NEW ZEALAND
AGRICULTURAL GREENHOUSE GAS
Research Centre

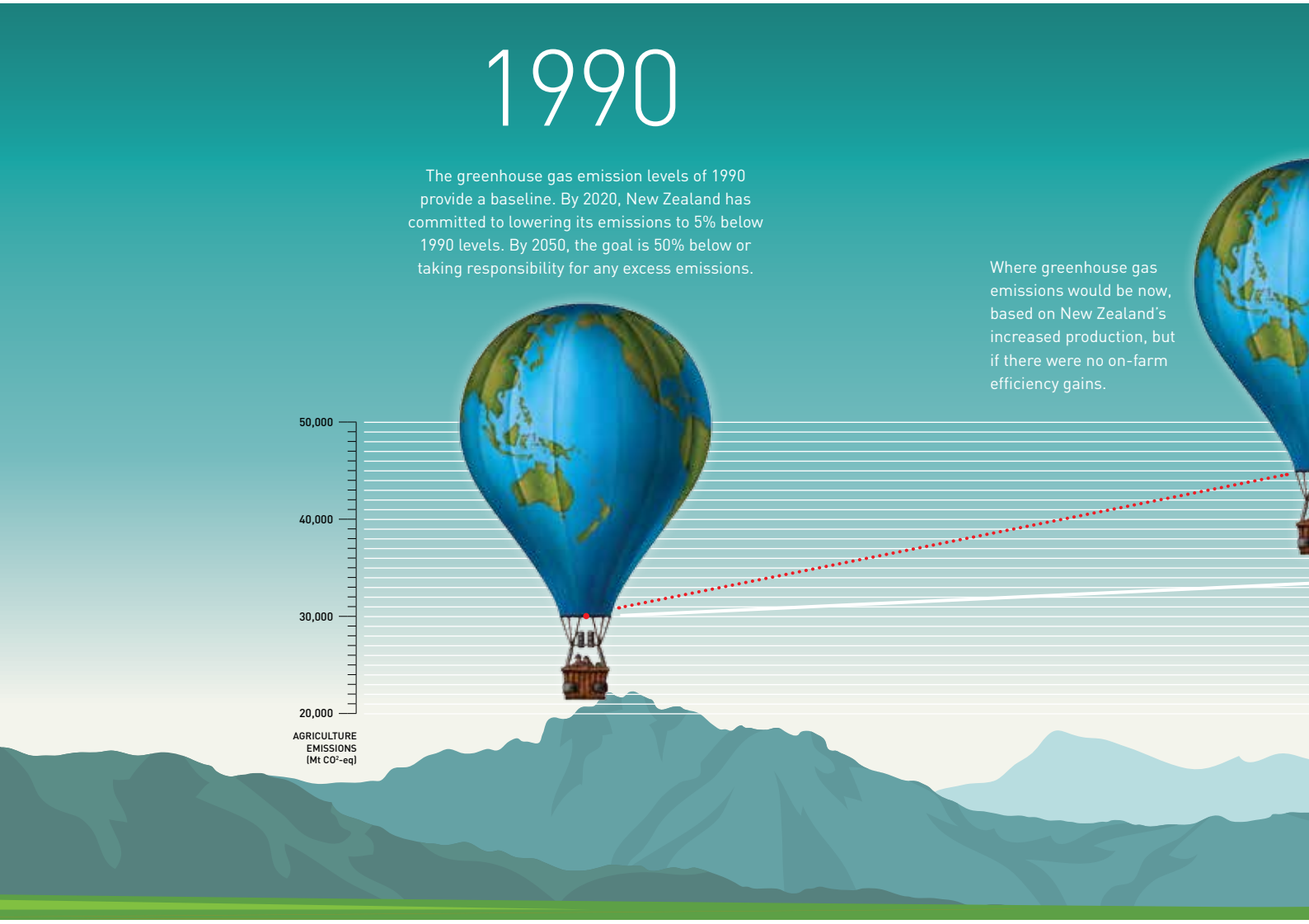
HIGHLIGHTS 2014

WORKING TOGETHER TO REDUCE AGRICULTURAL GREENHOUSE GAS EMISSIONS

Improvements in on-farm efficiency have led to the emissions intensity of New Zealand agriculture declining on average by about 1% per year since at least 1990.

Farmers are already part of the solution. By continuing to improve their farm efficiency, they will also continue to reduce the intensity of GHG emissions per unit of product.

But that will not stop New Zealand's total agricultural GHG emissions from rising. The country needs practical and cost effective tools to help it achieve economic growth targets, as well as its environmental, social and international aspirations and obligations.



This is where the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) fits in.

In alignment with the Pastoral Greenhouse Gas Research Consortium (PGgRc), Government, industry and researchers are working together – pooling resources to identify and develop effective and practical additional interventions that will allow further reductions in agricultural greenhouse gas emissions by 2020 and beyond.

NEW ZEALAND AGRICULTURAL GREENHOUSE GAS Research Centre

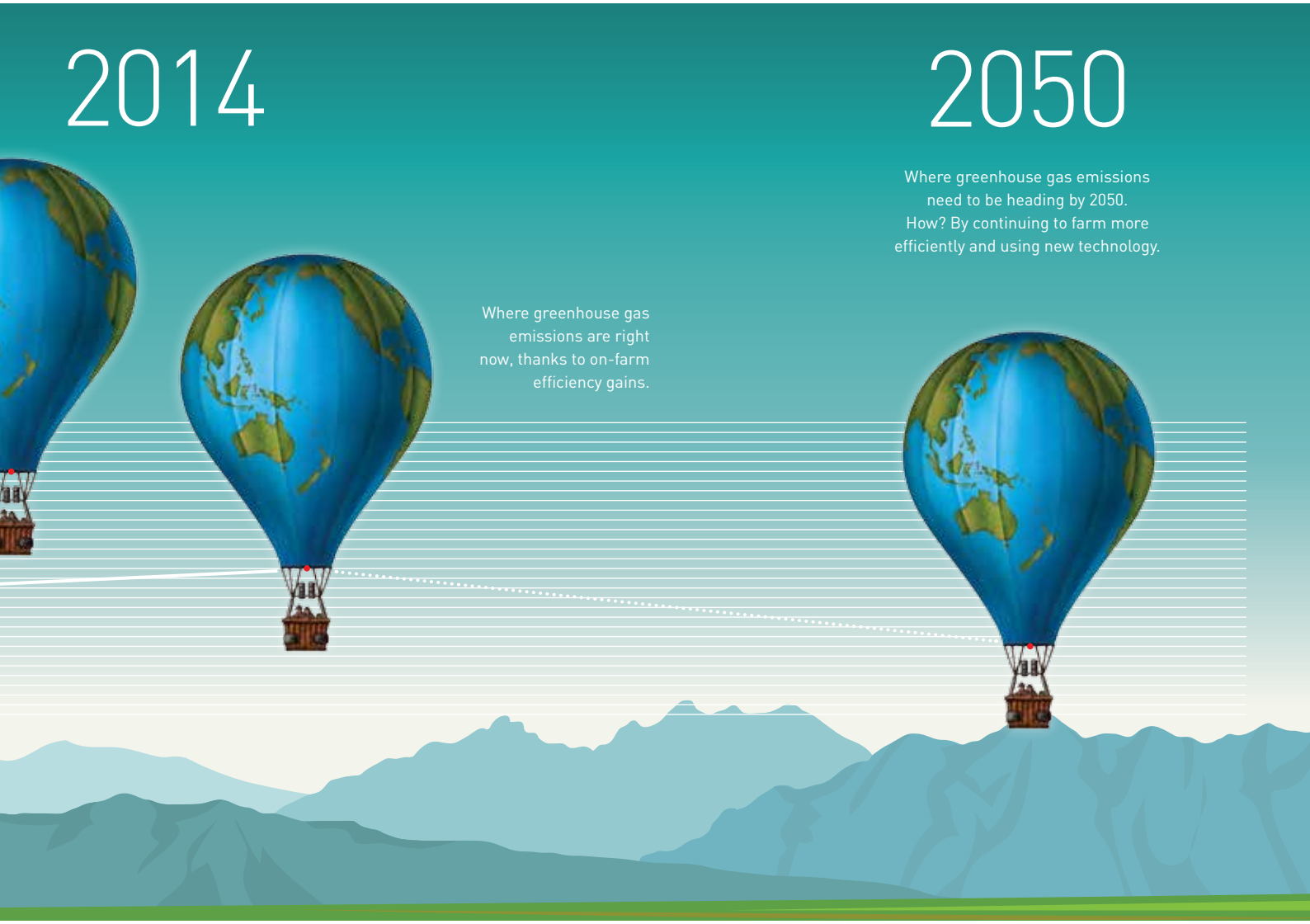
PGgRc PASTORAL GREENHOUSE GAS RESEARCH CONSORTIUM

WORKING TOGETHER

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

Ministry for Primary Industries
Manatū Ahu Matua

New Zealand Government



THE NZAGRC

The NZAGRC is a core component of the New Zealand Government's approach for addressing greenhouse gas (GHG) emissions from agriculture.

This includes New Zealand becoming a world leader in agricultural GHG mitigation research and in international collaborative initiatives. The initiatives will advance the search for, and implementation of, mitigation solutions for agriculture that are consistent with countries' economic, social and environmental aspirations.

The Centre is primarily a science funder, with additional responsibilities for strategic research coordination, capacity building and leading New Zealand's science input into international research activities in the agricultural GHG area.

OUR MISSION

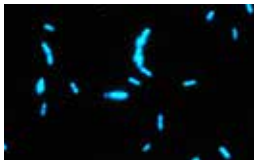
To be an internationally renowned centre for research and development into agricultural greenhouse gas mitigation solutions.

OUR VISION

To provide knowledge, technologies and practices which grow agriculture's ability to create wealth for New Zealand in a carbon-constrained world.

The NZAGRC building in Palmerston North.

OUR RESEARCH PROGRAMMES



Mitigating Methane Emissions

(Joint programme with the PGgRc)

- Breeding low GHG animals
- Low methane feeds
- Vaccines
- Inhibitors

Mitigating Nitrous Oxide Emissions

- Manipulating N inputs
- Plant effects on N_2O emissions
- Manipulating nitrification processes
- Manipulating denitrification processes

Increasing Soil Carbon Content

- Manipulating carbon inputs - carbon capture and supply
- Manipulating processes - carbon transfer, incorporation and stability

Integrated Farm Systems

- Currently under further development
- Demonstrating profitable, practical and low GHG emitting farm systems

OUR GOALS

1 Advance knowledge and understanding

Progress in 2013/14:

- 11 journal articles
- 12 conference papers
- Four core science programmes supported

2 Enhance awareness among shareholders

Progress in 2013/14:

- Alignment with industry via PGgRc
- Range of knowledge transfer activities
- Dedicated Māori GHG research programme established

3 Contribute to policy

Progress in 2013/14:

- On-going input into IPCC
- Leadership role in Global Research Alliance
- Range of national and international advisory roles

4 Develop science capability

Progress in 2013/14:

- 21 undergraduate student placements supported
- 11 PhD students studying and graduated
- 3 Post-doctoral researchers completed projects

5 Develop science and commercial partnerships

Progress in 2013/14:

- Proactive input into Global Research Alliance
- 5 international scientist exchanges funded
- Commercialisation support to MPI and PGgRc

2013/14 AT A GLANCE

SCIENCE

Progress towards solutions

- Low methane breeding trait moves closer to on-farm adoption
- Animal trials show prototype vaccinations reduce ruminal methanogens
- Lead inhibitor compound able to reduce methane production *in vitro* by >80%
- Feeding forage rape leads to reduced GHGs even when mixed with rye grass
- Preliminary results indicate some NZ pastures could act as carbon sinks

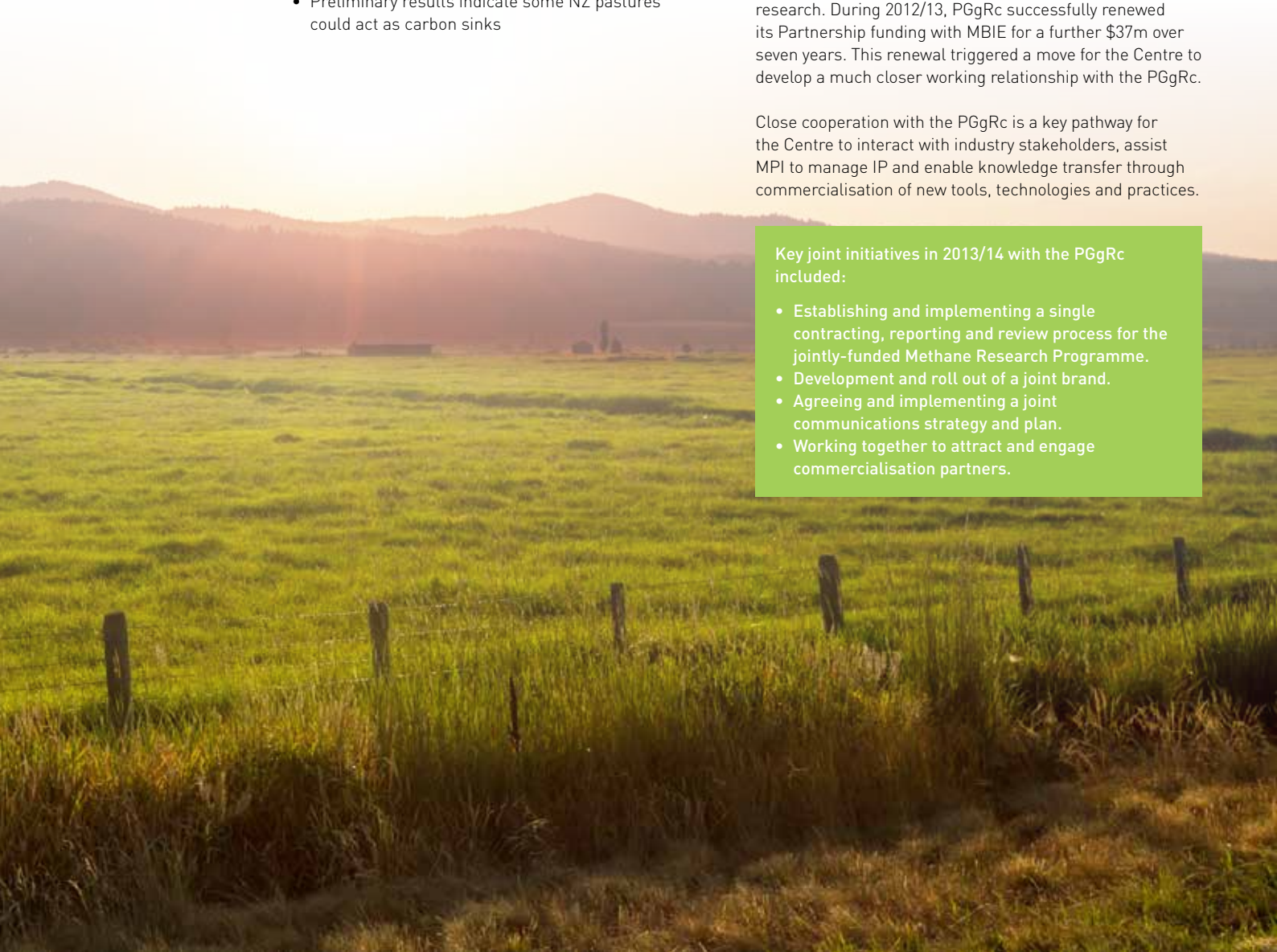
ENGAGEMENT

NZAGRC has always worked closely with the PGgRc to design its research strategy and determine research investment priorities. From 2002-2012, the PGgRc invested more than $37m in GHG (mainly methane) mitigation research. During 2012/13, PGgRc successfully renewed its Partnership funding with MBIE for a further $37m over seven years. This renewal triggered a move for the Centre to develop a much closer working relationship with the PGgRc.

Close cooperation with the PGgRc is a key pathway for the Centre to interact with industry stakeholders, assist MPI to manage IP and enable knowledge transfer through commercialisation of new tools, technologies and practices.

Key joint initiatives in 2013/14 with the PGgRc included:

- Establishing and implementing a single contracting, reporting and review process for the jointly-funded Methane Research Programme.
- Development and roll out of a joint brand.
- Agreeing and implementing a joint communications strategy and plan.
- Working together to attract and engage commercialisation partners.



CHAIRMAN AND DIRECTOR REPORTS

Chair's Report 2014

New Zealand has made international commitments to take action to lower its GHG emissions. Whilst the country is small by global standards, its reputation as a trading nation confers an obligation to contribute fairly towards the global effort to reduce emissions and the risks from climate change.

During 2013/14, the NZAGRC and PGgRc research programmes have formally aligned their operations, and jointly funded contracts are now in place. The governance bodies of both organisations now meet jointly every quarter and there is a strong drive towards engaging commercial partners by mid-2015. A number of key science results in 2013/14 demonstrate that the science teams are getting closer to viable solutions to reduce agricultural GHGs.

Through its national and international roles and responsibilities, including through its active involvement in the Global Research Alliance on Agricultural Greenhouse Gases, the Centre continues to build on its reputation as an important source of clear and unbiased advice on the science behind agricultural greenhouse gases and their mitigation options.

Professor Warren McNabb
Chair of NZAGRC Steering Group

Director's Report 2014

The 2013/14 financial year has been another eventful one for the Centre. Working alongside MPI and the PGgRc, we are moving closer to usable results from our research as well as maintaining a high standard in scientific publications to enhance our international reputation. We keep a close eye on ensuring that the outcomes of our funding can be easily translated into practical solutions and in some areas results have reached the stage where engaging with potential commercial partners is now a priority.

A key focus this year has been to re-evaluate and update the Centre's investment in nitrous oxide, soil carbon and integrated systems for the period 1 July 2014 to 30 June 2017. This has involved significant input from NZAGRC Principal Investigators, science teams and our wider network of industry and policy representatives who provided review and feedback. I would like to thank everyone that has contributed to this process. I am happy that the new work plans are both scientifically rigorous and highly targeted towards practical solutions, and I look forward to outputs from these updated programmes.

In addition to our core science programmes, we have contracted a three year project that aims to assist the Māori pastoral sector to improve its collective capacity to increase resource efficiency and farm productivity while lowering GHG emissions. This will allow us to ensure that our research is applicable to all sectors of New Zealand society and also provide tangible knowledge transfer materials that can be used by our member organisations and industry partners.

Highlights for Centre staff this year include contributions to the latest IPCC report by the Centre Director (Lead Author) and in particular the Deputy Director, Andy Reisinger, who was not only a Coordinating Lead Author of WGII chapter 25 but also actively participated in preparing the report's Summary for Policy Makers and is also contributing to the IPCC's final Synthesis Report.

I would like to express my thanks to all of our Advisory Groups, and particularly to the Steering Group, for their dedication to the Centre and the knowledgeable advice that they have provided throughout the last year.

Dr Harry Clark MNZM
NZAGRC Director

WORKING TOGETHER

MITIGATING METHANE EMISSIONS

PRINCIPAL INVESTIGATORS:
DR GRAEME ATTWOOD AND DR PETER JANSSEN (AGRESEARCH)

The NZAGRC methane programme is jointly funded with the PGgRc and aligns with existing MPI programmes. It aims to reduce emissions by directly targeting the methane-producing methanogens through small molecule inhibitors and vaccines and indirectly through feeding and breeding naturally lower-emitting animals.

Lead inhibitor compounds ready for animal trials

The search for safe, cost effective, environmentally friendly compounds that can inhibit methane production in the rumen has moved closer to its goal this year. Over 100 target compounds identified via either enzyme or pure culture screening have been analysed in the laboratory using pure methanogen cultures and simulated rumen fluids, with a number of them successfully causing inhibition. The most promising compounds will now move on to animal trials in 2014/15 to see whether they prove to be effective in the rumen.

The key is to find inhibitors that are effective at low concentrations whilst still obtaining significant methane emission reductions. The lower the required concentration, the lower the dosage that the animal needs to ingest. Low concentrations may allow administration via a single long acting bolus, have lower risk of toxicity and lower cost to the farmer, and not least are most likely to be consistent with food safety requirements.

Proto-type vaccines have a measureable effect

In the vaccine development pipeline, important work continues on the identification and testing of new vaccine targets to suppress methane-generating microbes.

Three animal trials using both sheep and cattle have been conducted this year, and re-boosting of sheep and cattle with fractions of the vaccines is underway. Subcutaneous vaccination of sheep with peptides (chains of amino acids) resulted in significant changes in methanogen populations in the rumen providing further 'proof-of-concept' for an anti-methanogen vaccine. Further animal trials are planned for 2014/15.

Low emitting sheep get closer to commercial reality

Breeding for sheep that have lower methane emissions per kg of feed they eat has continued this year. The research team have set themselves a target of delivering sheep GHG Breeding Values to industry by mid-2016.

The high and low emitting sheep selection lines continue to be measured, selected, genotyped and monitored for a wide variety of production traits. Potential methods for indirect selection of low methane producing animals via blood markers and genomic selection based on DNA profiles have been identified and are being further investigated. Portable chambers are being evaluated as a possible low cost method to rank animals. Key checks include ensuring that there are no productivity losses from low-emitting animals, and no other undesirable implications for resilience. Initial studies indicate no detrimental effects on live weight gain or carcass characteristics.

Methane vaccine trials underway.

Feeding forage rape can make a real impact on emissions

The feeds programme this year has focused on improving the understanding of the mechanisms behind the reduction in enteric methane emissions of sheep fed forage brassicas, and how those mechanisms relate to other feeds such as starchy supplements e.g. maize.

Preliminary experimental results suggest that feeding forage rape reduces methane emissions even when mixed with ryegrass. If confirmed, this novel finding means that forage rape does not have to be fed as a sole diet to reduce methane emissions.

New insights on digestion processes influencing methane emissions when fresh forages are fed have also been acquired. By understanding these effects, we will be in a better position to understand variation in responses in methane emissions to different feeds, and the potential to reduce net emissions through changing the overall feed composition while remaining consistent with general New Zealand farm practices.

New and improved sheep rumen model developed

Models of the rumen are a key part of understanding and predicting the effect of different feeds, vaccines or inhibitors on overall GHG emissions and productivity. The predictions of methane from the Molly dairy cow model have been significantly improved in the past year by developing a sub-model of particle and outflow rate from the rumen. Additionally, the original Molly95 model has been rescaled to represent the rumen of sheep.

This model will be useful to support the analysis and interpretation of animal experiments that use sheep. A model has also been developed that simulates methanogen growth and activity in the rumen. This leads to an improved ability to predict the consequences of methane mitigation strategies.

Microbiology and growing genome database provide invaluable information

Underpinning microbiology work aims at understanding the microbial processes occurring in the rumen during the application of different methane mitigation strategies. This understanding guides the four different research streams within the overall programme.

Rumen samples from various animal trials have been analysed for the presence of different microbes and their activities in the rumen. This has been accompanied by the constant development of genome sequencing and analysis pipelines to achieve the highest possible resolution of the rumen microbial community structure in a cost-effective way.

Targeted rumen methanogen genome sequencing is being undertaken to confirm current targets for inhibitor and vaccine development and to identify new targets for further investigation. The genomes of five new rumen methanogens have been sequenced this year. These genomes have been intensively studied and their sequence information has been added to a growing global rumen methanogen gene database.

Genome sequencing underpins methane programme.

MITIGATING NITROUS OXIDE EMISSIONS

PRINCIPAL INVESTIGATORS:
DR CECILE DE KLEIN (AGRESEARCH) AND PROFESSOR HONG DI (LINCOLN UNIVERSITY)

A significant amount of time during 2013/14 has gone into summarising and analysing the results obtained to date in the nitrous oxide (N_2O) programme. During 2013/14 the nitrification, manipulating nitrogen inputs and denitrification programmes started in 2010 were completed and new projects further investigating plant effects on N_2O emissions and wrapping up the denitrification work were established.

Optimisation and improved performance of nitrification inhibitors

This research has significantly improved our knowledge and understanding of soil moisture effects on N_2O emissions and ammonia oxidiser growth. The results showed the potential for the use of DCD to reduce N_2O emissions in wet soils such as those under winter forage grazing. The results have also identified ammonia oxidising bacteria as the prime target for inhibition in high-N loading urine patch soils; this is important in the development/testing of new nitrification inhibitors.

The effectiveness of an alternative nitrification inhibitor (DMPP) has been compared with DCD. The results showed that the two inhibitors were equally effective in reducing N_2O emissions in grazed pasture soils. Results showed no adverse effect on other microbial communities or enzyme activities after seven years of DCD use, thus demonstrating the longer-term viability of the inhibitor approach. Further work on inhibitors depends on decisions by the Government and industry about future options regarding the use of DCD.

Genes identified that play a critical role in regulating grass regrowth

One goal of our research is to reduce the amount of nitrogen that has to be applied to achieve high rates of pasture production. Work this year confirmed that the growth rate of forage plants is not at all times limited by the amount of nitrogen available, and revealed that this can be manipulated externally.

A set of genes related to gibberellic acid biosynthesis and degradation have been identified that play a critical role in regulating grass regrowth and carbohydrate metabolism. The molecular mechanisms limiting plant growth under nitrogen limitation have been unraveled. A candidate gene has been identified that could support the breeding of higher yielding ryegrass cultivars that require less nitrogen input.

Field experiment to test effect of plant cultivars on soil N_2O emissions.

Denitrification processes revealed

Certain soil microorganisms have the capacity to change nitrate into nitrous oxide and some change nitrate into environmentally inert nitrogen gas. The denitrification programme has demonstrated that both soil type and geographical location are powerful regulators of which gas is being emitted at a given time.

The results of experiments examining different levels of soil water content show that measuring certain genes present under saturated soil conditions is a better reflection of the ability of the soil to change N_2O to N_2 than using soil moisture values.

The overall goal of this work is to find strategies to accelerate the conversion of N_2O to N_2. By understanding how soil conditions affect the gas emitted, potential modifications can then be investigated.

The search for plant species to reduce nitrous oxide emissions

Could plants be used to reduce nitrification rates in soils and hence reduce nitrate leaching and emissions of nitrous oxide? Results from screening experiments suggest that they could. Plus, the variability of nitrification activity detected presents an opportunity to explore alternatives to synthetic inhibitors such as DCD.

A screening experiment measured the potential nitrification rate in soil associated with 126 cultivars of 26 species representing three functional groups used in temperate managed grassland. The team found large differences between individual cultivars. Fortuitously, several cases were found where a low nitrification rate was coupled with an above average biomass, suggesting that some currently available cultivars may influence soil processes and result in lower soil N_2O emissions.

A field experiment is now underway to test whether the screening experiment results are also true under more realistic pasture conditions.

INCREASING SOIL CARBON CONTENT

PRINCIPAL INVESTIGATORS:
PROFESSOR FRANK KELLIHER (AGRESEARCH) AND DR DAVID WHITEHEAD (LANDCARE RESEARCH)

Increasing the quantity of carbon stored in agricultural soils could offset emissions of greenhouse gases to the atmosphere. However, realising this potential is technically challenging when soil carbon stocks are already high, relative changes in soil carbon are small and spatial variability is high.

The initial NZAGRC programme (started in 2010) had three distinct components (1) assessing the potential to store carbon across the range of physical and climatic conditions found in New Zealand, (2) devising management practices that can increase the long term soil carbon store and (3) development of tools for verifying that soil carbon stocks have in fact been changed.

The initial goals of parts (2) and (3) were completed in 2013/14 and a significant amount of time has gone into using the results to plan the next stages out to 2017.

Field studies show potential of grassland soils to store carbon

Four years of monitoring carbon inputs and outputs on a Waikato dairy farm suggest a net carbon gain of 0.6 t/ha/yr over this period. A compilation of 54 site years of carbon balances made over grazed New Zealand pastures suggests that many of these sites were net carbon sinks when accounting for all imports and exports.

This is a positive message for New Zealand farmers demonstrating the potential of grassland soils to store carbon. However, we cannot generalise this result to all farms, as carbon changes in other places may differ due to different managements and environments. In soil carbon terms, four years is not a long term study (see also section on models).

Impact of earthworms and biochar appears minimal over short term

Experiments to determine the effects of earthworm introduction on long term carbon stocks in the field have shown inconsistent results. Biochar addition does not affect the stability of existing soil carbon under controlled conditions. The collective work on biochar to date suggests it has limited practical applicability as a method of increasing carbon stocks in New Zealand's pastoral soils.

Models give insights into long term effects of management practices

Modelling soil C and N pools and fluxes using the Hurley Pasture model has provided new insights into how they are influenced by management practices. Initial indications are that increased N fertilizer use accompanied by increased stocking rates lead to a sustained increase in N losses but only a transitory increase in soil carbon storage. Therefore indicators such as emission factors and C and N balances based on field measurements collected during the period of transition (some 2 to 10 years minimum) may be misleading about the drivers and the long-term scale of changes in soil carbon and nitrogen pools and fluxes. These findings are completely in line with recent international opinion that short term changes in C stocks are not a good indicator of the potential for grasslands to store C.

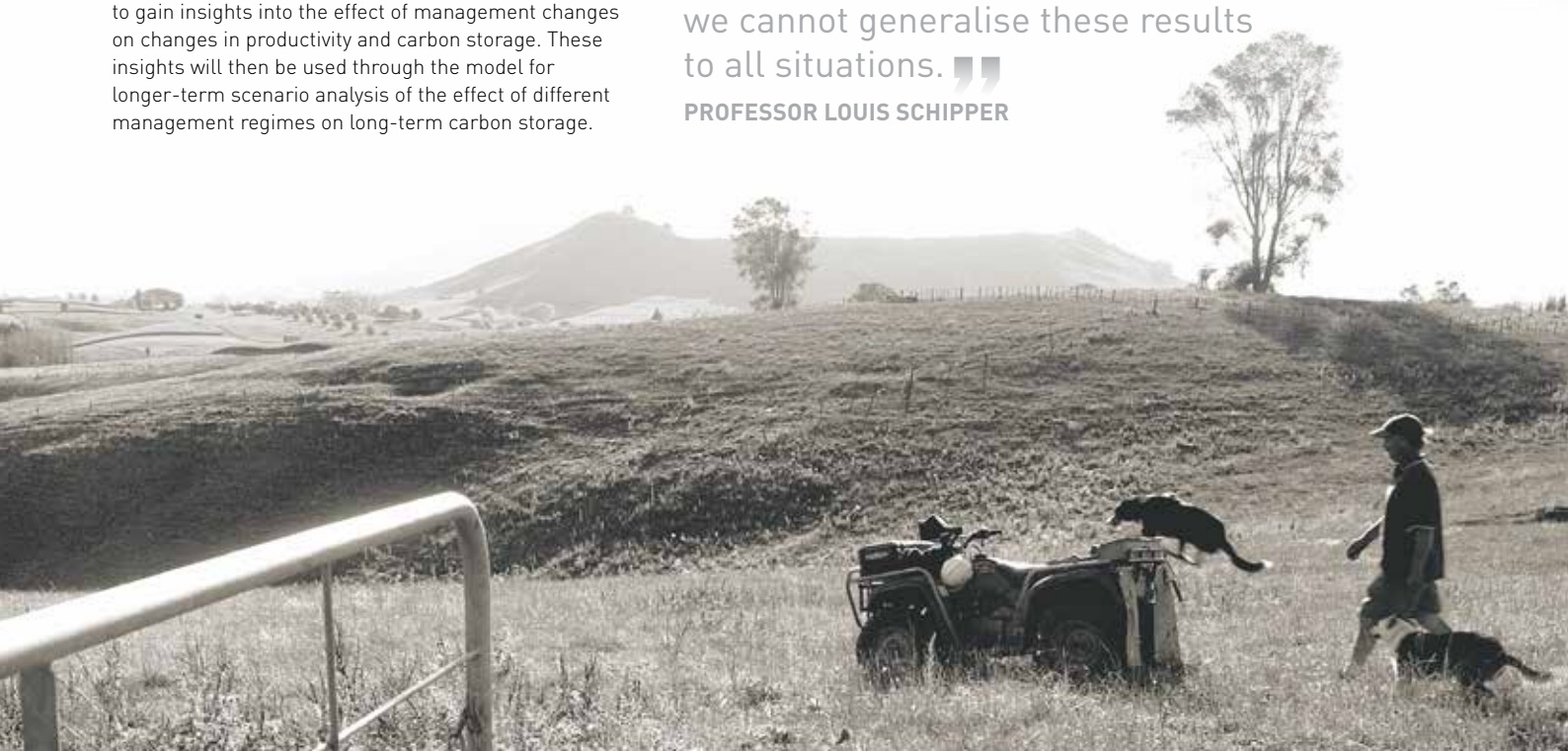
Work with the CenW model has focused on a detailed comparison between model runs and site observations with eddy covariance (EC) data at a Waikato experimental farm. Overall, good agreement was obtained between modelled fluxes and field measurements. This work has made it possible to use short-term EC measurements to gain insights into the effect of management changes on changes in productivity and carbon storage. These insights will then be used through the model for longer-term scenario analysis of the effect of different management regimes on long-term carbon storage.

Determining the best way to measure soil carbon stocks

Measuring soil carbon stocks is complex and difficult. We discovered that to estimate carbon stocks accurately, soils should be sampled deeply across depth intervals reflecting the vertical distributions of soil mass per unit area and carbon concentration. By measuring the carbon stock and establishing a robust baseline, change can be determined over time.

Although carbon stock change can be inferred by sampling soils on treated and control sites, the results of a dairy farm conversion study suggested soil carbon stock change can depend on the sampling depth, calculation basis, the period between sampling campaigns and suitable control sites.

> “Detailed monitoring of a Waikato dairy farm suggests a net carbon gain of 0.6 t/ha/yr. However we cannot generalise these results to all situations.”
>
> **PROFESSOR LOUIS SCHIPPER**



INTEGRATED FARM SYSTEMS

PRINCIPAL INVESTIGATOR:
DR ROBYN DYNES (AGRESEARCH)

The NZAGRC initially funded two Integrated Farm Systems projects from 2010 to 2013. No new projects were contracted during 2013/14. However, based on input from industry, NZAGRC advisory groups and external reviewers it was agreed that a new contract should begin in late 2014. During 2013/14 a number of workshops were held to plan the new programme and the areas of focus are outlined below.

Goal

The Integrated Farm Systems programme aims to estimate GHG emissions from practical farm systems that utilise existing and new near-market practices and technologies to reduce the intensity of greenhouse gas emissions, and if possible absolute emissions, from grazing animals within the context of increased product output.

Objectives:

- Test whether previously identified and previously modelled (direct and indirect) mitigations result in decreased GHG emissions intensity when integrated into functioning farm systems; and document impacts on both total GHG emissions and emissions intensity of systems investigated
- Evaluate whether the farm systems under consideration operate productively and profitably; and document impacts on farm profit and nitrogen, phosphate (and sediment where applicable) emissions to water of those systems
- Co-develop implementation pathways for extension of demonstrations and programme outputs working with industry and extension specialists

Alignment with existing industry initiatives:

- **Sheep and Beef Sector:**
  The programme proposes to align with a new environmental extension programme within B+LNZ. NZAGRC funding will assist with development of extension material/processes that enable S&B farmers to understand which mitigation approaches are most effective and their influence on overall farm system performance.
- **Dairy Sector:**
  The dairy sector programme will assess the GHG emissions from dairy systems, demonstrating a range of practical mitigation options for management of environmental impacts. NZAGRC work will integrate with two existing programmes; measurement and modelling will be based on the P21-II farmlet sites, while integration with the SLMACC Practical GHG Measurement will enable multi-year measurement of GHG emissions.

LOW EMISSION FARM SYSTEMS FOR THE MĀORI FARMING SECTOR

PROGRAMME LEADERS:
DR TANIRA KINGI (AGRESEARCH) AND PHIL JOURNEAUX (AGFIRST)

Since the NZAGRC's inception in 2010 ensuring that the outputs of the Centre are applicable to all sections of the NZ agricultural community has been a high priority. The Centre has a Māori strategy and a Māori advisory group (MAG) to guide its decision making and funding in this area.

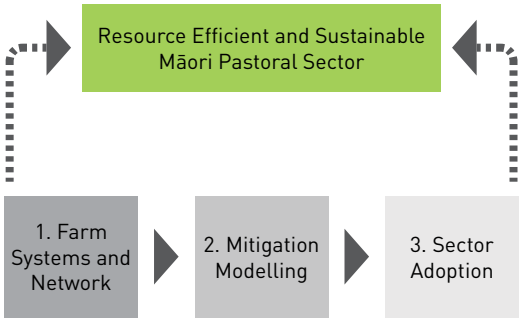
During 2013/14 the Centre issued a Request for Proposals for a comprehensive study on mitigation options on Māori farms. This was based on a scoping study carried out for the Centre in 2013 and incorporated feedback from the Steering Group and MAG. A proposal from a multi-organisation team (AgFirst, AgResearch and Scion) was contracted at the end of 2013/14 with work commencing 1 July 2014.

Aim of programme:

This programme aims to assist the Māori pastoral sector to improve its collective capacity to increase resource efficiency and farm productivity while lowering greenhouse gas emissions. The programme will achieve this by developing a set of Māori farm typologies, which represent the predominant pastoral farming systems, identify key factors that underpin farm productivity, resource and emission efficiency and sustainable profitability, and then identify and test a range of GHG mitigation strategies. Farm typologies are important to avoid the problems of homogenizing a heterogeneous group that range from very small farms to large multi-enterprise corporates. These typologies will be compared against existing databases and help in the selection of in-depth representative case study farms for scenarios of alternative farm system configurations that will evaluate mitigation options.

The programme will improve our understanding of the critical characteristics of GHG profiles (both in terms of absolute emissions and emissions intensity) of existing Māori pastoral farming systems and produce a range of mitigation options to modify farm systems to lower absolute emissions and/or emissions intensity. A key contribution will be an enhanced understanding of Māori farm typologies along with the economic, environmental, social and cultural implications of low emission farming systems within the Māori sector, and the wider implications across New Zealand.

Programme structure:



NZAGRC INTERNATIONAL DIMENSION

The Global Research Alliance on Agricultural Greenhouse Gases (GRA) is a voluntary initiative between governments to increase cooperation and investment in research activities to reduce the emissions intensity of agricultural production systems. It forms a key pillar in New Zealand's international science and policy engagement on climate change and agriculture.

New Zealand's participation in the GRA is led by MPI. The Centre supports MPI by leading science inputs, monitoring and administering research contracts on behalf of MPI, and providing strategic advice to MPI on collaborative funding opportunities, partnerships and capacity building initiatives. New Zealand's GRA investment extends the NZAGRC and PGgRc domestic research programme by focusing on outcomes that could not have been achieved by New Zealand working alone.

New Zealand's science engagement in the GRA focuses on the Livestock Research Group (LRG). The Centre Director co-chairs this Group together with a director from Wageningen UR (Netherlands). The Centre Deputy Director acts as New Zealand's representative on the LRG. The Deputy Director and the Centre Operations Manager (International) support the co-chairs and the LRG, and help manage and deliver on MPI's investment in support of the GRA.

The GRA expands its membership

The GRA expanded its membership in 2013/14 to 43 countries. It now covers most of the Americas and Western Europe, with a strong and growing membership in Asia and growing interest in Africa.

The GRA is currently chaired by the Netherlands. The coming year will see increased efforts to promote the GRA and its role in the context of other international initiatives, and link the GRA with international partners that can support the implementation of mitigation options.

Working with partners to implement solutions

The LRG started a major collaboration with the Food and Agriculture Organisation of the United Nations (FAO) in 2013/14 to design regionally appropriate packages of actions that could reduce the emissions intensity of food production. A related initiative driven by the United Nations Environment Programme, called the Climate and Clean Air Coalition (CCAC), will seek to implement such options through networks of regional partners. The CCAC already funds a project on improving manure management practices. The NZAGRC and FAO are also leading the development of a second project focusing on enteric fermentation.

The LRG also collaborated with the Sustainable Agriculture Initiative Platform (SAI), to publish a brochure summarising key on-farm options to reduce GHG emissions, highlighting the consistency of such options with other economic and sustainability goals.

LRG meeting in Dublin, 2013.

Building capacity around the world

A key goal of the GRA is to increase the capacity of countries and scientists around the world to measure and understand GHG emissions from their farm systems. It also seeks to help them identify the most relevant and promising mitigation options consistent with local farm practices.

In 2013/14, the NZAGRC led a pilot study in south-east Asia, organised a technical training course in Africa, and delivered presentations and engagement workshops around the globe. New Zealand continues to administer the LEARN award scheme for technicians, PhD students and postdoctoral researchers from developing countries, and GRASS awards for senior scientists from GRA member countries.

This work is supported by three technical manuals on measurement methodologies. This year, a manual on the SF_6 tracer technique for measuring methane from enteric fermentation was published.

> "Overcoming climate change is central to achieving a sustainable future for the planet's growing population, and food security must lie at the heart of that effort."
>
> **JOSÉ GRAZIANO DA SILVA, FAO DIRECTOR-GENERAL**

Research advancing the global search for solutions

New Zealand is supporting a variety of collaborative research projects to advance global knowledge. Several projects joining New Zealand scientists with their counterparts from Europe, the US and Canada were negotiated this year under the EU Joint Programming Initiative on Food Security, Agriculture and Climate Change. Later in 2014, decisions on projects funded under the third round of New Zealand's Global Partnerships Fund for Livestock Emissions Research will be made.

Outcomes from New Zealand-funded GRA projects to date include a better understanding of the diversity of microbial communities in the rumen in animals around the world, development of adjuvants for an anti-methanogen vaccine, international promotion of traits to identify naturally low-emitting animals, and improvements in testing methods for methane inhibitors.

The next big event on the GRA calendar for New Zealand is the annual meeting of the LRG, which will be held in November in Yogyakarta, Indonesia, alongside the 16th Asian-Australasian Association of Animal Production.

Further information can be found on the GRA's website (www.globalresearchalliance.org) and the regular newsletter of the LRG (contact: victoria.hatton@nzagrc.org.nz).

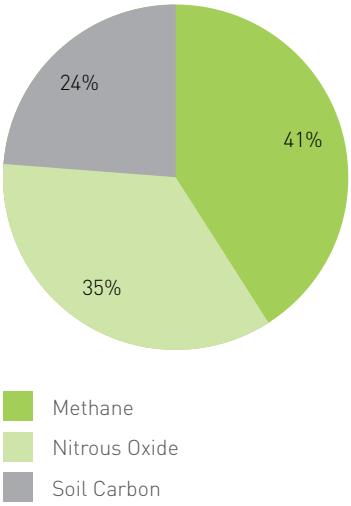
2013/14 IN NUMBERS

Finances

Total funding for the Centre in 2013/14 was $4.85m. This covers core research programmes, other research (including fellowships and short term projects) and administration.

In addition to the investment made in science, funding has also been used to provide workshop and conference support and to develop and implement a joint communication strategy with the PGgRc.

NZAGRC CORE RESEARCH FUNDING SPLIT 2013/14



Capability Development in 2013/14

3 POST-DOCTORAL FELLOWS FUNDED TO DATE* 0 NEW IN 2013/14

3 MASTERS PROJECTS FUNDED TO DATE* 1 NEW IN 2013/14

4 UNDERGRADUATE - HONOURS STUDENTS FUNDED TO DATE* 1 NEW IN 2013/14

11 PHDS FUNDED TO DATE* 1 NEW IN 2013/14

17 UNDERGRADUATE - SUMMER STUDENTS FUNDED TO DATE* 2 NEW IN 2013/14

**From March 2010, including new 2013/14 numbers*

Interactions and Outputs in 2013/14

5 INTERNATIONAL VISITORS AND GROUPS

11 JOURNAL ARTICLES PUBLISHED

18 JOURNAL ARTICLES IN PRESS

19 CONFERENCE PRESENTATIONS

20 MEDIA INTERACTIONS

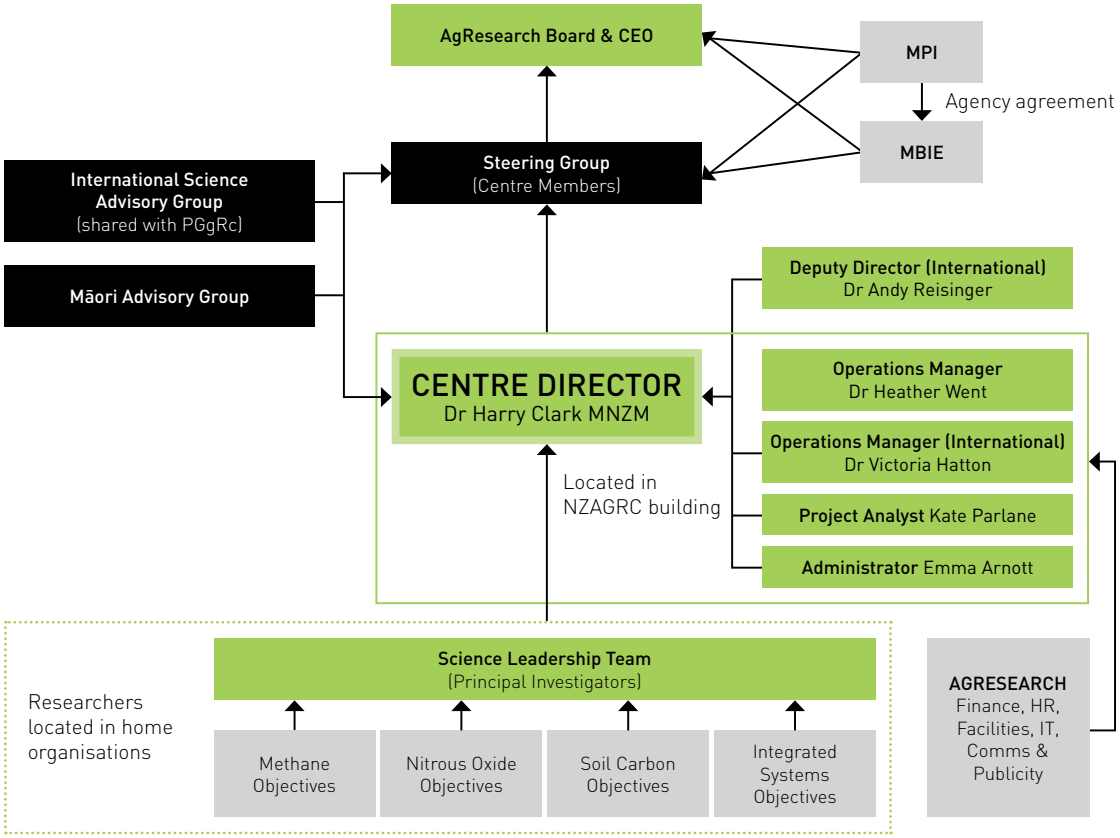
28 GLOBAL RESEARCH ALLIANCE RELATED INTERACTIONS

30 MEETINGS AND PRESENTATIONS (INTERNATIONAL)

63 MEETINGS AND PRESENTATIONS (NEW ZEALAND)

LEADING PARTNERS IN SCIENCE

The NZAGRC has nine members, who between them represent research, development, education and industry. Each member brings unique strengths to the NZAGRC through the specific capabilities and expertise of their science teams and research facilities, and provides one representative to the NZAGRC Steering Group (SG).



STEERING GROUP REPRESENTATIVES

Chair: Professor Warren McNabb

Dr Rick Pridmore

Dr Peter Millard

Dr Stefanie Rixecker

Professor Mike Hedley

Dr Murray Poulter

Mark Aspin

Warrick Nelson

Dr Brian Richardson

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