


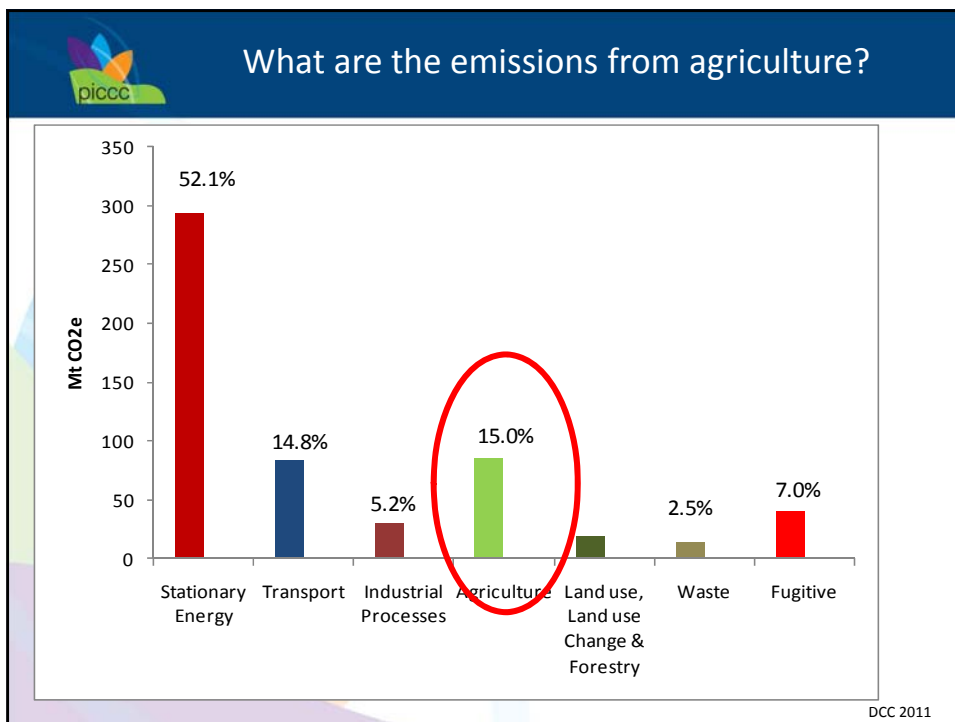


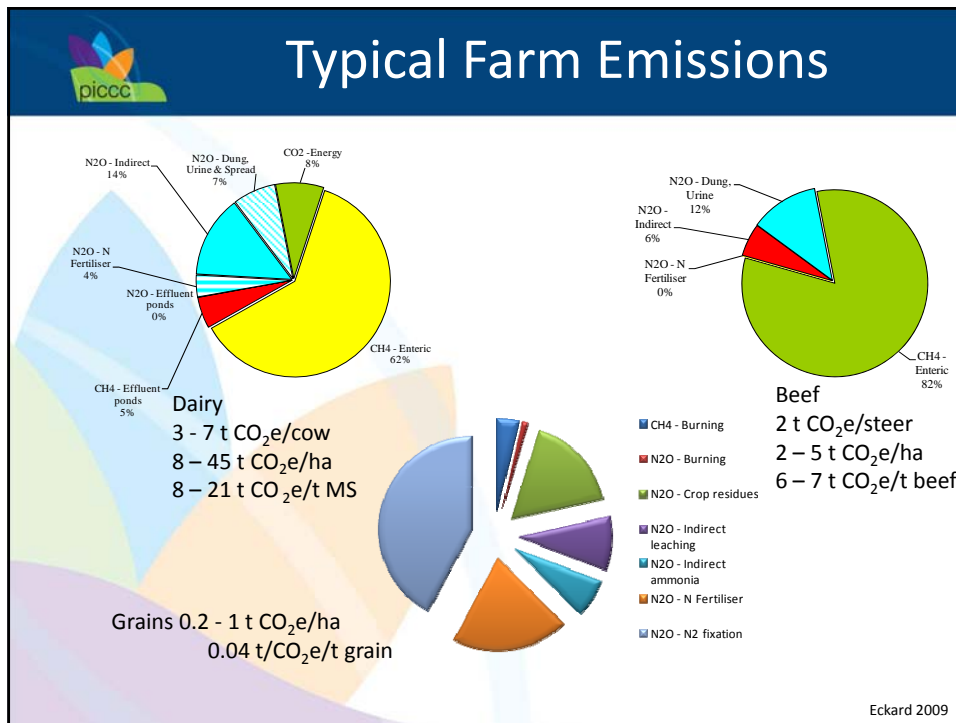
# The Carbon Farming Initiative – Opportunities for Agriculture

Richard Eckard




A joint venture between the University of Melbourne and the Victorian Department of Primary Industries



## Some Benefits and Risks


<ul style="list-style-type: none"> <li>• <b>Benefits Carbon Tax</b> <ul style="list-style-type: none"> <li>- China and India are watching</li> <li>- Significant funds back into agriculture</li> <li>- Agriculture most vulnerable to CC</li> <li>- Galvanise action to clean energy</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Risks Carbon Tax</b> <ul style="list-style-type: none"> <li>- Flow on effect to agriculture</li> <li>- Higher costs for                             <ul style="list-style-type: none"> <li>• Fertiliser, diesel, electricity</li> <li>• Sprays, etc</li> </ul> </li> <li>- Insufficient to impact CC</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Benefits of CFI</b> <ul style="list-style-type: none"> <li>- Incentive payments to farmers for action</li> <li>- CFI plus ?                             <ul style="list-style-type: none"> <li>• Biodiversity, water etc</li> </ul> </li> <li>- Some action will come from left field</li> <li>- Focus on soil carbon benefits</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Risks CFI</b> <ul style="list-style-type: none"> <li>- Modest returns</li> <li>- Soil Carbon                             <ul style="list-style-type: none"> <li>• 100 year obligations</li> <li>• Temporary fix</li> </ul> </li> <li>- Landscape change?</li> </ul> </li> </ul>

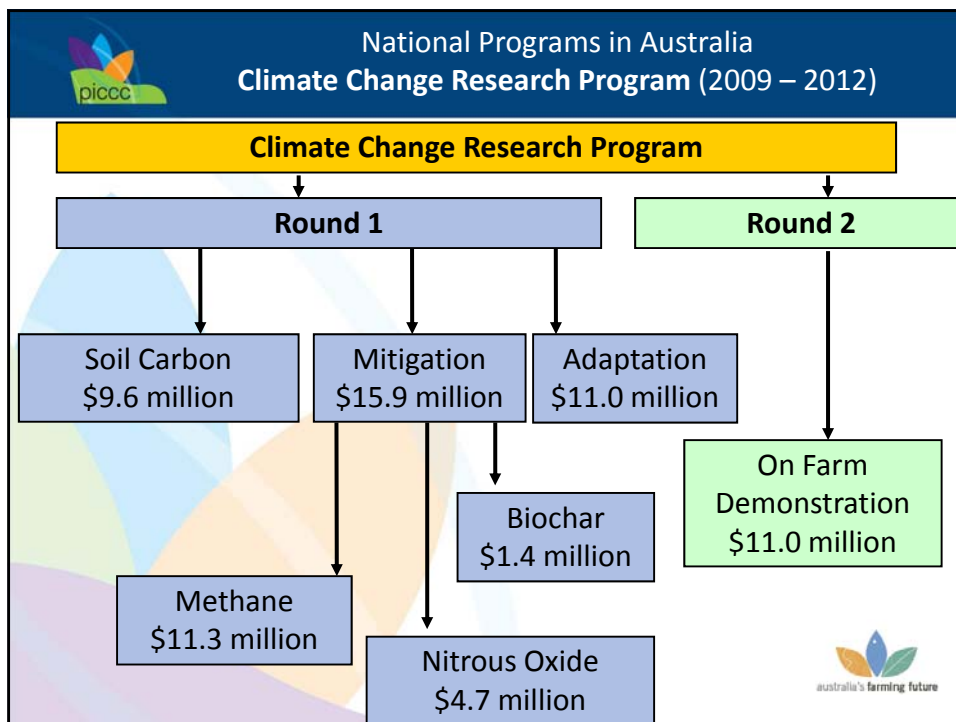


## CFI Methods

- Registered
  - Landfill gas
  - Methane from piggeries
  - Environmental plantings
  - Savannah burning
- In DOIC review
  - Landfill waste
  - Camel culling

- In development
  - Dietary supplements (oils)
  - Nitrogen rate
  - Inhibitors and EEF

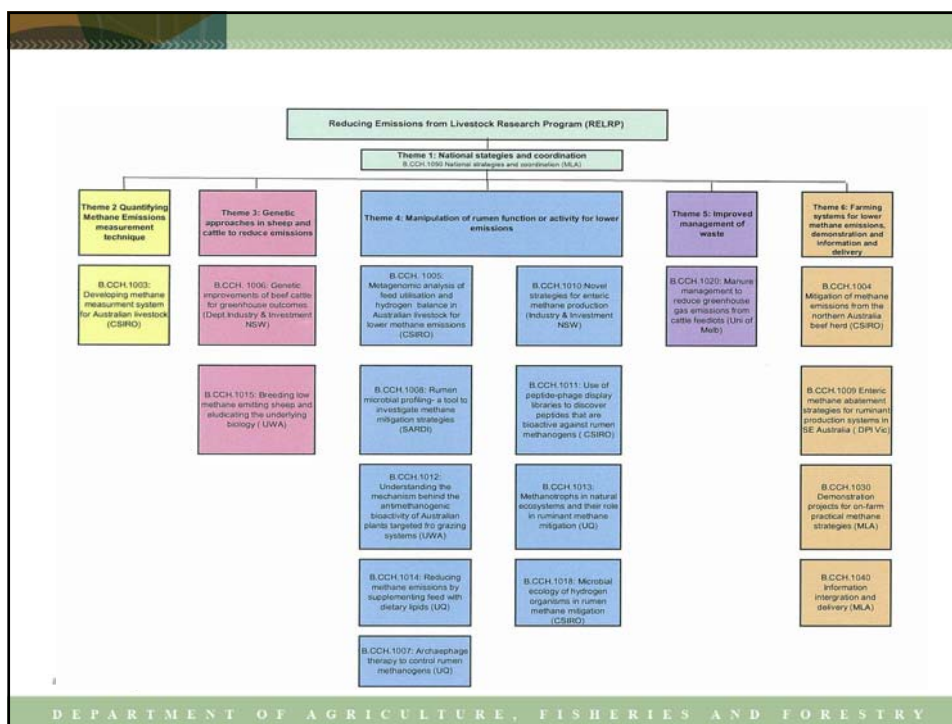







## Land Sector Measures





- **\$1.7 billion Land Sector Package**
- **Carbon Farming Futures** - \$429 million over 6 years
  - Filling the research gap \$201 million (DAFF)
  - Action on the ground \$99 million (DAFF)
  - Extension and outreach \$64 million (DAFF)
  - Developing methodologies \$20 million (DCCEE)
- **CFI non-Kyoto carbon fund** \$250 million 6 yrs.
- **NRM planning for climate change** \$44 million 5 yrs.
- **Indigenous Carbon Farming Fund** \$22 million 5 yrs
- **Carbon Farming Skills** - \$4 million 5 yrs
- **Land Sector Carbon and Biodiversity Board** - \$4 million 6 yrs
- **Biodiversity Fund** - \$946 million over 6 yrs




 Nitrous Oxide Research Program (NORP)


- National network
  - Automated chambers
- Satellite network
  - Manual chambers
- Laboratory studies

- Treatments
  - N Rates, timing, placement, legumes
  - Crop rotations
  - Inhibitors, other EEFs

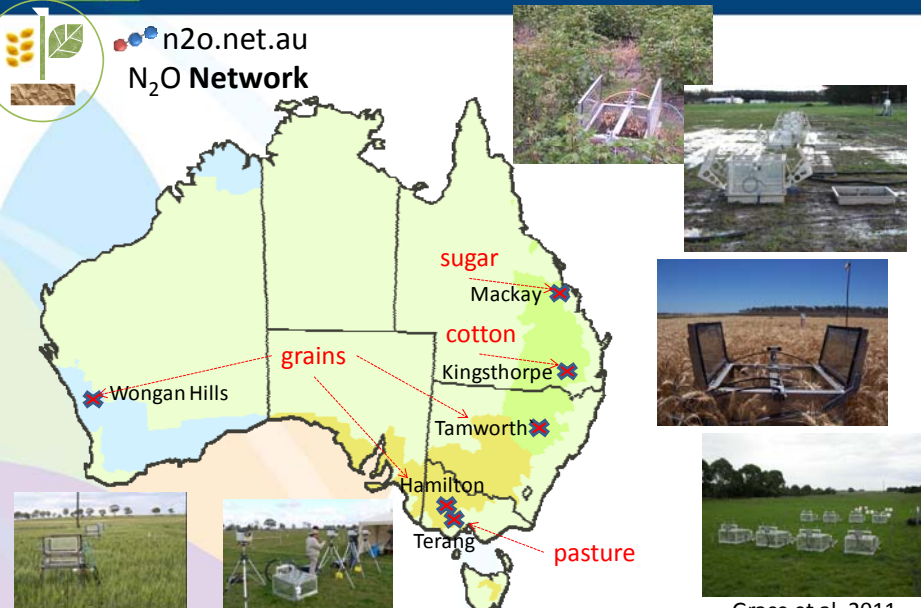





Grace et al. 2011

 Nitrous Oxide Research Program (NORP)




n2o.net.au  
N<sub>2</sub>O Network

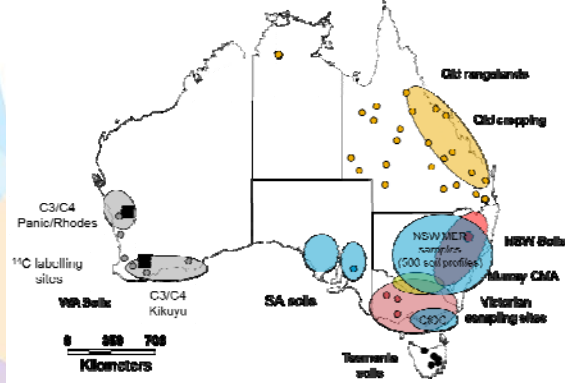


Grace et al. 2011


## Soil Carbon Research Program



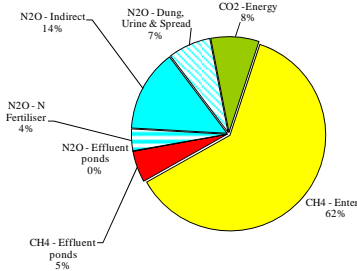
- Identify the impacts of land management on soil carbon stocks
- Assess MIR as a rapid and cost-effective means for quantifying soil carbon stocks and composition



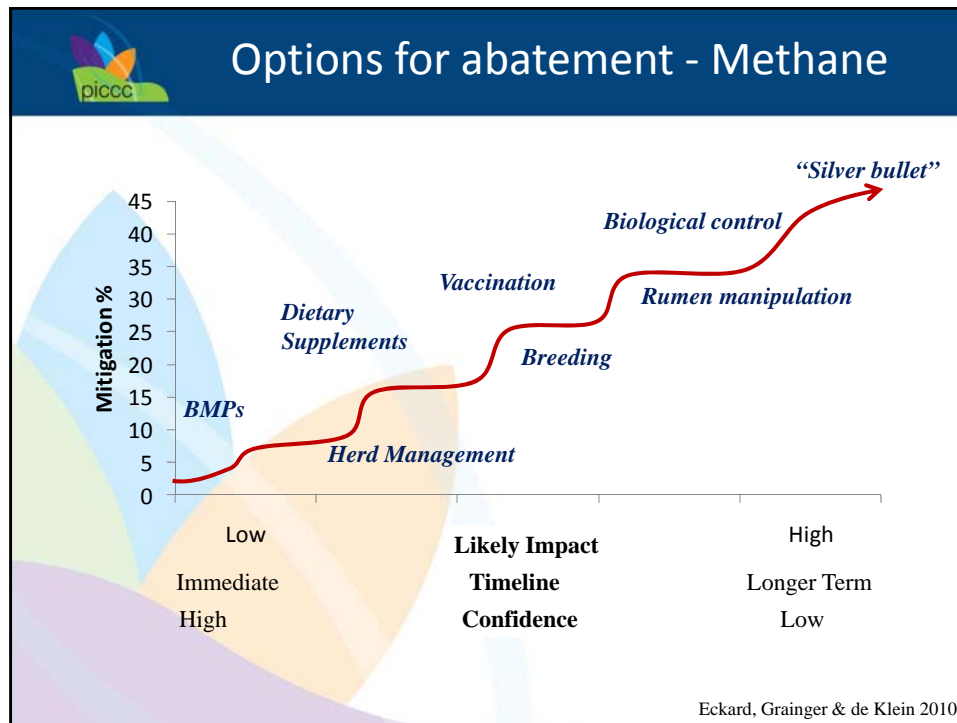
## Abatement Metrics




- Emissions intensity abatement
  - GHG/unit production
  - GHG/MJ or food unit
    - May not lead to reduced emissions
- Net emissions abatement
  - GHG/ha
  - GHG/farm or business unit
- Other metrics
  - GHG/human nutrition index
  - GHG/\$100 operating profit




Metric	Percentage
CH4 - Enteric	62%
N2O - Indirect	14%
N2O - N Fertiliser	4%
N2O - Effluent ponds	0%
CH4 - Effluent ponds	5%
N2O - Dung, Urine & Spread	7%
CO2 - Energy	8%



 Options for abatement - Methane


Short term

- Reducing unproductive animal numbers/ efficiency
  - Earlier finishing of beef
    - eg. P supplementation
  - Reproduction, fertility & health
  - Extended lactation in dairy
- Raising low methane animals
- Alternative livestock systems
  - Monogastrics & kangaroos?




Eckard *et al.* 2010




 Options for abatement - Methane

Short term

- Feed quality
  - Pasture improvement
  - C3 pastures, legumes
- Dietary supplements
  - Grain feeding
  - Tannins
    - Less methane
    - Less nitrous oxide from urine
  - Oils
    - 1% fat = 3.5% decrease CH<sub>4</sub> /kg DMI
  - Nitrate supplementation




Eckard *et al.* 2010; Moate *et al.* 2010

 Options for abatement - Methane


Medium Term

- Animal Breeding
  - Feed conversion efficiency
  - Reduced methanogenesis
- Plant Breeding
  - Improved ME: CP ratio
  - Tannin, oils, sugars




Eckard, Grainger & de Klein 2010

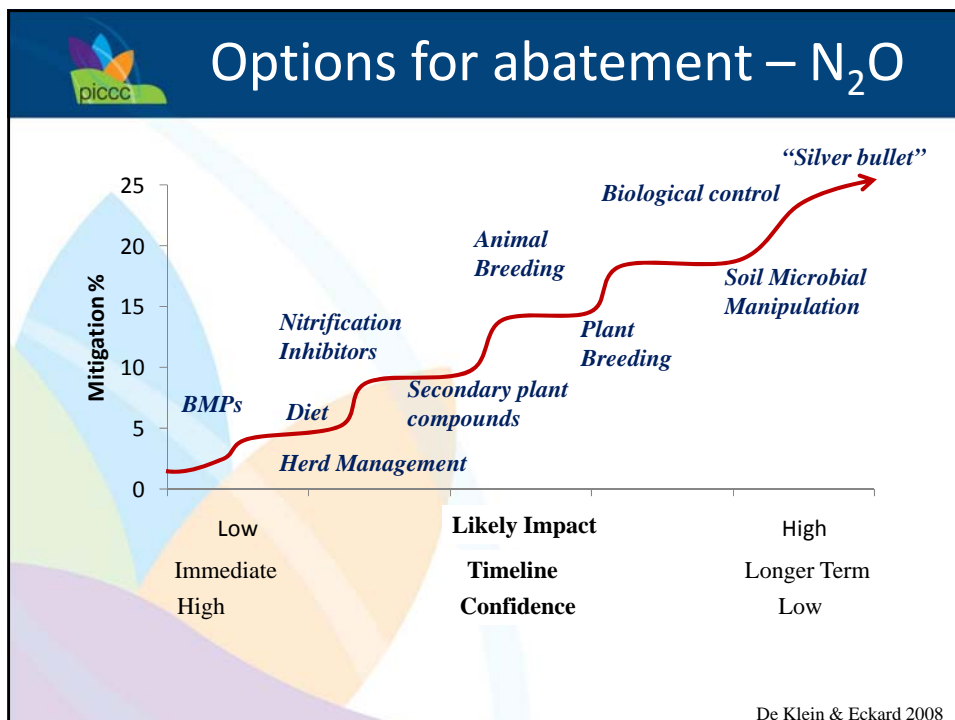



 **Options for abatement - Methane**

- Longer-term
  - Rumen manipulation/ biological control
    - Defaunation
    - Vaccination
    - Competitive or predatory microbes
    - Inhibitors
    - Alternative pathways
      - Acetogenesis (Kangaroo)
      - Succinate (Tamar Wallaby)
  - Methane oxidation
    - Methanotrophs, nitrate, sulphate








Eckard, Grainger & de Klein 2010





 Options for abatement – N<sub>2</sub>O

- Nitrogen fertiliser
  - Rate, source, timing, placement
  - Formulation
    - Nitrification inhibitors
    - Urease inhibitors
    - Slow release fertilisers
- Soil management
  - Tillage, stubble, compaction
  - Waterlogging
  - Fallow










 Options for abatement – N<sub>2</sub>O

- Medium term
  - Plant breeding
    - Tannin content
    - Less N required
  - Animal breeding
    - More N efficient


- Longer term
  - Rumen manipulation
  - Soil microbial manipulation


De Klein & Eckard 2008

 Options for abatement – N<sub>2</sub>O

- Urine Management
  - Ruminants excrete 75 to 95% of N intake
- Short Term
  - Balancing ME:CP
  - Feed tannins
  - Animal numbers
    - Reduce hot-spots
  - Inhibitor sprays
  - Feeding inhibitors
    - Only 5% of volume
- Longer Term
  - Animal Breeding
  - Plant Breeding




Grainger *et al.* 2009; De Klein & Eckard 2008

 CFI - The reality check


- Vic dairy farm - *Oils and inhibitors*
  - CFI income: \$4 to 6/ha/y
  - \$400 to \$600/farm
- Vic wheat farm - *N management and soil C*
  - CFI income: \$1.80 to 2/ha
  - \$900 to 1,000/farm/yr

Eckard 2011

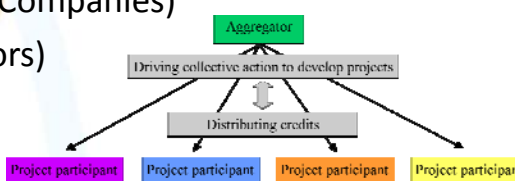
 **CFI - The reality check**

- NSW – 20% less cows in cross breeding
  - \$7,500 profit/farm
  - CFI income: \$600/farm
- Northern Beef – 25% improved weaning rate
  - CFI income: \$0.35 to \$2.50/ha
  - \$14,300 to \$60,000/farm

Herd 2012; Eady 2011

 **How CFI may work**

- Individual farmers?
  - Voluntary + Transaction costs high
  - Gross income from an offset method
    - \$2 - \$12 per method/ha/y
    - <1% of farm gross income
- Aggregators
  - Pre-farm (Fertiliser Companies)
  - Post Farm (Processors)
  - Consultants



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graph TD
    A[Aggregator] --> B[Driving collective action to develop projects]
    B <--> C[Distributing credits]
    C --> D[Project participant]
    C --> E[Project participant]
    C --> F[Project participant]
    C --> G[Project participant]
  
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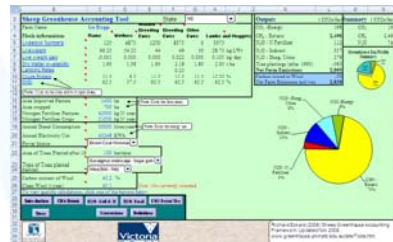
## In Summary

- Some options are available
  - To reduce emissions per unit product (intensity)
  - To reduce total emissions
- The Carbon Farming Initiative
  - A voluntary incentive scheme
  - Income is mainly modest and unlikely to drive action alone
  - Options could come from left field
- New area of research
  - In time more options will become available



## Tools and Resources

- [www.piccc.org.au](http://www.piccc.org.au)
- [www.greenhouse.unimelb.edu.au](http://www.greenhouse.unimelb.edu.au)
  - Greenhouse Accounting Tools
  - Articles
  - BMPs






www.piccc.org.au



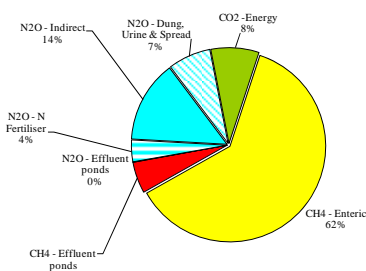
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