

Joining Up New Zealand's Climate Change Science Efforts in Agriculture

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The Need for Climate Change Science

Climate change science is diverse and complex
NZ capability is small
Collaboration is essential

Multidisciplinary science is needed to address
social, cultural, environmental and economic aspects
And their interactions

Climate change science for agriculture includes
atmosphere, climate, weather, plants, animals, soils,
water -
Integrated into practical and profitable systems

Need for evidence to support:
Decision making for mitigation and adaptation
To address unique NZ circumstances



The Organisation of Climate Change Science

Different funders have different interests and specific solutions to issues facing their farm, organisation, industry or government ministry.

Given the variety of interests and approaches, there are several different funding streams that seek to service those different needs.

As a result, the organisation and funding of agricultural GHG mitigation research in New Zealand can appear complex.



International Context for Climate Change Science

UNFCCC is the global structure through which NZ addresses climate change. UNFCCC relies heavily on science evidence in its decision making

UNFCCC Subsidiary Body on Scientific and Technological Advice advises on guidelines for improving standards of national communications and emission inventories

IPCC provides regular scientific assessments on climate change, implications and potential future risks, and assess adaptation and mitigation options to the UNFCCC

NZ science experts contribute to various IPCC reviews relevant to our interests e.g. AR6

International links and collaboration are essential for NZ to make progress, e.g., Global Research Alliance



Higher Level Emissions Reduction Science Investment in NZ

Playing our part in understanding global climate change

Understanding NZ's emissions

Understanding renewable energy/transport

Research contributing to low-emissions technologies

Creating new low-emissions industries

Reducing NZ's agricultural emissions and adapting

Primary Sector Research Focus Areas

Improved
agricultural
efficiency

Ag and forestry
GHG inventory

Methane - enteric
and waste

Nitrous oxide - soil
and waste

Soil carbon -
baseline/enhance/
stop loss

Integrated farm
systems - Māori
agribusiness

Forestry -
exotic/indigenous

Risks, impacts and
adaptation

Extension,
adoption, capacity
building

Current GHG Emissions Reduction Science Programmes

Agricultural Greenhouse Gas Inventory (GHGIR)

International, Industry and Government facing

Research to improve agricultural GHG reporting, accounting, ETS

2000

Sustainable Land Management and Climate Change (SLMACC)

Public Good, Government funded

Adaptation, forestry, mitigation, cross-cutting including technology transfer fund

2007

Global Research Alliance (GRA)

International facing, NZ initiated and host secretariat, 64 countries are now members

Support enhancement of international mitigation research

2009

2003

Pastoral Greenhouse Gas Research Consortium (PGgRc)

Industry facing, 50-50 Government-Industry funded

Methane and nitrous oxide mitigation focus

2009

New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)

Public Good facing

Methane, nitrous oxide, soil carbon, integrated systems, Māori



Other Climate Change Funding Avenues

MPI: Sustainable Food and Fibre Futures Fund

MBIE: Endeavour, Partnerships, Strategic Science Investment Fund, Marsden, National Science Challenges, tax credit

Universities: Performance Based Research Fund

Private sector/industry e.g., DairyNZ, Fonterra, Beef+Lamb NZ, Fertiliser Association of New Zealand, etc



Features of the NZ Climate Change Science Programmes

Longer-term funding provides confidence and security

Strong international reputation and linkages

Focused on greatest potential areas of GHG reduction and reduced emissions uncertainty for NZ

Good leadership and high level of technical expertise

Targeted and trusted communication of research

Focused through establishment of a physical centre

Enabled closer science/policy/Māori/industry links



How These Entities Work Together

Common membership on governance boards

Common members on working groups, project selection panels

Single research programmes with multiple funders and providers

Collaborative extension of research and messaging



How it Fits Together - An Example

LOW-METHANE ANIMALS BREEDING

Discovery/proof of concept

SLMACC-PGgRc

- Understand naturally occurring lower CH₄ emitters



PGgRc

- Establish heritability of CH₄ production



Pilot studies

GRA

- Establish international protocols to allow intercomparison
- Identify differences in rumen microbial communities of low & high CH₄ emitting animals
- Analyse large datasets from international partners to develop rapid, low cost technology to predict & select low CH₄ emitters



PGgRc-NZAGRC

- Identify genomic & phenotypic traits of low-emitting animals
- Test for correlations with productivity & disease resistance



Commercialisation

Good practice

GHGIR

- Develop EFs for cattle & sheep
- Develop methodologies to capture emissions reductions in NZ's GHG accounting





How it Fits Together - An Example

SPIKEY-R URINE PATCH CAPTURING TECHNOLOGY

Discovery/proof of concept

Pastoral Robotics
– Develop Spikey® technology

NZAGRC

- Develop Spikey 2 by improving & optimising Spikey®
- Test the technology using N₂O & N-leaching mitigation products

GRA

- Modify to Spikey-R to accurately map 3-D spatial configuration of urine patches through validated experiments with international partners

Pilot studies

Commercialisation

SFFF

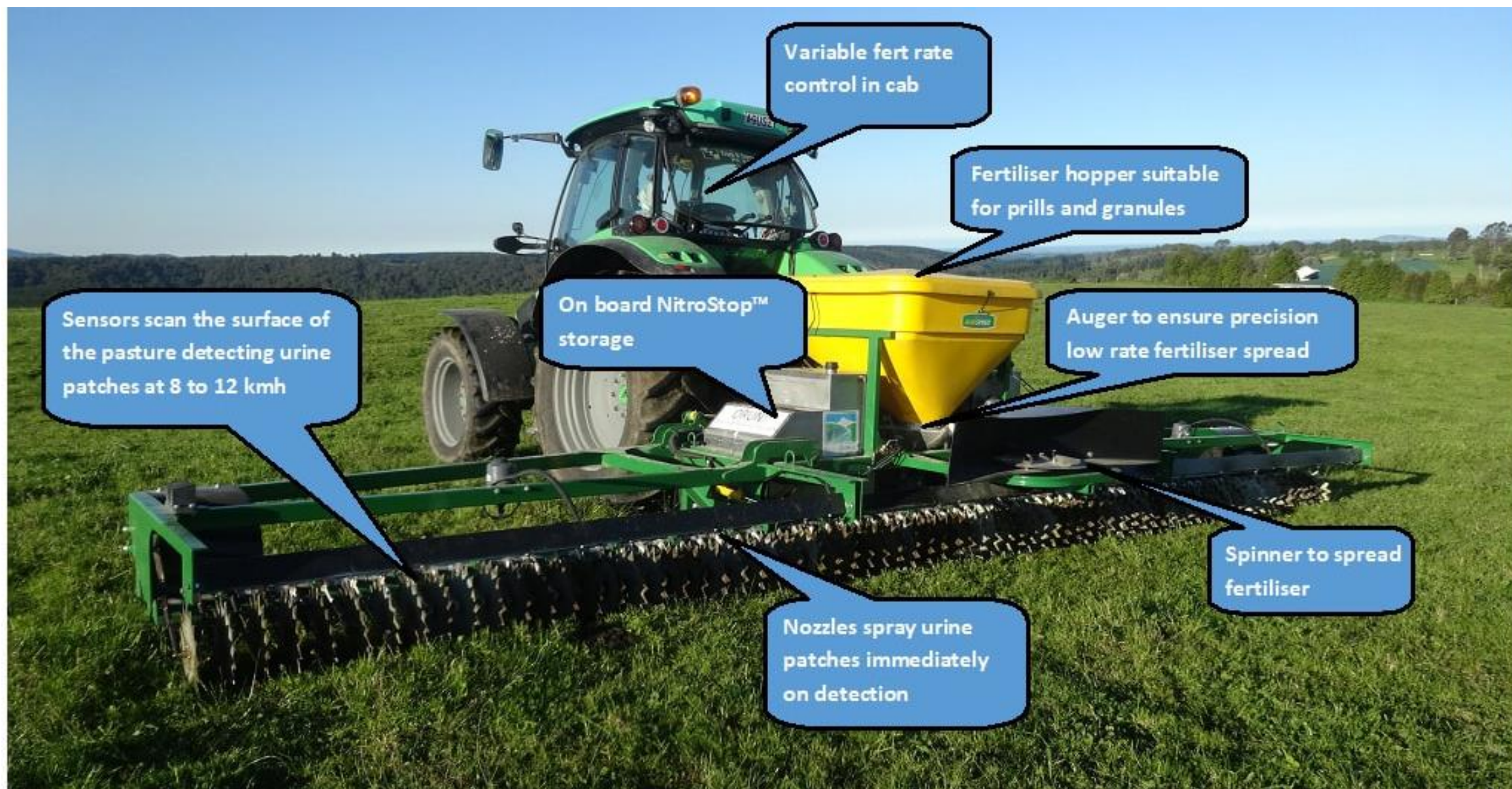
- Develop a new nitrate inhibitor & test its efficacy with Spikey-R
- Commercialise the technology

Good practice

GHGIR

- Derive N₂O EFs from potential hotspots
- Capture emission reduction in NZ's GHG accounting





Role of Regenerative Agriculture in Climate Change

The Technical Advisory Group for Regenerative Agriculture has a vision for *Regenerating Aotearoa*.

Regenerating Practices are those that, in isolation or collectively, may result in improved outcomes for:

- our productive land
- our freshwater and marine environments
- our animals
- the people that grow and consume our food and fibre products.
- It is not a "one-size-fits-all" activity, with prescribed inputs and outputs.

Role of Regenerative Agriculture in Climate Change

Greenhouse Gas Reduction Potential

- Less nitrogen fertiliser and more legume-based nitrogen inputs may mean less nitrous oxide
- Higher stocking intensities at grazing and longer intervals between successive grazings
- Greater efficiency in nutrient cycling and building soil carbon stocks.
- Lower overall stocking rates and less supplementary feed may mean lower emissions
- Less soil cultivation hence less soil carbon loss
- More diverse pasture with deeper root systems may provide more potential for carbon addition

Adaptation to Climate Change

- Greater residuals in grazing may make pasture more resilient to drought
- More pasture species potentially allows drought tolerant species to respond



MPI is seeking Regenerative
Agriculture proposals to
develop a sound evidence base
to test and confirm what works
in New Zealand soils, climates,
and farming systems including
for climate change



GHG Inventory Research: a Vital Foundation

‘Cannot manage what you cannot measure’

Annex 1 Countries required to report annually to UNFCCC

All Annex 1 countries have inventories formally and independently peer reviewed every year

UNFCCC requires continuous improvement of inventory

Research needed to address unique NZ features

Supports other systems ETS, Overseer, ghg tools

Needs to incorporate mitigations as they are adopted and reduce uncertainty in estimates



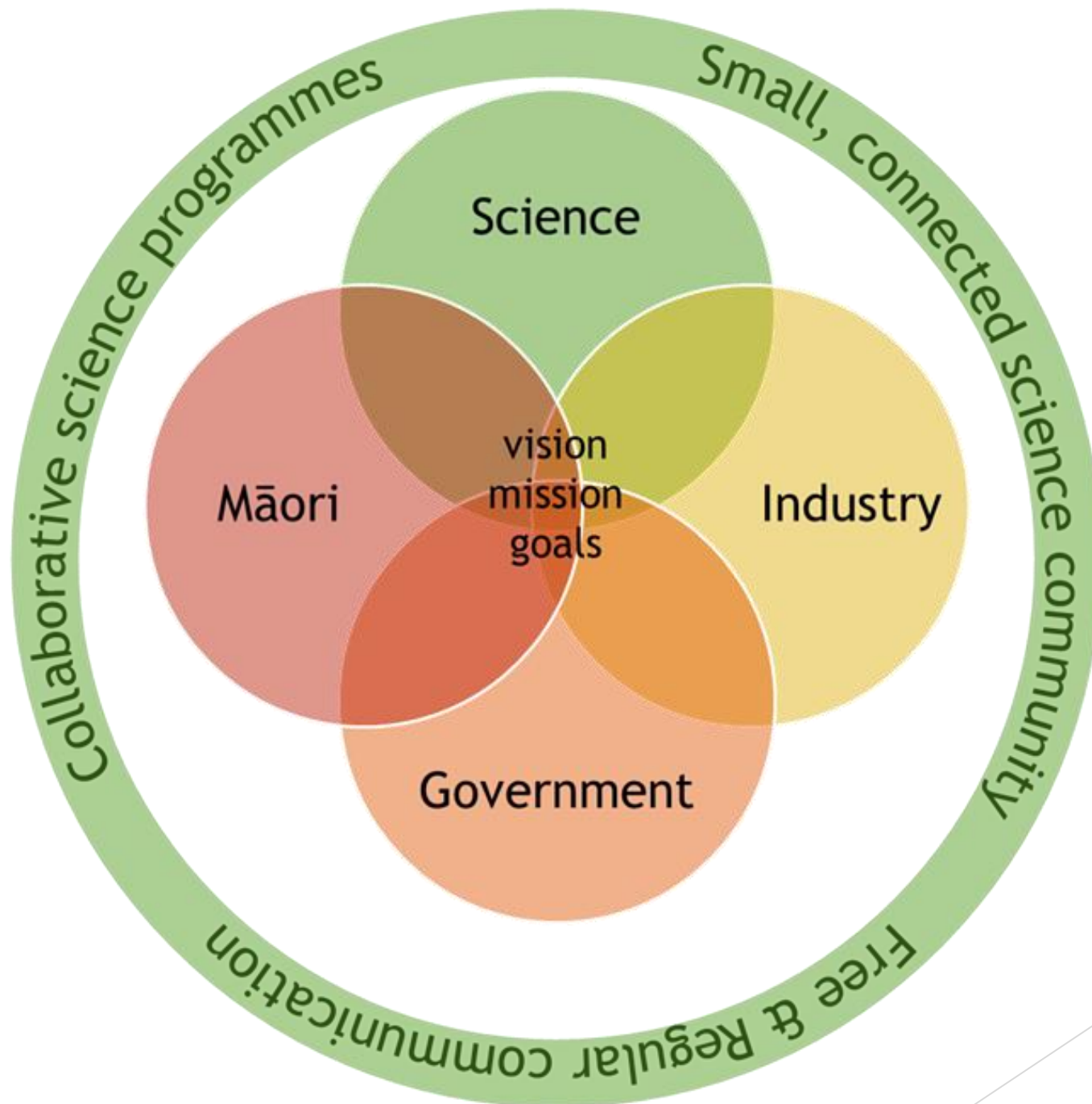
Science Accelerator Plan

Biological Emissions Reduction is an area where science acceleration can support delivery of 'Fit For A Better World'

A longer-term strategic plan, developed in partnership, that pulls together and builds on all our collective work to date

Will show where new mitigations are today, their path to widespread impact, and the actions needed to get them there





Where Are We Now?

A national agricultural and forestry GHG **inventory** that is globally recognised as 'world leading'

NZ is globally recognised for its 'world leading' agricultural greenhouse gas **mitigation** research

There has been development of a domestic evidence base in climate change **risks and adaptation** in the primary sector

We are more **joined up** than most other countries with greater and more direct communication between all parties

Wrap-up

There is a lot being done
Progress is being made

It is complex but it does fit together
The science accelerator will help tell
that story and define the future pathway

We might think we're disjointed, but we
are better than most!

