Ministry for Primary Industries
Manatū Ahu Matua

Minutes of the 2017 Agricultural Greenhouse Gas Inventory Advisory Panel Meeting

8 November 2017

10.00am – 4.00pm

Conference room 1, Saint Andrews on the Terrace, Wellington

Panel members in attendance:

The Agricultural Greenhouse Gas Inventory Advisory Panel ('the Panel') comprises:

Dr Gerald Rys – Principal Science Adviser, MPI – Chair

Dr Harry Clark – Director, New Zealand Agricultural Greenhouse Gas Research Centre

Dr Andy Reisinger – Deputy Director, New Zealand Agricultural Greenhouse Gas Research Centre (also for The Royal Society of New Zealand)

Dr Keith Lassey - Lassey Research and Education Ltd

Dr Andrea Brandon - Senior Analyst, MfE

Dr Cecile de Klein – Science Impact Leader, AgResearch

Dr Surinder Saggar – Portfolio Leader, Landcare Research

Other attendees:

Phil Wiles – Resource Information & Analysis, MPI

Mike Rollo - AgResearch

Alice Ryan - Resource Information & Analysis, MPI

Joel Gibbs - Resource Information & Analysis, MPI

Caroline Read – Chief Executive, Overseer Limited

Kelly Forster – Senior Policy Analyst, MfE (attended for part of the afternoon)

Mark Aspin – General Manager, Pastoral Greenhouse Gas Research Consortium (attended for part of the afternoon)

The purpose of the meeting was for Panel members to discuss and consider proposed changes to the Agricultural Greenhouse Gas (GHG) Inventory. Changes which the Panel considers are scientifically robust enough to implement are recommended to Deborah Roche, the Deputy Director-General, Policy & Trade.

Opening and Introduction

The meeting started at 10am. Brief introductions were made. Phil Wiles provided health and safety, and emergency exit information on the meeting room.

Gerald noted that Deborah Roche will try to meet the Panel at lunch. Her appreciation for the work of the Panel was noted.

Review of the 2016 Panel Meeting Minutes

The minutes and actions from the 2016 meeting were tabled and reviewed by the Panel. The actions from last year were reviewed:

Action 1. MPI to look to see if there is anything significantly different in the 2007 CSIRO equations (vs the 1990 CSIRO equations) that could be put into the inventory.

Harry Clark noted that there is work being done in NZ assessing all intake models (taking into account the CSIRO 2007 update), and expects recommendations on the appropriate algorithms to use. The Inventory uses CSIRO 1990, Overseer uses CSIRO 1990, some of CSIRO 2007 and Nicol and Brookes (2007), while Farmax uses CSIRO 1990 and some of CSIRO 2007. These models are all based on the same principles but with some nuanced differences.

The results are due within the next 3-6 months. The recommendations will be shared and considered by the Panel when available.

Action 2. Deferred

Actions 3-6. Completed

Action 7. Completed. Joel Gibbs noted that the papers tabled at the current Panel meeting did not require independent review as the scale of changes were small. Gerald briefly outlined the new contracting oversight process at MPI

Action 8. Completed

Action 9: MPI to send Tony van der Weerden the comments made by the reviewer on 'Recommendations for country-specific EF1 values for farm dairy effluent (FDE) and urea fertiliser'. MPI to also talk to Tony about his views on the comments made by the reviewer.

The Panel discussed the appropriate level of decimals places for rounding. It was agreed that emission factors should not be rounded so much as to change the results of the work.

Actions 10-14. Completed

Action 15. Andrea Brandon to send out to the Panel a list of topics for which she is seeking authors and reviewers - in relation to the 2019 refinements of the IPCC guidelines.

Andrea Bandon advised the Panel there are five NZ representatives for IPCC Guidelines refinements, including Tony van der Weerden, Steve Wakelin and Paul Thomas.

The minutes were accepted by the Panel.

Panel Paper: Improvements and corrections to inventory model

Gerald briefly outlined the role and purpose of the Panel papers before discussion began.

Nitrogen retained in wool

After last year's Panel meeting, an error in the calculation of nitrogen contained in wool was found by Donna Giltrap through work on other MPI projects. A technical correction was made for the publication of this year's inventory.

The Panel noted that the correction seemed large and requested MPI and Mike Rollo to investigate.

MPI explained the current Agricultural Inventory Model (AIM) quality assurance processes:

1. a second programmer reviews the code
2. the equations in code are being checked against the methodology document.

The Panel discussed how future errors could be avoided and asked MPI to prepare a paper (drawing on the Panel and OVERSEER) exploring options for unit testing. A 'working backwards / decision tree' approach was suggested by Cecile.

Caroline Read explained the different levels of testing and quality assurance used for Overseer code:

- testing of code to ensure proper implementation of the equations
- isolated testing of functionality. Datasets are currently being developed to test modules
- changes to the model are tracked with software.

The possibility of accounting for carbon in wool was discussed (as in harvested wood products). It was noted that this is just a deferred liability, which could actually lead to higher emissions due to past higher sheep populations. IPCC guidelines would also need to be followed.

ACTION 1. MPI and Mike Rollo to reassess the amount of N retained in wool, and circulate the new proposed result to the Panel

ACTION 2. Mike Rollo to check whether the historic error raised by Harry Clark two years ago has been fixed.

ACTION 3. MPI to determine the process for correcting errors and recording them, and adjust the Terms of Reference to reflect this process.

ACTION 4. MPI and AgResearch to develop a procedure for testing code in the inventory model, and circulate to the Panel.

ACTION 5. MPI to contact OVERSEER to learn more about the software they use to record changes to model, and fixing errors, and consider appropriate action for the AIM.

ACTION 6. MPI to include 2005 in Panel paper comparison tables since this is now NZ's base year.

ACTION 7. Cecile to check with colleagues at AgResearch about whether the amount of N retained in wool has changed over time.

Improvements and corrections to population models

Joel briefly outlined the errors and issues that had been found while documenting the population model in the inventory. These issues were relatively small on an inventory scale

Harry Clark explained that the February to March step-change in the bull population category (and in others in the model) looks reasonable and is an artefact in the model. Bulls transfer between model categories in reality, but the total numbers are not significant enough to warrant a full internally consistent model.

The slopes between each Feb/March should be constant (reflecting mortality rate). These slopes are different, however, which needs investigation.

The population model was last reviewed in 2011. The industry has probably not changed structure enough since then such that the current population models need revising. Changes that have occurred (e.g. geographical, sheep and beef moving onto hill country, and % hogget mating) are already captured by the model.

There was a discussion on how some long-term changes in farm practices are captured in the model. The difficulties of estimating death rates was noted. Slaughter statistics could potentially help determine death rates, however slaughter data (collected by MPI) is not currently used in the population model.

ACTION 8. MPI and AgResearch to check on the mortality rate e.g. investigate the difference in slope in 2011 vs slope in 2012. Harry can be called upon as required. Harry and MPI (Joel) to discuss population model methodology.

Improving the methodology used to estimate the areas of barley, oat and wheat crops burned

Joel Gibbs outlined a potential flaw in the methodology used to calculate the area of wheat, oat and barley crops burned, which could lead to negative areas of crop burning in the AIM. He proposed 3 potential solutions.

A question could be added to the Agricultural Production Census/Survey to help resolve this issue, however there is resistance to adding new questions and making the survey too long (in terms of respondent burden).

Unit data could also be investigated, but this could be time consuming. Cecile suggested that the farms that are growing a monoculture could be used to estimate what proportion of their crops they burn. It should be noted that the total impact to the NIR is very small.

DECISION: The Panel agreed that the method proposed by Joel be adopted, and further investigation (see action number 8) should be undertaken when possible.

ACTION 9. When possible, MPI to look at different options to obtain weighting for crop residues and send the results around the Panel. If this doesn't work a one-off APS survey question could be investigated.

Panel Paper: Correction of negative nitrogen excreta values

Mike and Joel outlined that nitrogen excreta values calculated for young animals in the first two months of their life are negative in the AIM.

Harry noted that this issue only affects pre-weaning stock. It is an artefact, not an error, and is due to the model averaging over short term fluctuations in N demand of the animals.

There could be a future need for a seasonal/monthly calculations and emission factors, which would make this work more relevant. However, there are many other emissions categories that would also need attention if we went monthly and there is a need to avoid scope creep.

Gerald and Andrea noted that the requirement for more transparency may require more disclosure of inventory data and methodologies. If this issue becomes known more widely and is not accompanied by adequate explanation, it could lead to greater scrutiny of the agriculture inventory and the inventory of other sectors (e.g. energy, waste)

Three options were discussed:

- Leave the model as it is, but include notes explaining the negative values
- Increase N intake in the first two months and balancing this later (a cosmetic fix)
- Undertake more work to figure out the details.

Gerald questioned whether this issue would have implications for the international work being done by the GRA. Harry and Andy said that it wouldn't, as most other countries do not use this type of model.

ACTION 10. MPI to include a clear explanation of the negative values in the AIM.

ACTION 11. MPI and Mike Rollo to investigate the impact of a non-linear growth rate, and possibly implement it.

The Panel took a break for lunch at 12.30pm and the meeting resumed at 1.15pm.

Before the after lunch agenda items got underway, Kelly Forster (MfE) introduced herself to the Panel and other attendees.

Annual UNFCCC/Kyoto inventory review outcomes

Joel Gibbs discussed the provisional main findings from the 2017 inventory submission, which was written by a UNFCCC Expert Review Team. No significant issues were found, and the questions were around annual changes of implied emissions factors, farming of rabbits and fur bearing animals, and more information about poultry emissions.

The Panel noted that more complex inventories will better reflect natural variability. Emissions (and hence IEFs) are primarily driven by intake. A graphic could be used in the next NIR to show this.

The upcoming in-country review of New Zealand's seventh national communication was discussed briefly, as well as the purpose and content of the 7NC.

Overview of the GHG research fund strategy and four year research plan

MPI presented the updated GHG research fund strategy and four year research plan. The Panel noted that projections of emissions do not come under the same scrutiny as the inventory, and MPI replied that they have procurement in place to re-establish a land use modelling network.

It was agreed that there is a need to maintain resources within MPI to undertake this work. The costs and benefits should be considered to support this argument.

The Panel queried the timing of bringing the impact of different slopes on N_2O emissions to the Panel, given previous Panel meetings agreed the changes in principal, but wanted to wait until additional data was collected. Alice noted the ongoing experiments, and the Panel agreed that all the slope/N_2O results need to be synthesized.

The effect of soil compaction on emissions was discussed, and Cecile outlined the status of current research on this topic including the 500 soils research project Andrea mentioned that the land domain report would be released in April next year.

Alice outlined the logic model of the fund which is used to highlight the benefits of the fund and the value of the inventory for policy.

ACTION 12. MPI to send out four year research plan to the Panel, who will provide feedback to MPI.

Mark Aspin introduced himself to the Panel and other attendees

Overseer discussion – improving consistency between Overseer and the Inventory model

Cecile de Klein provided information on work commissioned by the Biological Emissions Reference Group (BERG) on the suitability of Overseer as an on-farm emissions calculation tool. Some errors were found in the Overseer model, but broad agreement was found between OVERSEER and the AIM. The review also recommended the inventory team and Overseer team connect better and recommended inviting Caroline Read to this meeting. Harry is leading work (with others) looking at the specific Overseer issues.

There are issues around the transparency of assumptions embedded in all agricultural GHG emissions models. There could be potential for a common database of appropriate parameters to be used across the models.

The similarities and differences between Overseer and Farmax were discussed. Decisions to update Overseer and Farmax are made by the board as they are commercial entities, but the modellers should connect and line up. Overseer also needs to advise inventory team of changes to the model.

Cecile de Klein explained that there is also a model called AgInform, with a focus on optimisation, that is looking to add GHG info.

Work carried out by BERG will look to progress this. Harry is setting up a management group for this.

ACTION 13. Harry to keep the Panel informed of the progress of the additional BERG work around OVERSEER, including sending the published report to the Panel.

Status of current research

Pasture quality update

Alice discussed the status of the two projects currently underway (a framework for pasture quality, and the hyperspectral imaging for pasture quality). Gerald noted that the pasture quality data in the model is poor, and mentioned the difficulties of obtaining good data

Note that digestibility will also be calculated as part of obtaining metabolisable energy from near infrared radiation analysis.

Harry has the draft Pasture Quality measurement framework report ready to review.

The limits/extremes of the measurement of metabolisible energy were discussed briefly

Soil carbon

The status of this research was discussed. It was noted that this area of research gets lots of interest from farmers, and will be questioned more and more.

There is a need for long-term (i.e. decadal) funding of soil carbon research, but this is difficult given the shorter timeframes for funding science. Existing work is using historic sites where possible to build long time scale pictures.

The upper limits of soil carbon content were discussed. Miko has a theory there is no limit, but this is not currently relevant for NZ as we would be nowhere near an upper limit.

There are no plans to include soil carbon in Overseer

Hill country N2O

Alice and Gerald gave an overview of hill country research and the outcomes of previous Panels which discussed the hill country work.

Surinder updated the group on the current status of the hill country research including timeframes. A meta-analysis could be completed by the end of the financial year.

It was noted that the publishing of a new journal article would not be needed for the Panel to consider the inclusion of hill country methodology, emissions factors and activity data into the inventory next year

General discussion on other projects

Andrea noted the new availability of year round satellite data due to the Sentinel 2 satellite, and there could be opportunities of this for LULUCF reporting.

Phil and Gerald noted that the administration of the GHG fund has moved to the Investment Programmes Team as part of a consolidation of funds across MPI.

ACTION 14. MPI to send the new methodology document to Caroline Read once it is ready for review.

ACTION 15. ACTION 15. MPI to follow up with OVERSEER on the findings of their review on supplementary feed

Prioritisation of future research

The following research priorities were noted by the Panel:

Whether the results of hill country slope effects on nitrous oxide be ready for the next Panel meeting. A question was asked around transfer functions (refer to Keith Betteridge - GPS on cows) and EF_3 values.

The full effects of brassica feeds (e.g. decrease of CH_4 emissions, but what about N_2O?)

The effect of nitrogen concentration of feed and/or urine on emissions factors?

Future incorporation of breeding for low emissions sheep in the inventory. Low emissions sheep are being trialled (about 1 million sheep). Is there a need for a statistical model or a gene flow population model to estimate the effect of this? What kind of data is needed?

The need for a more sophisticated approach around projections.

Other Business

Joel noted that MPI were looking to hold next year's Methanet/NzOnet meeting in March or April next year, and asked Harry, Cecile and Surinder to suggest suitable dates

ACTION 16. Harry, Cecile and Surinder to propose suitable dates in March or April for the Methanet/NzOnet meeting next year.

The meeting closed at 3.45 pm.

Summary of Actions

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