about nitrous oxide?

Ruminant animals are a key source of nitrous oxide, along with nitrogen fertilisers. When they urinate, the urea excreted is hydrolysed in the soil and quickly turns into ammonium, which is then nitrified, turning into nitrate. Some of this nitrate leaches from the soil, and some is nitrified by soil microbes into nitrous oxide gas ($N_2O$). A similar process occurs for nitrogen fertiliser applied to the pasture.

From this process, there is also some indirect production of nitrous oxide ammonia volatilisation from urine patches, and from nitrate leached into waterways. The amount of $N_2O$ produced is influenced by lots of things, including the protein level of the feed, soil type, and rainfall.




**Original image sourced from Agresearch**

## What practical steps could be taken on-farm to help stay ahead of the curve when it comes to GHG Emissions:

Make sure to seek advice on these issues from your farm consultant or trusted industry expert before making any farm system changes.

1. For an indication on how farm system changes affect GHG emissions and farm profitability, check out:
    - https://www.agfirst.co.nz/wp-content/uploads/2020/07/Achieving-Zero-Carbon-Act-Reduction-Targets-on-Farm.pdf
2. Get to know what the biological greenhouse gas emissions from your farm are. A great tool to use for this is the OverseerFM nutrient budget software.
3. Consider reducing methane emissions by controlling your animals dry matter intake. We don't ever recommend you reduce feeding levels to your animals, instead have a look at reducing stocking rates. This would require a strong focus on your grazing management to keep up pasture quality. If you can reduce stocking rates, but improve animal performance, your level of $CH_4$ will be reduced somewhat.
4. To reduce $N_2O$ emissions, have a look at the protein lever of the fodder you're using. You might find you can switch from a high protein supplement or pasture type to one with higher energy content.
5. Stay across crop/pasture research and development to find what will be suitable for your farm.
6. If you use nitrogen fertiliser, choose a slow-release fertiliser, or use less fertiliser overall where possible.
7. Some pasture species, like plantain, show promise in GHG reduction, but some more research is required.
8. Consider incorporating GHG emission mitigation into your Farm Environment Plan.
9. Ask your farm consultant for advice.

Along with our Natural Capital team, BNZ have dedicated Agribusiness Partners throughout New Zealand. We see natural capital like all other capital inputs into a farming business, and your local Agribusiness Partner can help you to think about where to start with the planning and budgeting of costs when it comes to enhancing your natural resources. If you need any further information on Greenhouse gas reduction targets, your local BNZ Agribusiness Partner can put you in touch with their trusted advisors.

**If you would like to read more about the climate change responsibilities for New Zealand or the Zero Carbon Amendment Bill, here are some great resources that can help:**

1. https://www.mfe.govt.nz/climate-change
2. https://www.mfe.govt.nz/climate-change/he-waka-eke-noa-primary-sector-climate-change-action-partnership
3. https://www.dairynz.co.nz/environment/climate-change
4. https://beeflambnz.com/your-levies-at-work/climate-change