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# RELEASE



**NEW ZEALAND**  
AGRICULTURAL GREENHOUSE GAS  
Research Centre

The newsletter of the New Zealand Agricultural Greenhouse Gas Research Centre

# Director's Update

Welcome to the ninth issue of the NZAGRC newsletter. It's been a busy start to 2013 with everyone preparing for the first formal review of NZAGRC science programme.

The review was held in Palmerston North from 18 to 22 February and undertaken by our current International Science Advisory Group (ISAG). Dr Ian Ferguson, the recently appointed Ministry for Primary Industries Chief Science Adviser, acted as chair. The ISAG produced a report with a set of constructive recommendations that will be addressed over the coming months and used to inform a revised science programme for 2013/14 and beyond. I would like to thank the NZAGRC Science Leadership Team for coordinating the production of the comprehensive review documentation provided to the ISAG. Also, thanks to all those involved in preparing and critiquing the presentations made to the ISAG.

To coincide with the formal science review, the individual science programme teams came together for their annual workshops. These workshops provide a great opportunity for the whole science team to

meet and discuss particular aspects of their research programmes. Again many thanks to all those involved for the work they put into organising these workshops.

Just to add to the fun, the NZAGRC hosted a visiting science delegation from the United Kingdom during the week of the science review. Kate worked with each member of the delegation to provide an individual schedule of meetings tailored to their interests and expertise. This UK-to-NZ Agricultural Greenhouse Gases Mission was organised by the British High Commission in Wellington. For more information about the visitors, see page six of this newsletter.

We are delighted with Minister Joyce's recent announcement that the Ministry of Business, Innovation and Employment will commit \$2.3 million per annum to the Pastoral Greenhouse Gas Research Consortium (PGgRc) for the next seven years. The



PGgRc and NZAGRC have essentially co-funded a single programme of work within the methane space since the inception of the NZAGRC. Closer alignment between the two organisations was signalled in the PGgRc funding application. You will hear more from us about our progress towards implementing closer operational links with the PGgRc in our next newsletter.

Another positive announcement: congratulations to Heather who welcomed her second son in early February. The family are all doing well.

Best wishes,

Dr Harry Clark

## News

### Welcome to Ayesha Hehir!

The NZAGRC is delighted to welcome Ayesha Hehir in an administration support role working closely with Kate Parlane, Centre Administrator. Ayesha took up her position in mid-January while the Centre was preparing for the NZAGRC science programme review. Ayesha has a Graduate Diploma in Teaching and an undergraduate major in English Literature. Ayesha is at the NZAGRC from Tuesday to Friday on a part time basis until the end of May.

### Heather's growing family

Heather Went, Centre Operations Manager, is on maternity leave. Eden Aubrey was born on the 4th of February and weighed in at a nice healthy 6lb 8oz. Joshua is adjusting to his new role as big brother, and Heather and Richard to managing their growing brood.



### Victoria Hatton: Wellington commuter

Victoria Hatton, Operations Manager (International) has been seconded to the Ministry of Primary Industries until the end of May 2013 to work on Global Research Alliance issues. Victoria is splitting her time between Wellington and Palmerston North and spends three days a week working for MPI. Victoria is enjoying the challenge of commuting to Wellington and finding out how all the pieces of the Global Research Alliance puzzle fit together.

For any enquiries, please contact Kate Parlane, NZAGRC Administrator: [kate.parlane@nzagrc.org.nz](mailto:kate.parlane@nzagrc.org.nz)

# Update from the Global Research Alliance

The year has started at a quick-fire pace for the Livestock Research Group (LRG) of the Global Research Alliance, with several significant new research funding initiatives that seek to accelerate the discovery and development of mitigation solutions through collaborative approaches. June will cap off this busy start with several key meetings planned for the group.

A call for collaborative research proposals under the Joint Programming Initiative on Food Security, Agriculture and Climate Change of the European Commission marks a significant milestone in international research collaboration. It is the first time that a large set of countries around the world are seeking to align their funding towards collaborative joint projects.

Earlier in the year, New Zealand scientists also had the opportunity to bid for research funding jointly with Australian colleagues, under the Australian "Filling the Research Gap" initiative. The New Zealand government allocated \$2 million for New Zealand scientists, for proposals to develop new mitigation options and enhance soil carbon storage in agriculture, consistent with the goals and New Zealand's priorities under the Global Research Alliance. Final funding decisions are dependent on the fit of proposals with these New Zealand priorities and evaluation of the full set of proposals for research quality by an Australian assessment panel.

February also marked the receipt of full proposals under the second round of New Zealand's Fund for Global Partnerships in Livestock Emissions Research. This fund seeks to accelerate investment in four core challenge areas that are relevant to New Zealand's pastoral livestock system, via increased collaboration and co-funding from international partners. The first round fund received New Zealand funding of \$6.7 million; for the second round, initial expressions of interest valued at \$12 million were shortlisted, and full proposals have been evaluated by a Technical Advisory Panel, chaired by New



Zealand Chief Scientist Sir Peter Gluckman. Announcements of successful proposals are due in May.

This flurry of research initiatives will be capped off by a series of meetings clustering around the Greenhouse Gases and Animal Agriculture (GGAA) conference (June 22-26) in Dublin, Ireland. The GGAA is the largest gathering of scientists in the field and up to 400 scientists are expected to attend. Much of the science funded through the New Zealand Government in support of the objectives of the Alliance will be on show at the conference. The Co-Chairs of

the LRG have been invited to deliver a key note address, and the LRG itself will meet immediately after this conference, on 28/29 June, preceded by a series of meetings of the LRG's dedicated research networks. A first joint workshop between a selection of LRG scientists and the Sustainable Agriculture Initiative Platform, which comprises some of the world's largest food producing companies, will round off this exciting gathering.

To register for the GGAA and find out more detail about the research network meetings go to [www.ggaa2013.ie](http://www.ggaa2013.ie).

# Receiving the Science Quality Tick

The Centre completed its first formal science review of its research programmes during the week of 18 to 22 February. The review was conducted by an international panel of science experts, our International Science Advisory Group (ISAG).

The confidential review has been received from the ISAG and is in the initial stages of dissemination and discussion. A response and action plan will be formulated with advice from the NZAGRC Steering Group and Science Leadership Team. We are pleased with the report and it contains some positive messages and some useful recommendations. Overall, the report notes that 4 of the 12 areas presented received a "strong" or "benchmark" rating for Science Quality and 5 of the 12 areas presented received a "strong" or "benchmark" rating for Research Impact. Some excerpts and general commentary from the report follow:

*"Within New Zealand, the Centre is recognised as a leader in funding/commissioning high quality and relevant GHG research for the benefit of New Zealand and New Zealand's international recognition and standing. The Centre has established a well-balanced portfolio of fundamental and applied research, and the ISAG encourage the Centre to maintain this. The Centre should also be commended for continuing to develop a "NZ Inc" approach by encouraging strong collaborations among the New Zealand research community."*

In a few areas of the Centre the ISAG considered the work being undertaken as truly world-leading. In a number of other areas, the work is of sound international standard, or close to that.

In summary, the ISAG compliments the Centre on its progress – it is becoming successful and is striving to achieve high quality and relevant research that fits its aims and vision. The ISAG strongly recommend that the Centre continues to be supported and, indeed, that it grows.



NZAGRC ISAG spent 18 to 22 February in Palmerston North

It is a vital part of NZ's world leading research efforts in sustainable primary food production.

## **Methane:**

*"...New Zealand is in a unique position in this space and currently leads the world. This is due to the programme's clear aims, dual focus on leading research for applicable on-farm solutions and integrated approach across multiple research disciplines."*

## **Nitrous Oxide:**

*"It is good to see that this multi-organisation programme is functioning successfully with continued good cooperation among the lead researchers. It is also good to see that there are growing links with other Centre programmes which could be strengthened further through additional cross-cutting collaborations."*

The ISAG considered this area of work to be strong and internationally leading.

## **Soil Carbon:**

*"...[the team] have built cohesion and improved coherency of direction in portions*

*of the programme. This is especially true with the good connectivity between the modelling work and field trials."*

The ISAG also commend the team for their enthusiastic and effective incorporation of students and post docs in the programme.

## **ISAG membership rotation**

The review concludes the ISAG's first three year tenure and, in line with the terms of reference, four group members have completed their rotation. The outgoing members are:

Dr Peter Kuikman  
Professor Mark Morrison  
Professor Johan Six  
Professor Keith Smith

The NZAGRC would like to acknowledge the contribution of Peter, Mark, Johan and Keith to the group, particularly in advising on the set up of the NZAGRC science programme, the informal progress review in 2012 and this year's formal review.





From 1 March, the ISAG membership is as follows:

**Dr Richard Eckard**  
(The University of Melbourne, Australia)

Richard leads a number of research programs investigating cost-effective mitigation and adaptation strategies for Australian agriculture, including dietary supplements for reducing enteric methane, reducing nitrous oxide from intensive grazing systems and whole farm systems modelling of mitigation strategies from grazing systems.

**Professor Keith Goulding**  
(Rothamsted Research, UK)

Keith's research focuses on biogeochemical cycling, particularly the optimisation of crop nutrient supply and minimisation of environmental pollution.

**Dr Tim McAllister**  
(Agriculture and Agri-Food, Canada)

Tim is Principal Research Scientist in charge of a research team studying areas of grain processing and quality, silage production, bulk management in feedlot cattle, pasture and feedlot bloat, antibiotic resistance, rumen ecology, GMO feed and strategies to reduce antibiotic resistant bacteria, E. coli O157:H7 in beef cattle as well as characterization and the development of strategies to mitigate greenhouse gas emissions from ruminants.

**Dr Dorian Garrick**  
(Iowa State University, USA)

**Professor Jamie Newbold**  
(Aberystwyth University, UK)

Jamie's research interests focus on the understanding and manipulation of gut ecosystems to improve animal productivity while reducing the environmental impact of animal husbandry.

**Dr Frank O'Mara**  
(Teagasc, Ireland)

Frank's research interests include the greenhouse gas emissions of ruminants, feed evaluation, feeding systems, and digestion.

**Professor Pete Smith**  
(University of Aberdeen, UK)

Pete's main areas of expertise are in modelling greenhouse gas / carbon mitigation, bio-energy for fossil fuel offsets, and biological carbon sequestration.

**Dr Jean-Francois Soussana**  
(French National Institute for Agricultural Research [INRA], France)

Jean-Francois' area of expertise is in grasslands and in particular their role in the greenhouse effect and climate change impacts. Jean-Francois has also been involved in modelling the role of biodiversity in the functioning of ecosystems. He studied plant diversity and the interactions between plants and soil organisms to consider the impact of climate change and the contribution of grasslands to the greenhouse effect.

An additional three international experts to advise on the NZAGRC and PGgRc science programme are currently being sought. Please email [Harry.Clark@nzagrc.org.nz](mailto:Harry.Clark@nzagrc.org.nz) to discuss nominating someone for the role.



## Developing rapid, low cost methods for identifying low emitting dairy cattle phenotypes

A joint PGgRc/NZAGRC workshop was held on 19th February involving 14 leading measurement technique scientists from New Zealand, Australia and the United Kingdom.

The aim of the workshop, facilitated by Mark Aspin, PGgRc Manager, was to prioritise future research to develop rapid, low cost methods for identifying low emitting dairy cattle phenotypes.

Nine possible research methods were discussed and three considered as lead techniques for development. All experts involved in the workshop have been asked to rank the respective systems cost, current stage of development, measurement precision, practicality, adaptability (to work with other systems), throughput and evidence of utility to give a view of the viability of moving forward with development.

The workshop was extremely useful as it allowed for scientists currently using the various measurement methods to share their thoughts on the advantages and shortcomings of each system at a roundtable. Development priorities identified are those with value, evidence of utility and best measurement precision based on scientists real experiences.

For more information on this work, please contact [mark.aspin@pggrc.co.nz](mailto:mark.aspin@pggrc.co.nz)

# UK-to-NZ Agricultural Greenhouse Gases Mission



The NZAGRC was pleased to host four UK-based scientists, each with a strong interest in mitigation of agricultural greenhouse gases, during the week of the NZAGRC science review and workshops. The UK delegation had unique research interests so, in addition to meetings with NZAGRC science programme leaders, each set out on a tailored itinerary (some organised by NZAGRC, other parts self initiated), which included visits to AgResearch, DairyNZ, University of Waikato, Massey University, Victoria University of Wellington and New Zealand's Ministry for Primary Industries.

The mission was facilitated by Dr Steve Thompson, Science and Innovation Promoter for the British High Commission in New Zealand (Steve.Thompson@fco.gov.uk) and funded by the British High Commission.

## The UK mission delegation included:

**Dr Jamie Bennison** is the Technical Director of Agrimin Ltd whose Head Office is located in Way, Humberside, England. As a privately owned R&D company, Agrimin Ltd has gained a reputation for technically advanced products to improve the health & welfare and productivity of farm animals. Agrimin's key expertise is sustained release intra-ruminal devices (or boluses) for ruminants which the company considers the best delivery option for mitigating methane technologies for ruminants in a pastoral system. Agrimin collaborates with a number of other commercially-orientated R&D companies, including some New Zealand-based companies.  
**Contact** [jbennison@agrimin.co.uk](mailto:jbennison@agrimin.co.uk)

**Dr Phil Garnsworthy** is a Professor of Dairy Science at the University of Nottingham. Dr Gansworthy's current research involves understanding the methane emissions of dairy cows, particularly the variation of output among individual cows, and developing techniques for rapid low-cost measurement of per cow emissions. The effective use and user-friendliness of these techniques are currently being field-tested by trailing them on 40 commercial farms in UK as part of

Defra-funded GHG Platform methane and EU Ruminomics projects ([www.ghgplatform.org.uk](http://www.ghgplatform.org.uk) and [www.ruminomics.eu](http://www.ruminomics.eu), respectively).  
**Contact** [Phil.Garnsworthy@nottingham.ac.uk](mailto:Phil.Garnsworthy@nottingham.ac.uk)

**Dr Bob Rees** is the Head of the SRUC Carbon Management Centre at SRUC in Edinburgh, Scotland. The SRUC is formally known as the Scottish Agricultural College and is one of Europe's leading specialist institutions in science and technology because it brings together a unique combination of research, consultancy and education in all areas of agricultural science. The SRUC Carbon Management Centre has been formed to provide research and advice on low carbon agriculture for policy makers, retailers and farmers. SRUC is a lead partner in the Scottish Government's Centre of Expertise for Climate Change, and is active within the Global Research Alliance with many international collaborations within Europe and elsewhere. SRUC is hosting a major conference in September 2013 on Sustainable Intensification and its role in delivering Low Carbon Farming Systems. The research community in New Zealand is encouraged to attend.  
**Contact** [Bob.Rees@sruc.ac.uk](mailto:Bob.Rees@sruc.ac.uk)

**Dr Kirsty Hammond** is a Research Fellow at the University of Reading in Reading, England. Her research is focused on GreenFeed (C-Lock Inc., USA) system, which is a relatively new technique to estimate methane emissions from livestock. The potential value of this technique over that of the current SF<sub>6</sub> and respiration chamber techniques for measuring methane production in ruminants is that it is automated. Dr Hammond's visit enabled collaborations between the University of Reading and DairyNZ and AgResearch to be developed in order to compare results from the current and new measuring systems in order to evaluate the accuracy of the GreenFeed system. This exchange of information will benefit both countries in the measurement of methane emissions for inventory and mitigation from ruminant agriculture.  
**Contact** [K.J.Hammond@reading.ac.uk](mailto:K.J.Hammond@reading.ac.uk)

# Earthworm Diversity Positively Affects Soil Carbon Storage

Certain earthworms can help us increase soil carbon stability and improve pasture production and resilience.

We know that earthworms are the great architects of soil, playing a critical role in biological decomposition and engineering soil pore size, distribution and connectivity through their dynamic burrowing activities. But as NZAGRC post doctoral researcher, Dr Nicole Schon (AgResearch), has found, this same burrowing behaviour means that earthworms can also contribute to long-term carbon storage in the soil by incorporating plant litter and dung into the soils and influencing the depths to which stored carbon can be found.

The indigenous earthworm fauna of New Zealand did not adapt well as European colonisation meant land was converted from forest to pasture. Consequently, earthworm species under farmed pasture soils are all exotic, with their introduction accidental. Exotic earthworms arrived here from the Northern Hemisphere as stowaways in potted plant containers or in soil used as ships' ballast. Earthworms introduced through plant containers tended to be limited to the surface active (or epigeic and endogeic species) rather than the deep burrowing anecic types, and were introduced throughout both Islands as settlers transplanted the live plant material into their farm house gardens.

Because there has been no systematic release of exotic earthworms, the number of species introduced is limited compared to the species diversity found in European farmland soils. Nicole and her team have estimated that anecic earthworms are currently present in only 4 million hectares (or less than 40%) of pasture land. Because earthworms migrate laterally slowly, farmers would need to actively introduce anecic earthworms to individual paddocks

on their property in order to spread this functional group.

Anecic earthworms are twice as large, can digest proportionally more plant litter and dung and burrow to great depths – as much as 1 metre below the soil surface – compared to their surface active cousins. Anecic earthworms are Nicole's special interest because she wants to know if these types of earthworms can improve the carbon cycling of New Zealand pasture soils. Nicole finds that, in soils where there is a mixed population of all three functional earthworm groups, significantly more carbon is stored at deeper levels to 150 millimetre – compared to soils without anecic earthworms. It is the anecic earthworms that seem to be doing the work of taking this carbon down further into the soil as they line their deeper burrows with vermicast. This suggests that anecic earthworms may assist with long-term carbon storage, because the deeper carbon is less likely to be mineralised and lost to the atmosphere as surface carbon tends to do. This availability of deeper stored carbon is also likely to encourage plant rooting depth and the resilience of plants to extreme growing conditions because of the greater soil volume available for buffering.

Nicole and her team have found in some separate study that because anecic earthworms occupy different soil strata, the presence of these deeper burrowing earthworms add greater resilience to the surface active earthworm community in intensive livestock systems.

**For more information on this work, go to [www.agresearch.co.nz](http://www.agresearch.co.nz) and search 'earthworms'.**

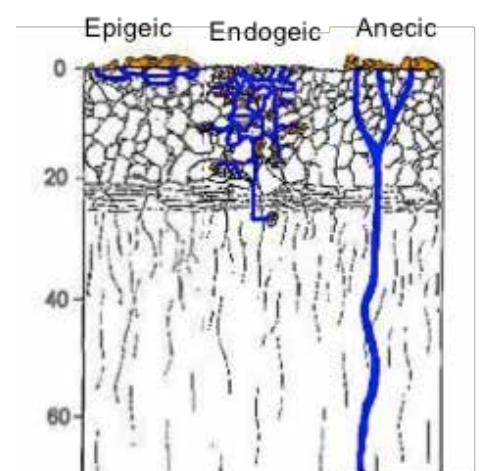


Nicole Schon working in the lab



Nicole Schon out in the field

## Types of earthworms



Adapted from Fraser & Boag 1998

# Capability Fund Update: Debbie Ryder

The NZAGRC congratulates Debbie Ryder who successfully completed her summer studentship with AgResearch.

Funded by the NZAGRC, Debbie has been working with Dr Jiafa Luo assisting him to prepare a critical review of International Nitrogen Inhibitors Research. Summer is the busiest time for the AgResearch soils research team so Debbie also helped out in the lab and with field work, this gave her opportunities to learn new techniques for pasture harvesting, soil coring and soil

analyses. Debbie will now move into her fourth year as an Earth Sciences student at the University of Waikato. Originally from Tauranga, her interests in researching soils in productive landscapes have been sparked by this summer experience. "It has been a really awesome experience," says Debbie. "I know now that I want to do my Masters."



Debbie Ryder



**GREENHOUSE GASES &  
ANIMAL AGRICULTURE**  
CONFERENCE · 23-26 JUNE 2013 · DUBLIN · IRELAND

The NZAGRC is a proud sponsor of GGAA 2013, which will be held in Dublin, Ireland from Sunday 23rd to Wednesday 26th June 2013. GGAA 2013 will attract speakers and delegates from throughout the globe and will build on previous successful meetings in the series. The meeting will focus on advancements in the areas of animal derived GHG mitigation since the last meeting in Banff, 2010.

For more information and registration, please visit [www.ggaa2013.ie](http://www.ggaa2013.ie)



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