



MPI POLICY AND TRADE  
Agricultural Inventory Advisory Panel Meeting  
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## DIRECT NITROUS OXIDE EMISSION FACTOR FOR UREA ( $EF_{1(UREA)}$ )

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**Main Purpose:** ☒ Decide ☒ Discuss ☒ Note

### Purpose of Report

1. Update the Agricultural Advisory Inventory Panel on a new requirement to estimate carbon dioxide emissions from urea from the 2015 reporting year onwards.
2. Seek approval from the Agricultural Inventory Advisory Panel to use a country-specific direct nitrous oxide emission factor for urea ( $EF_{1(UREA)}$ ) in the Agriculture Greenhouse Gas Inventory ('the Inventory').
3. Attached to this briefing paper is the report:
  - Kelliher et al. (2014), Statistical analysis of nitrous oxide emission factors from pastoral agriculture field trials conducted in New Zealand, Environmental Pollution 186: 63-66

### Summary

#### Background

4. New Zealand has an obligation under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol to report anthropogenic greenhouse gas emissions and removals every year. Emissions are estimated and reported in the annual submission of the National Inventory Report submitted to the UNFCCC. This reporting requirement is also legislated by the New Zealand Climate Change Response Act (2002).
5. Any future commitments taken by New Zealand to reduce greenhouse gas emissions may have a financial cost based on emissions reported in the National Inventory Report. Therefore reported emissions and removals need to be as accurate as possible. New Zealand has a long-standing research program in estimating country-specific emission factors to aid in the improvement of reported emissions and removals from the land-based sectors.
6. Reporting must meet the recommendations in the guidelines provided by the Intergovernmental Panel on Climate Change (IPCC)<sup>i</sup>. Improvements are encouraged to take account of national circumstances

beyond the default methodology and emission factors that are recommended in the 2006 IPCC Guidelines, and need to be well-documented and transparent.

### *Current Inventory*

7. New Zealand's Inventory currently includes estimations of nitrous oxide emissions from nitrogen fertilisers in general, noting that the majority of this fertiliser is urea. The emission factor,  $EF_1$  (direct nitrous oxide emissions from nitrogen applied to pastoral soils in New Zealand) used in the Inventory for all synthetic nitrogen fertiliser is the country-specific value of 1%. New Zealand has not previously reported on carbon dioxide emissions from urea, because there was not a requirement to do so from the IPCC guidelines.

### *Proposed Improvement to the Inventory*

8. There are two parts to the proposed change. The first part on a new requirement to estimate carbon dioxide emissions from urea is for the Panel to note. The second part on a proposed change to the nitrous oxide emission factor for urea is for the Panel to discuss and decide.

#### *Part 1 – New reporting requirement for carbon dioxide emissions from urea*

9. From the 2015 reporting year onwards, new reporting requirements have been introduced<sup>1</sup>. The Inventory must continue to meet the 2000 IPCC Good Practice guidelines but must now meet the 2006 IPCC guidelines (rather than the 1996 IPCC guidelines). Under the 2006 guidelines, carbon dioxide emissions from urea fertiliser must be reported.
10. MPI have already approached the Fertiliser Association to enquire after activity data for urea fertiliser applied on farms from 1990 to present.
11. In the absence of a published country-specific emission factor for carbon dioxide emissions from urea application ( $EF_{UREA-C}$ ), the Tier 1 default value of 0.2 (20%, default uncertainty of -50%) will be used, as is recommended in the 2006 IPCC guidelines<sup>2</sup>.

#### *Part 2 – Proposed reduction of the nitrous oxide emission factor for urea*

12. In a recent study Kelliher et al. (2014) statistically analysed 22 urea field trials between 2000 and 2013 and estimated a mean value for  $EF_{1(UREA)}$  value of  $0.48 \pm 0.13$  %.
13. As a result of the new reporting of urea carbon dioxide emissions, activity data will be available for the proportion of synthetic nitrogen fertiliser applied that is urea.
14. The proposed nitrous oxide emission factor for urea fertiliser ( $EF_{1(UREA)}$ ) will be 0.48 %. The emission factor for all other synthetic nitrogen fertiliser ( $EF_1$ ) will remain as 1 %.

### *Effect of changes*

15. The effect of using a value of 0.48 % for  $EF_{1(UREA)}$  on estimated nitrous oxide emissions has not been calculated, as we do not yet have activity data for the proportion of urea use in New Zealand. Overall, as the majority of synthetic nitrogen fertiliser used in New Zealand is urea, there would be a reduction

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<sup>1</sup> Mandated for Annex I Parties under UNFCCC Conference of the Parties, decision 24/CP.29

<sup>2</sup> The 2006 IPCC Guidelines note that uncertainties for this emission factor cannot exceed the default because this value represents the absolute maximum emissions associated with urea fertilization.

in nitrous oxide emissions. In the 2014 Inventory (1990-2012), direct emissions from synthetic fertiliser accounted for 5.9% of New Zealand's agricultural emissions, and as a large proportion of synthetic fertiliser is urea, it is anticipated that there would be a reduction of approximately 1-2 % in reported emissions.

16. The requirement to report carbon dioxide emissions is mandatory under the 2006 IPCC guidelines<sup>1</sup> and will result in an overall increase in agricultural emissions. Future analysis will determine the magnitude of these emissions.

### Review comments

17. Please note that we have not requested reviewers to complete the standard Inventory review forms for this panel briefing. Kelliher et al. (2014) has already been robustly peer-reviewed during the preparation of the manuscript and during the journal publication process.

### Recommendations

It is recommended that the Agricultural Inventory Advisory Panel:

18. **Note** the changes in reporting from 2015 onwards to include carbon dioxide emissions from urea.
19. **Agree** that the value of 0.48% for the  $EF_{1(UREA)}$  emission factor for urea derived by Kelliher et al. (2014) be incorporated into future Inventory calculations.

**Agree / not agreed**

Nicki Stevens  
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**Approved/ Not Approved/ Approved as Amended**

Peter Ettema  
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Chair Agricultural Inventory Panel

Date

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<sup>i</sup> 2000 IPCC Good Practice guidelines and 2006 IPCC guidelines