MPI POLICY
Agricultural Inventory Advisory Panel Meeting
12 November 2013

UREASE INHIBITORS

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Main Purpose: ☑ Decide ☑ Discuss ☐ Note

Purpose of Report

1. Seek approval from the Agricultural Inventory Advisory Panel on the recommendations to apply an efficacy scalar value of 0.55 to the fraction of nitrogen in fertiliser that volatilises ($Frac_{gasf}$) value where fertilisers containing urease inhibitors (UIs) are applied.

2. Attached to this paper are the reports:

   Saggar et al. (2009), Desktop study of emission factors for urease inhibitors for nitrogen fertiliser", MAF Technical paper No. 2012/17 – Final report.

   Saggar et al. (2011), Reductions in $Frac_{gasm}$ and $Frac_{gasf}$ in the GHG inventory when urease inhibitor has been applied to the soil and with N fertiliser" MAF Technical Paper no. 2012/18 – Final report.

   The change approval form completed by the reviewer Keith Smith. Keith did not write a separate report on the review.

   Saggar S, Singh J, Giltrap DL, Zaman M, Luo J, Rollo M, Kim D-G, Rys G, van der Weerden TJ (2013) Use of urease inhibitors in reducing ammonia emissions from fertiliser urea and animal urine in grazed pastures: an approach to quantifying emission reductions for the New Zealand agriculture inventory. *Science of the Total Environment* 465: 136-146.

Summary

Background

3. New Zealand has an obligation under United Nations Framework Convention on Climate Change (UNFCCC) to report anthropogenic greenhouse gas emissions and removals every year. Emissions are reported in the annual submission of the National Inventory Report submitted to the UNFCCC. New Zealand also has a responsibility under the Kyoto Protocol to reduce emissions growth and if not successful will incur a financial cost.

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4. The National Inventory Report forms the basis of any financial cost that the country may have under the Kyoto Protocol. 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.

5. Changes beyond the default methodology and emission factors in the Revised 1996 IPCC Guidelines and the 2000 IPCC Good Practice Guidance to take account of national circumstances are encouraged and need to be well-documented and transparent.

6. A recommendation to change $Frac_{gasf}$ where urease inhibitors are applied was put to the Panel in 2011. New experimental data became available the day before the 2011 Panel meeting that were likely to change the recommended value. It was therefore agreed to defer the decision on this recommendation until further analysis was completed, and an updated, peer-reviewed report with uncertainty analysis was completed and available for consideration under a later Panel meeting.

Current Inventory

7. There is no guidance in the IPCC guidelines on how to include agricultural mitigation technologies into the national inventory.

8. New Zealand has been accounting for and reporting the use of the nitrification inhibitor, Dicyandiamide (DCD), since the 2009 annual greenhouse gas submission.

9. The incorporation of DCD treatment in the national inventory earned New Zealand a commendation during an in-country review during 2010.

Reports

10. Two reports to the Ministry for Primary Industries were completed on the use of Urease Inhibitors (UI) with fertiliser (Saggar et al. 2009 & Saggar et al. 2011). The second report *"Reductions in $Frac_{gasm}$ and $Frac_{gasf}$ in the GHG inventory when urease inhibitor has been applied to the soil and with N fertiliser"* concluded that there was no new information available for UI use with fertiliser since the original report "*Desktop study of emission factors for urease inhibitors for nitrogen fertiliser"*. Therefore they had no new recommendations but did suggest a way in which UI use can be incorporated into the inventory. This is similar to how DCD is currently incorporated. The Saggar et al. (2009) desktop study was reviewed by Keith Smith.

11. Since the 2011 Agriculture Inventory Advisory Panel meeting, a paper by Surinder Saggar and colleagues using more data has been published in the journal *Science of the Total Environment* (Saggar et al. 2013). This paper recommends using an estimate for $Frac_{gasf}$ where $Frac_{gasf}$ = 0.055 where UIs are applied. This equates to scaling the value of $Frac_{gasf}$ that is presently used in the Inventory (0.1) by a multiplier of 0.55.

Effect of changes

12. Saggar et al. 2013 estimated the effect of including urease inhibitors for reducing New Zealand's total emissions, and calculated that it equates a potential reduction of 4.8 Gg equivalent of carbon dioxide emissions (0.016 GgN_2O).

13. All Annex 1 Parties are required to report using the default methodology in the revised 1996 IPCC Guidelines and the 2000 IPCC Good Practice Guidance. These guidelines apply the direct emission factor to the nitrogen that remains after volatilisation. As a consequence, the estimate of total direct

nitrous oxide emissions is increased by the same amount as the estimated reduction from volatilisation when urease inhibitor is applied. Therefore under the current (1996) guidelines, the estimate of total nitrous oxide emissions is not reduced or changed in New Zealand's Inventory.

14. The 2006 guidelines correct the formula to estimate to direct nitrous oxide emissions, and these guidelines will be used from the 2015 (1990-2013) Inventory submission onwards. Therefore from 2015, including the effect of urease inhibitors will reduce the estimated emissions of nitrous oxide.

Response to reviewer comments

15. The reviewer of Saggar et al. (2011) supported the recommended value of 0.06 to be used where fertilisers containing urease inhibitors are applied. The reviewer felt that there was clear experimental evidence to back this recommendation.

16. The recommended value in Saggar et al. (2013) has been vetted by international peer-review.

Uncertainty in estimates

17. Saggar et al. (2013) reports the estimate of the effect of urease inhibitor as +/-5.5 per cent at a 95 per cent confidence.

18. An earlier report by Sherlock et al (2009)[1] was used to recommend a New Zealand specific factor for $FRAC_{gasf}$ of 0.1 for fertilisers containing nitrogen. The uncertainty for $Frac_{gasf}$ (urea-only) was provided for studies based on Urea-N and had a standard deviation of 2.9%, and mean for $Frac_{gasf}$ (urea-only) of 0.108. Urea is the principal source of synthetic nitrogen fertiliser in New Zealand.

2011 Panel and subsequent findings

19. The 2011 panel became aware of additional data the day before the meeting. The Panel recommended the Ministry of Agriculture and Forestry (now MPI) obtain an updated report incorporating available new data and update uncertainty analysis.

20. Saggar et al. (2011), was subsequently published and more data later became available. As above, a subsequent journal paper Saggar et al. (2013) suggests an efficacy scalar of 0.55 be used to multiply by $FRAC_{gasf}$ where urease inhibitor is applied.

Strategic Risks

21. The changes may not be accepted by an expert review team of the *United Nations Framework Convention on Climate Change* (UNFCCC) reviewers. However, if this is the case there is an extensive process which is followed in which New Zealand can state its case or change back to the original IPCC defaults before any penalty would be applied.

Strategic Opportunities

22. New Zealand will be meeting the UNFCCC obligations of continual improvement of the national inventory

[1] Sherlock RR, Jewell P, Clough T. (2009). Review of New Zealand Specific $Frac_{GASM}$ and $Frac_{GASF}$ Emissions Factors. Report prepared for the Ministry of Agriculture and Forestry by Landcare Research and AgResearch. Wellington: Ministry of Agriculture and Forestry.

23. The new values will make a negligible difference to the estimate of nitrous oxide emissions from volatilisation for New Zealand, and will now be well documented, therefore meeting the UNFCCC requirement for transparency.

24. The change also prepares New Zealand to meet updated reporting requirements agreed in Durban during the Seventeenth Conference of the Parties (COP17) under the UNFCCC. Decision 15/CP.17 *Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention* decides that from 2015 Parties to the UNFCCC will report using the 2006 IPCC Guidelines and Global Warming Potentials from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Recommendations

It is recommended that the Agricultural Inventory Advisory Panel:

25. *Agree that the $Frac_{gasf}$ value should be multiplied by an efficacy scalar of 0.55 where fertilisers containing urease inhibitors are applied.*

Agree / not agreed

Simon Wear
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Approved/ Not Approved/ Approved as Amended

Peter Ettema
Resource Information and Analysis Manager
Chair Agricultural Inventory Panel

Date