BEFORE THE FRESHWATER HEARING PANEL OF GREATER WELLINGTON REGIONAL COUNCIL

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF Proposed Plan Change 1 to the Regional Policy Statement for the Wellington Region (Hearing Stream 3)

STATEMENT OF EVIDENCE BY ROGER SCOTT LINCOLN

14 AUGUST 2023

Introduction

Qualifications and experience

1. My full name is Roger Scott Lincoln. I am a Principal Policy Advisor for DairyNZ. In my role I lead on agricultural pricing work (*He waka eke noa*) and all climate change related policy issues. Previously I was Director, Climate Change at the Ministry for the Environment and I have held various Government roles working on domestic policy land sector issues, legislation (including the NZ ETS) and regulations, and international trade and environment treaty negotiations (including WTO, UNFCCC, and international sustainable forestry).
2. The focus of my evidence is to outline the existing and proposed measures designed to guide mitigation of agricultural sector climate change emissions and summarise these for the hearing

panel, to inform decision making in relation to the topics covered under Hearing Stream 3 (Climate Change) for Proposed Plan Change 1 (PC1) to the Regional Policy Statement for the Wellington Region (RPS).

3. In this evidence I cover

   a) National level Agricultural Greenhouse Gas Policy
   b) He Waka Eke Noa Partnership between Government, the Primary Sector, and iwi/Māori
   c) Pricing Agricultural Greenhouse Gases
   d) DairyNZ's Agricultural Greenhouse Gas Initiatives
   e) Market and Customer signals on greenhouse gas emission reductions
   f) Acceleration of Science Solutions for Agricultural Greenhouses Gases
   g) Differences between short lived and long-lived greenhouse gas emissions
   h) Measuring the Warming Impact of Methane requires an Appropriate Metric

Code of Conduct Statement

4. I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. I agree to comply with the Code and I am satisfied that the matters which I address in my evidence are within my field of expertise. I am not aware of any material facts that I have omitted which might alter or detract from the opinions I express in my evidence.

5. Regulation has a role to play in supporting emissions reductions, but it needs to be practical, pragmatic, fair, and underpinned by sound science.

6. Legislated methane reduction targets should be the floor, not the ceiling, for climate action and ambition. Individual farmers, and the companies they supply, can then choose to go further or faster if they wish.

7. Because Kiwi farmers are already among the world's most emission efficient producers of milk, they will need new technology and tools to support further reductions. We need to continue investing and working hard to develop those options.

8. This submission is made in the context of work already well underway to address greenhouse gas emissions within the dairy sector, the legislative and regulatory landscape, clear market and customer signals and our latest understanding of the science of warming and measurement.

National level Agricultural Greenhouse Gas Policy

9. The Government has set clear targets for reducing greenhouse emissions. The Climate Change Response (Zero Carbon) Act set domestic targets for reducing New Zealand's total greenhouse gas emissions. New Zealand's domestic targets are:

   - net zero emissions of all greenhouse gases other than biogenic methane by 2050, and
   - 24% to 47% reduction below 2017 levels of biogenic methane emissions by 2050, including a 10% reduction by 2030.

10. Note that the methane targets include the waste sector, are sector-wide and national, not farm-level, farm-type or regional. These targets are also in the process of being reviewed with the Climate Change Commission currently calling for evidence before advising Government of their findings in late 2024.

11. New Zealand's first emissions reduction plan (ERP) was published in May 2022. This plan includes a set of key actions to support farmers, growers, and whenua Māori owners to lower agricultural emissions, while continuing to produce high-value, high-quality food and fibre.

12. Key actions outlined in the ERP include:

- introducing an effective system to price emissions by 2025
- establishing a new Centre for Climate Action on Agricultural Emissions to accelerate new research and development.
- supporting producers to make changes on-farm
- developing specialised extension services with a climate and environmental focus
- establishing tikanga-based programmes to support the needs and aspirations of Māori.

He Waka Eke Noa Partnership between Government, the Primary Sector, and iwi/Māori

13. He Waka Eke Noa is a partnership between government, the primary sector, and iwi/Māori (the partnership) to equip farmers and growers to measure, manage, and reduce on-farm agricultural greenhouse gas emissions and adapt to climate change. This is to enable sustainable food and fibre production for future generations.

14. The partnership's work includes developing an effective system to price agricultural emissions from 2025. He Waka Eke Noa is working towards all farmers and growers:

- By December 2022, knowing their greenhouse gas emissions numbers (95% of dairy farmers know their numbers, as at Dec 2022)
- By December 2024, having a written plan to manage greenhouse gas emissions (45% of dairy farmers have a written plan, as at Dec 2022)
- Being supported to adapt to climate change.

Pricing Agricultural Greenhouse Gases

15. The Government plans to introduce a farm-level levy on agricultural greenhouse gas emissions from 2025. Agricultural GHGs are legislated to go into the Emissions Trading Scheme (ETS) in 2025 (this is referred to as the "ETS backstop."). He Waka Eke Noa was established to develop an alternative to the ETS.[1]

[1] Both the HWEN Partnership and Government modelling showed detrimental impacts to farmers and regional economies if agriculture were to go into the NZETS as prescribed in the Climate Change Response Act.

16. In my opinion, a farm-level scheme would be the most effective mechanism to reduce emissions. It would be self-funding, apply nationally, cover ~96% of the sector's emissions, and enable payments for uptake of mitigation technologies and/or eligible sequestration. Crucially, it would maintain a viable and productive agriculture sector.

17. He Waka Eke Noa provided its recommendations to Government on a system to price agricultural emissions in May 2022.[2] See the HWEN recommendations here:

18. The Government has also considered advice from the Climate Change Commission.[3]

19. In December 2022, the Climate Change Minister and Agriculture Minister released a report outlining the Government's system to price agricultural emissions, as an alternative to the New Zealand Emissions Trading Scheme. The Government agreed a farm-level, split gas levy would be introduced by 2025, and also agreed to replace the ETS 'back-stop'.[4]

20. The partnership is currently awaiting the Government's final policy decisions. A Technical Advisory Group has also been established to advance measurement issues, including for a simple greenhouse gas calculator.

DairyNZ's Agricultural Greenhouse Gas Initiatives

21. DairyNZ is researching different farm systems options, such as feed types and use, improved fertiliser and effluent use, and options for on-farm carbon sequestration. This research is partnering with others e.g., AgResearch, LIC, and CRV.

22. DairyNZ is also researching how to reduce greenhouse gas (GHG) emissions to ensure the most relevant products are available for our farmers sooner. The research will prove that products suit New Zealand pasture-based systems and help achieve our GHG targets.

23. DairyNZ maintains active involvement in He Waka Eke Noa to ensure any pricing scheme remains practical, fair and incentives the uptake of new technologies.

24. DairyNZ provides extension support to farmers on GHGs alongside freshwater and financial performance.

25. DairyNZ conducts research into on-farm solutions for reducing GHGs and increasing climate resilience.

26. DairyNZ partners with dairy companies via Dairy Tomorrow.

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[2] See Emissions pricing recommendations – He Waka Eke Noa

[3] See Advice to Government on agricultural emissions – Climate Change Commission

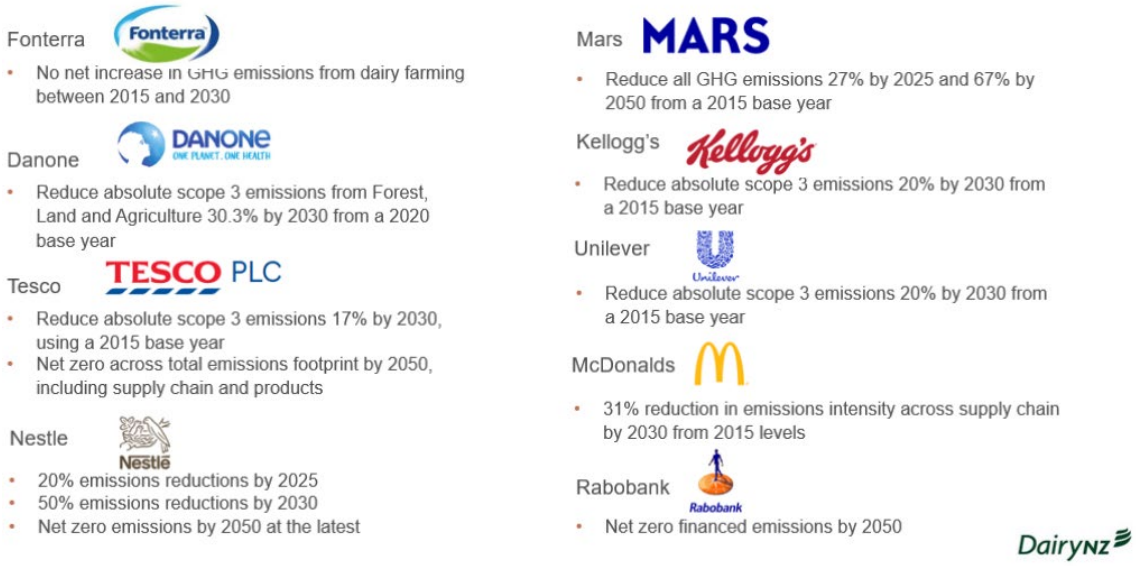
[4] See Pricing agricultural emissions – Report under section 215 of the Climate Change Response Act 2002

Market and Customer signals on greenhouse gas emission reductions

27. Farmers and dairy processors are increasingly aware of the environmental impact of their operations, including greenhouse gas emissions. Various customer and market signals play a significant role in encouraging producers to consider and manage their emissions. Growing consumer awareness and concern about environmental issues drive demand for sustainable and environmentally friendly products and services. Investors are increasingly considering environmental, social, and governance (ESG) factors when making investment decisions. Farmers are part of complex supply chains, and sustainability practices are cascading throughout these networks.

28. The following table (Table 1) lists some of the businesses that New Zealand dairy farmers interact with who are setting their own greenhouse gas targets. Note the differences in use of base years, target end points, absolute reductions vs improving GHG intensity and scope 1, 2 and 3 (Scope 1 and Scope 2 emissions are considered more directly under the organization's control e.g. emissions from company-owned vehicles, heating systems, and manufacturing processes; Scope 2 emissions are indirect greenhouse gas emissions associated with the generation of purchased electricity, heating, and cooling consumed by the reporting entity; and Scope 3 emissions often represent a larger portion of a company's total emissions and can extend far beyond the boundaries of its own operations e.g. on-farm greenhouse gas emissions).

Table 1



Acceleration of Science Solutions for Agricultural Greenhouses Gases

29. For the dairy sector to maintain international competitiveness, reduce its environmental footprint, and make a greater contribution to New Zealand's economy a strategic approach is needed for greenhouse gas research and development. It will not be possible to meet long-term

targets for biogenic methane without very large financial costs to dairy farms and the dairy sector unless the breakthrough technologies under development come to fruition.

30. The Government and agricultural industry sector bodies, including DairyNZ, continue to invest via the Pastoral Greenhouse Gas Research Consortium and New Zealand Greenhouse Gas Research Centre (NZAGRC) to research and develop technologies to reduce biological methane and nitrous oxide emissions.

31. Government Budget 2022 allocated $338.7 million over 4 years to strengthen the role of research and development in getting new tools and technology to reduce on-farm emissions to farmers quicker.

32. The Centre for Climate Action on Agricultural Emissions plays a key role in efforts to lower New Zealand's agricultural emissions. The new centre will also:

    - unite efforts to accelerate research and development.
    - get new tools, technology, and practices to lower on-farm emissions to farmers faster.
    - complement the work being done through the He Waka Eke Noa partnership.
    - include mātauranga-based approaches to support whenua Māori owners with climate change mitigation.

33. AgriZeroNZ is a new public-private partnership, and the New Zealand Agricultural Greenhouse Gas Research Centre. Partners have made an indicative funding commitment that will rise to around $35 million a year by 2025. This will be matched by the Government and will see around $170 million invested over the next 4 years.

34. AgriZero is focusing on investment in tools that will work on New Zealand's pasture-based farms. Its role is to ensure farmers have equitable access to affordable and effective tools and technology to cut their methane and nitrous oxide emissions, while maintaining efficiency, production and profitability. The Government is a 50% shareholder, in partnership with ANZCO Foods, Fonterra, Rabobank, Ravensdown, Silver Fern Farms and Synlait. These shareholders have access to over 70% of New Zealand's farms.

Differences between short lived and long-lived greenhouse gas emissions

35. There is increasing recognition that different species of Greenhouse Gases have different warming impacts. As a result, there is both national and international recognition that treatment of these gases should differ, including through regulation.

36. Methane, as a short-lived, flow gas, does not accumulate in the atmosphere in the same way as long-lived gases. Although much more effective at trapping heat than long-lived gasses, methane emitted today will have largely disappeared after 12 years. Short-lived gases maintain warming if they are sustained, add to warming if they are increased, and reverse warming if they decrease.

37. Carbon dioxide and nitrous oxide are long-lived, stock gases. Nitrous oxide stays in the atmosphere for centuries, and carbon dioxide for millennia. Therefore, every unit emitted today increases its concentration in the atmosphere and adds to the warming caused by past emissions. Long-lived gases add to warming if they are sustained, add to warming if they are increased, and maintain warming if they decrease.

38. The latest science understanding calls for the separation and different treatment of short and long-lived gases. Consistent with this, New Zealand's domestic climate change targets use a split gas approach.[5]

39. The IPCC 6th Assessment Report (AR6) makes clear the importance of separating long-lived gases and short-lived gases in chapter 7 of AR 6 Climate Change 2021.

40. A recent report by 33 respected scientists in the prestigious Nature Journal, also recommends recognising the separate contributions to global warming of long-lived and short-lived gases when setting targets and monitoring progress. The report underlines that separate indication would support an objective assessment of the implications of aggregated emission targets for global temperature and long-term low-emission development strategies.

41. The differences of emissions and warming for long-lived and short-lived greenhouse gases are explained in the Table 2 below and drawn in graph form in Figure 1.

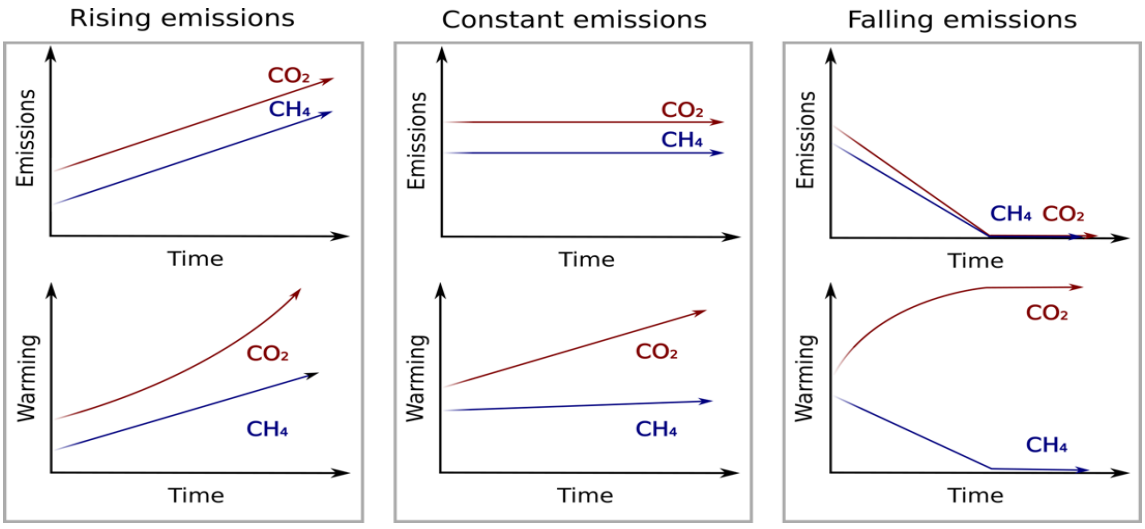
Table 2

Long-lived: carbon dioxide and nitrous oxide	Short-lived: methane
Eliminating emissions maintains contribution to global warming at a steady level (temperature change caused by CO2 plateaus)	Eliminating emissions leads to temperature declining from a peak, as contribution to global warming is driven by methane emissions rate (temperature change caused by methane declines until nearly all past warming has been reversed)
A constant rate of emissions leads to increased warming year-on-year (temperature change caused by CO2 increases)	A constant rate of methane emissions maintains a constant level of warming relative to the base year, to first order. Including second order effects, temperature will increase slowly, as the climate is slowly responding to past increases in methane emissions (temperature change caused by methane increases slowly)

[5] Note that New Zealand's NDC bundles all GHG's together and UNFCCC's default reporting requirement uses GWP100, which is inaccurate for methane.

Reducing emissions slows the rate of increase of global warming (temperature change caused by CO2 increases)	Reducing emissions can maintain methane's contribution to global warming at a constant level, if reductions are approximately 3% over 10 years. Reducing emissions faster than this can reduce global warming from methane. (temperature change caused by methane stable or declines)

Figure 1



42. To stop carbon dioxide and nitrous oxide emissions from causing additional global warming, it is necessary to reduce the ongoing rate of emissions of these gases to net zero. Much smaller reductions, in the range of 10-30% over 30 years depending on prior methane emissions and ongoing emissions elsewhere, would stop methane emissions from causing additional global warming.

43. The IPCC confirmed that "limiting human-induced global warming to a specific level requires limiting cumulative CO2 emissions, reaching at least net zero CO2 emissions, along with strong reductions in other greenhouse gas emissions." For this reason, methane does not need to reach net zero and should be treated differently.

Measuring the Warming Impact of Methane requires an Appropriate Metric

44. The Global Warming Potential (GWP) of a greenhouse gas represents its ability to trap extra heat in the atmosphere over time relative to carbon dioxide. This is commonly calculated over 100 years and is known as GWP100. While GWP100 can work well for measuring gases with a long lifetime in the atmosphere, it is inaccurate for short-lived gases such as methane – over-stating the warming impact of methane emissions by three to four times when emissions are stable.

45. GWP* is a much more accurate method for accounting for methane emissions and the impact on temperature. This time-based metric still uses GWP100 values but adapts them to take account of methane's short lifetime and other behaviour.

46. To demonstrate the difference, using GWP100 agriculture contributed 51% of New Zealand's total emissions in 2020. However, using GWP*, the proportion of the agricultural sector's contribution to additional warming between 1990 and 2020 was only 37%.

47. All metrics are a tool not a solution. Using appropriate metrics that account for different warming potential of short-lived gasses allow policy decisions around burden sharing to take place transparently, and on a level playing field. Relying on a metric that overstates the impact of agricultural emissions when setting targets would unfairly punish farmers.

48. The IPCC report highlighted the need to split out short-lived gases and long-lived gases to have certainty in meeting temperature targets:

    "The choice of emission metric affects the quantification of net zero GHG emissions and therefore the resulting temperature outcome after net zero emissions are achieved. In general, achieving net zero CO2 emissions and declining non-CO2 radiative forcing would be sufficient to prevent additional human-caused warming. Reaching net zero GHG emissions as quantified by GWP-100 typically results in global temperatures that peak and then decline after net zero GHGs emissions are achieved, though this outcome depends on the relative sequencing of mitigation of short-lived and long-lived species."

    "In contrast, reaching net zero GHG emissions when quantified using new emission metrics such as CGTP or GWP would lead to approximate temperature stabilization (high confidence) {7.6.2}."*
    "By comparison expressing methane emissions as CO2 equivalent emissions using GWP-100 overstates the effect of constant methane emissions on global surface temperature by a factor of 3-4 over a 20-year time horizon (Lynch et al., 2020, their Figure 5), while understating the effect of any new methane emission source by a factor of 4-5 over the 20 years following the introduction of the new source (Lynch et al., 2020, their Figure 4)."

49. New Zealand still monitors progress by aggregating emissions using the GWP100 metric to convert all emissions to Carbon dioxide equivalent (CO2-e), which the recent Intergovernmental Panel on Climate Change (IPCC) report noted provides an inaccurate comparison on warming contribution.

50. In particular the IPCC stated that GWP100 overstates the warming impact of methane by a factor of 3-4, if methane is stable and understates the warming impact of an increase in methane by 4-5 times over a 20-year period.

51. GWP100 is even more inaccurate if methane is reducing. Using the GWP100 aggregated emissions approach currently results in a finding that agriculture in New Zealand accounts for 48 percent of emissions. It does not give any indication that the actual contribution of this country's methane emissions differs considerably from that of carbon dioxide when it comes to the contribution to global warming pathways.

52. A national inventory where 48 percent of emissions are agricultural greenhouse gases does not equate to being a country where 48 percent of our contribution to temperature increase is derived from agriculture. It is important that Councils and the general public understand this.

53. Failing to consider the warming impact differences may overestimate the methane reductions needed and create unnecessary social and economic impacts as a result.