Agricultural GHG Emissions – New Zealand's story

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Online presentation
The Signpost Series – *'Pointing the way to a low emissions agriculture'*
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NEW ZEALAND AGRICULTURAL GREENHOUSE GAS Research Centre

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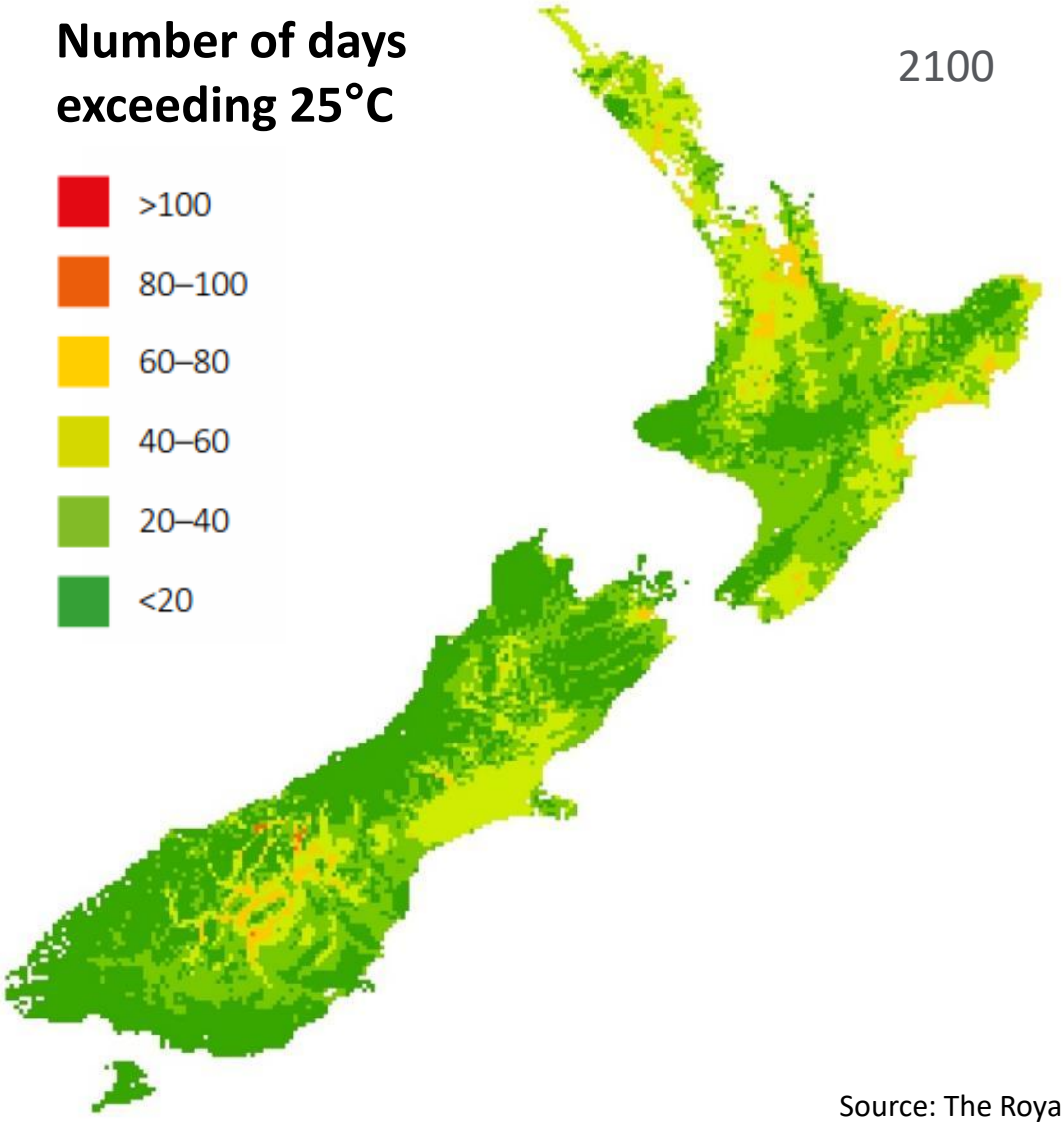
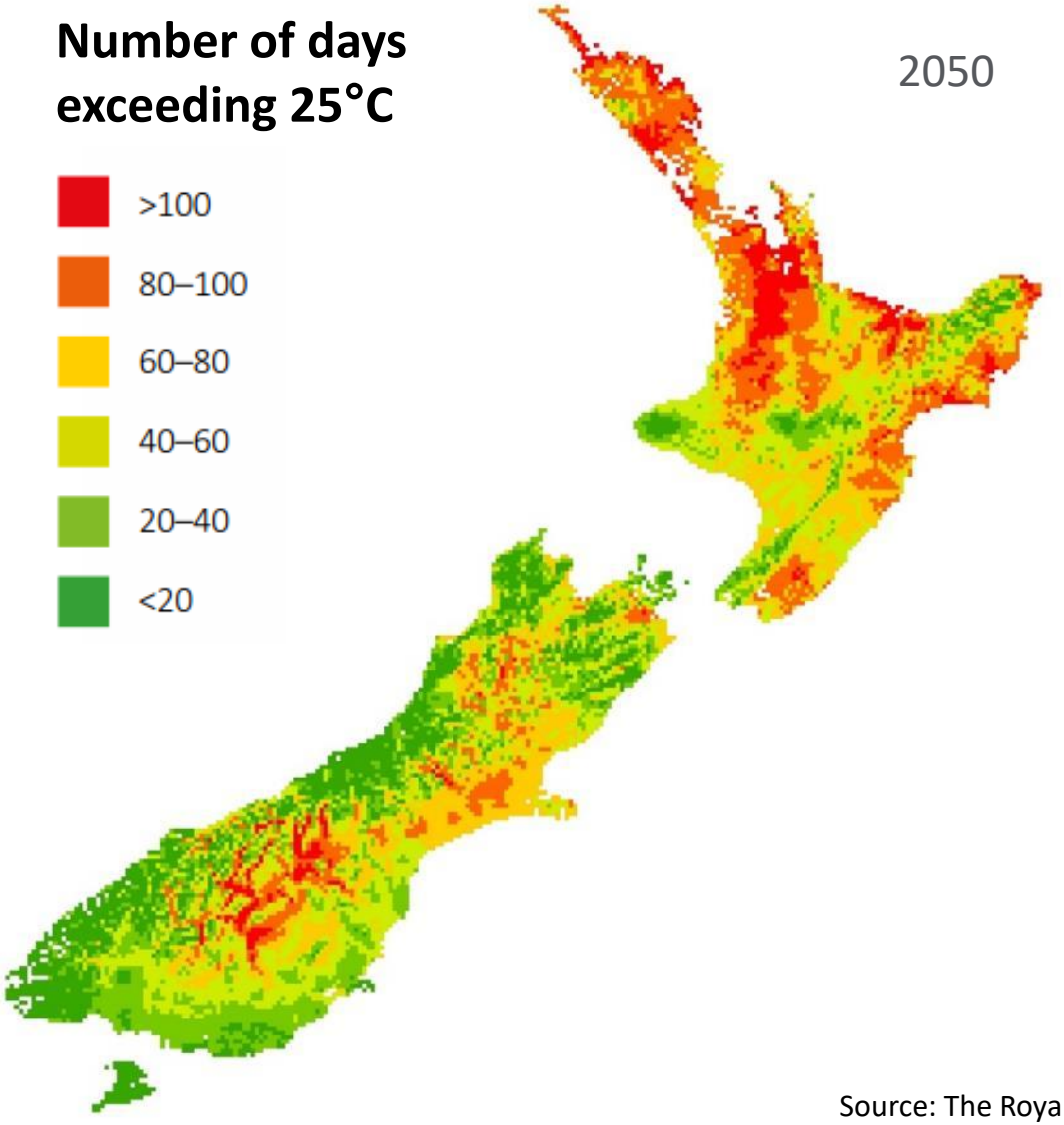
Climate change matters to New Zealand



Source: The Royal Society of NZ 2016

Climate change matters to New Zealand



Source: The Royal Society of NZ 2016

The Size of the Mitigation Task for NZ

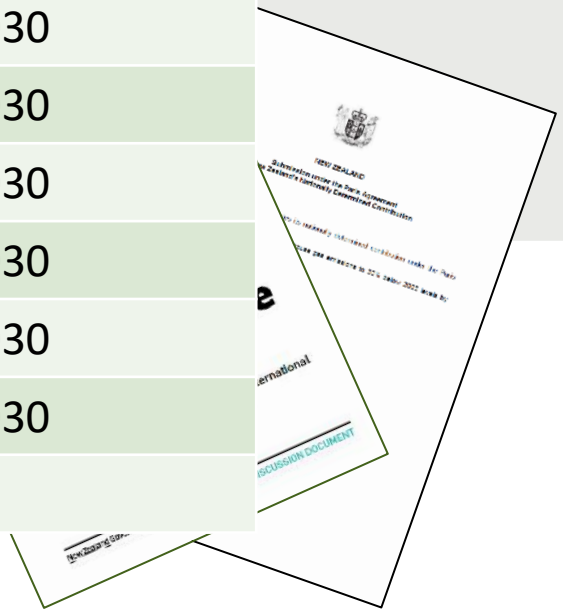
New Zealand Climate Targets

Time	**Domestic Targets** (Zero Carbon Act)	**International Targets**
2030	Methane reduced to 10% below 2017 levels	Our Paris Agreement is to reduce emissions to 30% below 2005 levels by 2030 (CO_2 equivalents)
2050	Net emissions of carbon dioxide and nitrous oxide to zero Methane reduced to 24-47% below 2017 levels	-

New Zealand Climate Targets

Time	Dom		
2030	Metl 2017		educe 05 levels by
2050	Net nitrc Metl 2017		

Country	Climate Commitments
New Zealand	30% below 2005 levels by 2030
Australia	26-28% below 2005 levels by 2030
California	40% below 2005 levels by 2030
Brazil	37% below 2005 levels by 2030
United Kingdom	37% below 2005 levels by 2030
Canada	30% below 2005 levels by 2030
Ireland	30% below 2005 levels by 2030
Netherlands	36% below 2005 levels by 2030
France	37% below 2005 levels by 2030



Company	Base year	Target
Danone	2015	-Reduce Scope 1, 2, and 3 emission intensity by 50% by 2030 -Achieve a 30% absolute reduction of scope 1 and 2 emissions by 2030 -Achieve net zero (Scope 1+2+3) by 2050
Mars Inc.	2015	-Reduce total emissions (Scope 1+2+3) 27% by 2025 and 67% by 2050 -Achieve net-zero GHG emissions in direct operations by 2040
Nestle	2010 2014	-Reduce GHG emissions (Scope 1 and 2) per ton of product in every product category to achieve an overall reduction of 35% in manufacturing operations vs. 2010 -Reduce GHG emissions per ton of product by 10% in distribution operations vs. 2014 -Reduce Scope 3 emissions by 8% by 2020 from base year 2014
Synlait Milk Limited	–	Reduce emissions per kilogram of milk solids on-farm by 35% (consisting of −50% nitrous oxide, −30% methane, and −30% carbon dioxide) and off-farm by 50% by 2028
Tesco	2015	Reduce Scope 3 emissions by 17% by 2030 Reduce Scope 1 and 2 emissions 60% by 2025
Coca-Cola Co.	2010	Reduce scope 1+2+3 emissions 25% by 2020
General Mills Inc.	2010	Reduce absolute GHG emissions across full value chain (Scope 1+2+3) by 28% by 2025
Kellogg	2015	Reduce Scope 3 emissions by 50% by 2050
PepsiCo.	2015	Reduce Scope 1+2+3 emissions by 20% by 2030
Unilever PLC	2010	Reduce emissions from the life-cycle of their products 50% per consumer use by 2030

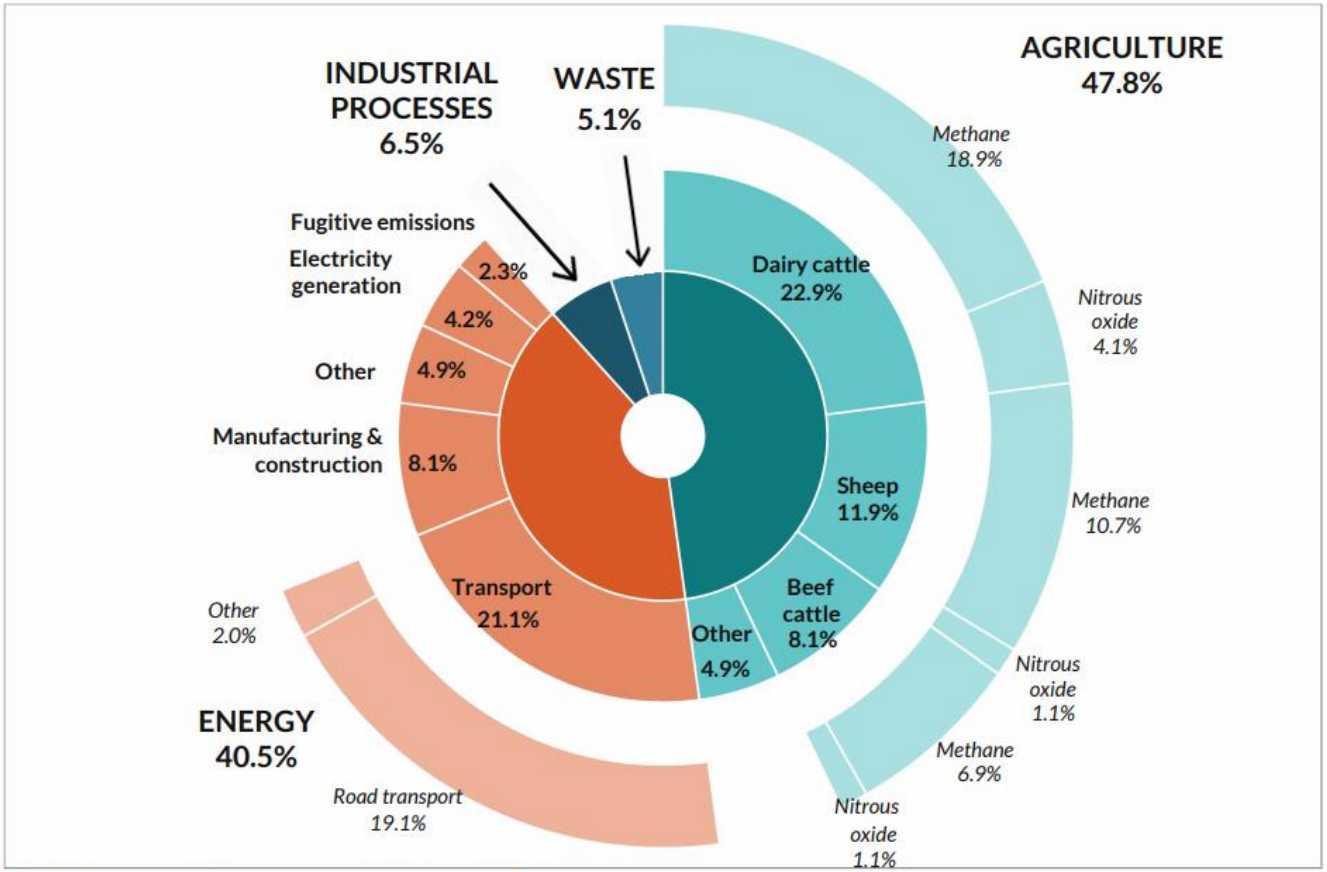
Sources: www.sciencebasedtargets.org; https://www.nestle.com/csv/impact/climate-change/climate-change; https://www.synlait.com/sustainability/#env.

Companies outflanking governments? Watch this space!

Source: Leahy, Clark, Reisinger Front. Sustain. Food Syst., 22 May 2020
https://doi.org/10.3389/fsufs.2020.00069

What are New Zealand's GHG emissions?

New Zealand's Emission Profile is Unique



Note: Percentages in the graph may not add up to 100 due to rounding.

Fugitive emissions are from the leakage, burning and controlled release of gases in oil and gas operations as well as escaping gases from coal mining and geothermal operations. Agricultural methane is mainly from livestock digestive systems and nitrous oxide is mainly from manure on soil. Emissions from Tokelau are not represented on this graph as they are 0.005% of New Zealand's gross emissions.

Source: NZ GHG Inventory 1990-2018, published April 2020

Sources of NZ agricultural gases (Methane and Nitrous Oxide)

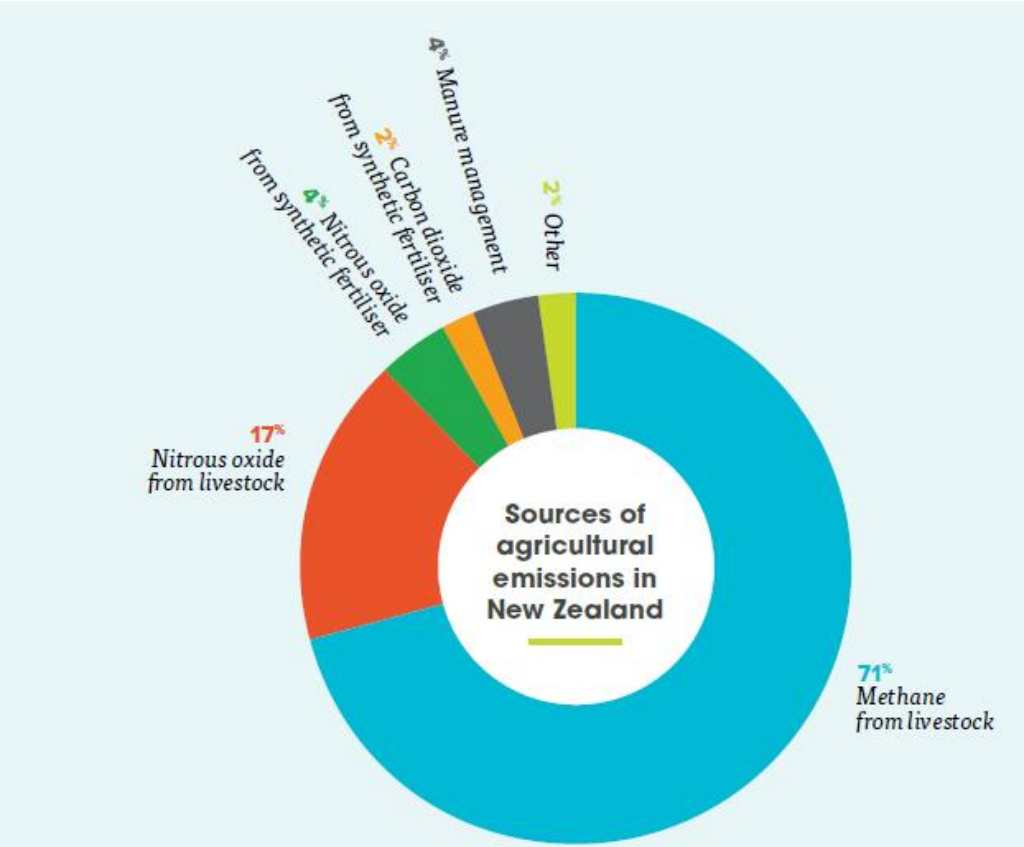


Figure 3.1: The breakdown of New Zealand's agricultural emissions in 2017.
Source: Ministry for the Environment (2019)

Source: ICCC Agriculture Report 2019

Where Do Livestock Emissions Come From?

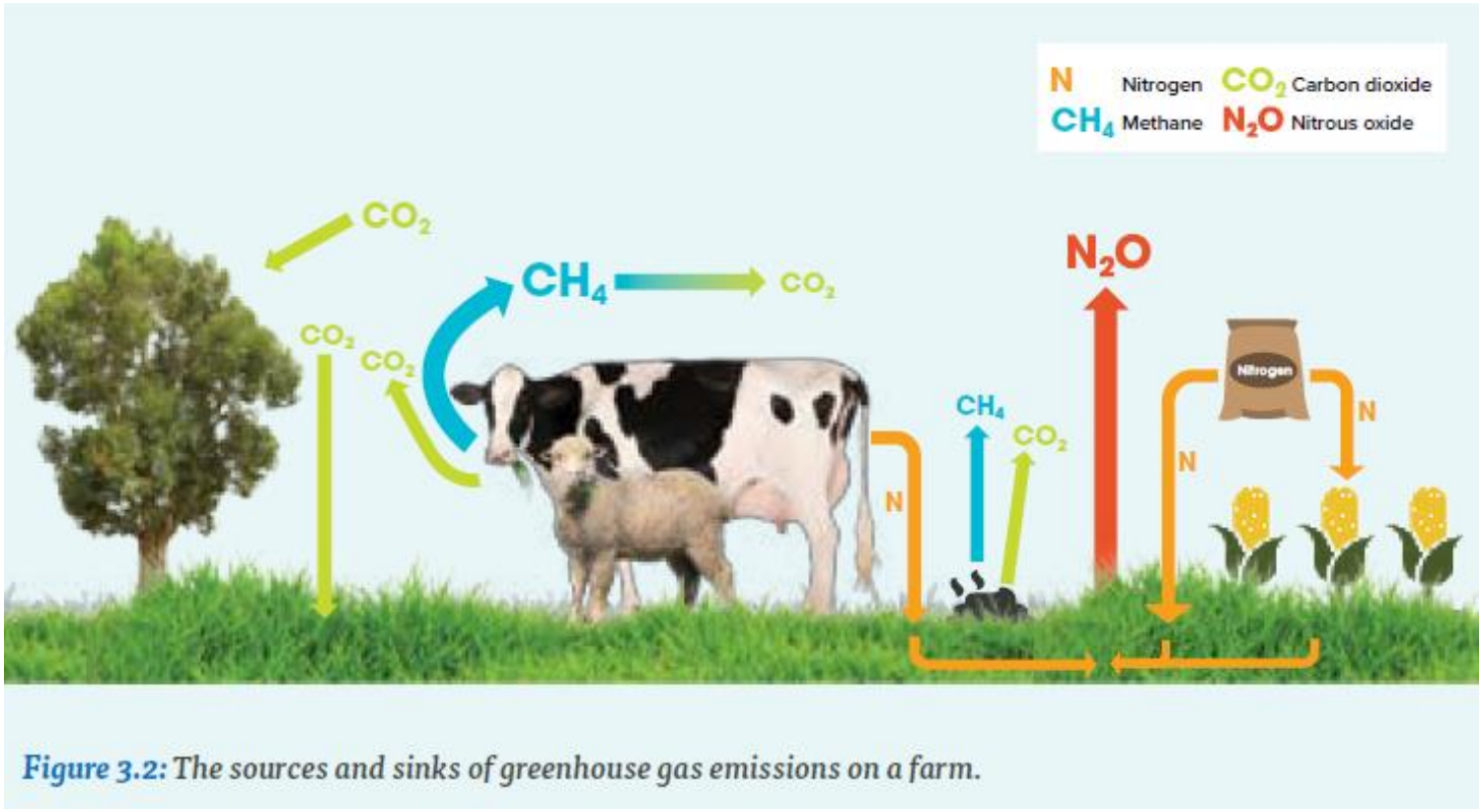


Figure 3.2: The sources and sinks of greenhouse gas emissions on a farm.

- **Livestock are neither a source nor a sink of carbon dioxide (CO_2).**
- **Livestock are a source of methane (CH_4).**
- **Livestock are a source of nitrous oxide (N_2O).**

Trends in NZ agriculture emissions

How Are Agricultural Emissions Changing in NZ?

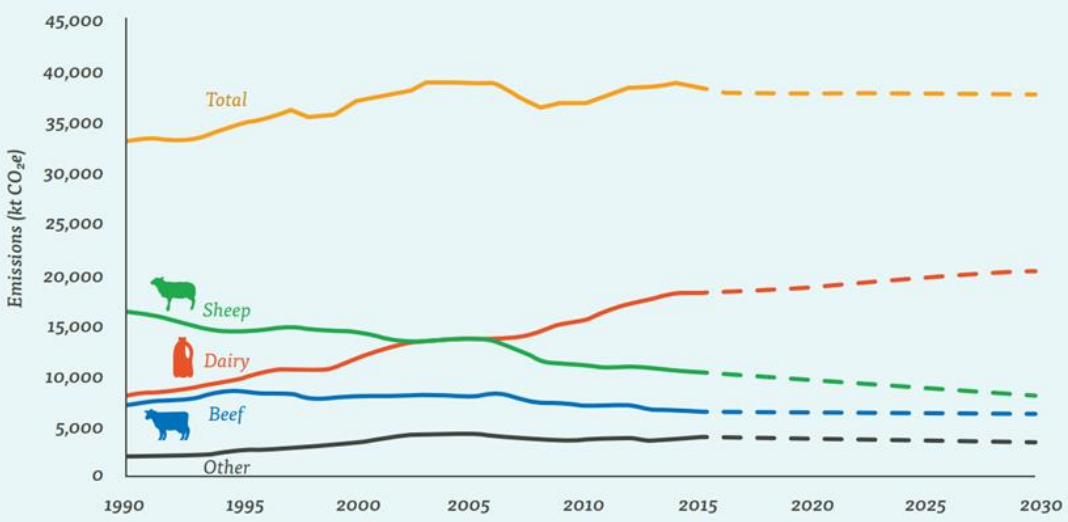


Figure 3.6: *New Zealand's actual and projected agricultural emissions (1990-2030).*
Source: Ministry for the Environment (2017a)

Historical and projected trends in GHG emission from the livestock sector in New Zealand, from ICCC (2019)

Predicting How Agricultural Emissions Will Change?

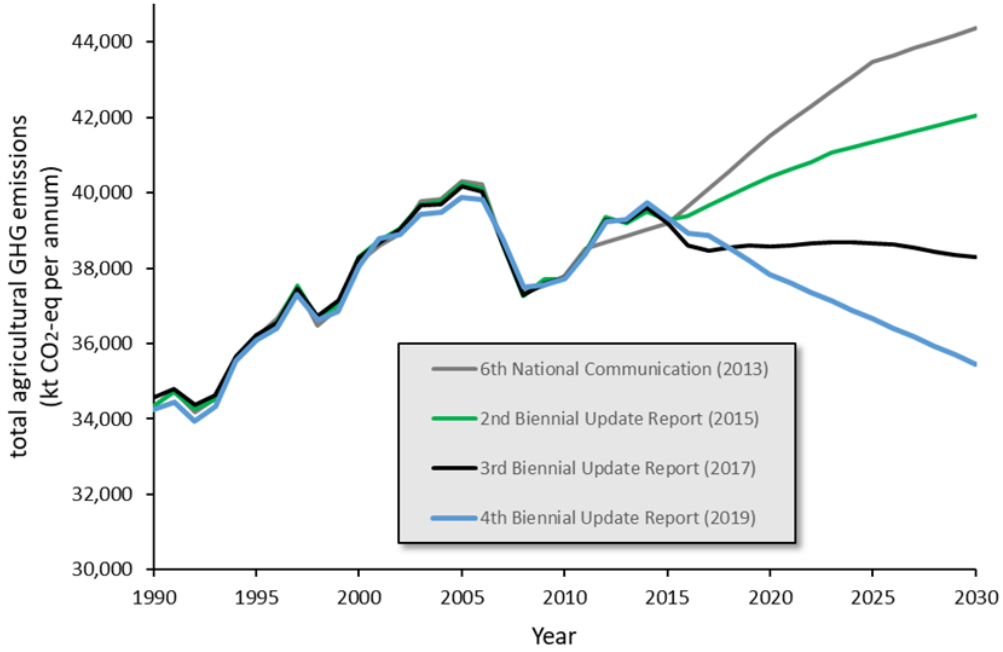
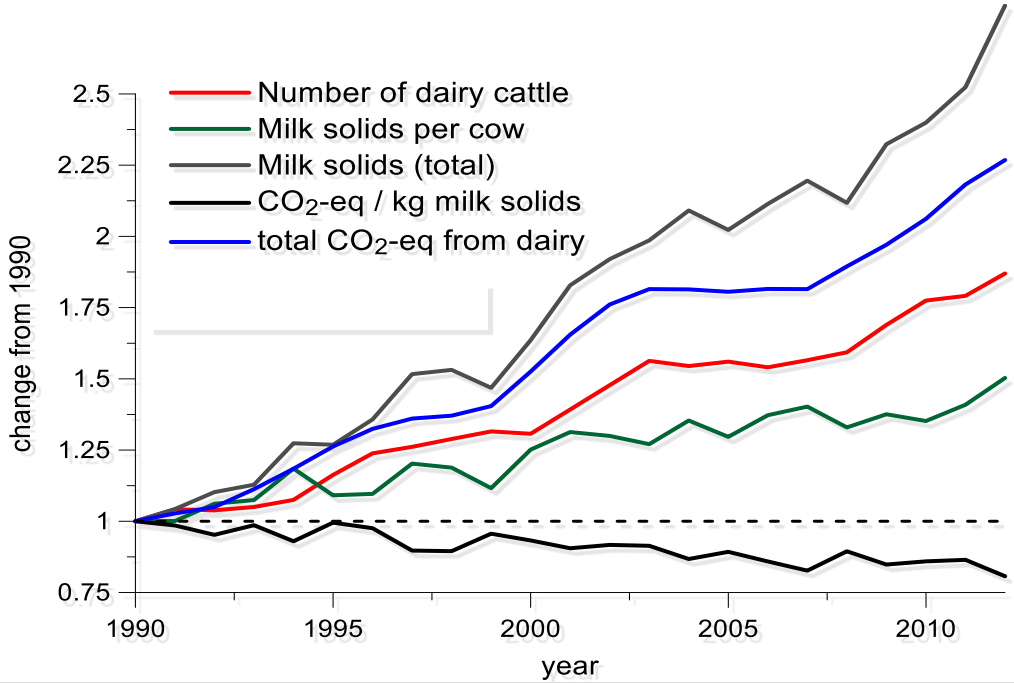


Figure 1. Historical and projected agriculture emissions from New Zealand based on 4 successive government reports. Assumptions for agricultural climate policy are identical in all reports, but non-climate and market assumptions differ. Based on Reisinger et al. (2018) with updated estimates from MfE (2019a).

Absolute Emissions vs Emissions Intensity



Source: MPI, 2015 (75% of N fertiliser apportioned to dairy)

Progress made…

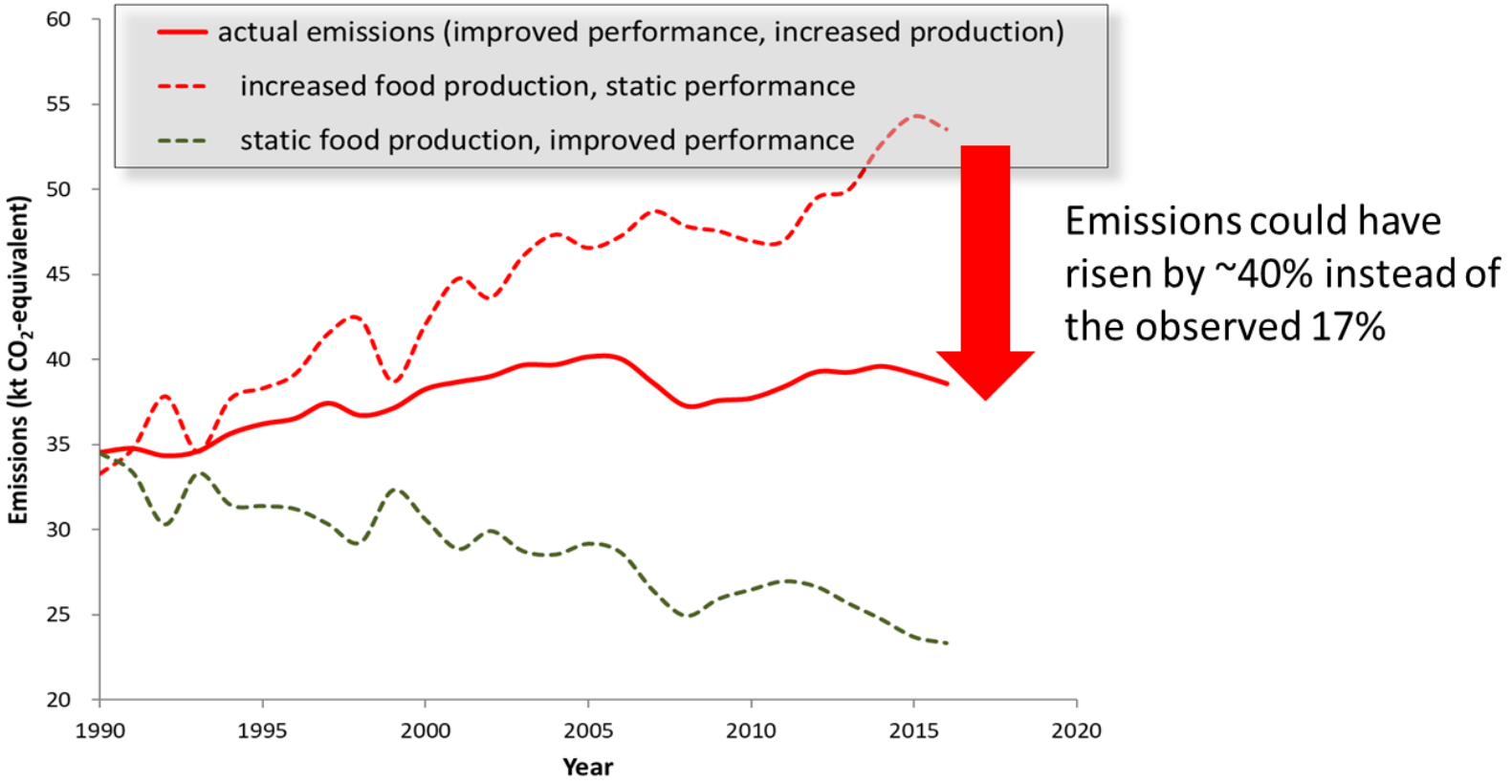


Figure. Total agricultural emissions 1990-2016 (solid red line), and two hypothetical scenarios with (a) identical increase in food production but no improvements in animal performance (i.e. a further increase in animal numbers to achieve the additional production; dashed red line), and (b) an identical improvement in animal performance but no increase in food production (i.e. a reduction in animal numbers to match the improved animal performance; green dashed line).

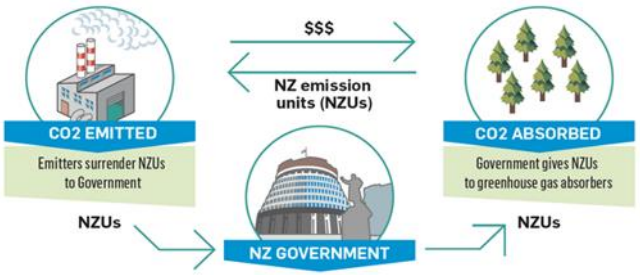
Agricultural greenhouse gases and policy

Agricultural greenhouse gases and policy

- Emissions Trading Scheme (ETS) is the principal tool for meeting NZ domestic and international targets.

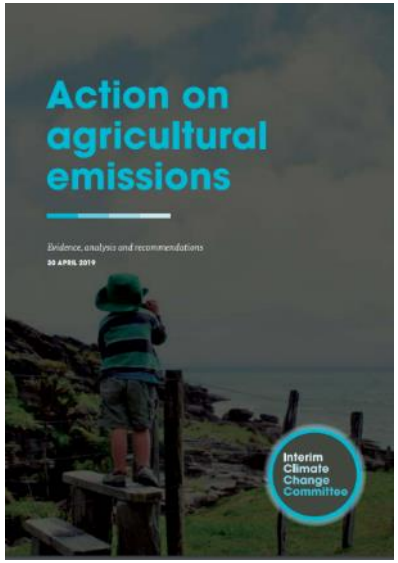
- It was designed to be an ‘all gases, all sectors’ scheme but agriculture is not currently included other than for reporting purposes, meaning carbon dioxide is the only gas priced at the moment.

NZ ETS



There isn’t a price on agricultural GHGs.
How will the sector meet its targets?

He Waka Eke Noa: Primary Sector Climate Action Partnership



April 2019: Interim Climate Change Committee recommended putting a price on ag GHGs

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July 2019: Proposal received from industry and Iwi/Māori to develop farm-level system for pricing ag GHGs

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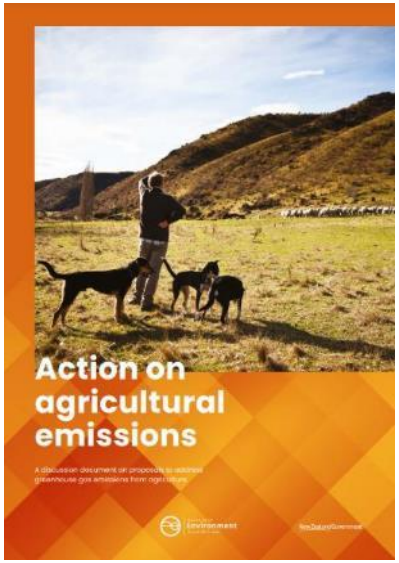

August 2019: Government undertook public consultation on both options

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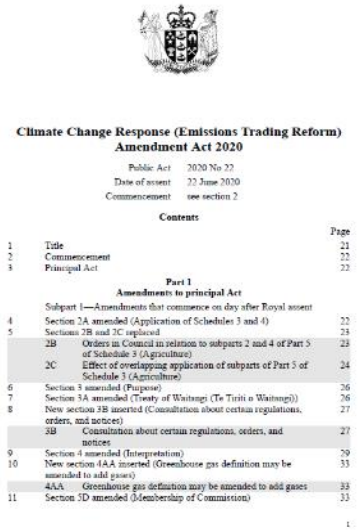

Climate Change Response (Emissions Trading Reform) Amendment Act 2020

Public Act 2020 No 22
Date of assent 22 June 2020
Commencement see section 2

Contents

Oct 2019: He Waka Eke Noa partnership announced, milestones included in legislation as part of ETS reforms in June 2020

He Waka Eke Noa: main features of the agreement

- Agricultural GHGs will be priced from 2025
  - Farm level for livestock
  - Processor level for fertiliser
- Ministers for Climate Change and Agriculture must put forward details of the pricing scheme by December 2022
- Milestones are set in legislation (see next slide) and Climate Change Commission will review progress in 2022

He Waka Eke Noa: milestones

Actions	Deadline
Guidance provided on how to measure and manage GHG emissions through farm planning	1 January 2021
25% of farmers and growers know their annual total on-farm GHGs and have a written plan to manage emissions	31 December 2021
100% of all farmers and growers know their annual total on-farm GHGs	31 December 2022
Pilot farm accounting system completed	31 December 2023
100% of farmers and growers have a written plan to measure and manage emissions	31 December 2024
All farms in NZ using system for farm-level accounting and reporting of 2024 agricultural GHGs at the farm level	1 January 2025

What happens if milestones aren’t met?

- In 2022, the Climate Change Commission will check progress and if milestones aren't being met, Government can bring agriculture into the ETS at processor level before 2025
- If the farm-level pricing mechanism is not ready for implementation by 2025, agriculture will come into the ETS with the point of obligation at the processor level

He Waka Eke Noa: 5 workstreams

1. Farm planning: Good Farm Practice principles for GHGs
2. **Emissions reporting:** criteria, methodologies and definitions for a farm-level accounting system
3. On-farm sequestration: programme to recognise on-farm sequestration
4. **Emissions pricing:** farm-level pricing mechanism to incentivise farmers and growers to reduce ag GHGs and contribute to 2050 targets
5. Extension, innovation and uptake, and supporting early action: TBC

Māori perspectives integrated into each of the above

He Pou a Rangi
Climate Change Commission

2021 Draft Advice for Consultation

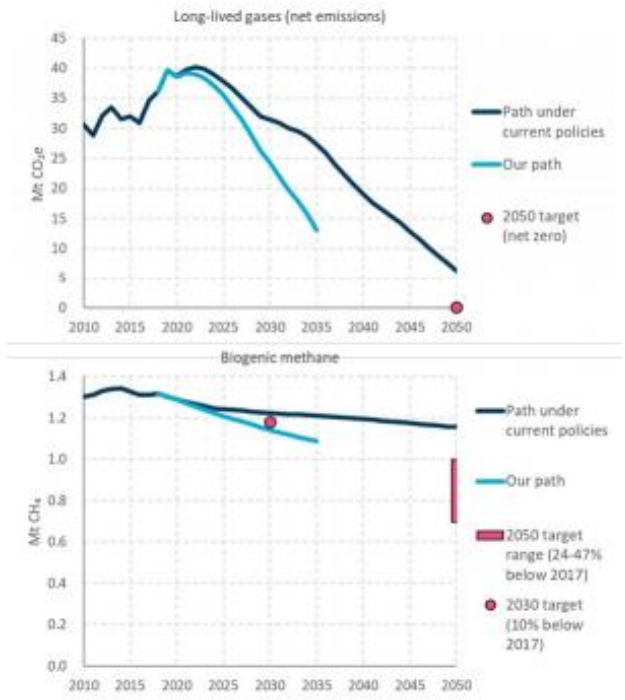

Figure ES1: Current government policies do not put Aotearoa on track to meet the Commission's emissions budgets and the 2050 targets. This figure shows how our path to 2035 would reduce emissions of long-lived gases (top figure) and biogenic methane (bottom figure)

First package of advice is now available and will be open for formal consultation from 1 February to 14 March 2021.

Final report 31 May 2021

The Proposed Path forward for Agriculture…..

Key points from the report

- Assume no new technologies to reduce methane are available before 2035
- Proposed path would see dairy and sheep and beef animal numbers each reduced by around 15% from 2018 levels by 2030. This compares with an 8-10% reduction proposed under current policies
- Farmers continue to achieve productivity improvements in line with historic trends. Adopt low emission practices on-farm
- Selective breeding for lower emissions sheep progressively adopted
- Land use changes – dairy into horticulture, at a rate of 2,000 hectares per year from 2025; Pine trees will play an important role in getting to 2050
- Increase in Native forests on less productive land

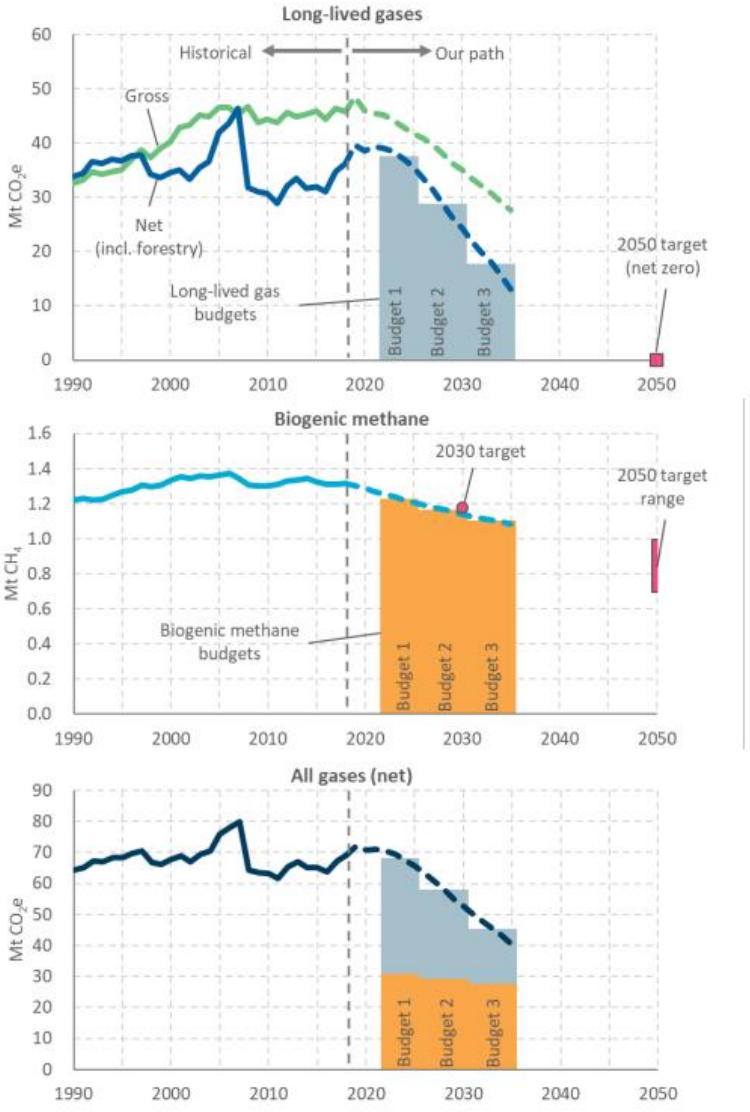

Figure 2.2: These three figures show how our proposed emissions budgets would step Aotearoa towards its emissions reduction targets. The top figure shows long-lived gases, the middle figure shows biogenic methane, and the bottom figure shows all gases combined as CO_2-equivalent.

Source: Commission analysis.

He Pou a Rangi
Climate Change Commission

Mitigating Emissions

You can’t manage what you don’t know. Finding out your on-farm greenhouse gas emissions is the critical first step.

Mitigation options for New Zealand agriculture

- Further increase animal productivity and farm efficiency
- Additional technologies that directly reduce emissions
- Constraints on total production, e.g. from freshwater restrictions
- Movement towards lower-emitting land uses, e.g. cropping & horticulture, forestry

→ **More information available on www.agmatters.nz/actions**

Ag Matters

On farm system change can impact on GHG emissions but limited:

- Modelling studies and expert judgement suggest that there a limited number of on-farm practice changes that could reduce emissions on some farms **by up to 10%** while still maintaining profitability

BUT

- Every farm will have a unique emissions profile
- There is no 'one size fits all' solution
- Each farmer will need to identify the right mix of actions for them and their farm taking into account their specific climate and soil conditions, current management system and skill level of farm staff

Each. Farm. Is. Different.

Further increase animal productivity and farm efficiency

- Increasing individual animal performance while reducing stocking rate
- Low emissions feeds
- Less intensive systems
- Fertiliser use
- Diversifying farm operations
- Manure management

What Drives Emissions?

- Methane emissions are related to the total amount of dry matter eaten. For a NZ forage fed animal about 21g of methane is produced per kg of feed eaten
- Nitrous oxide emissions depend on the total amount of nitrogen going through a farm via feed and fertilizer

What New Technologies are Being Developed?

Technology	When available	Maximum efficacy
Low CH_4 emitting sheep	2-3 years	10%?
Low CH_4 emitting cattle	>5 years	10%?
Low N excreting cattle	Now in theory	??
CH_4 vaccine	>10 years	30%?
CH_4 inhibitors	2-5 years	30+%
Nitrification inhibitors	3-5 years	50+%
Low emission feeds (e.g forage rape, fodder beet, plantain)	Available now	?
Novel low emitting feeds (e.g. GM ryegrass, seaweed)	?	?

So what should farmers be thinking about

Know their current farm GHG emissions – methane & nitrous oxide. Benchmark

Understand the basics of what drives methane & nitrous oxide emissions – as a precursor to understanding/developing:

- Farm system mitigation strategies to reduce on-farm GHG emissions
- Land use change options
- Implications for business profitability

Understand the basics of forestry as an offset, that it is not a permanent solution, & that they need expert advice

Know what is happening in the wider sector around meeting GHG reduction targets

Understand what they need to do regarding water quality mitigations, and how this will impact on GHG emissions

Be. Prepared.

For more information

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Thanks for your attention