



Northern  
Territory  
Government



Australian Government  
Department of Agriculture  
and Water Resources

DEPARTMENT OF  
PRIMARY INDUSTRY AND FISHERIES

# Understanding greenhouse gas emissions through improved nitrogen management on NT farms

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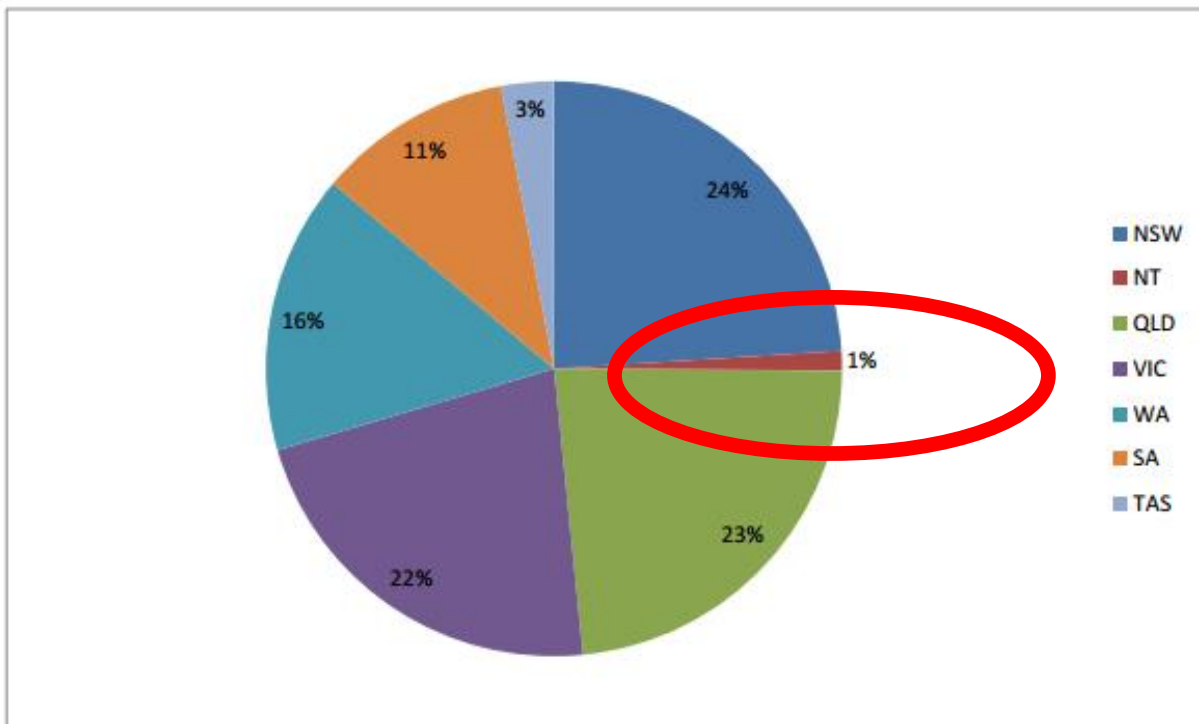




# Greenhouse gases & Agricultural Production

	<b>CO<sub>2</sub>-Equ (100 years) <i>Global warming potential</i></b>	<b>Sources</b>
CO <sub>2</sub>	x 1	Transportation, manufacturing inputs, electricity
CH <sub>4</sub>	X 27	Transportation, manufacturing inputs,
N <sub>2</sub> O	X 298	N fertiliser production, <b>land emissions</b>

Source: Forster et al. 2007. Changes in Atmospheric Constituents and in Radiative Forcing. In: *Climate Change 2007: The Physical Science Basis, IPCC*. Cambridge Uni Press.



**Figure 1.** Carbon dioxide equivalent (CO<sub>2</sub>-e) emissions from agricultural soils, 2013

This figure includes both direct emissions from organic and inorganic fertiliser application, crop residue, dung and urine deposited by grazing animals, indirect soil emissions, including atmospheric deposition, nitrogen leaching and runoff (State Greenhouse gas Inventory).

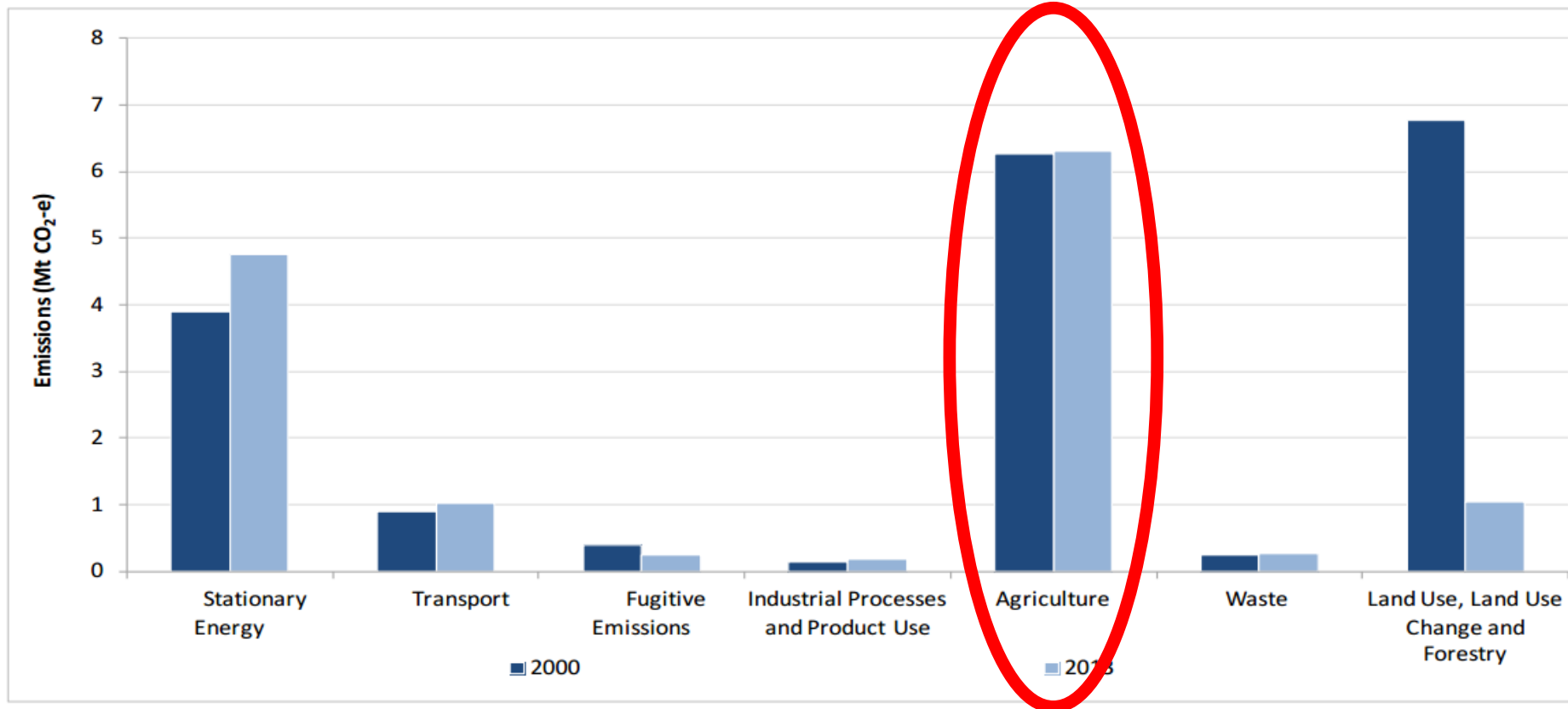
## State and Territory Inventories 2013

Australia's National Greenhouse Accounts



# NT farming soils just 1%

Figure 18: Northern Territory – Emissions by Sector, 2000/2013



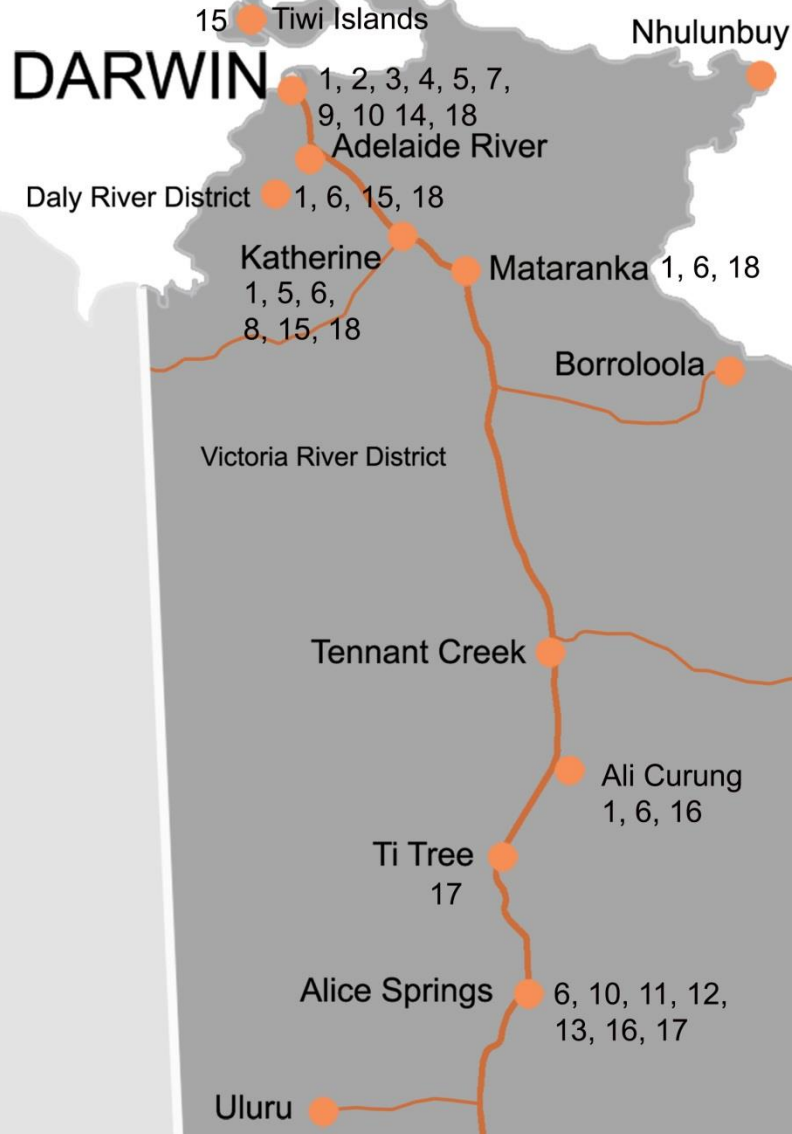
# More sustainable farming practices



Manage  
losses  
= ***reduce  
emissions***  
= improved  
efficiency  
= ***increased  
profitability***



Northern Territory Government



# Aim

- Evaluate NT farming practices in hay, vegetable and melons
  1. Use wet season cover crops to improve N management between crops
  2. Quantify emissions in melon & vegies
  3. Use enhanced efficiency fertilisers (EEF) to reduce emissions and maintain productivity



# Questions

1. Do wet season cover crops 'mop up' residual N from dry season melon or vegie cropping?
2. How efficient is N use in melon & vegies?
3. Do EEF reduce emissions and maintain productivity in hay?









# Measurements



# Results: cover crops

- no impact on residual soil N remaining after the dry season
- Soil GHG emissions were correlated with soil moisture (driven by rainfall), and management events, rather than by type of cover crop grown.
- biomass N shows soils with cover crops store **far greater** whole plant + soil N, than do bare soils, preventing loss through leaching

# Results: melons & vegies

- 
- 
- Farmers are applying at recommended rates
  - Mean soil N<sub>2</sub>O emissions were generally low
  - rank in the **lower range** of emissions reported for other irrigated crops worldwide
  - Some high emissions = room to improve

# Results: melons & vegies

- Emission factor<sub>fert</sub>:

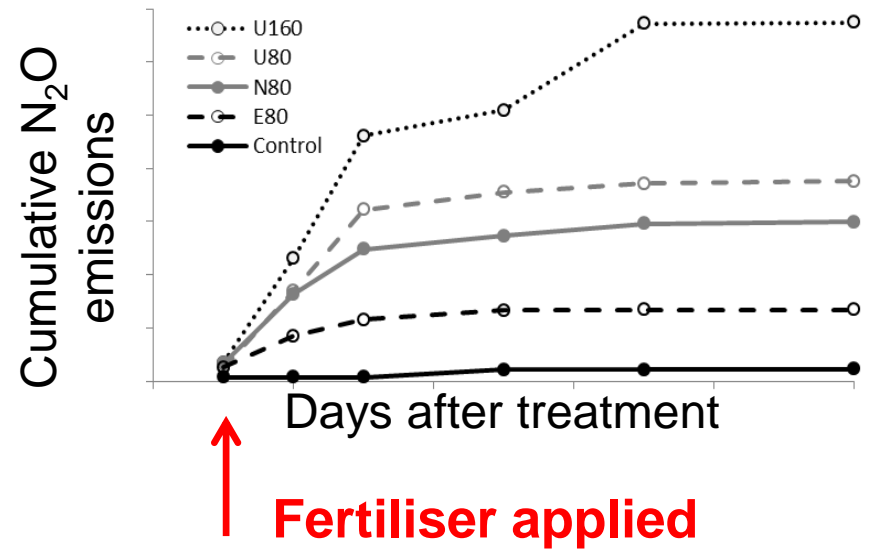
$$\frac{(N_2O-N_{\text{fertilised soil}} - N_2O-N_{\text{non-fertilised soil}}) * 100}{\text{Nitrogen applied}}$$

Default IPCC  
value **1% N  
loss per crop**  
(IPCC 2006)

	<b>Emissions Factor (%) (proportion of N fert emitted as N<sub>2</sub>O)</b>
Watermelon	0.11 – 3.81
Rockmelon	0.17 - 0.27
Cucumber	0.13 - 0.17
Pumpkin	0.09
Taro	0.02
Tomato	0.21

# Results: EEF in hay

- GHG emissions from soils hay crops occur immediately after application of fertiliser
- Hay quality and production is maintained



## Using EEF

- soil N<sub>2</sub>O emissions were **reduced by 25 – 60%**



# Understanding emissions

- high ***rainfall*** events and ***management*** were the strongest drivers of GHG
- Cover crops ***reduce soil erosion*** and ***maintain organic matter***
- Emission factors, were very low at ***one-fifth of international standards*** in most melon and vegies in the Top End.
- ***Reduced GHG emissions by up to 60%*** using EEF in hay

# Understanding emissions

**Top Paddock Newsletter**  
Kununurra Soils Workshop Summary 2015

Department of Primary Industry and Fisheries  
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**Katherine Rural Review**  
EDITION 319 - June 2014

**Action on the Ground sees new equipment perform**

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ISSN 0204-9823  
[www.dpi.nt.gov.au](http://www.dpi.nt.gov.au)

On 7 April, the Plant Industries team enjoyed the arrival of the much anticipated automated soil gas sampling equipment. This technology will assist in the collection of greenhouse gas samples from the Australian Government funded project "Nitrogen fertiliser management strategies for emerging pig farming systems. The automated system will also reduce the labour required to collect samples from the field.

The new equipment was designed, developed and built by a team from the Queensland Government's Technology (QUT). Once ready, the equipment was freighted to Katherine as part of the Cooperative Kununurra, also came to learn how to use the equipment to measure soil nitrous oxide emissions. Outside of QUT, will use the equipment collect gas samples from sugarcane, fertilizer treatments on sugar cane. Not only does the equipment collect gas samples, it also utilises this technology outside of QUT, will use the equipment collect gas samples from sugarcane, fertilizer treatments on sugar cane. Not only does the equipment collect gas samples, it also utilises this technology outside of QUT, will use the equipment collect gas samples from sugarcane, fertilizer treatments on sugar cane.

**Agnote**  
No: C38  
July 2015

**Reducing Nitrous Oxide Emissions when Fertilising Hay Crops with Nitrogen Fertiliser**

P. Richter and M. Bristow, Plant Industries Development, Darwin

**Agnote**  
No: D47  
July 2015

**Greenhouse Gas Emissions in Top End**

**Katherine Rural Review**  
EDITION 323 - May 2015

**Entec Urea reduces nitrous oxide emissions by 20% compared to conventional urea when applied to Sabi grass (*Urochloa mosambicensis*) in northern Australia**

Dr Ali Sarkhosh, Research Scientist (Horticulture & Agronomy)

The chemical 3,4-dimethylpyridinyl methylurea (DMPP) is mixed with urea to be less susceptible to nitrification. There may be some benefits using urea treated urea, as less nitrogen is lost to the atmosphere, meaning less nitrous oxide emissions.

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Action on the Ground project



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# Preparing industries

help farmers  
understand  
how to manage  
losses

= ***reduce  
emissions***  
= improved  
efficiency  
= ***increased  
profitability***





# Acknowledge the support

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Dao Nguyen

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Berrimah Agricultural Research Farm

Red Dirt Melons

Dawson Family

Kalano

Howie Family: Maneroo Station

Katherine Research Station

NT Farmers



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Full report and further work see:

[www.nt.gov.au/d/Primary\\_Industry/index.cfm?header=Action%20on%20the%20Ground](http://www.nt.gov.au/d/Primary_Industry/index.cfm?header=Action%20on%20the%20Ground)