# National Greenhouse Gas Inventory

INFORMATION FROM THE AUSTRALIAN GREENHOUSE OFFICE—JULY 2000

FACT SHEET 4

1998

# Agriculture

## 1998 inventory and trends

| 1998 emissions | Changes in emissions 1990–1998 |
|---|---|
| **Australia's estimated greenhouse gas emissions** in 1998 totalled 455.9 million tonnes of carbon dioxide equivalent* (Mt $CO_2$-e), excluding emissions from land clearing.# | This represents an increase of 5.2% on 1997 national greenhouse gas emissions and a 16.9% increase on 389.8 Mt in 1990. This does not equate to the Kyoto Protocol accounting requirements. |
| **The Agriculture sector** accounted for 20.2% or 92.2 Mt of total national net emissions in 1998. | Emissions from agriculture were 2.5% higher in 1998 than in 1997, and 1.8% higher than in 1990. |
| The bulk of this comes from **livestock** emissions, which were 61.9 Mt in 1998 or 13.8% of total national net emissions. | Emissions from livestock have decreased by 5.1% from 1990 to 1998. |
| Emissions from **agricultural soils** and **burning savannas** together accounted for 28.3 Mt (6.2%) of the national total in 1998. | There was an estimated increase of 19.6% in emissions from agricultural soils and savanna burning from 1990 to 1998. |

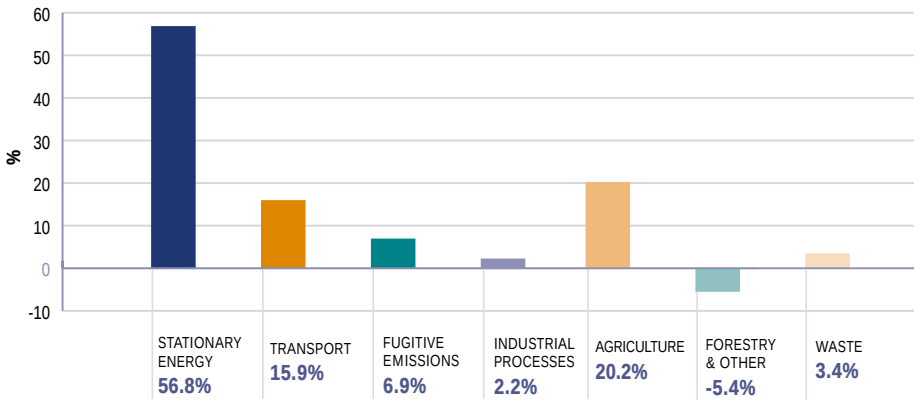
AUSTRALIAN Greenhouse Office

The lead Commonwealth agency on greenhouse matters

* Carbon dioxide equivalents, $CO_2$-e, provide the basis for comparing the warming effect of greenhouse gases such as methane, nitrous oxide, the perfluorocarbons, etc

\# Including the current best estimate of land clearing emissions, Australia's total emissions would be 519.9 Mt in 1998 and 493.3 Mt in 1990, representing a 5.4% increase. This does not equate to the Kyoto Protocol accounting requirements.

1998 Estimated emissions by sector (excluding land clearing)
Total 455.9 Mt $CO_2$-e



## The National Greenhouse Gas Inventory

As part of commitments under the Framework Convention on Climate Change, Australia has produced an annual inventory of national greenhouse gas emissions since 1990. The 1998 Inventory provides the latest report on Australia's greenhouse gas emissions. This Inventory incorporates improvements in methods that have been used to update emission estimates in the 1990–1997 inventories.

The total emissions reported in the national inventory do not represent Australia's performance against the Kyoto Protocol. Guidelines for reporting on the Kyoto Protocol are still being negotiated. For example, some parts of the land based emissions and sinks that are reported in the national inventory will not be included or will be reported differently for the Kyoto Protocol.

Australia's National Greenhouse Gas Inventory is based on international guidelines established by the Intergovernmental Panel on Climate Change and reports on human-induced greenhouse gas emissions in six sectors:

1. Energy
2. Industrial Processes
3. Solvent and Other Product Use
4. Agriculture
5. Land Use Change and Forestry
6. Waste

The numbers presented in the text and figures may not add up to the reported total due to rounding errors. Inclusion of the decimal place does not necessarily indicate a level of precision in the estimates.

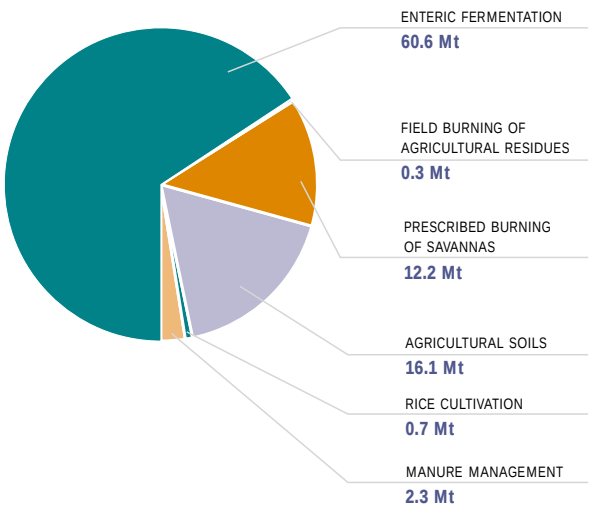
## Agriculture sector

The Agriculture sector is the largest source of Australia's methane and nitrous oxide emissions. The sources of Agriculture emissions are:

- **Enteric fermentation** – emissions associated with microbial fermentation during digestion of feed by ruminant and some non-ruminant domestic livestock
- **Manure management** – emissions associated with the decomposition of animal wastes
- **Rice cultivation** – methane emissions from anaerobic decay of plant and other organic material when rice fields are flooded
- **Agricultural soils** – emissions associated with the disturbance of agricultural lands by cropping, animal production and the application of fertilisers.
- **Prescribed burning of savannas** – non-carbon dioxide emissions associated with the burning of tropical savanna and temperate grassland for pasture management, fuel reduction, prevention of wildfires, and traditional Aboriginal burning. (Carbon dioxide emissions are not included as the annual growth cycle results in no net annual change.)
- **Field burning of agricultural residues**

All emissions from the Agriculture sector will be included in the 1990 baseline (that will provide a benchmark for comparison of future emissions) and the accounting for the Kyoto Protocol commitment period in 2008–2012.

1998 Agriculture sector emissions Total 92.2 Mt $CO_2$–e



## Emissions estimates and trends from 1990 to 1998

Agriculture contributed 20.2% of total net national emissions in 1998. Emissions were 2.5% higher than in 1997, and 1.8% higher than in 1990.

### Livestock

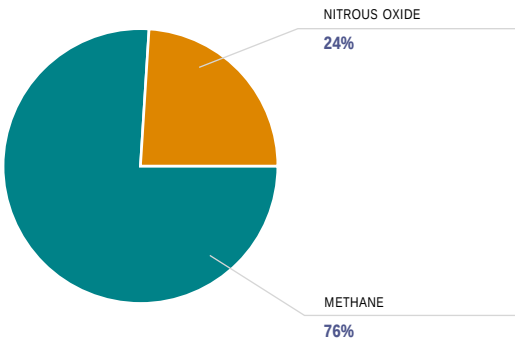
Livestock, mostly sheep and cattle, is the largest source of Australia's methane emissions. National methane emissions in 1998 totalled 114.8 Mt $CO_2$-e, of which 53.9% was from livestock.

Most of the methane emissions from livestock arose from enteric fermentation (97.2%) with the remainder from manure management systems associated with intensive livestock industries. These proportions have changed little since 1990.

In 1998, livestock generated 68.2% of the Agriculture sector's emissions, representing 13.8% of total national emissions. There was a peak in livestock-related methane emissions in 1991 largely due to high sheep numbers. Since then, a 30% reduction in sheep numbers, due to decreasing value of wool production, has resulted in an overall decline in livestock emissions. However, beef and dairy cattle numbers have increased during this period and emissions from these industries have increased.

Increases in milk production and feed intake rates have added to the average emissions from dairy cattle. Emissions from feedlot cattle have doubled since 1990 but this sector remains a small contributor (1.8%) to total livestock emissions.

Contributions to agriculture emissions by gas 1998

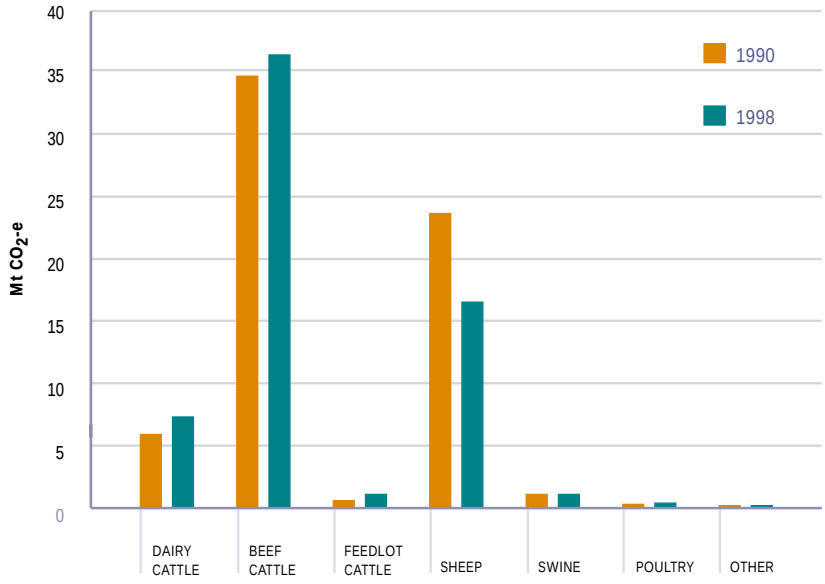



In 1998, emissions from enteric fermentation had decreased by 6.5% from 1990 but were similar to those in 1997. Methane emissions from manure management increased by 2.2% from 1997 but were 10.4 % higher than in 1990 due to the increase in dairy, feedlot cattle and poultry production.

### Crops, soil and fire-related emissions

The Agriculture sector is also the largest source of Australia's emissions of nitrous oxide. In 1998, total national emissions of nitrous oxide were 27.5 Mt $CO_2$-e, of which 79.8% were from agriculture. Nitrous oxide emissions from agriculture increased by 16% from 1990 to 1998. Animal production, soil cultivation, the use of nitrogenous fertiliser and burning of savannas or grassland contributed to these emissions. Agricultural soils generated 16.1 Mt $CO_2$ -e of the total national nitrous oxide emissions. This was 58.5% of total net national emissions of this gas and represents an increase of 10.4% from 1990.

Emissions from livestock classes, 1990 and 1998



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Emissions of methane and nitrous oxide from burning of savannas increased 13.0% from 1997 and 34.3% from 1990, totalling 12.2 Mt $CO_2$-e or 2.7% of total national emissions. Emissions of carbon dioxide from the burning of savannas and agricultural residues are not included in the inventory, because it is assumed that the amount of carbon dioxide emitted equals the amount that would have been emitted if the material had decayed naturally.

Rice production under irrigation produced 0.7 Mt $CO_2$-e of methane emissions in 1998. From 1990, emissions increased by 47.0%. This is due to the increase in the area under cultivation rather than changes in cultivation practices. However, competing demands for water are now beginning to limit rice cultivation. From 1997 to 1998 there was only a 0.2% increase in emissions from rice cultivation.

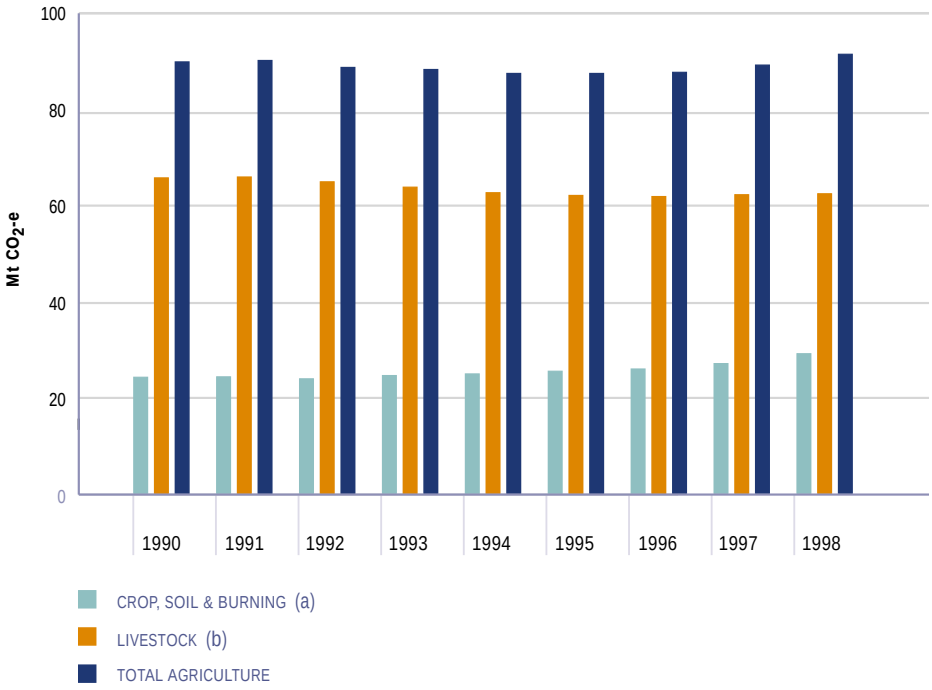
There has been a 91.1% increase in the quantity of nitrogen fertiliser used since 1990, and the area of land sown for crops has increased by 27% to 22 million hectares. This has contributed to the increase in emissions of nitrous oxide.

## Changes to methods

Data collected by the Australian Bureau of Statistics agricultural census provides the information on animal numbers and areas of crops used to estimate emissions from the agriculture sector. Changes in the coverage and presentation of the ABS census resulted in an overestimate of livestock emissions in previous inventories. Corrections in the 1998 Inventory have revised estimates of livestock emissions from 1993 to 1997 downwards by about 6%.

In 1995 the Australian Bureau of Statistics revised the definition of an 'agricultural enterprise' and incorporated other changes into the agricultural census. These changes have resulted in a discontinuity in the reported areas of sown pasture, with 1995 to 1998 estimates approximately 35% lower than the areas of sown pasture reported for 1990 to 1994.

Trends in $CO_2$-e emissions, Agriculture sector




(a) Includes agricultural soils, burning of savannas and field burning of agricultural residues
(b) Includes enteric fermentation and manure management

## Reliability of emissions estimates

The uncertainty associated with emissions from the agriculture sector is thought to be between 20% and 80%. Emissions from agriculture arise from a number of diffuse sources, the extent of which can in some cases only be estimated through surveys of a sample of the activities. Uncertainties in crop production, pasture area, animal production and savanna fire areas, also contribute to total uncertainty. The increasing coverage of fire scar mapping using satellite data promises significant reductions in uncertainty in the area of savanna fires.

In addition, some of the processes leading to emissions are not well understood and robust data is not always available on the emissions associated with the activities. The level of uncertainty in estimates varies between sources and gases.

Collection of the information is itself often complex and this introduces another source of uncertainty. Since the agricultural census conducted by the Australian Bureau of Statistics in 1990-91, livestock classes that are reported have been combined. This has reduced the amount of information that is available on the numbers of different animals. Changes have also been made to definitions, the frequency of the census and the number of farmers who are surveyed.

All of these changes introduce errors into the emission estimates that are included in the inventory. Work is continuing on finding new data sources that will allow verification of existing data.

## Reducing greenhouse gas emissions in the agriculture sector

Australia is undertaking a range of activities that will reduce emissions from the agriculture sector.

Some current measures include extension programs conducted by government agriculture departments to help farmers achieve increased efficiency. The programs specifically target rangeland systems and animal waste processing systems for intensive livestock holdings.

Research and extension activities are also addressing more effective fertiliser application, extension of minimum tillage practices and stubble retention as an alternative to burning agricultural residues in the field. Such activities have potential benefits for agricultural efficiency and land management beyond the likely greenhouse benefits.

In the area of research, the Commonwealth Government has funded CSIRO to further develop its methanogen vaccine which is suitable for sheep and cattle, and has the potential to reduce methane emissions and increase production.

The National Greenhouse Strategy, an initiative by Commonwealth and State and Territory governments released in 1998, contains measures that target the reduction of greenhouse gas emissions from the agriculture sector.

Governments are also promoting the delivery of programs addressing sustainable agricultural management practices, including:

- conservation cropping
- opportunities to improve animal husbandry
- manure management and the use of biogas and other technologies by intensive animal industries
- reduction of biomass burning where appropriate.

The Commonwealth Government has established the $400 million Greenhouse Gas Abatement Program to further assist Australia in meeting its commitments under the Kyoto Protocol to the United Nations Framework Convention on Climate Change. This program aims to deliver cost-effective and large-scale abatement across all sectors of the economy, particularly in the first commitment period under the Protocol (2008 - 2012).

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Information about the National Greenhouse Gas Inventory and initiatives to reduce greenhouse gas emissions from the agriculture sector can be obtained from the Australian Greenhouse Office web site:

**http://www.greenhouse.gov.au**

Copies of the 1998 Inventory and related documents can be obtained by contacting AGO Publications:

**Telephone:** 1300 130 606
**Facsimile:** 02 6299 6040

National Greenhouse Gas Inventory 1998 with Methodology Supplements.

National Greenhouse Gas Inventory Land Use Change and Forestry Sector 1990-1998

National Greenhouse Gas Inventory: Analysis of Trends and Greenhouse Indicators 1990 to 1998

Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks: Workbook for Non-Carbon Dioxide gases from the Biosphere, Workbook 5.1 reprinted with Supplements 1998

Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks: Workbook for Livestock, Workbook 6.1 reprinted with Supplements 1998

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