

# Memorandum

## Agricultural Inventory Advisory Panel recommendations for changes to the Agricultural Inventory



**TO:** Paul Stocks, Deputy Director-General

**CC:** Ian Cossar, Director Sector Performance Policy

**FROM:** Alice Marfell-Jones – Information and Analysis Manager and  
Andrea Pickering, Senior Policy Analyst

**DATE:** 15 December 2011

**STATUS:** Confidential

### 1 Purpose

The purpose of this paper is to advise you of the proposed changes to the Agricultural National Inventory methodology following new science outcomes agreed by the Agricultural Inventory Advisory Panel (the Panel).

It is requested that the DDG (Policy) approve these changes to be incorporated into the 2012 submission of the Agricultural National Inventory.

The briefing papers that were discussed and approved by the Panel at their meeting on Tuesday 15 November 2011 and the meeting minutes are attached.

### 2 Background

New Zealand has an obligation under the United Nations Framework Convention on Climate Change Convention (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. New Zealand also has a responsibility under the Kyoto Protocol to reduce emissions growth and if not successful will incur a financial cost.

The NIR forms the basis of any financial liability that the country 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 to take account of country specific factors are encouraged and need to be well documented and transparent.

### 3 Agriculture Inventory Advisory Panel

The Panel was 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) This 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 will consist of scientific representatives whose knowledge will cover the UNFCCC process and the science of agricultural greenhouse gas emissions and scientific research in general. Generally these representatives will be from NZMethanet (methane emissions knowledge), NZN2Onet (nitrous oxide emissions knowledge) and The Royal Society of New Zealand (scientific community representative).
- c) The panel will also consist of one MAF policy nominee (Chair) and one MfE nominee.

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:

- Alice Marfell-Jones, Information and Analysis Manager, MAF (Chair)
- Sonia Petrie, Senior Analyst, MfE
- Dr Frank Kelliher, AgResearch (NZN2Onet)
- Dr Keith Lassey, NIWA (NZMethanet)
- Dr Andy Resinger, New Zealand Agricultural Greenhouse Gas Research Centre (The Royal Society of New Zealand)

Administration is provided by Andrea Pickering, Information and Analysis, MAF.

### 4 Panel Recommendations

Nine papers were presented to the panel this year detailing proposed changes for the 2012 NIR. All reports were externally peer reviewed before they were presented to the Panel.

#### 4.1 Nitrous oxide emission from cultivated histosols

It was noted by the UNFCCC expert review team during the 2010 in-country review of the NIR, that the area of organic soils (histosols) reported in the agricultural, and land use, land-use change and forestry (LULUCF) sections were not the same. Landcare was therefore commissioned to review the methodology used to determine the area of organic soils for the agricultural section and transparently link this with the value reported under the LULUCF section.

The panel reviewed the report and has recommended the following changes:

- a) No change in the definition of organic soils.
- b) Revise the mapping methodology for determining the area of organic soils in the agricultural sector.

It was noted that the value for activity data (the area of organic soils cultivated every year) used to estimate emissions of nitrous oxide from cultivated histosols will be changed from 10,109 ha/year to 8019 ha/year due to this revision.

This revision reduces emissions by 8.1 Gg CO<sub>2</sub>e annually.

## 4.2 Poultry methane and nitrous oxide emissions

Currently, default methodologies and emission factors are used to estimate emissions from New Zealand poultry. Default methodologies and emission factors tend to over estimate emissions as they are not based on country specific data.

The Poultry Industry Association of New Zealand (PIANZ) was therefore commissioned to carry out surveys of the New Zealand poultry industry to gather New Zealand specific information. This was then used to develop New Zealand specific values for the estimation of emissions from poultry. Also, the methodology used by Statistics New Zealand to estimate broiler bird population was assessed and an improved methodology developed to take into account down time in sheds between bird rotations.

The Panel reviewed the report and has recommended the following:

- a) The value used for volatile solids (VS) be changed from the IPCC default of 0.100 to 0.019 kg/Vs/bird/day for broilers, 0.014 kg/Vs/bird/day for layers, 0.023 kg/Vs/bird/day for ducks, and 0.110 kg/Vs/bird/day for turkeys.
- b) The current IPCC1996 default value for methane potential ( $0.32 \text{ m}^3 \text{ CH}_4/\text{kgVS}$ ) continue to be used until consensus can be obtained between the report's authors and the reviewer.
- c) The value used for nitrogen excretion rates ( $N_{\text{ex}}$ ) be changed from 0.60 to 0.39 kg N/bird/year for broilers and 0.42 kg N/bird/year for layers. No change to be made for ducks and turkeys.
- d) The value for the emission factor ( $\text{EF}_3$ ) be changed to from 0.005 to 0.001 kg  $\text{N}_2\text{O-N}/\text{kg N}$  for nitrous oxide for poultry waste using a litter system.
- e) Using expert opinion MAF to derive a time series back to 1990 of the proportion of free range birds.

It was noted that Statistics NZ and MAF are working together to update the methodology used to estimate the average annual flock size for broilers, ducks and turkeys.

These changes reduce emissions from poultry by approximately 88 Gg  $\text{CO}_2\text{e}$  (66 percent) for the 2009 year.

## 4.3 Nitrous oxide and methane emission from swine

Currently, default methodologies and emission factors are used to estimate emissions from New Zealand swine. Default methodologies and emission factors tend to over estimate emissions as they are not based on country specific data.

The Pork Industry of New Zealand (PINZ) was therefore commissioned to carry out surveys of the New Zealand swine industry to gather New Zealand specific information. This was then used to develop New Zealand specific values for the estimation of emissions from swine. The panel reviewed the report and have recommended the following changes:

- a) The value used for methane emissions from enteric fermentation from swine be changed from the IPCC default to of 1.50 kg  $\text{CH}_4/\text{head}/\text{yr}$  to a country specific value of 1.06 kg  $\text{CH}_4/\text{head}/\text{yr}$ .
- b) The value used for methane emissions from manure management from swine be changed from the IPCC default to of 20.00 kg  $\text{CH}_4/\text{head}/\text{yr}$  to a country specific value of 5.94 kg  $\text{CH}_4/\text{head}/\text{yr}$ .

- c) The method used to determine the nitrogen excretion from swine be changed from using the 1996 IPCC default value of 16 kg N/head/yr to using the 2006 Tier 1 equation of  $N_{ex} = N \text{ rate} \times \text{TAM}/1000 \times 365$ . Where TAM is the typical animal weight.
- d) The data used in the nitrogen excretion equation agreed to above be;
  - a. the population distribution as reported in Appendix 5 in the report and,
  - b. population numbers from Statistics NZ and,
  - c. the average weight as reported by the New Zealand Pork Industry Board.
- e) The country specific manure management proportions be adopted as follows using the manure management systems detailed the 1996 IPCC Guidelines
  - a. Anaerobic Lagoons –20.5 percent of manure
  - b. Daily spread – 25.7 percent of manure
  - c. Direct to pasture – 8.9 percent of manure, accounted for in animal production
  - d. Solid storage and dry lot – 42.5 percent of manure
  - e. Other – 2.4 percent of manure

It was noted that due to the restrictions in implementing the 2006 IPCC guidelines changes to the methodology of indirect emissions from manure management and direct and indirect emissions from Agricultural soils will not be implemented.

The effect on emission estimates from the inclusion of these changes reduce emissions by approximately 105.8 Gg CO<sub>2</sub>e (56 percent) for the 2009 year.

#### 4.4 Methane and nitrous oxide emission from crops, and tussock burning

In the 2010 in-country review carried out by the UNFCCC expert review team, it was recommended that further crops be included in the New Zealand NIR. Therefore Plant and Food Research was commissioned to investigate the inclusion of further crops in the NIR. Also, as part of continually improving the NIR, the activity data and methodology used for estimating emissions from crop residue and tussock burning were also assessed.

The Panel reviewed the report and has recommended the following:

- a) New and updated activity data - based on Statistics New Zealand data - and methods to estimate cropping data are used for the 2012 inventory submission.
- b) Nitrogen inputs for crop residues for all crops including crops not already in the inventory, are based on parameters (harvest index, root shoot indices, dry matter content, above and below ground residue) obtained from the OVERSEER model.
- c) The area of tussock burned for 1990 to 2003 be based on the total area of land consented for burning,
- d) For 2005–2010 data on tussock burning be based on data from Statistics NZ.
- e) The fraction burned ( $\text{FRAC}_{\text{BURN}}$ ) be changed from the default 0.320 to 0.356.

The Panel did not recommend the inclusion of forage brassica at this time due to some concern around the methodology used to estimate the area of forage brassica prior to 2006. Once further information has been collected this will be revisited in a subsequent year.

The effect on emission estimates from the incorporation of new crops, changes to activity data for crops, and the methodology for crop residue and tussock burning, has not yet been quantified. However, as both crop residue and tussock burning are very small categories (in total less than 0.5 percent of the agricultural inventory) these changes are not expected to be substantial.

#### 4.5 Methane emissions and nitrogen excretion rates for New Zealand Goats

Currently New Zealand uses country specific emission factors for estimating emissions from goats. However, these values were roughly estimated by expert opinion and were not clearly documented. NIWA was commissioned to re assess the goat emission factors, develop a more robust method and document the assumptions and recommendations for the New Zealand specific values creating transparency.

The panel reviewed the report and have recommended the following changes:

- a) The value for estimating methane emissions from goats in the New Zealand National Inventory Report be changed to  $8.5 \pm 0.7$  kg CH<sub>4</sub>/head/year for 2009 and 7.4 kg CH<sub>4</sub>/head/year for 1990, noting the reported uncertainty is at 95 percent confidence interval.
- b) The value used to estimate nitrogen excretion from goats in the New Zealand National Inventory Report be changed to  $12.1 \pm 1.0$  kg N/head/year for 2009 and 10.6 kg N/head/year for 1990, noting the reported uncertainty is at 95 percent confidence interval.
- c) For intermediate years between 1990 and 2009 that the EF and N<sub>ex</sub> values should be interpolated based on assumptions that the dairy goat population has remained in a near constant state over time.

The effect on emission estimates from changing the emission factors is a decrease in emissions from goats in 1990 by 28.5 Gg CO<sub>2</sub>-e (- 0.094 percent of agricultural emissions) and increase emissions from goats in 2009 by 0.5 Gg CO<sub>2</sub>-e (+ 0.001 percent of agricultural emissions).

#### 4.6 Review of population models within the national methane inventory (2010)

New Zealand uses an inventory model to estimate emissions from dairy, beef, sheep and deer. This model uses productivity and population data to estimate the dry matter intake for each category on a monthly time step. As data is generally available only on an annual basis, population models based on industry data are used to estimate monthly populations for different livestock categories.

As part of the continual improvement process of the Agricultural Inventory, On-Farm Research was commissioned to review the current population models. Changes to the population models for sheep, cattle and deer were presented to the Panel for review. Following is a list of current assumptions and the recommended changes.

##### *Sheep*

Variable	Current Value	New Value
<b>Lambing date</b>	1 September	11 September

<b>Lamb slaughter date</b>	One slaughter date in February	Two slaughter dates with 84 percent of lambs slaughtered 28 February and the remainder 31 August using the average carcass weight for each month as input values
<b>Cull ewe slaughter date</b>	31 March	20 January
<b>Culling of dry ewes</b>	Alive for entire 12 months	Cull 31 July
<b>Death rate for breeding ewes</b>	5 percent dispersed over entire year	5.6 percent with 40 percent of ewe deaths over August and September. Spread remainder of deaths evenly throughout the remainder of the year
<b>Death rate for weaned lambs</b>	2 percent	4.5 percent
<b>Death rate for hoggets</b>	2 percent	3.6 percent
<b>Dressing out percentage of ewes</b>	43 percent	40 percent
<b>Change in ram numbers</b>	Linear change in numbers from one year to the next	Cull rams 28 February
<b>Ram growth rate</b>	50 g/day	0 g/day
<b>Change in wether numbers</b>	A linear change numbers from one year to the next	Change to adjustment of wether numbers on 1 October

### *Cattle*

Variable	Current Value	New Value
<b>Calving date</b>	1 September	20 September
<b>Beef cow slaughter date</b>	End of February	31 March
<b>Replacement heifer number</b>	25 percent of beef herd	17 percent of beef herd

<b>Cow death rate</b>	2 percent evenly across entire year	2.7 percent with 50 percent occurring in September and the remainder of deaths spread throughout the remainder of the year
<b>Steers slaughter age</b>	12 and 24 months old	(1 September) and 28 (1 February) months old

### *Deer*

Variable	Current Value	New Value
<b>Baseline liveweight for hinds</b>	110 kg	95 kg
<b>Calving date</b>	1 December	17 November

### *Dairy*

Variable	Current Value	New Value
<b>Rate for dairy cows</b>	0	2.1 percent with half of the deaths occurring in August and the remainder of deaths occurring throughout the year
<b>Milk feed to calves</b>	0	Add 107 litres of milk to the first half of each annual lactation
<b>Calving date</b>	1 August	13 August
<b>Change in Bull numbers</b>	Occur evenly across the entire year	Surplus bulls culled in January and February, increases in bull numbers to occur through increases in bull calves kept

The following changes were also detailed in the report but have not been recommended until further information can be obtained.

### *Cattle*

- a) Changes in bull numbers occur evenly across the entire year – change to surplus bulls being culled in January and February, increases in bull numbers to occur through increases in bull calves kept.
- b) Heifers slaughtered at 1 and 2 years old on 1 September – change to slaughter date 31 October so that heifers are still 2 years old once the calving date has been changed (point k).
- c) Bulls slaughtered at 1 and 2 years old on 1 September – change the 2-year-old slaughter age to 18 months.

Re-programming of the Inventory Model is required before these changes can be incorporated. However, this work is a few weeks behind schedule and may not be completed in time to

incorporate the methodology changes into the 2012 NIR. An update on this will be provided to you at the end of January.

The effect on emission estimates from these changes will not be known until the reprogrammed model is run.

#### **4.7 Better estimation of national liveweight – Part 1 ewes**

As part of the continual improvement process of the agricultural inventory, On-Farm research was commissioned to investigate if the estimates that are currently used in the Inventory Model are a true representative of animal liveweights on farm. This report was split into two for review by the Panel. The first part was on ewe liveweight.

The panel recommended that:

- a) the dressing out percentage used to estimate ewe liveweight be changed to 40 percent.

The effect on emission estimates from changing the dressing out percentage increases emissions from sheep in 1990 by 235.7 Gg CO<sub>2</sub>e and in 2009 by 139.5 Gg CO<sub>2</sub>e (1.6 and 1.4 percent increase in sheep emissions respectively).

#### **4.8 Better estimation of national liveweight – Part 2 cows**

The second part of the report on national livestock liveweights reported on cow liveweight.

The panel recommended that changes to the cow weight population tool be carried out, including;

- a) changing the dressing out percentage for beef cows to 42.6 percent
- b) dairy dressing out percentage be changed from 44 percent to 42 percent
- c) the cow replacement rate be changed from 25 to 17 percent.

The effect on emission estimates from changing the dressing out percentages and replacement cow rate increases emissions from beef cattle in 1990 by 133 Gg CO<sub>2</sub>e and in 2009 by 457 Gg CO<sub>2</sub>e (2.1 and 7.2 percent increase in beef cattle emissions respectively).

#### **4.9 Reduction of nitrous oxide emission from nitrogen fertiliser due to the use of urease inhibitors**

New experimental data became available the day before the meeting that is likely to change the recommended value. It was therefore agreed to defer the decision on this recommendation until the 2012 Agricultural Inventory Panel meeting, at which time an updated, reviewed report with uncertainty analysis will be presented to the panel.



## 5 Next Steps

Pending your approval of the Panel's recommendations:

Action	Date
MAF 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	18 January 2012
MAF officials will advise MfE of the proposed changes to the Agricultural Inventory for the 2012 submission	19 January
Incorporate the changes into the Agricultural Inventory	19–26 January 2012
The Agricultural Inventory estimates and documentation signed off by Alice Marfell-Jones.	27 January 2012
Submit the Agricultural Inventory section to MfE	27 January 2012
Provide Minister for Primary Industries with briefing on changes to Agricultural Inventory	Early February 2012
MfE submits the New Zealand National Inventory Report to the UNFCCC	12 April 2012

## 6 Strategic Risks

MfE on behalf of NZ submits the National Inventory to the UNFCCC. The National Inventory is reviewed annually by internationally qualified reviewers. The reviewers have the authority to accept or reject inventory changes. Rejections usually occur as a result of a lack of transparency/robustness in the changes being made and/or inadequate systems and processes used to generate the national inventory. If this should happen there is a long and detailed process that is followed whereby the reviewers and country concerned work through the issue. In such instances it is very rare that financial penalties are applied.

Obtaining the Panel agreement to inventory changes provides transparency and robustness and minimises the risk of the UNFCCC reviewers rejecting New Zealand's agricultural inventory improvements.

## 7 Strategic Opportunities

New Zealand has made a commitment to meet UNFCCC requirements. Continuous inventory improvements demonstrate this commitment.

The proposed changes results in two main benefits:

- a) A more accurate reflection of the real world in the methodology used to calculate the inventory; and
- b) Many changes result in a reduction in New Zealand's agricultural greenhouse gas liability.

## 8 Recommendations

It is recommended that you:

- a) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding nitrous oxide emissions from cultivated histosols (as detailed in section 4.1.a. and 4.1.b.).

**Approve / not approved / approve as amended**

- b) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding poultry methane and nitrous oxide emissions (as detailed in section 4.2.a., 4.2.b., 4.2.c., 4.2.d., and 4.2.e.)

**Approve / not approved / approve as amended**

- c) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding nitrous oxide and methane emissions from swine (as detailed in section 4.3.a., 4.3.b., 4.3.c., 4.3.d., and 4.3.e.).

**Approve / not approved / approve as amended**

- d) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding methane and nitrous oxide emissions from crops, and tussock burning (as detailed in section 4.4.a., 4.4.b., 4.4.c., 4.4.d., and 4.4.e.).

**Approve / not approved / approve as amended**

- e) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding methane emissions and nitrogen excretion rates for New Zealand Goats (as detailed in section 4.5.a., 4.5.b., and 4.5.c.).

**Approve / not approved / approve as amended**

- f) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding the review of population models within the national methane inventory (as detailed in section 4.6.a., 4.6.b., 4.6.c., 4.6.d., 4.6.e., 4.6.f., 4.6.g., 4.6.h., 4.6.i., 4.6.j., 4.6.k., 4.6.l., 4.6.m., 4.6.n., 4.6.o., 4.6.p., 4.6.q., 4.6.r., 4.6.s., 4.6.t., and 4.6.u.).

**Approve / not approved / approve as amended**

- g) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding better estimation of national liveweight – Part 1 ewes (as detailed in section 4.7.a.).

**Approve / not approved / approve as amended**

- h) **Approve** the Agricultural Inventory Advisory Panel's recommendations regarding better estimation of national liveweight – Part 2 cows (as detailed in section 4.8.a and 4.8.b.).

**Approve / not approved / approve as amended**

- i) **Note** discussions on the reduction of nitrous oxide emission from nitrogen fertiliser due to the use of urease inhibitors has been delayed until a further report incorporating new data can be obtained. This is likely to be presented to the Panel at the end of 2012.

**Noted**

Submitted for your approval by:

\_\_\_\_\_  
Alice Marfell-Jones  
Information and Analysis Manager

\_\_\_\_\_  
Date

Approved

Not Approved

Reasons if declined:

\_\_\_\_\_  
Paul Stocks  
Deputy Director-General

\_\_\_\_\_  
Date