



SEPARATING OF THE EMISSION FACTOR, EF_3 INTO DUNG AND URINE VALUES FOR SHEEP AND CATTLE

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Main Purpose: ☒ Decide ☒ Discuss ☐ Note

Purpose of Report

1. The purpose of this paper is to summarise the work commissioned by MAF on partitioning of the emission factor EF_3 into dung and urine values for sheep and cattle.
2. Attached to this paper is "*Determination of the N_2O emission factor for animal dung applied in spring in three regions of New Zealand*".

Summary

3. The emission factor $EF_{3PR\&P}$ is used to estimate direct nitrous oxide emissions from animal excreta applied directly to soil in a pasture grazed environment.
4. The Intergovernmental panel on Climate Change (IPCC) default for this emission factor is 0.02. However, past research has demonstrated that for New Zealand conditions a country specific $EF_{3PR\&P}$ of 0.01 is better suited, and this value has therefore been used since 2000.
5. Recent research has been carried out on nitrous oxide (N_2O) emissions from dung and urine separately. International and national research has shown that the proportion of excreta-N loss as N_2O is lower for dung-N than urine-N.
6. The report presented here documents dairy, beef and sheep dung and dairy urine emissions under conditions likely to induce high N_2O emissions (i.e. warm and wet soils) on various soils. The report also compares and assesses emission factors with previous research, contains an extensive literature research on $EF_{3PR\&P}$, and recommends values for $EF_{3PR\&P}$ dung and $EF_{3PR\&P}$ urine.
7. The literature review assesses results from 261 international and national samples and clearly suggests a much lower emission factor for cattle or sheep dung compared to cattle urine.
8. A further seven national NzOnet trials confirm a suggested lower value for dung from cattle and sheep.

9. The report recommends a urine $EF_{3PR\&P}$ value of 0.01 and a dung $EF_{3PR\&P}$ value of 0.0025.
10. Although there was some evidence that sheep dung may have a lower emission factor than cattle dung, it was concluded that there is currently not enough evidence to justify *a further reduction* at this time.
11. This report was internationally peer reviewed by Keith Smith. Keith supports the recommendations of keeping the animal urine $EF_{3PR\&P}$ at the country specific value of 0.01 and changing the animal dung $EF_{3PR\&P}$ to 0.0025. The reviewer commented on the clarity of the report, soundness of the methodology, and feels recommendations are justified.
12. A draft paper has been written on this work and is intended for scientific publication.

Proposed changes to inventory

13. *Separate out the $EF_{3PR\&P}$ for sheep and cattle into dung and urine*
14. *Keep urine $EF_{3PR\&P}$ at the current country specific value of 1%, or 0.01, for all species*
15. *Change dung $EF_{3PR\&P}$ change to one quarter of a percent for sheep and cattle only. Leave all other species at the country specific value of 1%.*

Proposed changes to initial report and justification

16. *The inclusion of the uncertainty (95% confidence interval) needs to be added to tables such as Table 6 in order to aid uncertainty calculations within the National Inventory report.*

Response to reviewer comments

17. All reviewer comments are positive. No issues need to be responded to.

Strategic Risks

18. The reduction in the Dung $EF_{3PR\&P}$ may not be accepted by 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 IPCC default before any penalty would be applied.

Strategic Opportunities

19. New Zealand will be meeting the UNFCCC obligations of continual improvement of the National inventory
20. Direct nitrous oxide emissions from New Zealand Agricultural soils will be calculated more accurately

Recommendations

It is recommended that the Agricultural Inventory Panel:

21. **Agree** that the emission factor $EF_{3PR\&P}$ for sheep and cattle be separated into dung and urine values.

Agree

22. **Agree** that the emission factor urine $EF_{3PR\&P}$ for sheep and cattle be kept at 1%.

Agree

23. **Agree** that the emission factor dung $EF_{3PR\&P}$ for sheep and cattle be changed to *one quarter of a percent*.

Agree

24. **Note** that there is some evidence that the emission factor value for sheep dung ($EF_{3PR\&P}$) is lower than that for cattle dung. However, further research is required and until such time the cattle emission factor *for dung* value will be allocated to sheep *dung*.

Noted as amended

25. **Note** that separating dung and urine in the calculation of nitrous oxide may also have consequences for other fractions such as $Frac_{GASM}$ and $Frac_{LEACH}$. This was highlighted in the report on the country specific $Frac_{GASM}$ value presented to the panel in 2009.

Noted as amended

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Approved/ Not Approved/ Approved as Amended

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

Date