

# Agricultural GHG mitigation post 2012

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# How will we reduce emissions

- What's going to drive the reduction in the agricultural emissions through mitigation?
  - Some key factors involved:
    1. Knowledge & Understanding of the issue from the target audience
    2. Solutions that actually reduce emissions
    3. High rates of adoption that ensure maximum impact of the mitigation technology and
    4. Whether they are accounted for within Climate change agreements internationally
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# What is it going to take to reduce emissions

- Agriculture's ability to mitigate its non CO<sub>2</sub> emissions will be influenced the following formula
  - Knowledge X Solutions X adoption rate
  - All of these will take time to achieve
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# Knowledge

- We have high level understanding but many questions remain, e.g.
    - There are 2 non CO<sub>2</sub> GHG's – methane & nitrous oxide
    - Emission levels within a farm business are not clear
    - There are many variables associated with the emissions, farm / animal type, forage, time of year, ability to estimate or measurement
    - If you reduce GHG does it make your business more robust ?
    - What part do sinks play in offsetting these emissions?
    - How will a carbon signal relate to the current market signals that drives the business?
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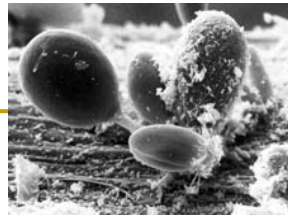
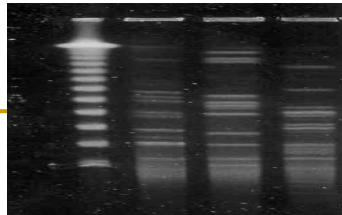
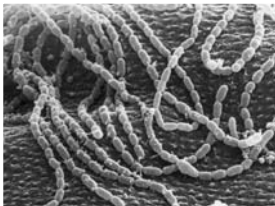
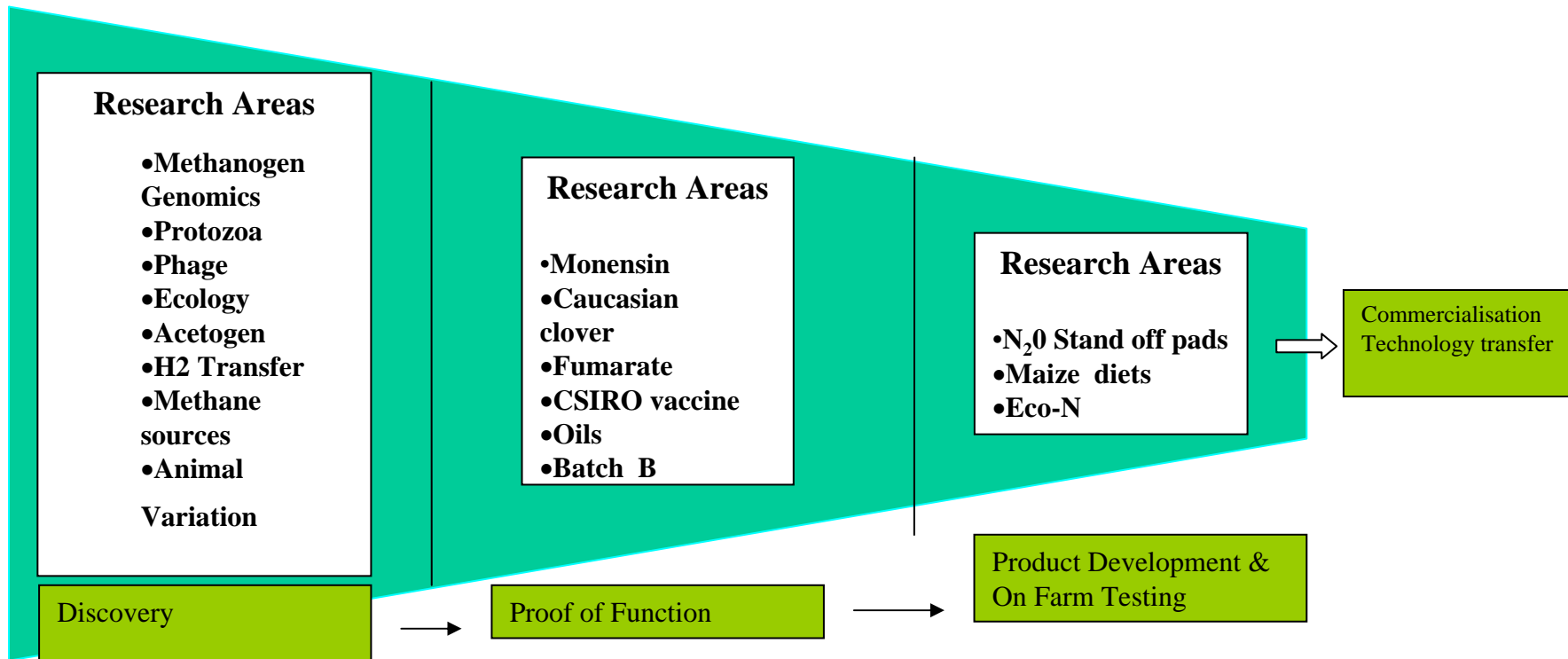
# Knowledge cont'd

- Unlike other resources (soil and water) emissions don't always give you direct visual feedback
  - Unsure about magnitude and long term effects – although the Kyoto target has gone some way to sheeting this home
  - Some doubt remains of what NZ can do.
  - Needs a programme of engagement and education to move forward once mitigation is proven and accepted internationally
  - An open mind by sector and society as understanding grows – govt policy needs to reflect this.
  - We are ALL going to have to take part in this as it is a new way of doing business.
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# Solutions need time

- They need time to be developed
  - Time to prove concept and delivery
  - Time to be; Commercialised
  - Counted within the Climate change framework, and
  - Influence business
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- And they have to fit with other productivity goals
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# Research Continuum (2002-07)



# Solutions

- Methane Opportunities through:
    - Rumen ecology
    - Methanogen genomics
    - Methanogen Vaccine.
  
  - Targeting the microbiology of the rumen population
  - Realistically these solutions are at least 5-7years from market.
  - Considerable technological challenges in the development of the technology and its delivery mechanism.
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# Solutions

- Methane cont'd
  - Animal variation - long term 3 approaches;
    - Direct measurements
    - Bio Markers
    - Gene markers
  - Forage –long term
    - Identify plant constituents then,
    - Refine and feed directly
    - Breed into plants used in forage
  
  - These are 2-5 years away before delivery and if through conventional breeding longer.
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# Solutions

- Farm Systems & Adoption
    - Mitigation technology in a real life situation
    - Informs and educates end users
    - Using all options available and demonstrating these
  - Incorporation of Sinks
    - Forests – opportunity that has potential
    - Riparian strips / Scrublands
    - Soil Carbon ? Not seen as a NZ option
    - Bio Char ? new on the block
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# Solutions

## Nitrous oxide

- ❑ Feed pads
- ❑ Nitrification Inhibitors (DCD)

Available now but yet to be used, or able to be used across the wide variety of farming systems and be proven to be cost effective. Some concern about long term N cycle effects.

- ❑ Diet changes
  - ❑ Plants low in N still being proven for our farm systems
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# Adoption rate *Informed by*

- Economic value to business
  - How it fits in the existing business or the parameters of what can be done if we change systems
  - Level of complexity
    - Is it a slight change to existing
    - Radical new approach
  - Risks and uncertainty factors following its adoption
    - Does it rely on a “new” economy – carbon
  - Widespread understanding across sector and therefore reinforcement of positive values
  - Availability
  - Market signals and returns
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# Adoption

- Nature of innovation delivery
    - Appropriateness to farm system
    - Daily administration
    - Annual
    - Lifetime
    - Animal/ soils/ water system?
  
  - All of the above will be factored in to any decision to use a mitigation technology
  - Regulatory drivers will not automatically override these factors.
  - Policy factors will influence these and could if well thought through be used to accelerate adoption
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# Six main areas of focus for PGGRC

Research carried out by



## Short Term opportunities

### Farm Systems and Adoption

Demonstrate and measure integrated mitigation strategies, larger scale trials and facilitate uptake by farmers.

### Nitrous Oxide

Tackling N<sub>2</sub>O emissions from fertilizer use and animal waste, inhibitors and systems changes.

## Medium Term opportunities

### Rumen Microbe Ecology

Manipulating the ruminal microbes that produce methane offers an opportunity for mitigation.

### Rumen Microbe Genomics

Rumen microbial genomics is a vital scientific and mitigation tool (phages / vaccines).

## Long Term opportunities

### Animal variation

Determining genetic and/or other bases for population variation to breed for lower emissions per animal.

### Forage & Plant inhibitors

Diet is a key factor known to influence methane production and nitrous oxide emissions.

- **Short term Opportunities** – mitigation solutions that have the potential to have an impact on greenhouse gases in the next 5 years, i.e. can be rolled out rapidly.
- **Medium term Opportunities** – mitigation solutions that have the potential to have an impact from 2013 require product development (but can be rolled out rapidly with appropriate economic signals).
- **Long term Opportunities** – requires long-term rollout of breeding or regrassing programmes, to be economic. For regrassing @ 3% per annum regrassing likely impact to occur over 20+ years. However, long term solutions are potentially most economic as do not require ongoing administration of mitigation technology (e.g. vaccine), and hence ongoing investment

## This research carried out in New Zealand under contract to:

- The Pastoral Greenhouse gas Research Consortium members ;
  - Fonterra \* Meat & Wool NZ \* Dairy InSight \* AgResearch \* PGG Wrightson \* Deer Industry NZ\* FertResearch and;
  - The Foundation for Research, Science & Technology
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