



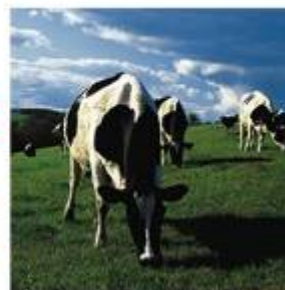
Farming, Food and Health. **First**

*Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi*

# New Zealand's Agricultural GHG Emissions

## Policies and Approaches

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**AgResearch**





# Outline of talk

- **New Zealand's unique situation**
  - Agriculture in the NZ economy
  - Emissions profile
- **New Zealand approach; policy pre-2007**
  - Flatulence fiasco
  - PGGRC
  - Research priorities
- **New Zealand approach; policy post-September 2007**
  - Consultation document
  - Emissions trading scheme
  - Sustainable land management & climate change



# Agriculture in the New Zealand economy



- **Agriculture 53% of total merchandise exports – unique for a developed country**
- **Agriculture 17% of New Zealand GDP**
- **New Zealand approx 40% of worlds tradeable dairy products, 66% of worlds tradeable lamb products**



# New Zealand GHG emissions

	<b>1990</b>	<b>2005</b>	<b>% Change</b>
<b>N<sub>2</sub>O emissions</b>	<b>10.1</b>	<b>12.7</b>	<b>25.7</b>
<b>CH<sub>4</sub> emissions</b>	<b>22.4</b>	<b>24.7</b>	<b>10.3</b>
<b>Total CO<sub>2e</sub> emissions</b>	<b>61.9</b>	<b>77.2</b>	<b>24.7</b>
<b>Agriculture as % of total emissions</b>	<b>52.5</b>	<b>48.4</b>	



# New Zealand agricultural GHG emissions in an international context

- Agricultural emissions in many developed countries going down, New Zealand's rising at 1%/annum
- Research into agricultural GHG emissions low priority in many developed nations
- Agricultural emissions high in developing countries (eg South America) but economic development, not reducing GHG emissions, has greater priority



# Situation pre-2007



# NZ Climate Change Policy 2004-2007



# The flatulence fiasco (2003)

- Government response to increases in GHG emissions from the agricultural sector.
- Agricultural sector exempt from any levies on GHG emissions **but obliged to fund research into GHG mitigation (minimum \$8.4m/year)**
- Provoked farmer outrage and strong political opposition
- Popular government in dispute with a sector of the economy which earns \$14 billion per annum in export revenue over an \$8.4 million research levy

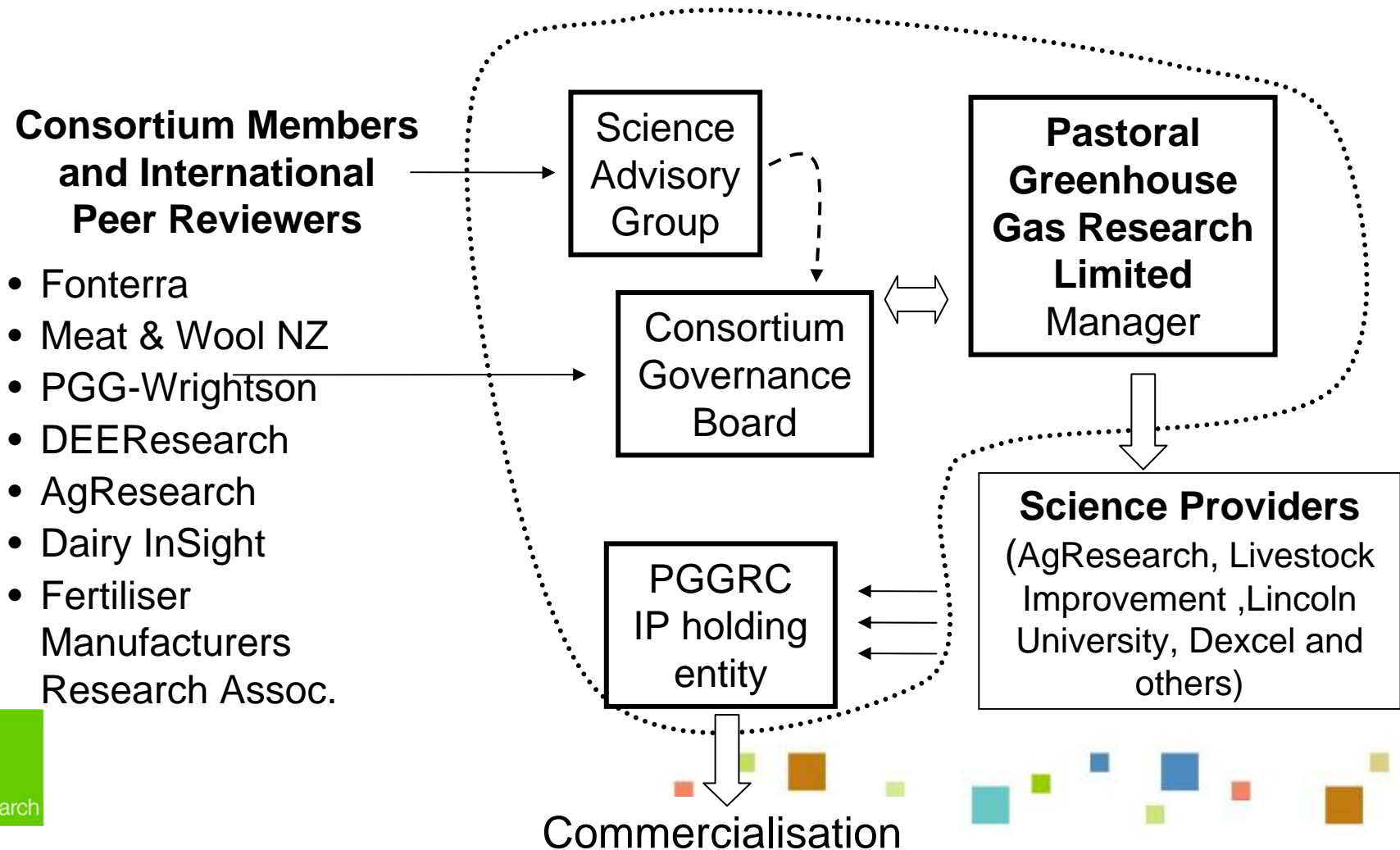


# 2003 political compromise

- Industry agreed to voluntarily fund GHG research and agreed an MOU with the Government
- Pastoral Greenhouse Gas Research Consortium (PGGRC) signed the MOU on behalf of the agricultural industry
- Target research investment achieved by adopting a broad definition of GHG research
- PGGRC became the principal route for funding agricultural GHG research in New Zealand; PGGRC 50% Government funded. Total funding approx \$5m/annum, \$3m on GHG mitigation.



# Pastoral Greenhouse Gas Research Consortium



# PGGRC Goals

- To develop one or more greenhouse gas mitigation solutions that can be implemented within New Zealand's agricultural industries
  - That are practical in terms overall economics, product safety, and animal safety, and will produce sustainable results that are accepted by the international regulatory authorities and our customers.
  - Reduce GHG production by 20% compared to business as usual.

*Initial concentration on methane but nitrous oxide research added in 2004*



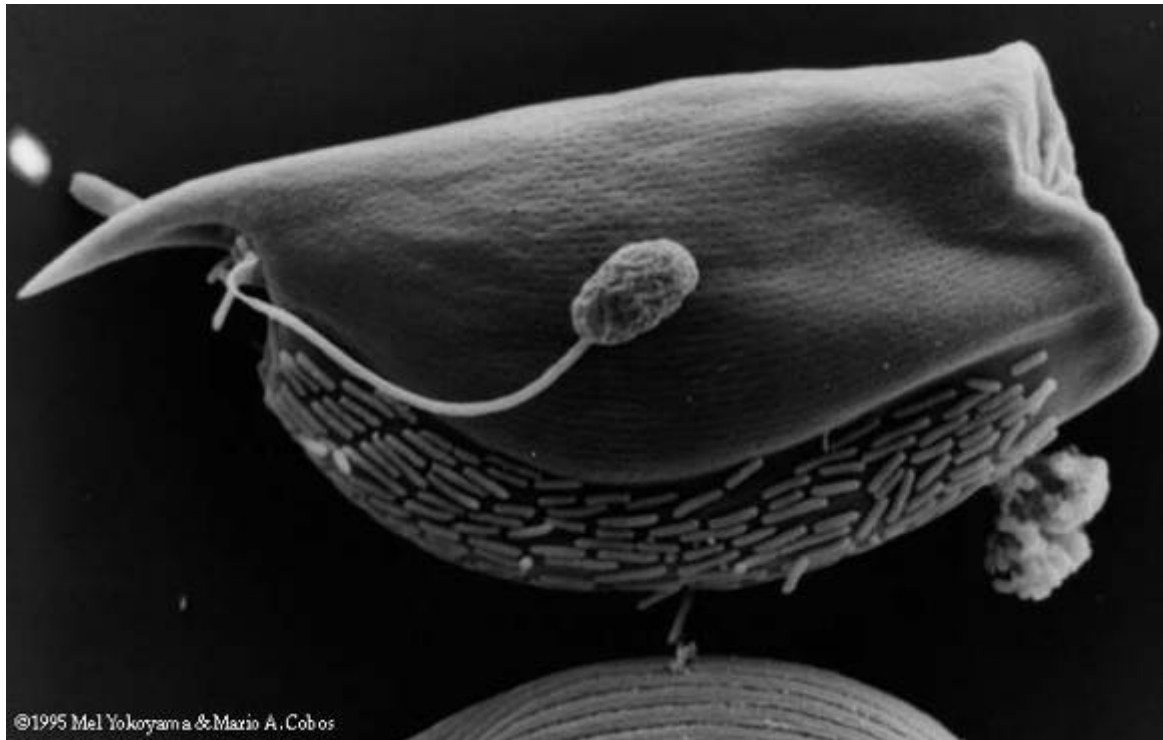
# PGGRC Research Priorities

(funding \$5m/annum)

- **Rumen microbial ecology**
- **Rumen microbial genomics**
- **Anti methanogen vaccine**
- **Exploiting animal to animal variation**
- **Low GHG farm systems development**
- **Nitrification inhibitors (DCD)**



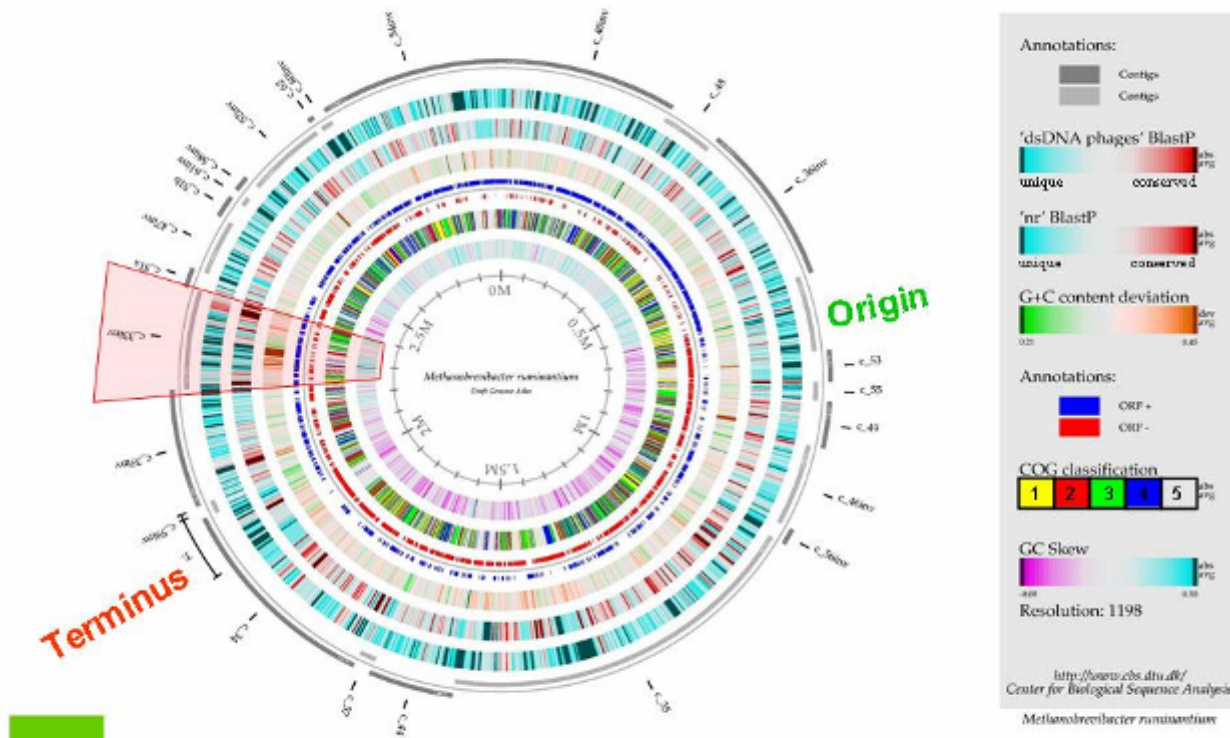
# Rumen microbial ecology



# Rumen microbial genomics

## Whole genome atlas of *M. ruminantium*

DRAFT  
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# Anti-methanogen vaccine

- **Efficacy of Australian formulations low, but approach highly attractive.**
- Identify methanogen fraction to induce antibodies that neutralize methanogens.
- Identify specific antigens which are targets for antisera that neutralize methanogens *in vitro*
- Identify adjuvants that stimulate a strong salivary antibody response to methanogen fractions.



# Exploiting animal to animal variation

	Min	Max	Mean	St. Dev	Lower Quartile	Upper Quartile
CH <sub>4</sub> g/day	213.9	478.8	332.1	38.1	285.6	381.0
CH <sub>4</sub> kg/ DMI	11.0	31.1	19.3	2.9	16.1	23.1



**Methane emissions from a herd of 302 Friesian x Jersey dairy cows measured between January 12th and February 6th 2004.**

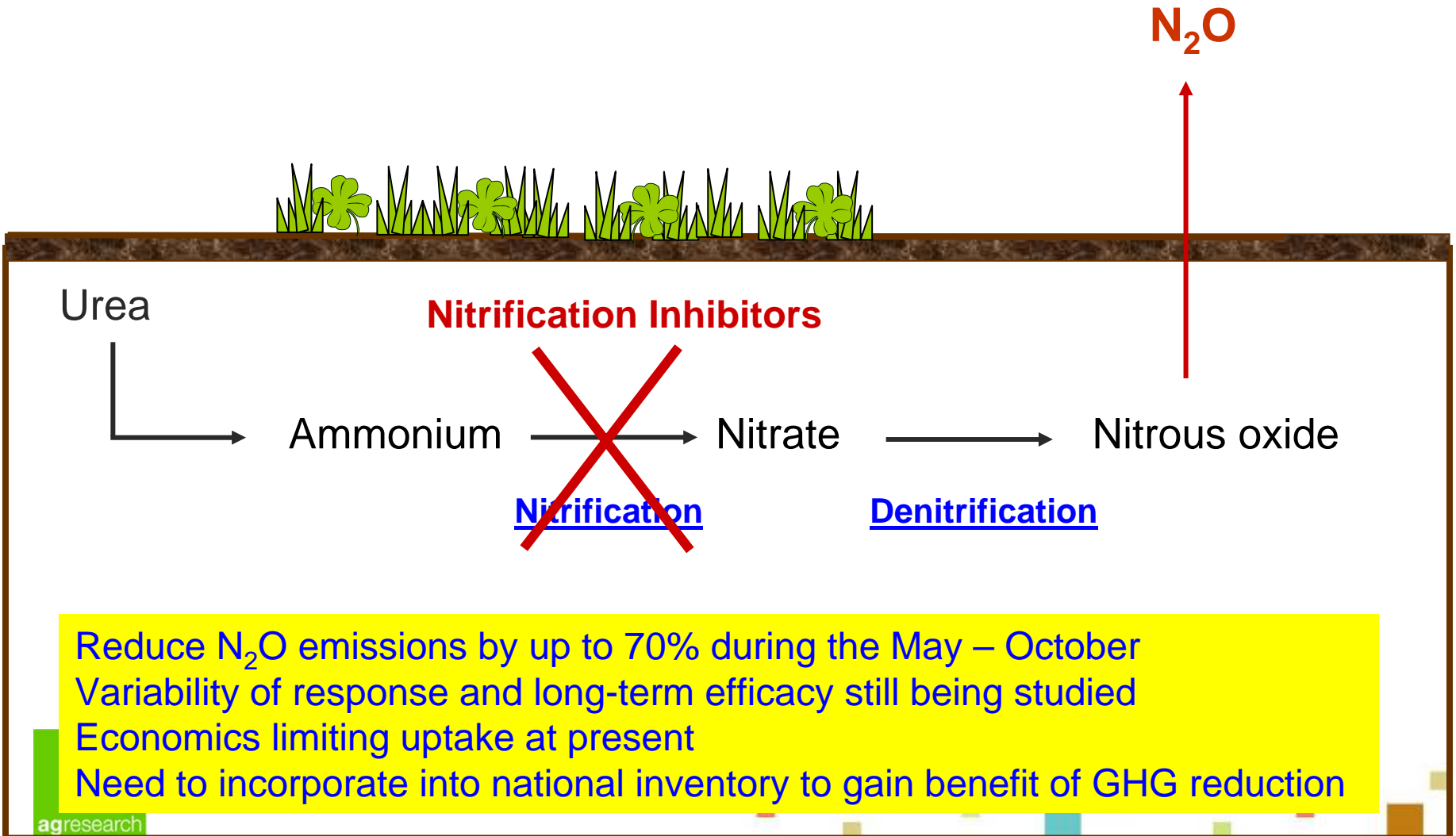


# Low GHG emitting farm systems

- Nutrition – defining targets for plant breeders + identifying low CH<sub>4</sub> emitting forages
- Low N loss systems (herd homes, maize silage, stand-off pads)
- Systems modelling



# Nitrification inhibitors



# Situation post-2007



# Sustainable Land Management & Climate Change

## LONG-TERM OPTIONS

Research, technology transfer and voluntary reporting

### 1. Research

Research into adaptation, mitigation and measurement technologies and practices for methane and nitrous oxide

### 2. Technology transfer

Use of demonstration farms to promote adoption of mitigation technologies e.g. nitrogen inhibitors, nutrient budgeting, improved forage crops

### 3. Voluntary reporting

Voluntary reporting of emissions at the farm level

## OPTIONS FOR ENCOURAGING EMISSIONS REDUCTIONS NOW

### Price-based measures

#### Government pricing mechanisms

#### 4. Incentive for nitrification inhibitors

Pay a financial incentive to encourage the use of nitrogen inhibitors

#### 5. Charge on nitrogen fertiliser

Impose a charge on nitrogen fertilisers

#### Market-based mechanisms

#### 6. Tradable permit regime for agriculture emissions

Devolution of agriculture greenhouse gas emission obligations and permits to farmers

#### 7. Offset schemes for agricultural emissions

Farmers required to offset emissions by emission reductions elsewhere i.e. tree planting, biofuels etc

#### Regulation

#### 8. RMA standards to control agricultural greenhouse gas emissions

Development of a National Environmental Standard to control agricultural greenhouse gas emissions: i.e. input and/or output controls

### Options focusing on land use change from forestry to agriculture

#### 10. Charge where deforested land is used for agriculture

Impose a charge on agriculture emissions created when land is converted from forestry to agriculture

#### 9. RMA standards to control new agricultural land use after deforestation

Controlling the greenhouse gas emissions and other effects arising from land use change from forestry to agriculture

# New Zealand's climate change solutions

- Sustainability programme designed for all New Zealanders to act
  - **Emissions Trading Scheme**
  - Energy Strategy and NZEECs
  - Transport: fuel efficiency labelling, biofuels sales obligation , public transport funding
  - **Sustainable Land Management and Climate Change Plan of Action**



# Emissions Trading Scheme: Key in-principle decisions ...(1)

- Economy-wide ETS covering all sectors and all gases
- Sectors' entry into ETS will be staggered – forestry first
- Units of trade will be a New Zealand Unit (NZU)
- NZUs will be convertible to Kyoto Protocol units (with limits)
- Kyoto Protocol units can be used to meet ETS obligations
- Each NZU must be backed by a Kyoto unit
- Key obligation - participants report their emissions (or the emissions that will arise from their activities) and surrender units equal to those emissions
- Absolute emission levels not intensity based



# Scheme administration

- All scheme participants will be required to hold an account in the NZ ETS registry
- Participants will get units by:
  - Buying them off other participants
  - Free allocation from government
  - Buying international units
  - Government may auction units if required



# Entry to the ETS by sector

Sector	Commencement of obligations	End of initial compliance period
Forestry (includes deforestation of pre-1990 forest land and afforestation post-1989)	1 January 2008	31 December 2009 (first compliance period for deforestation two years)
Liquid fossil fuels (mainly transport)	1 January 2009	31 December 2009
Stationary energy (includes coal, natural gas and geothermal)	1 January 2010	31 December 2010
Industrial process (non-energy) emissions	1 January 2010	31 December 2010
Agriculture (includes pastoral and arable farming and horticulture)	1 January 2013	31 December 2013
Waste	1 January 2013	31 December 2013



# Agriculture Emissions

- Covers agriculture gases
  - Methane from enteric fermentation
  - Nitrous oxide from animal urine and dung
  - Nitrous oxide from synthetic fertilisers
- Main sources covered: pastoral agriculture, horticulture, and arable production (~98% of emissions)
- 1 January 2013 entry date to honour the 2003 Memorandum of Understanding and operational challenges
- Sector to monitor and report emissions by 2011



# Point of obligation

- Principle to minimise the number of participants in the scheme (reduce transaction costs)
- Initial Government preference for company/processor level point of obligation
  - Meat and dairy processors ( $\text{N}_2\text{O}$  &  $\text{CH}_4$ )
  - Fertiliser companies ( $\text{N}_2\text{O}$ )
- Farm level option provides better incentives to change behaviour. Feasibility?



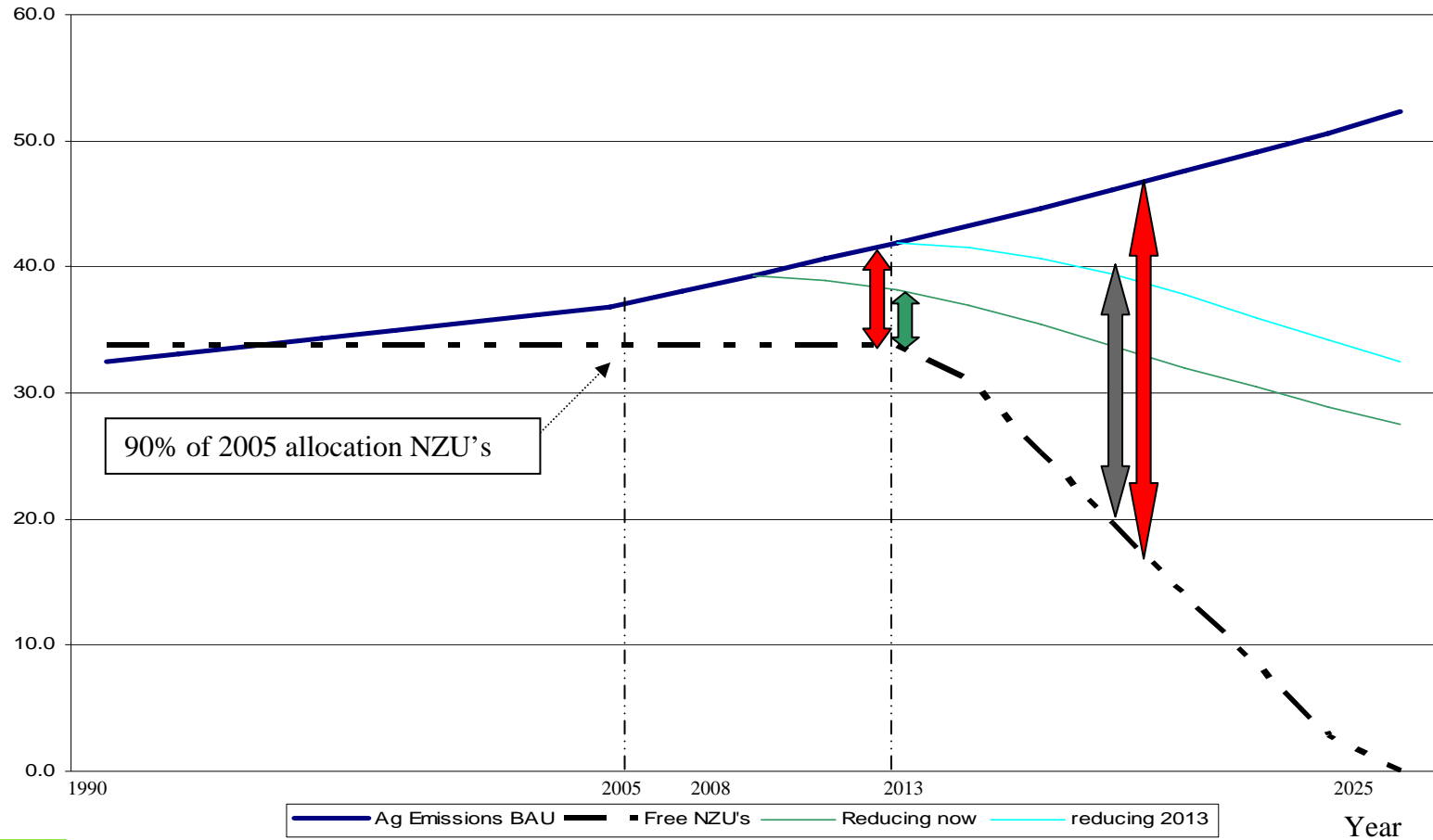
# Assistance to the sector

- Total quantity of free allocation of NZUs will be 90% of 2005 total emissions
- Allocation to phase-out to 2025 (up for discussion)
- No decisions made on allocation within the sector (eg. dairy viz-a-viz sheep)
- Government preference is for allocation to benefit farmers



# Transition arrangements for agriculture

Emissions MT



# Estimated supply price impacts at \$15/t CO<sub>2</sub>-e and 25/t CO<sub>2</sub>-e

- Price impacts sensitive to assumptions
- Figures assume:
  - Processor/company level point of obligation
  - Allocation spread evenly across sectors
  - Benefits of free allocation fully reflected in payout
  - No emissions reductions
- Figures based on 2006/07 prices

Emission price scenarios: change in average payout relative to business-as-usual scenario - with <i>no</i> reductions in emissions		
Possible Impact in 2013 (90% of 2005 free allocation)	\$15/t CO <sub>2</sub> -e	\$25/t CO <sub>2</sub> -e
Dairy	-1.0%	-1.6%
Beef	-0.2%	-0.3%
Sheepmeat	-0.7%	-1.2%
Venison	-0.1%	-0.2%

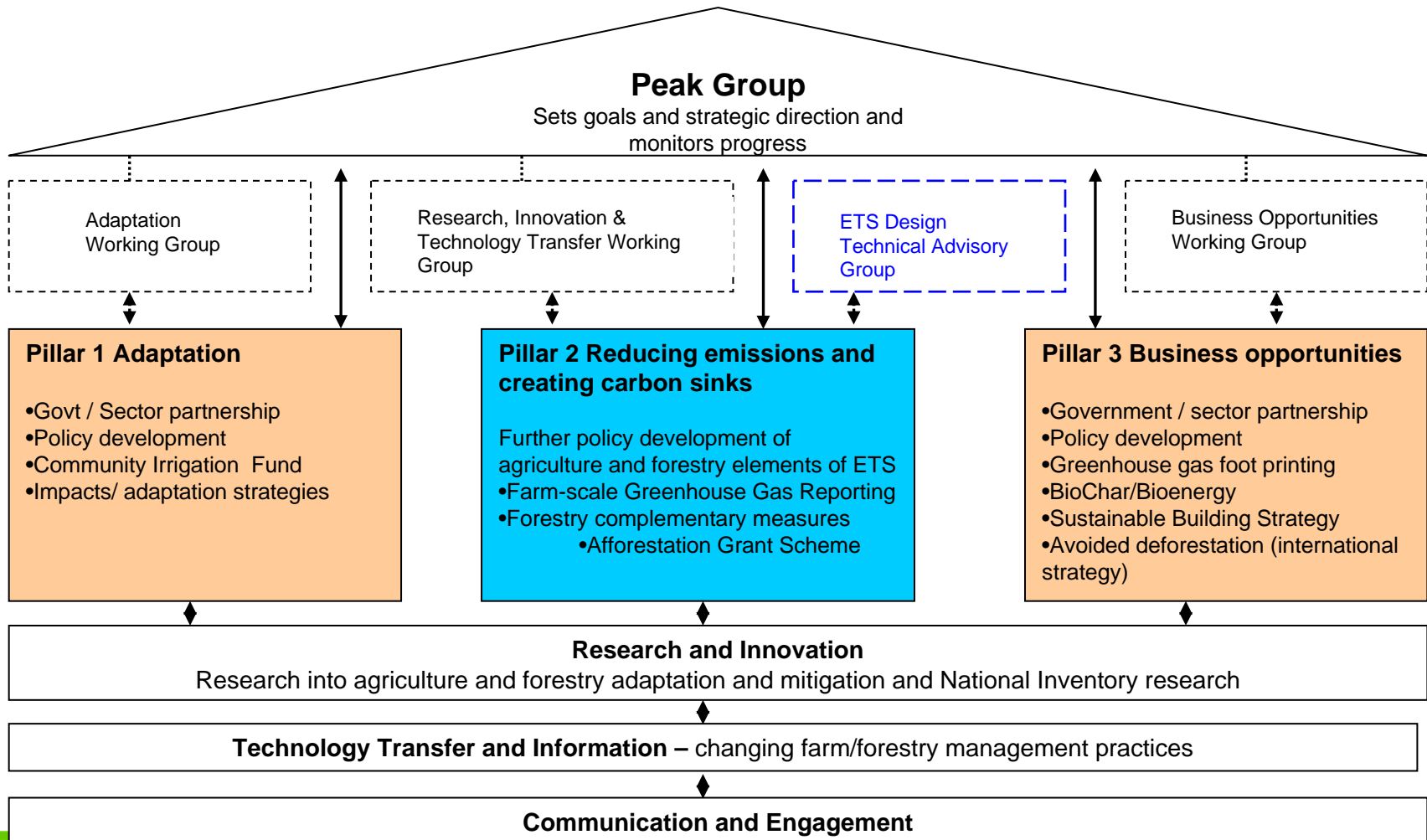


# Sustainable land management and climate change *Plan of Action*

- ETS cornerstone of NZ's efforts to reduce carbon emissions, but:
  - On its own won't do enough to reduce agricultural emissions
  - ETS won't address challenge for land management sectors to *adapt* to climate change or take advantage of *business opportunities*
  - Government will invest \$175 million over next 5 years on Sustainable Land Management and Climate Change *Plan of Action*
  - Plan will be developed and delivered in close partnership with land management sector



# Plan of Action: Proposed Structure and Activities



Vote Agriculture and Forestry	All figures are \$m				
Pillars and Initiatives	2007/08	2008/09	2009/10	2010/11	2011/12
<b>Pillar 1: Adaptation</b>					
Partnership and Policy Development	0.335	0.660	0.790	0.910	0.910
Community Irrigation Fund	0.112	0.360	0.600	0.980	1.360
<b>Pillar 2: Reducing Emissions and Creating Carbon Sinks</b>					
Emissions Trading Policy Development	1.200	1.827	1.415	1.415	1.415
Farm Level Greenhouse Gas Reporting	0.860	1.510	1.210	1.210	1.215
Afforestation Grants Scheme	1.068	6.341	11.497	11.497	11.547
GIS infrastructure	2.468	1.535	1.453	1.496	1.432
<b>Pillar 3: Business Opportunities</b>					
Partnership and Policy Development	2.844	3.615	3.215	2.335	2.055
Bioenergy and Bio-Char research and development	3.775	3.750	2.300	0.500	-



# Plan of Action: Funding for Supporting Work Programmes

Vote Agriculture and Forestry	All figures are \$m				
Supporting Work Programmes	2007/08	2008/09	2009/10	2010/11	2011/12
<b>Research and Innovation</b>					
Research	4.300	6.475	8.475	10.475	10.605
Inventory Development	2.720	2.850	2.850	3.150	3.150
<b>Technology Transfer</b>					
Partnership Development and Implementation	2.744	5.060	5.020	4.670	4.469
<b>Communications and Engagement</b>					
Communications and sector engagement	0.897	0.698	0.653	0.653	0.653
<b>TOTAL INVESTMENT</b>	<b>21.960</b>	<b>33.881</b>	<b>39.478</b>	<b>39.291</b>	<b>38.811</b>
<b>TOTAL OVER 5 YEARS</b>	<b>\$M175.584</b>				

