MAF POLICY

Agricultural Inventory Panel Meeting

27 November 2009

REVIEW OF NEW ZEALAND SPECIFIC $FRAC_{GASM}$ AND $FRAC_{GASF}$ EMISSIONS FACTORS.

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Main Purpose: ☑ Decide ☑ Discuss ☐ Note

Purpose of Report

1. The purpose of this paper is to summarise the report contracted by MAF from Lincoln University on using country specific values for the emissions factors of $Frac_{gasm}$ and $Frac_{gasf}$.

2. Attached to this paper are the report, an international peer review carried out by Keith Smith and the emission factor change form required by MfE.

Summary

3. Countries are encouraged to develop country specific emission factors in order to increase the accuracy of their national inventory. $Frac_{gasm}$ and $Frac_{gasf}$ are two fractions used in the calculation of indirect emissions of nitrous oxide from atmospheric deposition. They relate to the emissions from livestock manure and N fertiliser application respectively.

4. The report is a review of all the published New Zealand studies relating to both emission factors, as well as relevant published peer-reviewed pasture-based studies carried out overseas. The data was scrutinised and means, ranges and standard deviations were assessed.

5. The influence of various climatic conditions is discussed as are the different methods used to measure the emissions in the various studies. The effect of urease and nitrification inhibitors on these factors was also investigated.

6. Excluding the studies on nitrification inhibitors, eight international papers covering 45 individual measurements and nine national papers covering 19 individual measurements were reported on for $Frac_{gasm}$.

7. The international papers had a mean of 9.3 (SD ~ 4.5) % and the national papers had a mean of 12.3 %.

8. For $Frac_{gasf}$ 79 individual measurements reported in 17 peer reviewed paper were reviewed. Twenty eight of those measurements were carried out in New Zealand.

9. The mean from studies using application rates of Urea-N typical to New Zealand was 10.8 (SD ~2.9) %. Taking into account the ~20% use of DAP in New Zealand, which has a lower emission factor, the weighted mean was 9.6 %.

10. Along with studies on emissions from solely manure or fertiliser application, 19 whole farm studies reported in six papers were also reviewed.

11. It is recommended in the report by Lincoln that a New Zealand specific value of 0.1 for $Frac_{gasm}$ be considered for adoption in the Agricultural Greenhouse Gas Inventory. The IPCC default is currently 0.2 which relates to the European situation where animals are housed for extensive periods of time and larger amounts of manure are managed. However, 97% of livestock in New Zealand are grazed on pasture and therefore indirect emissions tend to mainly occur when manure is deposited on the pasture, which is less than in manure management. This leads to a smaller $Frac_{gasm}$ value than the default.

12. The report also recommends that a New Zealand specific value of 0.1 for $Frac_{gasf}$ be considered for adoption in the Inventory. This is the same value as the IPCC default, but by taking it on as a New Zealand specific value it demonstrates that this value is appropriate to New Zealand conditions.

Proposed changes to inventory

13. Change the $Frac_{gasm}$ value from 0.2 to 0.1 in calculating the New Zealand's National inventory.

14. Adopt the IPCC default value of 0.1 for $Frac_{gasf}$ as a New Zealand specific value in calculating the New Zealand's National inventory.

Proposed changes to initial report and justification

15. There are no changes suggested to the methodology in the Lincoln report to MAF

Response to reviewer comments

16. All reviewer comments were positive (Appendix 1). No issues need to be responded to.

Strategic Risks

17. The reduction in the $Frac_{gasm}$ value may not be accepted by the UNFCCC reviewers. However, if this is the case there is a long process which is followed in which New Zealand can state its case or change back to the IPCC default before any penalty would be applied.

Strategic Opportunities

18. New Zealand will be meeting the UNFCCC obligations of continual improvement of the National Inventory

19. Indirect emissions from New Zealand Agricultural soils will be calculated more accurately.

Recommendations

It is recommended that the Agricultural Inventory Panel:

20. **Agree** that the value for $Frac_{gasm}$ be changed from the IPCC default of 0.2 to a country specific value of 0.1

Agree/Not agree

21. **Agree** that the IPCC default value of 0.1 for $Frac_{gasf}$ be taken on as a country specific value.

Agree/Not agree

Andrea Pickering
Senior Policy Analyst

Approved/ Not Approved/ Approved as Amended

Alice Marfell-Jones
Manager Monitoring and Evaluation
Chair Agricultural Inventory Panel

Date

Appendix 1: international review of report.

Below is the relevant extract from the reviews carried out by Keith Smith.

AGREEMENT MAF POL 0809-11159:

Peer Review of Nitrous Oxide Reports

by

Keith Smith

School of Geosciences, University of Edinburgh, UK

Final Report

25 February, 2009

1. Introduction

1.1 Peer reviews have been conducted on three reports:

- Review of New Zealand Specific $Frac_{GASM}$ and $Frac_{GASF}$ Emissions Factors (Project Code CC MAF POL_0708-72), by R. Sherlock, P. Jewell and T. Clough (October 2008);
- Incorporation of the Nitrification Inhibitor DCD into New Zealand's 2009 National Inventory (Project code CC MAF POL_0809-37), by T.J. Clough, F.M. Kelliher, H. Clark and T.J. van der Weerden, 31 October 2008;
- Review of IPCC 2006 guidelines to determine NZ inventory requirements from 2010, by T.J. van der Weerden, C.A.M.de Klein, F.M.Kelliher, H.Clark and K.R.Lassey, August 2008.

1.2 Interim comments on the first two reports, together with a series of completed "New Zealand Inventory Approval for change to emission factor, parameter or methodology" forms, were sent to Dr Gerald Rys on 19 December 2008. The comments on the Nitrification Inhibitor report led to a follow-up question and a request for an assessment form relating to the nitrification inhibitor methodology being sent by Dr Rys by email in late January, 2009; that email and my response to it (re-sent on 23 February 2009) are included here in this final review, together with all the material sent on 19 Dec.

1.3 My comments on the 3rd of the NZ reports listed above: Review of IPCC 2006 guidelines….", by T.J. van der Weerden et al., August 2008, were sent to Dr Rys on 23 February 2009. That material is also included in the present document.

2. Comments on "Review of New Zealand Specific $Frac_{GASM}$ and $Frac_{GASF}$ Emissions Factors (Project Code CC MAF POL_0708-72)", by R. Sherlock, P. Jewell and T. Clough (October 2008)

2.1 This review begins with an excellent coverage of NH_3 volatilisation from pastures.

2.2 The next section, on NO emissions, is also an informative and well-written section. The only comment I have here is that a potentially useful additional reference on NO emissions

(including the impact of applying DCD) is the paper by Skiba et al., in *Soil Biol. Biochem*., 25, 1527-1536, 1993.

2.3 The section on international data on ammonia volatilisation in pastoral agriculture is good, both in the comprehensiveness of the review, and in the discussion. One point that is well made is that a key difference between the NZ and European typical systems is that the proportion of dung and urine deposited directly onto pasture is much lower in NZ.

2.4 The review of New Zealand data on ammonia volatilisation in pastoral agriculture is very adequate, and I have no additions or changes to suggest.

2.5 The review of international and New Zealand data on ammonia volatilisation from fertiliser-N in grazed pastures, in Section 6, is also equally satisfactory. The evidence that the ammonia emission factor for urea is lower at low N application rates seems very clear, and the consequent judgement that the NZ FracGASF should be of the order of 10% is reasonable.

2.6 The review of international and NZ data on NO_x emissions from pastoral agriculture is, once again, a good and very adequate coverage of the subject.

2.7 General Discussion, Conclusions and Recommendations (Section 8): this section sums up the topics very succinctly. It makes a good case for consideration of adopting a NZ-specific value of 0.1 for $Frac_{GASM}$, but also makes an equally good case for further refinement by means of more whole-system measurements. Similarly, the case for adopting a NZ-specific value of 0.1 for $Frac_{GASF}$ is well made, and the proposal for work on the effect of urease inhibitors is reasonable. Re Scenario 1 (p. 44), however, I feel that neither the use of irrigation nor the timing of N application to coincide with rainfall is sufficiently controllable to be a factor that can be used to further amend EF values.

2.8 A final comment: I fully agree with the general approach of this Report, in which a strong body of data is provided to justify Recommendation 1, but there is a recognition that whole-system methodologies are better in principle and therefore that more research is desirable, using such methods to further refine the $Frac_{GASM}$ value (Recommendation 2). Likewise, the proposed adoption of Recommendation 3, a NZ-specific value for $Frac_{GASF}$, is based robustly on the weighted mean of a large body of work (19 studies). Recommendation 4 – to do

research on the effect of urease inhibitors and then reconsider whether the $Frac_{GASF}$ value can be further refined – is also a sound one.