Commissioning and Managing Agriculture Inventory Research Projects

Commissioning and designing research projects to maximise the chances of new research being incorporated in GHG inventories

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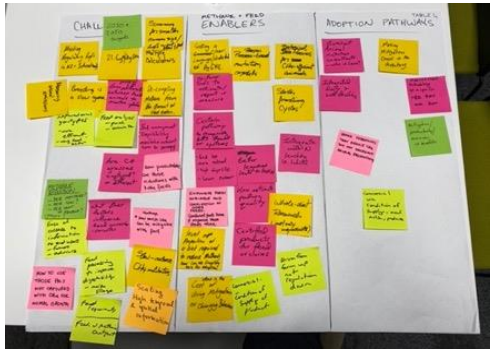
Introduction

- Overall purpose of commissioning research and incorporating this research into the inventory is to improve accuracy of emissions estimates, or to get a better understanding of emissions uncertainty
- The notes in this presentation are based on my experiences only – others may have their own observations based on their experience and the situations with their inventories and available resources

Identifying/prioritising research topics

- Existing inventory analysis(i.e. key category analysis, expert review recommendations and main sources of uncertainty)
- Workshop/conference with researchers and scientists to identify new research
- How long since research in a particular area was done



Procurement design

- Important to have clear, unambiguous requirements in commissioning research
- Making sure the intended outcomes of the research will have clear recommendations for inventory improvements (Unless the work is intended to be exploratory).

Procurement design (continued)

Worth considering:

- setting aside resource for independent peer review, particularly if a significant change is being proposed.
- asking researchers to submit their research to a Journal and;
- if EF's generated, submitting these to relevant databases (i.e. IPCC EFDB, DATAMAN, MELS, N2O EF Database)

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Meta-analysis of New Zealand's nitrous oxide emission factors for ruminant excreta supports disaggregation based on excreta form, livestock type and slope class

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HIGHLIGHTS

- Current NZ-specific N_2O emission factors (EF_3) are 1.0% (urine) and 0.25% (dung).
- A meta-analysis of 1217 EF_3 data representative of livestock grazing was completed.
- The analysis showed that the dung EF_3 values should be reduced to 0.12%.
- Urine EF_3 values ranged from 0.08% to 0.58%, based on livestock type and topography.
- We recommend the revised values are employed in NZ's national N_2O inventory.

GRAPHICAL ABSTRACT

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ABSTRACT

Globally, animal excreta (dung and urine) deposition onto grazed pastures represents more than half of anthropogenic nitrous oxide (N_2O) emissions. To account for these emissions, New Zealand currently employs urine and dung emission factor (EF_3) values of 1.0% and 0.25%, respectively, for all livestock. These values are primarily based on field studies conducted on fertile, flatland pastures predominantly used for dairy cattle production but do not consider emissions from hill land pastures primarily used for sheep, deer and non-dairy cattle.
The objective of this study was to determine the most suitable urine and dung EF_3 values for dairy cattle, non-dairy cattle, and sheep grazing pastures on different slopes based on a meta-analysis of New Zealand EF_3 studies. As none of the studies included deer excreta, deer EF_3 values were estimated from cattle and sheep values. The analysis revealed that a single dung EF_3 value should be maintained, although the value should be reduced from 0.25% to 0.12%. Furthermore, urine EF_3 should be disaggregated by livestock type (cattle > sheep) and topography (flatland and low sloping hill country > medium and steep sloping hill country), with EF_3 values ranging from 0.08% (sheep urine on medium and steep slopes) to 0.58% (dairy cattle on flatland and low slopes). While the mechanism(s) causing differences in urine EF_3 values for sheep and cattle are unknown, the 'slope effect' on urine EF_3 is partly due to differences in soil chemical and physical characteristics, which influence soil microbial processes on the different slope classes.

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Implementation of new research in inventories

- Significant inventory improvements will be reviewed more thoroughly by ERTs – need to ensure the case for change is justified and backed up by strong evidence
- Worth considering having a group of independent inventory experts to review any inventory change and make recommendations – Audit/paper trail is useful as well

Research examples

Some examples of inventory research leading to inventory improvements

- More accurate information on the purity of agricultural lime (which affects GHG emissions) - research commissioned in 2020, completed in 2021, and incorporated into the New Zealand inventory in 2022
- N_2O emission factors for different hill slopes – 3 separate pieces of research over 6 years

Some research projects can be incorporated directly into inventories, while other improvements require multiple research projects, which might be both field or desk based

Key messages

- Important to have clear, unambiguous requirements in commissioning research
- Make sure the intended outcomes of the research will have clear inventory recommendations, and ensure these are clearly stated in the contract
- Important to set aside resource for independent peer review, particularly if a significant change is being proposed
- Some research projects can be incorporated directly into inventories, while other improvements require multiple research projects, which might be both field or desk based