



**Developing solutions to reduce New Zealand agricultural emissions**  
Feb 2010

**Welcome to our first newsletter.**

We intend to send them out periodically, communicating to our stakeholders what our programme is about and what progress has been made. We hope you find this a quick read, informative and useful in identifying what New Zealand farmers are doing to make themselves more competitive in the emerging carbon conscious world. Feel free to follow up on any enquires by contacting us.

**Mark Aspin – Consortium Manager**

**The Pastoral Greenhouse Gas Research Consortium (PGgRc)** is a partnership between New Zealand pastoral industries and the Government. It was formed and set up by the Industry to achieve three goals:

- *To identify, establish and develop on-farm technologies to improve production efficiency for ruminants.*
- *To identify, establish and develop on-farm technologies for sheep, dairy, beef cattle, and deer, which lower methane emissions from New Zealand ruminants and nitrous oxide from grazing animal systems.*
- *To exploit commercial opportunities arising from the science and technologies in a global market.*

PGgRc has been a "centre of excellence" for pastoral-based agricultural greenhouse gas mitigation research both in New Zealand and

internationally since 2002, and expects to continue its high-quality science programme into the foreseeable future.

Over the past eight years the Consortium has invested over \$25 million in scientific programmes aimed at reducing agricultural greenhouse gases. It has produced internationally acknowledged research on the production of methane and nitrous oxide from grazing livestock as part of the most comprehensive programme of its type in the world.

**New Zealand GHG centre**

The launch of the New Zealand Agricultural Greenhouse Gas Research Centre by the Crown will broaden and add to the work developed to date. Through investment by farmers and government since 2002, New Zealand is uniquely placed to accelerate progress with the Centre's funding, along with the developing global research alliance. The Consortium looks forward to making the most of these opportunities for our pastoral farmers.

**How the investment works**

The PGgRc is a research consortium working within the funding mechanism developed by the Crown through the Foundation for Research, Science and Technology (FRST). This approach has seen farming organisations' (see bottom of the page) funds matched by the Crown then invested by the joint venture into the desired research. PGgRc is governed by those organisations focusing on the three goals. The knowledge and intellectual property generated is owned and managed by the Consortium to deliver on these goals to New Zealand farmers. By June 2012, when the contract ends, the





Consortium will have invested over \$45 million into this challenge.

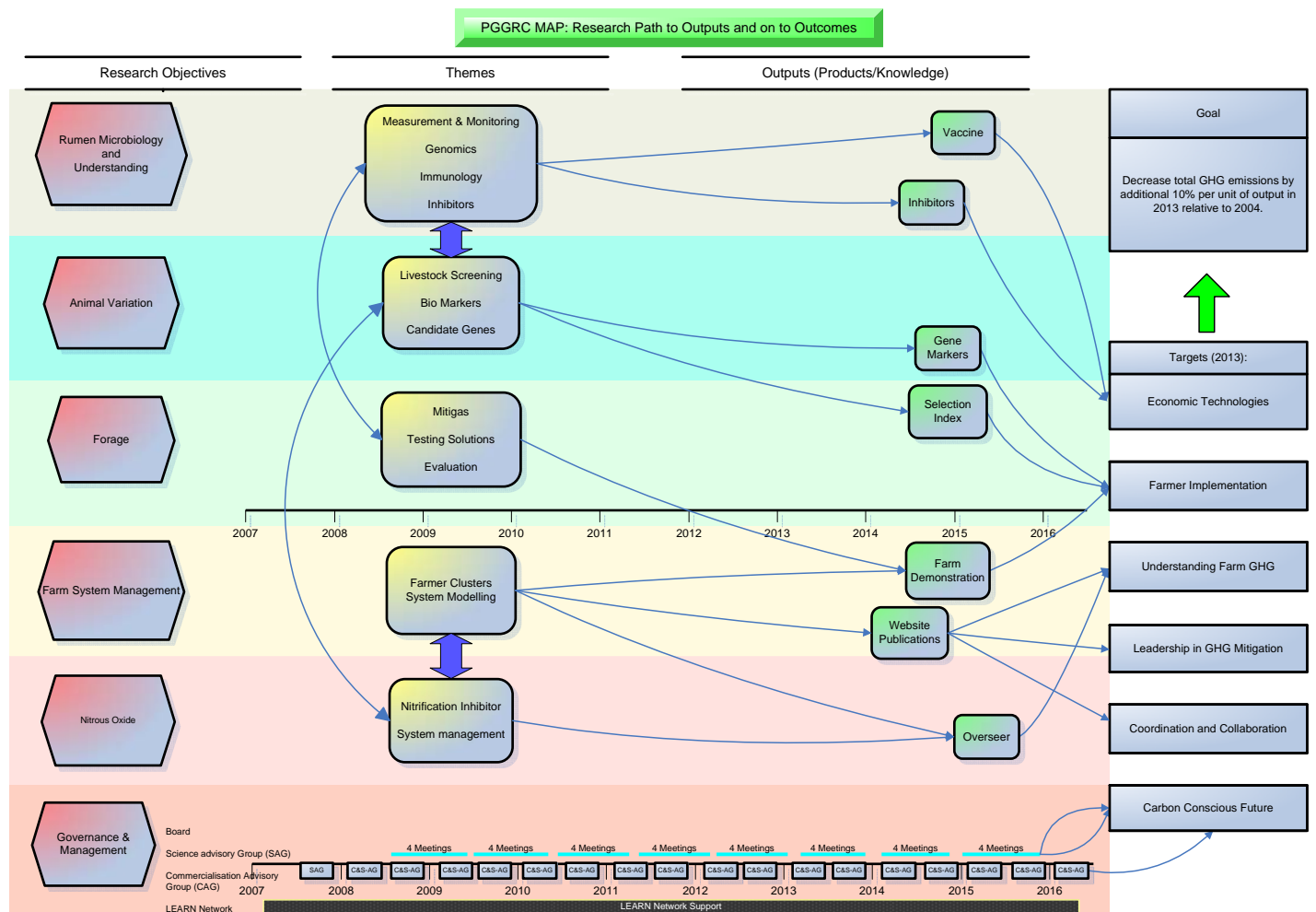
Industry benefits will come from solutions that are highly effective and widely used by farmers; on the back of this the sector may also derive some license return. Therefore there needs to be practical focus on ensuring any mitigation solutions can fit with farming activities as well as reduce emissions.

### Our programme

The PGgRc programme integrates a wide range of science approaches from the microbe to

the farm. It encompasses fundamental research to further understand the processes of methane and nitrous oxide formation through to the design of practical, relevant, on-farm greenhouse gas mitigation systems. Recognising that the goal is a mitigation that works in a farm system, there is emphasis on integration across these disciplines to deliver a robust solution.

The diagram below maps the Consortium's investment, through its programmes, to its goals and targets, showing the integration and connections over time required to achieve the reduction goal.





### Did you know?

There are 1.4 billion cattle and 1.1 billion sheep in the world. The lead country for cattle is Brazil with 199.7 million cattle, while China is king of sheep with 146 million in their national flock.

*FAO statistics 2007*

### What we have achieved

Our programme spans a wide field. Some of the more memorable achievements since inception are:

- Sequencing the first rumen methanogen and publishing it.
- Evaluating an early version methane vaccine.
- Developing better measuring and monitoring tools for reevaluating rumen function.
- Created a flock of consistent low methane sheep.
- Evaluating promising forages.
- Evaluating the early stage nitrification inhibitors.



Many of these and other achievements were profiled in our 2002-2007 review available on our website at

[www.pggrc.co.nz/Research/AnnualReports/tabid/69/Default.aspx](http://www.pggrc.co.nz/Research/AnnualReports/tabid/69/Default.aspx)

### Rumen methanogen genome published

We recently published the first rumen methanogen to be sequenced, enabling other groups working in this field to gain an understanding of how these microbes function.

A concerted effort over many years by PGgRc-funded AgResearch scientists has given

us leads on ways that could reduce ruminant methane emissions.

Cows, sheep and other ruminant animals produce their methane emissions because of microbes that live in their digestive systems, and the PGgRc team has successfully mapped the genetic information of one of the microbes responsible. This discovery will accelerate work altering the methane generation of the organism through vaccine and direct inhibitory interventions.

The Consortium will use the gene sequence information in our other research areas as it gives us the specific insights to target how these microbes operate.

### Methane: where does it come from?

Methane is a by-product of the digestion of forage, and also the breakdown of animal wastes. The rumen is the first stage of a ruminant's digestive tract. Forage is chewed up and swallowed with copious quantities of saliva. Once in the rumen the forage is subjected to the action of numerous species and types of micro-organisms, such as fungi, bacteria, protozoa and methanogens. This type of digestion produces hydrogen which is utilised by the methanogens to produce methane (hence the name). They play an important role maintaining optimum conditions in the rumen. Without methanogen or any other mechanism to absorb or remove the hydrogen gas, the hydrogen accumulation would be detrimental for the animal and farming productivity.

Our New Zealand systems are primarily focused on the reduction of this source of methane as it accounts for 95% of the farm related methane. The balance from waste is a greater issue in intensive farming systems where the livestock are housed and the dung and urine accumulate. This creates the opportunity for the resulting methane to be captured and flamed off or used for energy.





## Creating understanding: farmer clusters

The scientific challenge of reducing methane and nitrous oxide emissions from our grazing systems should not be underestimated. It will take considerable resources and time for us to understand and mitigate these gases. We have excellent researchers focused to that end but we also recognise that getting these solutions rapidly adopted and used should not be neglected either.

Farmers have said to us that there is not much point in talking “technology transfer” until we have a technology to transfer, but we do see the need to start this process sooner rather than later.

As part of our farm systems objective, since 2009 we have funded farmer cluster groups, alongside MAF and the Sustainable Farming Fund. To understand the needs of farmers better, we are working with 10 groups (four dairy, four sheep and beef, and two deer) to learn more about how GHGs affect their businesses and how they might do something about it.

From all accounts these groups have had some robust debate, spanning topics from rumen digestion through to the Emissions Trading Scheme (ETS) and carbon sequestration. This reflects the real life complexity of issues that farmers will have to consider as they assess what to do about this challenge.

The project is developing case studies of some of the approaches which will be available for the wider audience later this year. We will keep you posted as these come to hand.

## Making it count

The Consortium investment is jointly focused on reducing emissions while maintaining or improving livestock productivity. Productivity as a driver is well understood, as it enables our pastoral farming businesses to thrive.

Reducing emissions is a little more difficult to value as direct measurement is not practical and

there is no cost of carbon currently leveled against farm businesses, although the ETS being established will provide that.

For carbon to work as a driver it has to become measurable, be seen as objective, and count in any market to have a material effect on whether a mitigation solution is seen as an opportunity for farmers.

To this end we have made the data from our research available to the government for use in the national inventory, which has resulted in greater accuracy and in some cases a reduction in the emissions attributed to livestock. We will continue to assess our research outputs as they develop to ensure that they can provide benefit either through productivity or in carbon cost reduction.

## Leading approaches

It's going to take time to deliver mitigation solutions into farmers' hands but some of the leading approaches we are currently focused on are:

- Animal selection for low methane.
- Methane vaccine.
- Methanogen inhibitors.
- Nitrification inhibitors.

We look forward to giving you an insight into progress with these projects and others as they develop further.

If you would like more information on any of the subjects raised in this newsletter, or the PGgRc, please visit our website or contact us directly through [www.pggrc.co.nz](http://www.pggrc.co.nz).

