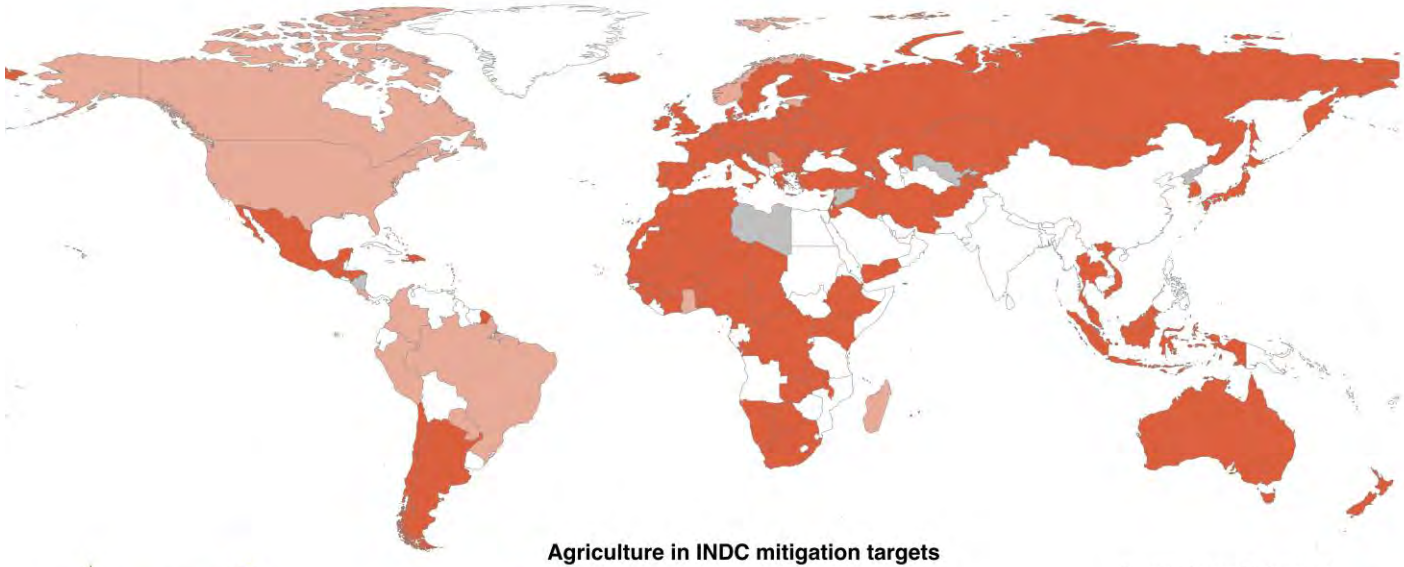
Addressing Emissions in the Dairy Industry

Nicholas Tait – Developer, DairyNZ

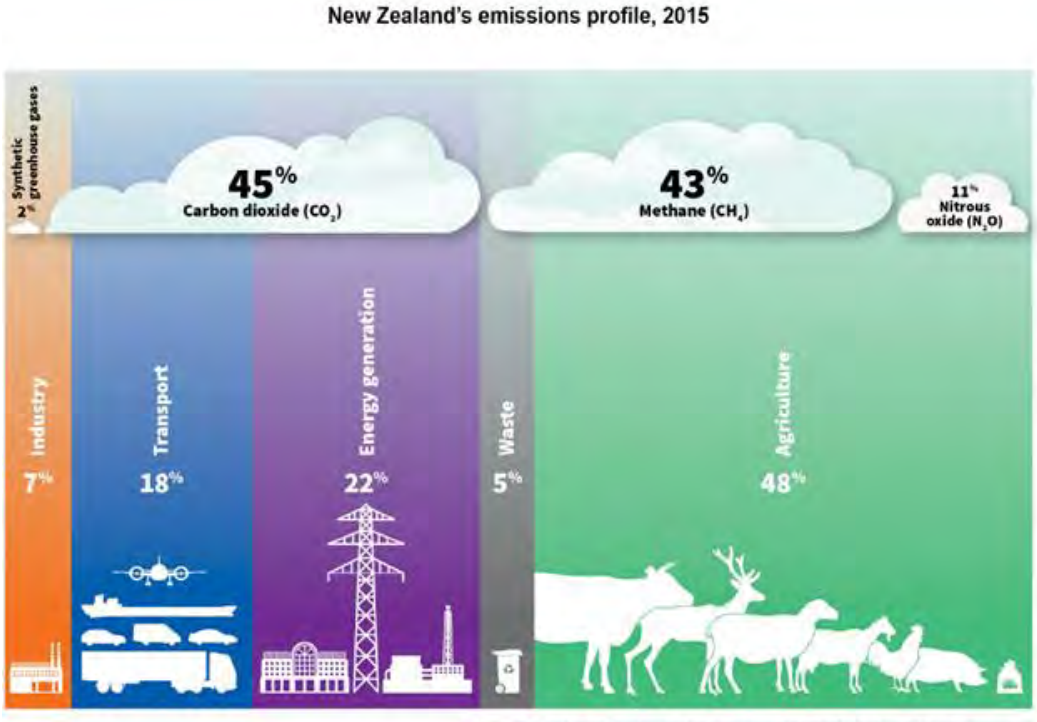
EIANZ Annual Symposium – 14th September 2018

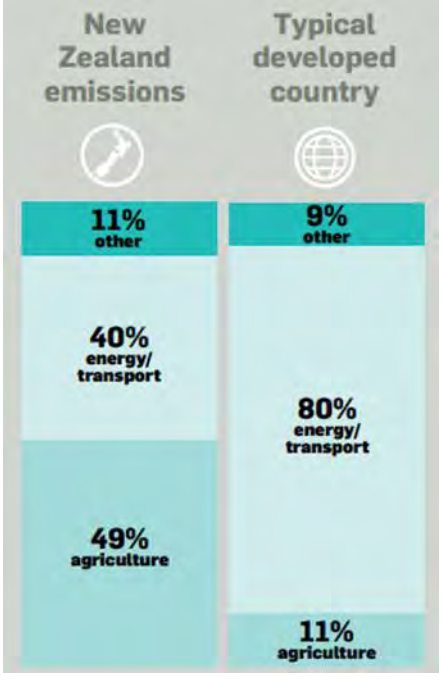
DairyNZ

We are not alone…

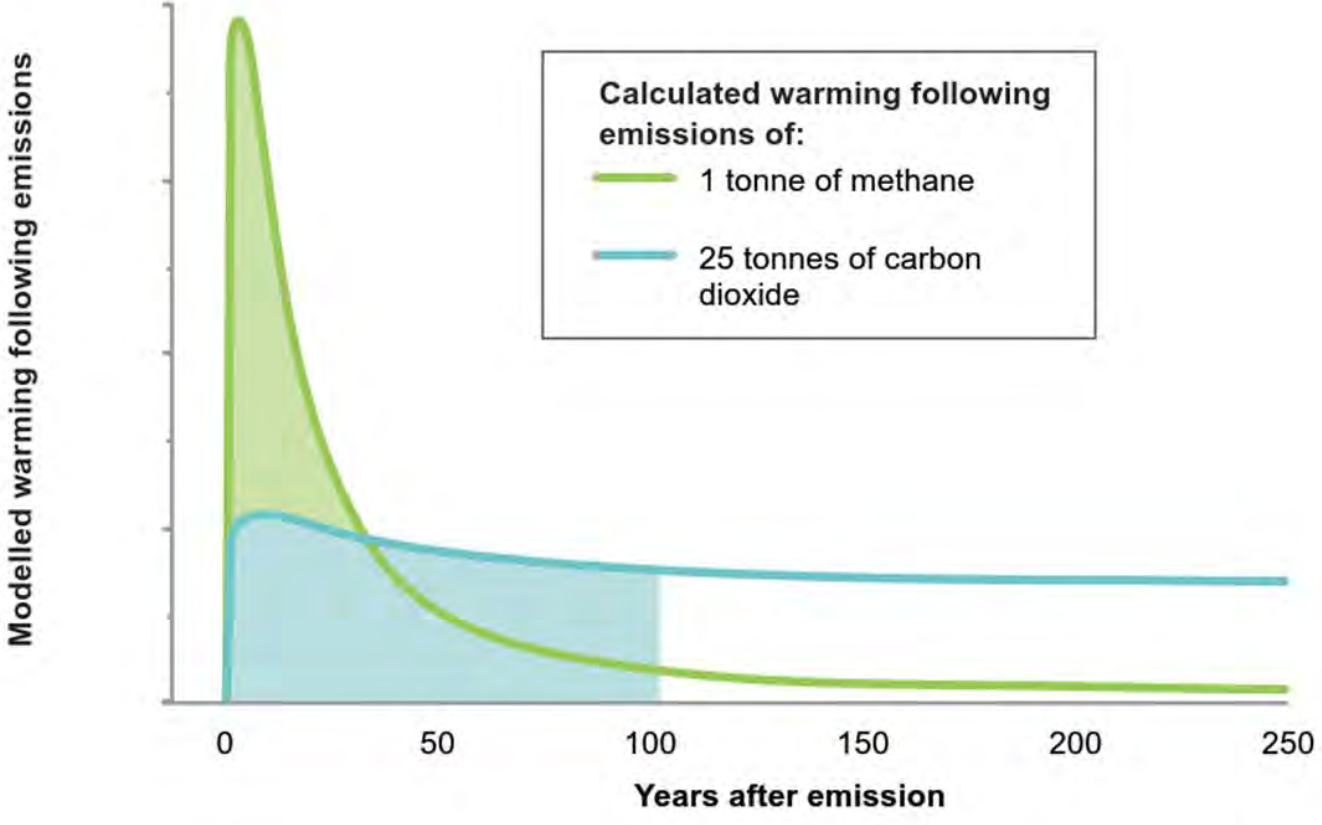


NZ's Unique Emission Profile





Gases Effect on Climate



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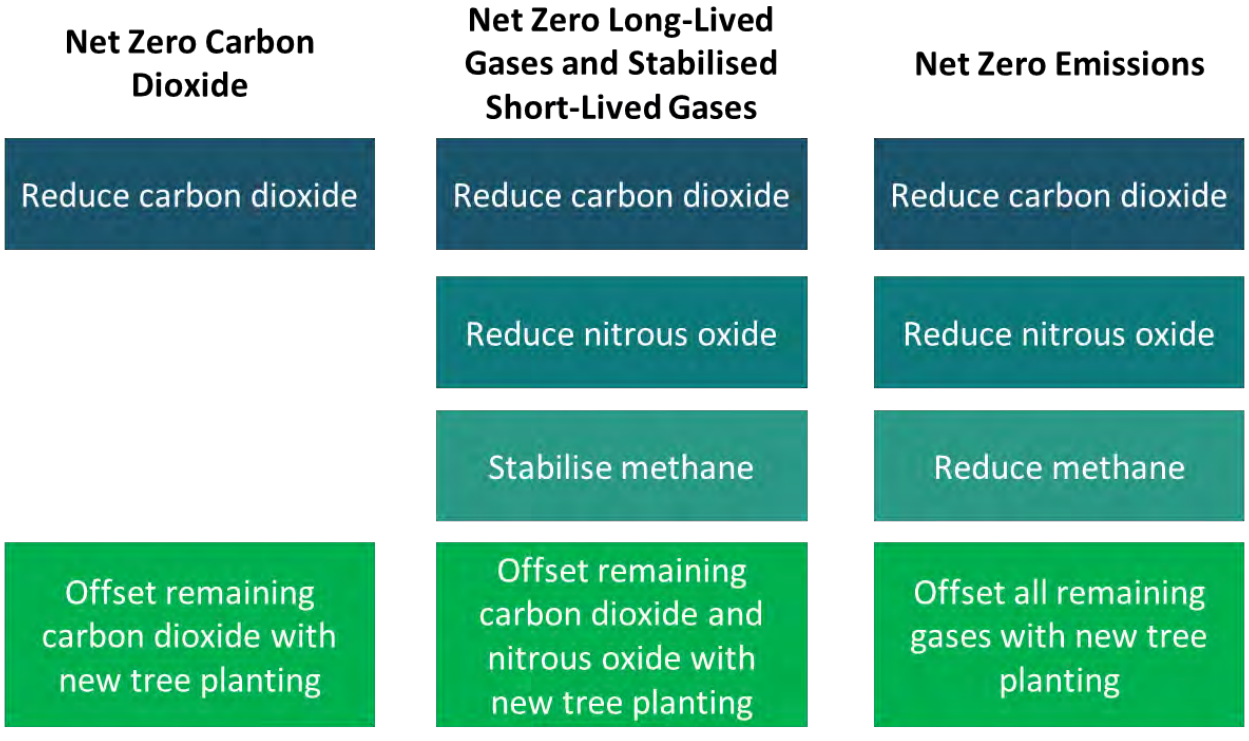
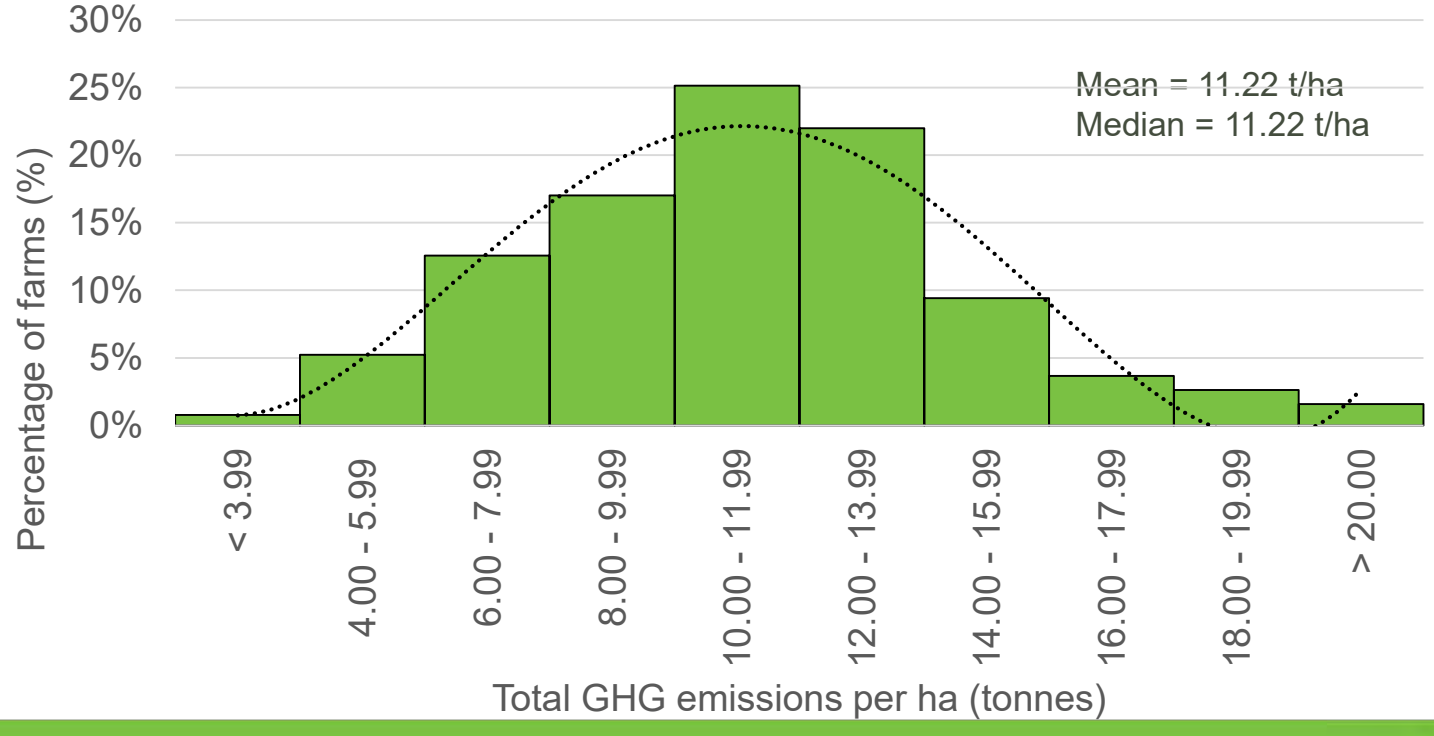
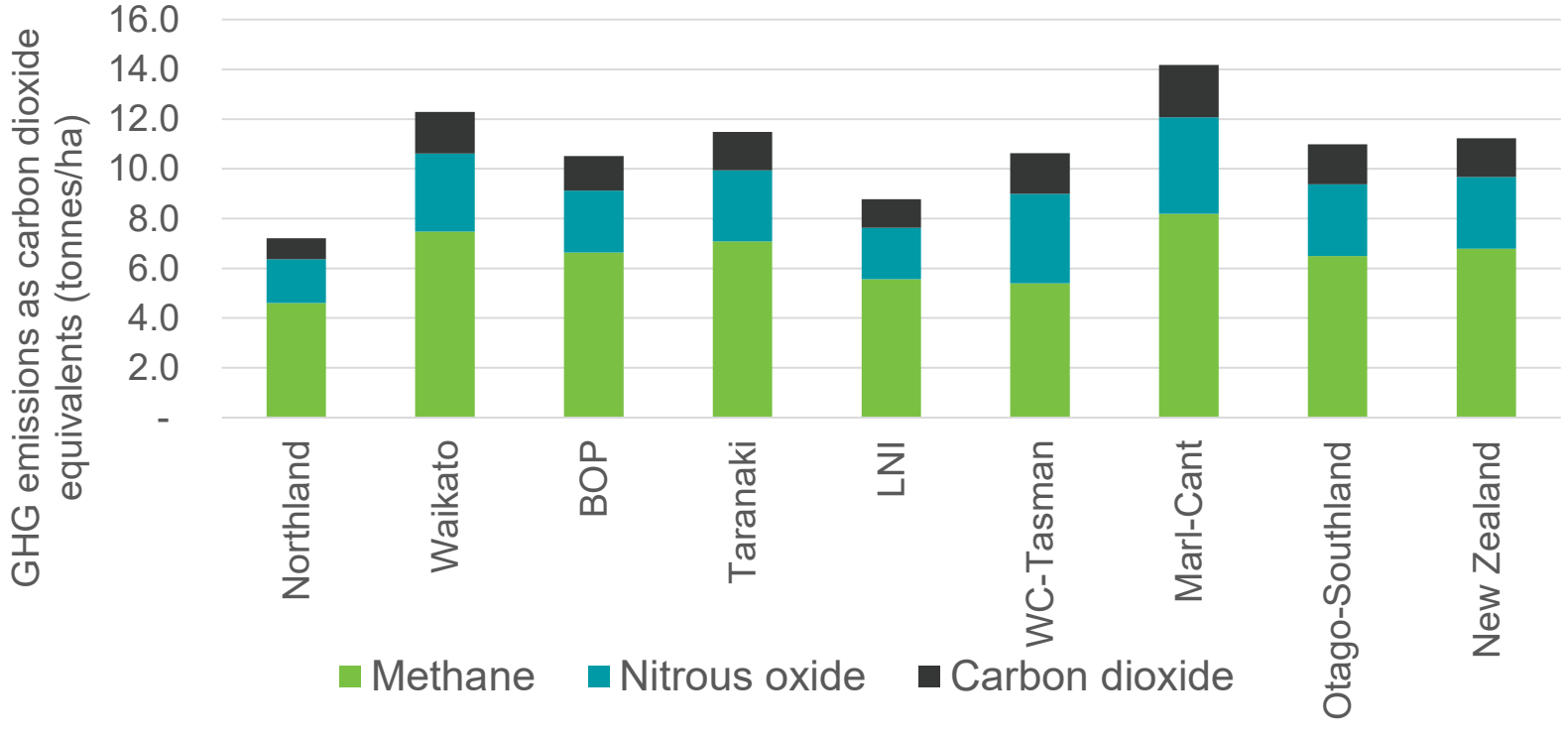
Zero Carbon Bill Options



Farm Emissions/ha



Farm Emissions/ha by Region



Agriculture's contribution

The land sector is crucial to helping* countries meet their ambitions:

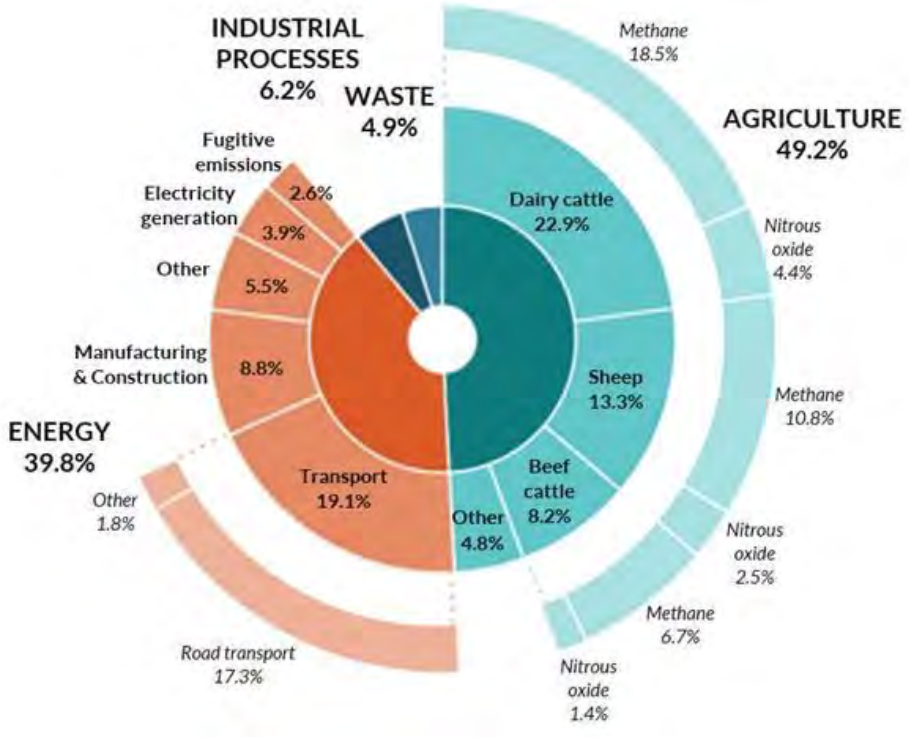
- Enable removal of CO_2
  - afforestation, bioenergy, carbon capture & storage
- Reduce pressure from non-CO_2 gases
  - Methane and nitrous oxide

(in addition to, not instead of, stringent reductions of CO_2 emissions by other sectors)*

Inventory

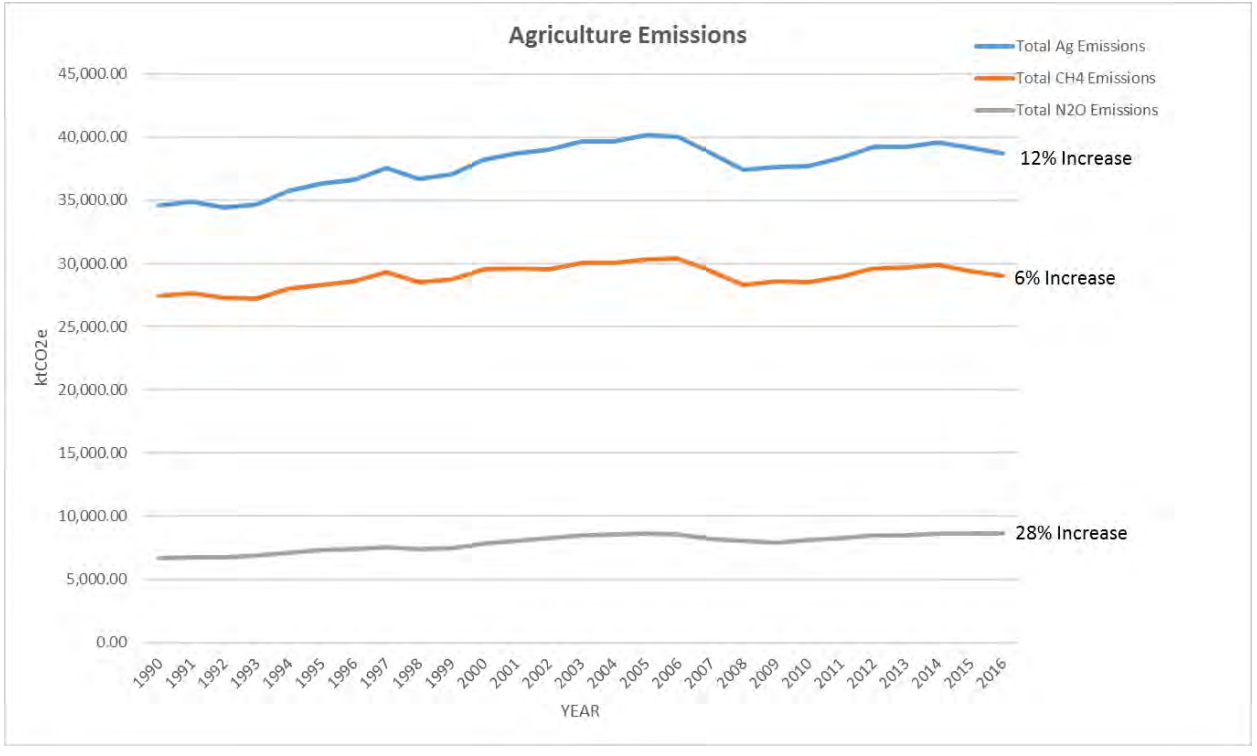
DairyNZ

NZ Inventory (2016)

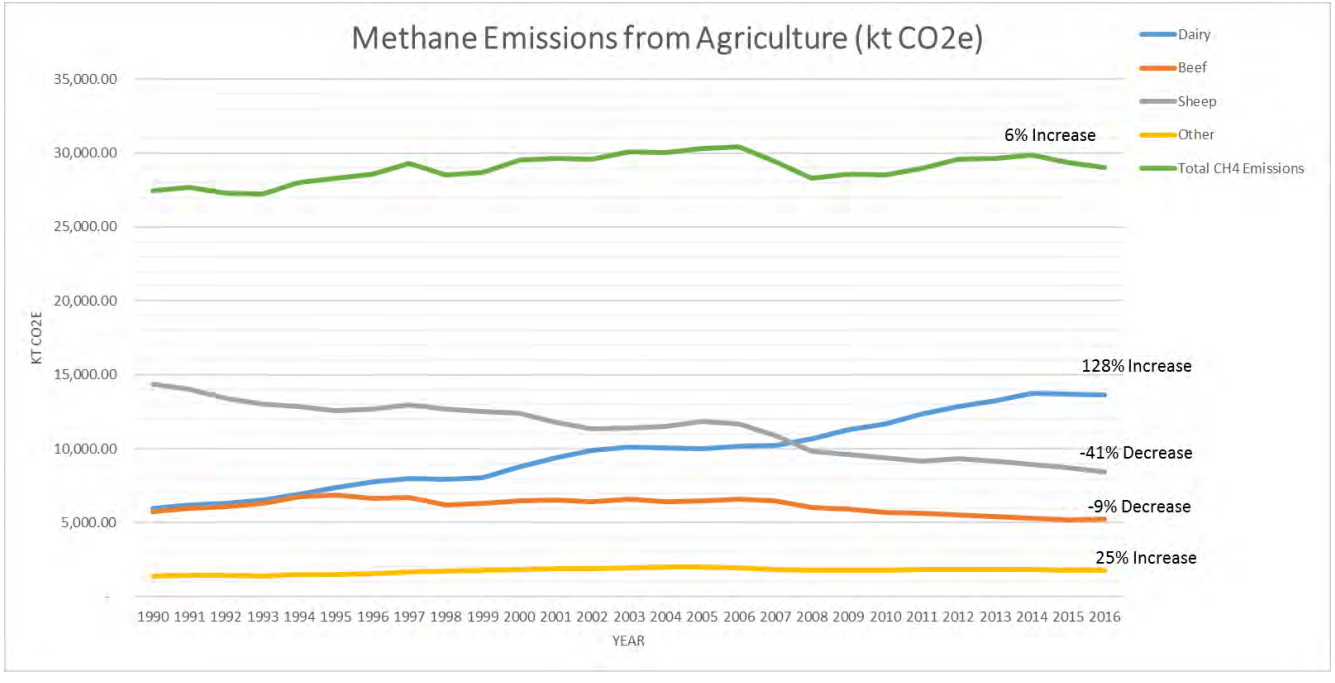


- Agriculture's make up 49.2% of NZ's emissions
- Dairy farming makes up 46.5% of agricultural emissions
- Dairy farming makes up 22.9 % of NZ's emissions

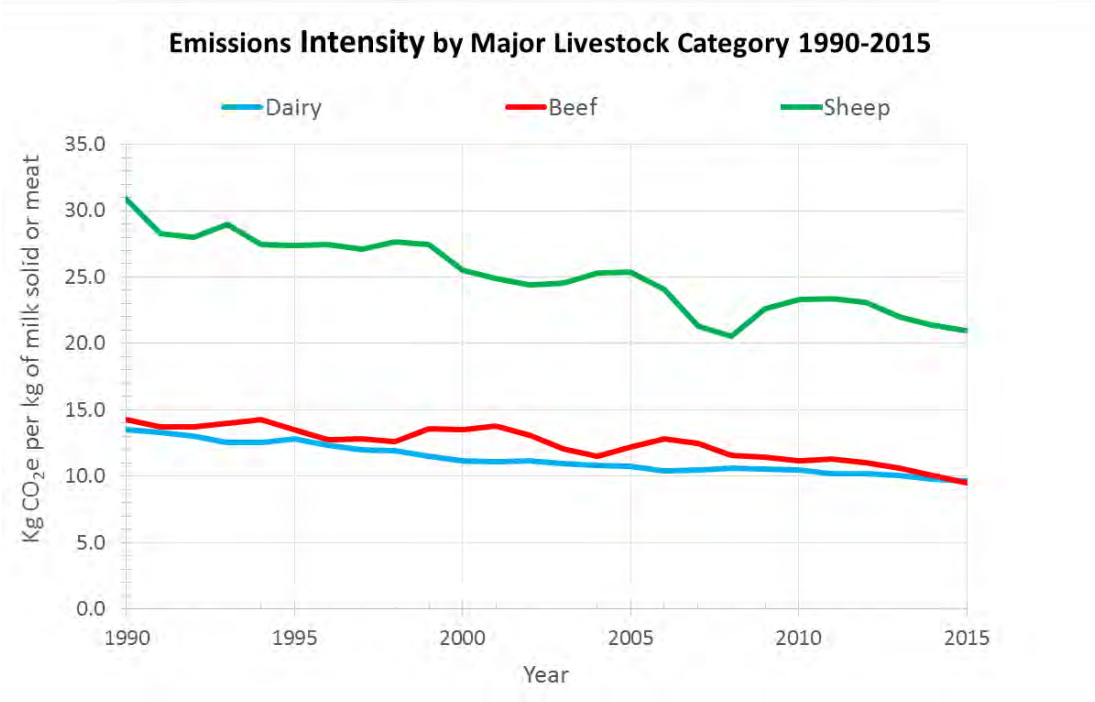
Agriculture Emissions



Methane Emissions



Agricultures Efficiency



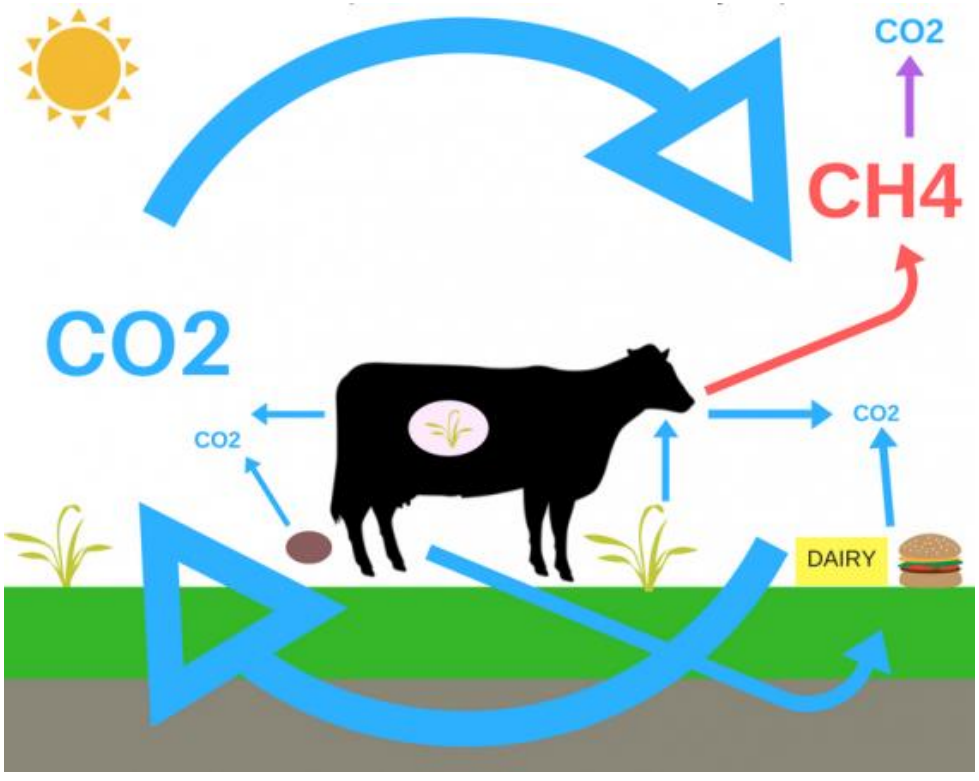
- New Zealand farmers have consistently made improvements in farming systems since 1990
- Between 1990 and 2015, the emissions intensity of milk solids decreased by 29%.
- Without these improvements, agricultural emissions would have increased by almost 40%

Source: MfE

Research

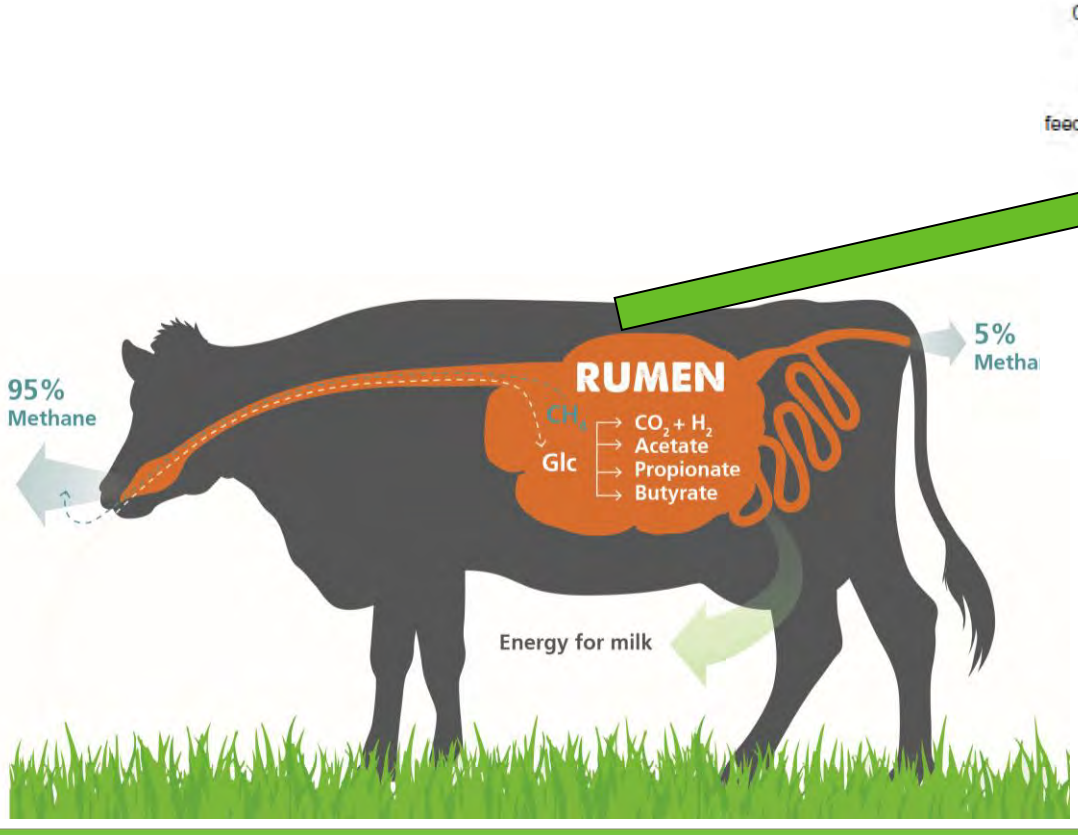
DairyNZ

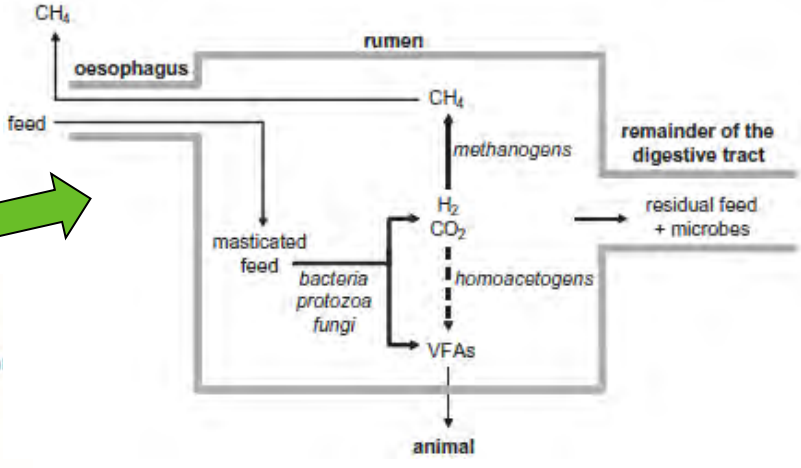
The Carbon Cycle



Sources: NZAGRC

How Methane is Produced





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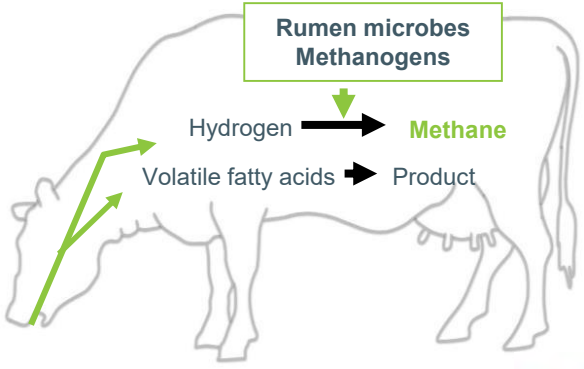
Current Methane Research

1. Low CH_4 **feeds** (approx. 25% reduction with forage rape)



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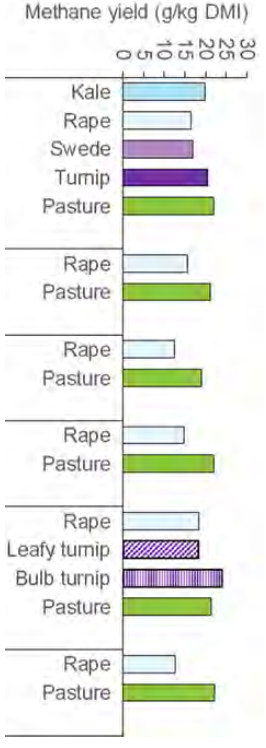
Current Methane Research

Low methane feeds

- Forage rape reduces CH_4 emission by 20-30% in sheep (limited cattle studies)
- Fodder beet (ongoing)
- High cereal diets (>80% of total diet)
- Maize silage (inconsistent response)
- Plants with tannins (e.g. birdsfoot, trefoil, sulla)



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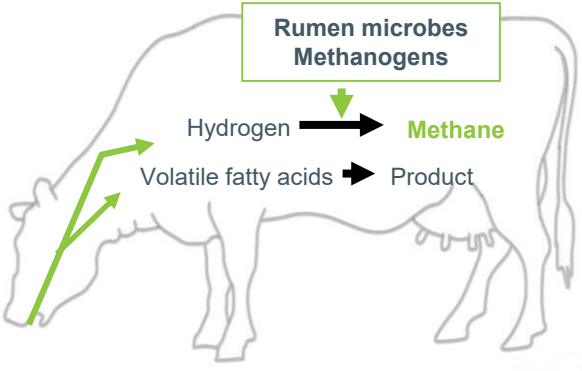
Current Methane Research

1. Low CH_4 **feeds** (approx. 25% reduction with forage rape)
2. Low CH_4 **animals** (approx. 4-6% reduction in grazing sheep)



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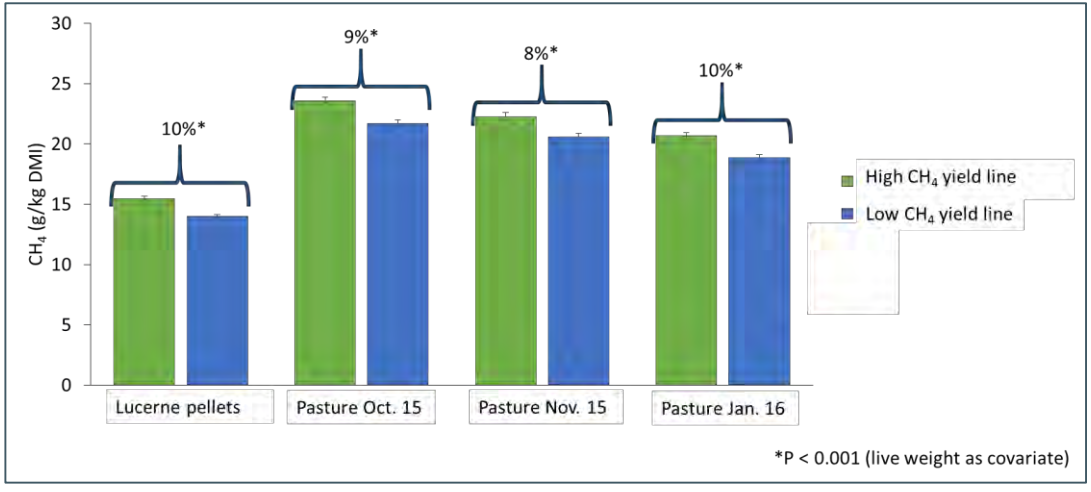
Breeding: Selection of low emitters



- Trails mainly in sheep
- Sheep selected for divergent CH_4 yield on Lucerne pellets also express the same trait when fed fresh pasture
- Trails underway to establish traits in cows

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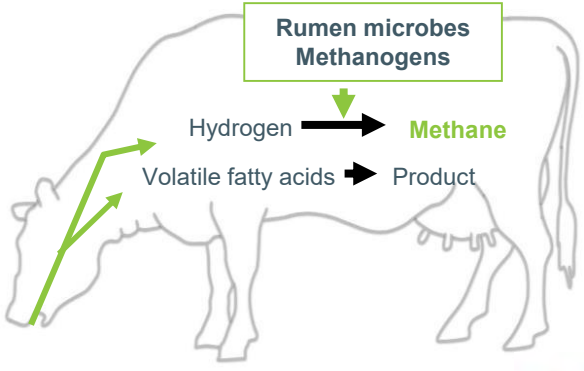
Current Methane Research

1. Low CH_4 **feeds** (approx. 25% reduction with forage rape)
2. Low CH_4 **animals** (approx. 4-6% reduction in grazing sheep)
3. CH_4 **inhibitors** (approx. 30% for lead inhibitors)
4. CH_4 **vaccine** (targeting 30% reduction in wide range of systems)



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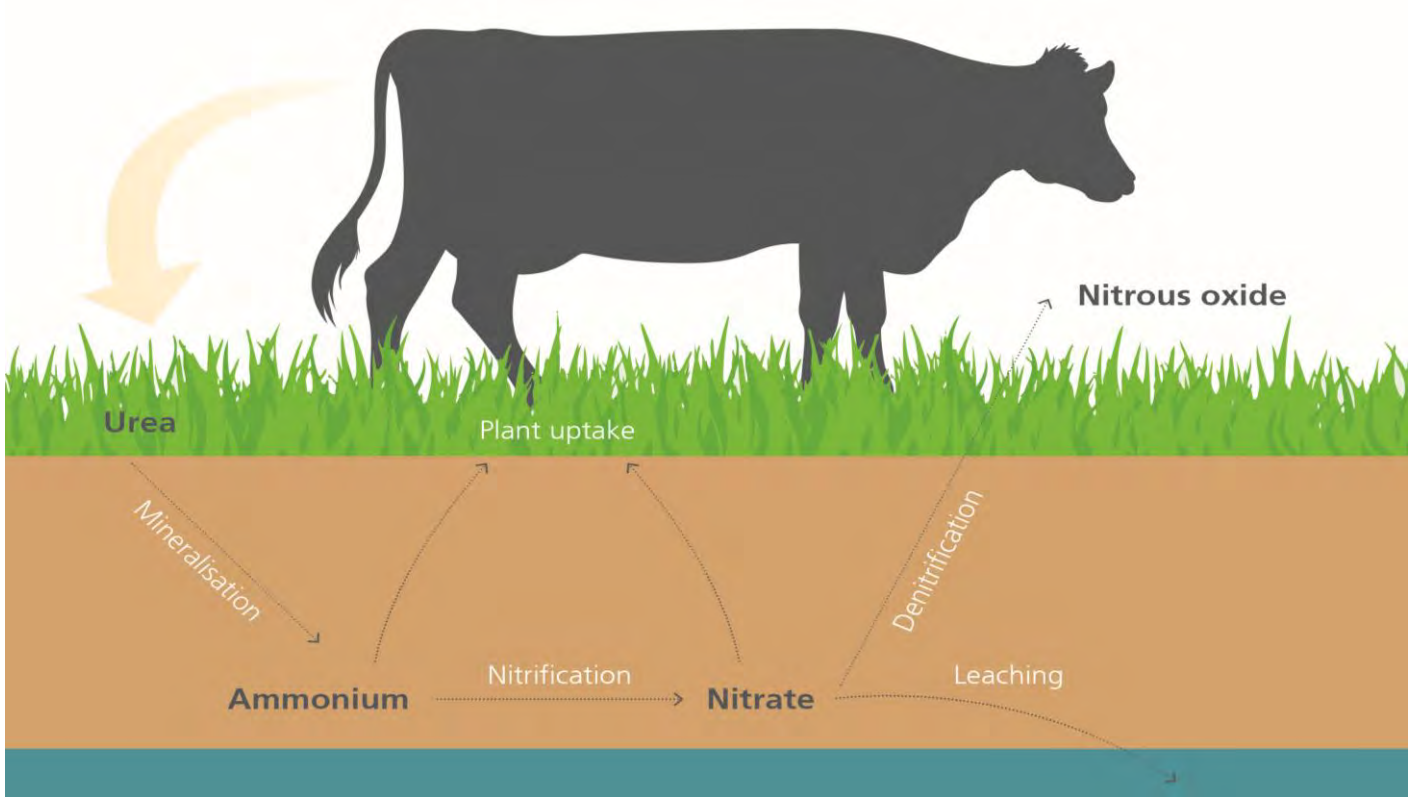
How N_2O is Produced



Low N_2O feeds – early results

3.9 kg N_2O-N/ha

6.4 kg N_2O-N/ha

Fodder beet
39% lower emissions than kale.

1.6 kg N_2O-N/ha

2.2 kg N_2O-N/ha

Plantain monocultures
28% lower emissions than ryegrass monocultures.

Pastoral21 and Forages, Reduced N leaching programmes

NEW ZEALAND AGRICULTURAL GREENHOUSE GAS Research Centre

PGgRc PASTORAL GREENHOUSE GAS RESEARCH CONSORTIUM

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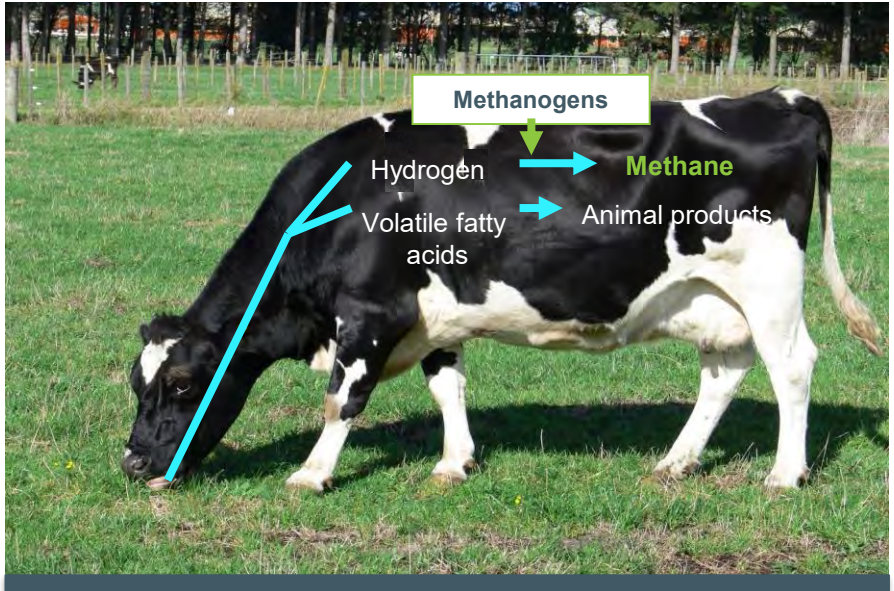
Mitigation

Dairy Farm Mitigation

Methane Mitigation



Manage dry matter intake

Nitrous Oxide Mitigation

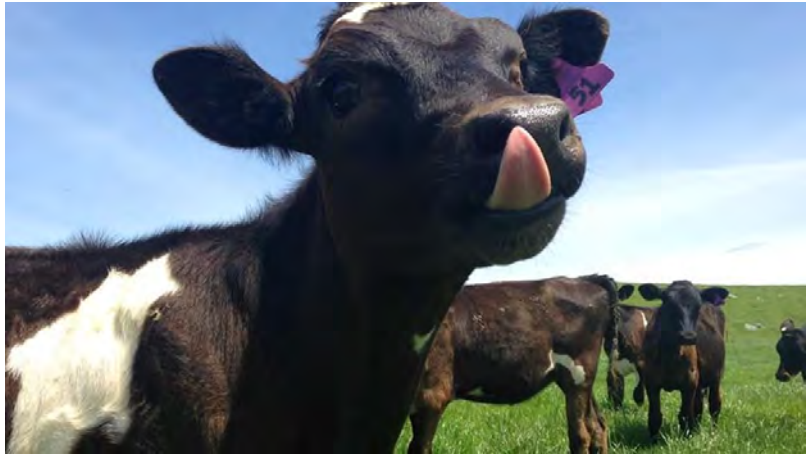
Manage nitrogen surplus

Managing dry matter intake

- Increase per cow performance/lower stocking rate
  - Increased genetic merit/breeding worth
  - Improve animal health
  - Improve reproduction
- Once-a-day milking
- Reduce replacement rates
- Improve pasture quality
- Change pastoral land to forestry

Reduce Replacement Rate

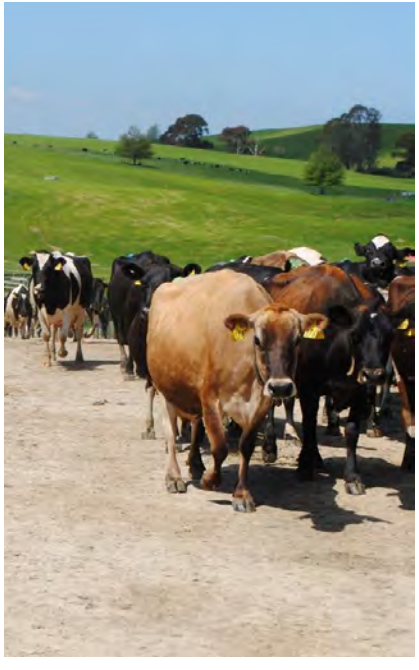
- Current rate 22-23%
- Modelling and farmlet trials suggest reducing rate to ~18% with improved breeding management can reduce GHG emissions by 2-11%



Dairy NZ & LIC, 2016; Garnsworthy, 2004; Beukes et al. 2011, unpubl.

Managing N Surplus

- Optimise fertiliser and effluent use
  - Timing and rates
- Substitute N applications for low-N feed
  - Reduce overall intake
- Use low Nitrogen feeds
  - Fodder Beet/Plantain
- Stand-off/housing systems
  - Avoid urine deposition at risky times of year
- Urease Inhibitors
  - Limit volatilisation of ammonia
- There are co-benefits for water quality



Stand-off/housing systems

- Avoid urine deposition at risky times of year
  - Late autumn, early spring
- Keep animals off the paddock during wet season
  - Winter stand-off pad or animal shelters
- Potential unintended consequences….
  - Increase in other gaseous emissions e.g. methane? → 'Pollution swapping'
  - Increase cow numbers to re-coup investment

What are we doing?

BERG, NZAGRC, PGGRC

Biological Emissions Reference Group

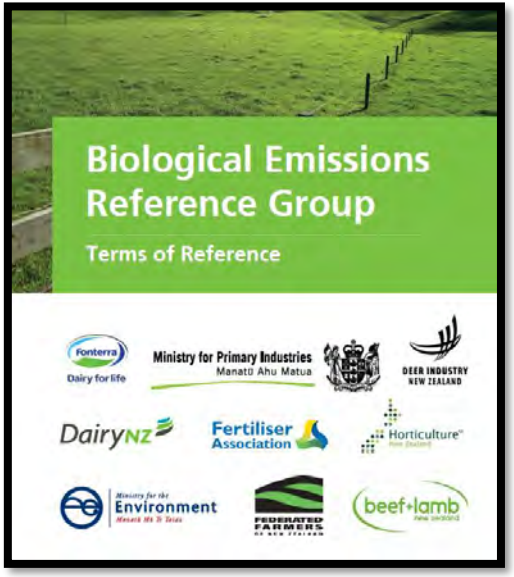
- Joint industry-government group
- Build an agreed evidence base on what the agricultural sector can do on-farm to reduce emissions, now and in the future,
- The costs and opportunities of doing so.
- Synthesis report of their research shortly.

NZ Agricultural Greenhouse Gas Research Centre

- MPI funded

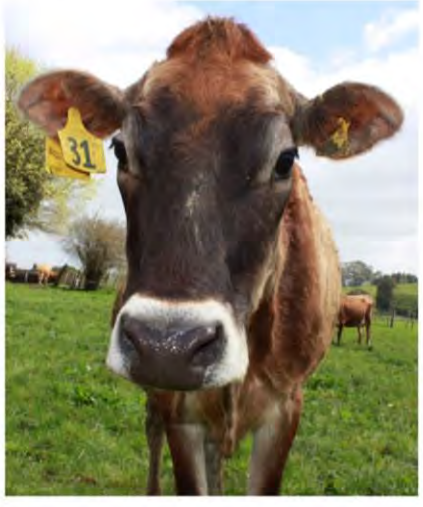
Pastoral Greenhouse Gas Research Consortium

- Industry and MBIE funded



Dairy Action for Climate Change 2017-2018

"To address on farm dairy greenhouse gas emissions in the context of a profitable and sustainable dairy industry"



DairyNZ
Profitability. Sustainability. Competitiveness.

Fonterra

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Ministry for the Environment
Manatu Mo Te Taiao

DairyNZ

1. Building the Foundation

- RP GHG 101 roadshows to build awareness and provide the mitigation options currently available
  - 450 attendee over 9 roadshows in September 2017
- Train 60 RP's at the Massey GHG courses
  - December 2017 & May 2018
- Building awareness and capability amongst the Dairy Environment Leaders and create climate ambassadors.
  - 9 DEL workshops on policy options and position
- Selected 15 climate change ambassadors
- Farmer Climate Change roadshow
  - 330 attendees over 8 workshops in June 18

Climate Change Ambassadors

- Selected from DEL farmers at the policy workshops
- Two-day training in Wellington with DairyNZ, MPI, MfE, AgR
- Aim to help other farmers understand the challenge of climate change
- Media representation

Aidan Bichan	**Wairarapa**
Andrew Booth	Northland
Dean Alexander	Southland
Devon Slee	Canterbury
Earle Wright	North Auckland
Fraser McGougan	Bay of Plenty
George Moss	Waikato
Jacqui Hahn	Waikato
John Hayward	Waikato
Keith Riley	Dannevirke
Kevin Hall	Southland
Theona Blom	Canterbury
Trish Rankin	Taranaki
Vern Brasell	Wairarapa
Wayne Langford	Golden Bay

2. Steps to a Lower Emission Dairy Sector

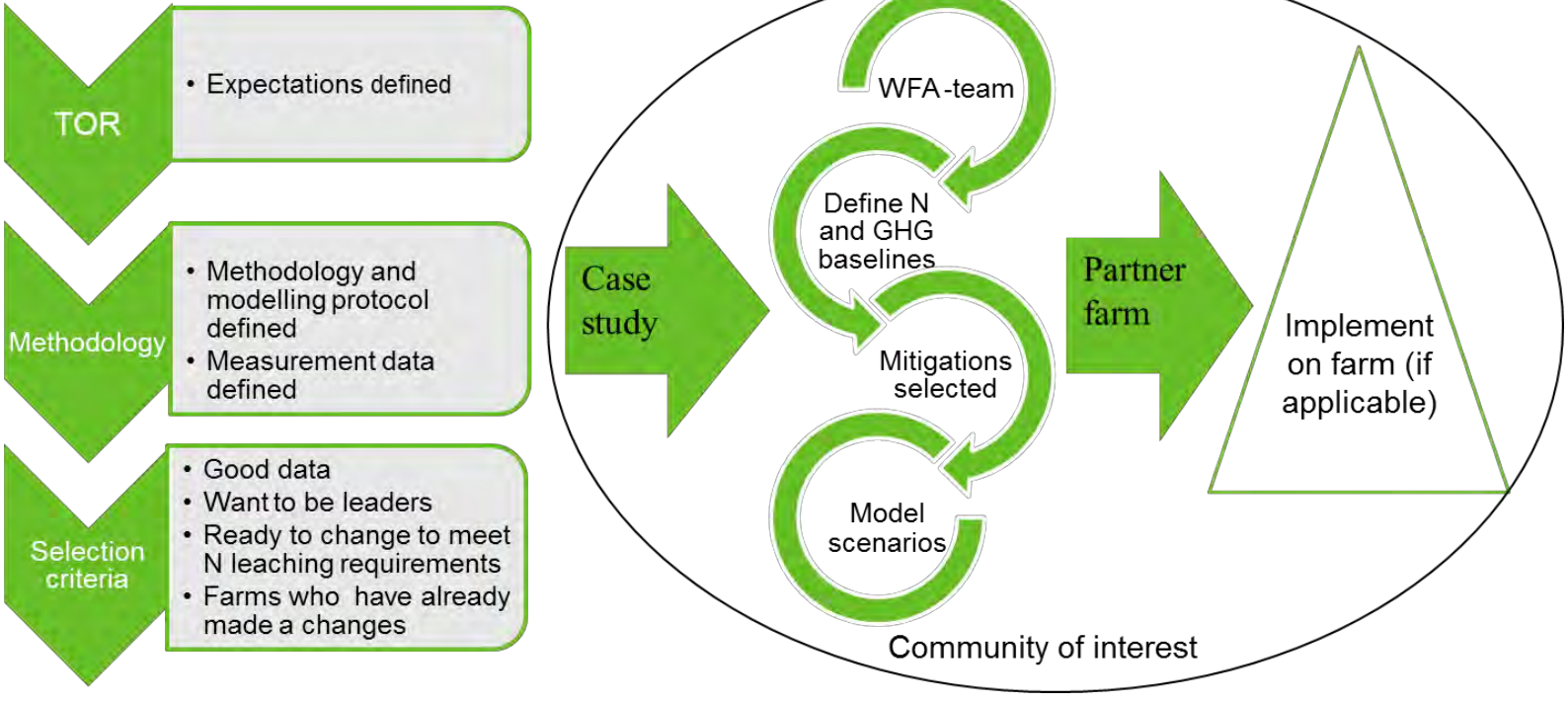
- Characterise and implement farm system changes which have the potential to reduce biological emissions on dairy farms
- Establish 10 partnership farms across a range of farm systems throughout New Zealand.

Partnership Farm Objectives

'This project will partner with farmers, scientists, rural professionals, and government to demonstrate the feasibility and practicality of implementing mitigation strategies to address greenhouse gas emissions and nitrate leaching from farm systems.'

- Set up ten GHG partnership farms across the country on a range of different farm systems
- To demonstrate the potential biological emissions reduction on dairy farms through farm system changes and to quantify the effect on production and productivity
- To ground-truth the farm system changes with dairy farmers
- To educate dairy farmers, rural professionals, and the wider sector of farm systems changes which may be possible and the implications of these changes.

Partnership Farm Project



3. On-Farm Recording

- Undertake a GHG on-farm recording pilot involving up to 100 Fonterra suppliers which provides each farmer with a GHG report which includes methane as part of environmental performance reporting they already receive from Fonterra.

- Reporting the GHG profile of 100 dairy farms from their nitrogen reporting pages
  - against the national inventory methodology
  - and a life-cycle assessment method.

Lessons Learnt…

1. Still climate change deniers out there that influence farmers.
2. Wide range of feedback on policy options from our Dairy Environment Leaders.
3. We need to ensure rural professionals working with farmers understand the issue and the options to mitigate emissions on-farm.
4. Modelling emissions reductions is difficult as Overseer has limitations.
5. Accuracy of data from farmers historically can be hard to obtain.
6. Consistency of inputs to modelling and accounting. i.e. farm boundary/lease/contracted grazing.
7. Fairness of reductions across regions.
8. Time it takes. Farmers must understand issues before changes are accepted.

Dairy Action for Climate Change 2019-2020, Draft

Dairy Tomorrow Commitment 1.2:

‘Lead efforts on agriculture’s contribution to meeting New Zealand’s climate change goals through identifying and implementing strategies to reduce or offset greenhouse gas emissions from dairy farming.’

Overall objective to fulfil the strategy and build of the current DACC, including all MS companies with the support of MPI and MfE

Areas include;

1. Leading efforts on climate change action
2. Measuring our emissions
3. Contributing to emissions reductions

Thank You

DairyNZ