



# Memorandum

Ref:

To: Julie Collins, Acting Deputy Director-General

Cc: Iain Cossar, Peter Ettema

From: Chris Jones (Panel chair)  
Simon Wear

Date: 10 December 2012

Subject: **AGRICULTURE INVENTORY ADVISORY PANEL – RECOMMENDATIONS FOR 2013  
AGRICULTURE GREENHOUSE GAS INVENTORY**

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## Purpose

The purpose of this paper is to seek your approval of proposed changes to the Agricultural Inventory methodology, following new science outcomes agreed by the Agriculture Inventory Advisory Panel (the Panel).

## Background

### New Zealand's greenhouse gas reporting obligations

New Zealand has an obligation under the 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 (NIR) submitted to the UNFCCC.

The NIR forms the basis of any financial cost that New Zealand 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.

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.

### Agriculture Inventory Advisory Panel

The Panel was first convened in 2009 and has met annually to assess proposed changes to the agricultural section of the NIR for robustness.

According to its Terms of Reference:

- a) The Panel is set up so that there is an official process for advising the DDG (Policy) on suggested changes to the Agricultural Inventory submitted to the UNFCCC.
- b) The Panel consists of scientific representatives whose knowledge covers the UNFCCC process and the science of agricultural greenhouse gas emissions and scientific research. Generally these representatives will be from NZMethanet (methane emissions expert group), NZN2Onet (nitrous oxide emissions expert group) and The Royal Society of New Zealand (scientific community representative).
- c) The Panel will also consist of one Ministry for Primary Industries (MPI) policy nominee (Chair) and one Ministry for the Environment (MfE) nominee.

- d) Scientific representative Panel members were selected on the basis of their skills and experience, rather than as representatives of particular organisations or sectors.

The Panel comprises:

- Chris Jones MPI (Chair)
- Dr Andrea Brandon, Senior Analyst, LUCAS, MfE
- Dr Harry Clark, New Zealand Agricultural Greenhouse Gas Research Centre (NZMethanet)
- Dr Frank Kelliher, AgResearch (NZN2Onet)
- Dr Keith Lassey, Lassey Research and Education LTD (NZMethanet)
- Dr Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre (The Royal Society of New Zealand)

Administration is provided by Simon Wear, Resources Information and Analysis, MPI.

## Panel recommendations

On 13 November 2012 two papers were presented to the Panel detailing proposed changes for the 2013 NIR. All reports were externally peer reviewed before they were presented to the Panel.

### Paper 1: Nitrous oxide from leaching and runoff

#### Summary

The current national inventory uses a default emission factor ( $EF_5$ ) for nitrous oxide emissions from nitrogen leaching and runoff under the *Revised 1996 IPCC Guidelines*. The  $EF_5$  default comprises three components for nitrous oxide ( $N_2O$ ) emissions from groundwater and surface drainage ( $EF_{5-g}$ ), estuaries ( $EF_{5-e}$ ) and rivers ( $EF_{5-r}$ ). The *Revised 1996 IPCC Guidelines* default emission factors for groundwater and surface drainage, estuaries, and rivers are: 0.015, 0.0025, and 0.0075 kg  $N_2O$ -N/kg  $N_{LEACHED}$ , respectively. Therefore, the combined  $EF_5$  in the Revised 1996 IPCC guidelines is 0.025 kg  $N_2O$ -N/kg  $N_{LEACHED}$ .

Rivers in New Zealand are short and fast flowing, compared with rivers in other parts of the world on which the current international defaults were based. A study of nitrous oxide emissions from New Zealand's longest river, the Waikato River did not measure an  $EF_{5-r}$  higher than 0.005 kg  $N_2O$ -N/kg  $N_{LEACHED}$ . The river is situated in the Waikato region in New Zealand's North Island. The paper also cited two recent studies of  $N_2O$  of South Island rivers that confirmed emissions from New Zealand rivers were typically less than 0.005 kg  $N_2O$ -N/kg  $N_{LEACHED}$ .

A paper seeking approval to change the emission factor ( $EF_5$ ) for nitrous oxide emissions from nitrogen leaching and runoff from 0.025 kg  $N_2O$ -N/kg  $N_{LEACHED}$  to 0.0075 kg  $N_2O$ -N/kg  $N_{LEACHED}$  was presented to the Panel. The paper used the value of 0.0025 kg  $N_2O$ -N/kg  $N_{LEACHED}$  from the *IPCC 2006 Guidelines* (to be conservative) and the change implied an ( $EF_{5-g}$ ) of 0.0025 kg  $N_2O$ -N/kg  $N_{LEACHED}$  (also from the 2006 guidelines).

The Panel considered that it was a policy rather than a scientific decision whether to adopt the default 2006 Guidelines value for  $EF_{5-g}$ , given that there was no NZ-specific research. The Panel recommended that in light of some of the questions raised about the  $EF_{5-r}$  factor, it would be useful for MPI to commission a wider review of available evidence relevant to NZ regarding all three elements of  $EF_5$ . The results from this wider review could be brought back to the Panel in the future and may justify adoption of the *IPCC 2006 Guidelines* values even if no NZ-specific experimental work has been carried out.

#### Panel recommendation

The emission factor for  $EF_5$  should not be changed for the 2013 agriculture greenhouse gas inventory submission and the value remains the default value from the *Revised 1996 IPCC Guidelines* of 0.025 kg  $N_2O$ -N/kg  $N_{LEACHED}$ .

## Paper 2: Revisions to the parameters in the national inventory model for New Zealand deer

### Summary

A review, with support from Deer Industry New Zealand, of the current assumptions and parameters used for the deer model in the national inventory was completed during 2012. This was to ensure that the assumptions and parameters that are used, accurately and transparently reflect changes over time in New Zealand deer farming practices and the national deer herd.

Additional work was commissioned to review the energy equations used in the Inventory. A number of recommendations, specific to deer were also made.

### Panel recommendations

The Panel reviewed the report and recommended the following:

1. The death rate for deer of two per cent is changed to five per cent for deer less than one year old and to two per cent for animals that are older than one year. The monthly profile of mortality during the course of a year is detailed in table 16, MPI (2013 forthcoming) *Suttie Consulting, Report to Deer Industry NZ*.
2. The calving date for all years is changed from 1 December 2012, to 25 November for the period 1990-2008 and 19 November from 2009 onwards.
3. The velvet yield for stags is revised from an assumed average of 3.00 kg per year to an estimated annual rate of 1.94 kg per year in 1990 rising to 4.00 kg per year in 2011. The Metabolisable Energy (ME) demand for velvet growth is changed from 0.75 MJ<sup>1</sup> ME/day to 0.50 MJ ME/day (Bown *et al.*: 2012)<sup>2</sup>.
4. The annual liveweight assumptions for deer are tabled in table 12 MPI (2013 forthcoming) *Suttie Consulting, Report to Deer Industry NZ*.
  - o The liveweight for hinds is set at 110 kg for 1990 (no change), rising to 113 kg in 2011. Previously, it was assumed that the liveweight for hinds would increase to around 130 kg by 2010.
  - o The liveweight for stags in 1990 is revised from 150 kg to 133 kg and is expected to increase to around 150 kg by 2011.
5. The slaughter dates for deer are provided in MPI (2013 forthcoming) *Suttie Consulting, Report to Deer Industry NZ*.
6. The assumptions for feed quality of pasture that deer are grazed on are revised to reflect the movement of deer farming from flat land to predominantly hill country since 1990. The change is due to higher returns from dairy, shifting the land use from deer to dairy.

In 1990, 46 per cent of deer were grazed on flat land with relatively high quality pasture, while 54 per cent of deer were grazed on hill country and fed on low quality pasture. From 2010 onwards, it is assumed that 10 per cent of deer are now being grazed on high quality pasture and 90 per cent of deer are grazed on low quality pasture. Further reductions in evidence of deer being grazed on high quality pasture are not likely and pasture quality is assumed to remain at 2010 values.
7. The age and gender mix for the deer herd was previously static. New data on the deer gender and age class provides the proportions to split the national deer population into population by age and

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<sup>1</sup> Mega Joule (MJ)

<sup>2</sup> Bown, M.D., Thomson, B C, Cruickshank, G.J. and Muir, P.D. (2012) Evaluation of the energy equations used by the National Enteric Methane Inventory.

gender. Population by age and gender for the deer herd are provided in table 30 MPI (2013 forthcoming) *Suttie Consulting, Report to Deer Industry NZ*.

8. Lactation length and yield for deer is to be revised. Previously it was assumed that the average lactation of deer was 242 litres over 121 days. The revised lactation assumptions are now 204 litres over 120 days, an average daily lactation yield of 1.7 litres per day.
9. The maintenance equation for deer be revised to an equation recommended in Bown *et al* (2012) to use the energy equation for  $ME_{\text{basal}}$  with  $K = 1.4$  as given in CSIRO (2007)<sup>3</sup>

$$ME_{\text{basal}} (MJ/d) = K \times S \times (0.28W^{0.75} \times \exp(-0.03A))/k_m$$

Where:

$K$	= 1.4 for deer
$S$	= 1.0 for females and castrates and 1.15 for stags
$W$	= liveweight (kg)
$A$	= age in years
$k_m$	= net activity of use for ME for maintenance = $0.2 \times M/D + 0.5$

10. The energy equations have also been revised based on Bown *et al.* (2012) recommendation to adopt the CSIRO (2007) equation for  $ME_g$  in deer as applied by Nicol & Brookes (2007)<sup>4</sup>

$$ME_g (MJ ME/day) = ((6.7 + R) + (20.3 - R) / [1 + \exp(-6(P - 0.4))]) / kg \times LWG$$

Where:

$R$	= adjustment for rate of gain or loss = $[EBC/(4 \times SRW^{0.75})]-1$
$EBC$	= $0.92 \times LWG$ in g/d
$SRW$	= the standard reference weight in kg.
$P$	= current live weight /SRW (maximum value of 1)
$LWG$	= live weight gain in kg per day
$kg$	= $0.042 \times \text{pasture ME content} + 0.006$

<sup>3</sup> CSIRO. 2007. Feeding Standards for Australian Livestock: Ruminants. Victoria, Australia: Commonwealth Scientific and Industrial Research Organisation.

<sup>4</sup> Nicol, A.M & Brookes, I.M. (2007). The metabolisable energy requirements of grazing livestock. In: *Pasture and supplements for Grazing Animals*. Occasional Publication 14. New Zealand Society of Animal Production.

## Next steps

Pending your approval of the Panel's recommendations:

Action	Date
MPI officials will determine if programming of the Inventory Model has been completed so that the incorporation of the recommended population model changes in the 2012 submission of the NIR can occur.	14 December 2012
MPI officials will advise MfE of the proposed methodological changes to the Agricultural Inventory for the 2013 submission.	20 December 2012
Incorporate the changes into the Agricultural Inventory.	19–26 January 2013
The Agricultural Inventory estimates and documentation signed off by Peter Ettema, Acting Manager, Resources Information & Analysis.	4 February 2013
Submit the Agricultural Inventory section to MfE.	5 February 2013
Provide Minister for Primary Industries with briefing on changes to Agricultural Inventory.	Early February 2013
MfE submits the New Zealand National Inventory Report (including agriculture) to the UNFCCC.	12 April 2013

## Strategic risks

All changes proposed in the National Inventory Report are subject to approval by an expert reviewer team from the UNFCCC. If the proposed changes are not accepted by the expert review team, there is an extensive process which is followed where New Zealand can state its case or change back to the original IPCC defaults before any penalty would be applied.

## Strategic opportunities

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

The new values will make a noticeable difference to the total emissions estimate for New Zealand, and will now be well documented, therefore meeting the UNFCCC requirement for transparency.

The changes also prepare 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 you:

- a) **Note** the attached briefing papers and minutes.
- b) **Agree** the emission factor for EF<sub>5</sub> should not be changed for the 2013 agriculture greenhouse gas inventory submission and the value remains the default value from the *Revised 1996 IPCC Guidelines* of 0.025 kg N<sub>2</sub>O-N/kg N<sub>LEACHED</sub>.

**Agree / not agreed / Agreed as amended**

- c) **Agree** the revisions to the parameters in the national inventory model for New Zealand deer (panel recommendations 1-10).

**Agree / not agreed / Agreed as amended**

Chris Jones

Manager, Economic Information & Analysis

Julie Collins

Acting Deputy Director General (Acting)