LIVESTOCK RESEARCH GROUP
newsletter
GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

Update from the Co-Chairs

It's been a busy year. One of the goals we have set ourselves is to work with international partners to help us move from research to action and deliver benefits to farmers.

We are therefore pleased to announce the release of a new global collaboration: *"Reducing greenhouse gas emissions from livestock: Best practice and emerging options"*.

This document has harnessed the power of global collaboration. This joint effort between science and industry includes knowledge and inputs from the Beef and Dairy Working Groups of the Sustainable Agriculture Initiative (SAI) Platform and experts from the six global research networks of the LRG to demonstrate GHG reduction actions that we can take now, and areas where industry and researchers can work together to expand future options for reducing the GHG emissions intensity of livestock food production.

The document covers intervention options for animal feed and nutrition, genetics and breeding, rumen modification, animal health, manure, and grassland management. It provides a readily accessible guide to current best practices that can help reduce emissions intensity of livestock production, but also outlines current areas of active research that offer opportunities for industry to engage with the science sector to help expand the range of options and their effectiveness in different farm systems.

We sincerely hope that the information we have been able to compile will be useful for industry partners and policy agencies, to provide information about existing opportunities to reduce emissions, and to collaborate in the development and dissemination of additional options.

The document was commissioned by the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) on behalf of the LRG co-chairs and the SAI Platform.

The input from industry experts and the global science community is gratefully acknowledged, and warm thanks are extended for their contribution to this document.

You can download the document at globalresearchalliance.org

All the best for the Holiday season and we will see you in Lodi next June.

Harry and Martin

Update from the **Livestock Research Group meeting**

The sixth meeting of the LRG was attended by representatives from 21 member countries, Argentina, Chile, Colombia, France, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, The Netherlands, New Zealand, the Philippines, Spain, Sri Lanka, Switzerland, Thailand, United Kingdom, United States of America, Uruguay, Vietnam, two observer countries India and Bangladesh, and invited guests from the Global Agenda for Action on Sustainable Livestock Development.

The meeting took stock of activities within countries, reviewed the group's work plan and agreed on a range of new work items, in many cases building on ideas and proposals developed during workshops and network meetings held in the last twelve months.

Key points from the review of current activities:

The country round table provided a chance to share the many different projects on-going in LRG member countries and explore the opportunities for further research, collaboration, networking, and solution sharing. The discussion focused on the issue of resource mobilisation, and the importance of linking the work of the LRG with broader policy objectives at national levels, both in the GRA Council and also in individual countries. It was agreed by the LRG members that a high level review of countries activities to date, including successes and barriers to enhanced action, would demonstrate the benefit of collaborative research and implementation through the GRA to help countries achieve their broader policy goals. The review would seek to facilitate a dialogue between scientists and policy on issues of resourcing and translating research into action.

Dr Bess Tiessnamurti (Director of ICARD, Indonesia) opened the sixth meeting of the LRG. (*Pictured here with Martin Scholten,Co-chair of the LRG*)

The coordinators of the research networks met for dinner prior to the start of the LRG meeting. They report that this was a very constructive exchange of ideas and lessons learnt, and they would seek to further support interactions between the networks, given their overlapping and synergistic roles in reducing emissions intensity of livestock systems.

Since the fifth LRG meeting, the proposal for the Manure Management Kiosk (MMK) has been funded by the UNEP Climate and Clean Air Coalition (CCAC), and an update of this work was presented. The MMK addresses three major issues: food security and global health, equity and poverty reduction and resources and climate. The MMK aims to integrate manure management practices into livestock systems by managing and removing barriers to action with a view toward enhancing food security and sustainable development. The project's objectives are to:

- Facilitate multi-stakeholder dialogue at international and local level
- Implement and support joint analyses and assessments
- Identify and provide tools and guidance
- Promote and support innovation and local practice change

The LRG meeting 2014 at Jogyakarta Plaza Hotel, Jogyakarta, Indonesia, 14-15 November 2014.

Key areas for future action:
The Co-chairs will seek to develop a Roadmap for cooperation with SAI, building on the completion of the joint LRG/SAI publication on mitigation options, which is available at globalresearchalliance.org.

The Co-chairs and their support team will develop a document that demonstrates the benefits of improved understanding and management of greenhouse gas emissions intensity for achieving national development goals. This will complement work with the FAO to identify regionally appropriate packages of mitigation options (see following pages), and seek support for their implementation via a project proposal to CCAC on enteric methane mitigation.

The LRG will seek to intensify its interaction with the FAO Global Agenda for Sustainable Livestock (GASL), via the 'restoring value to grasslands' and the 'Waste-to-Worth' thematic work streams and the MMN and GRN of the LRG.

A brochure will be developed to communicate and highlight the achievements of the LRG over its past 4 years of existence, as part of an Alliance-wide effort to improve and increase communication about the Alliance. This brochure will draw strongly on material and inputs to be provided by LRG member countries.

A full updated work plan of the LRG will shortly be circulated to LRG members and then made available on the LRG website at globalresearchalliance.org/research/livestock

The next meeting of the LRG will be held in Lodi, Italy 23–24 June 2015.

Please book this in your diary now.

Details about the meeting will be circulated early in the New Year.

Italy is the host to the world Expo 2015 which is held in Milan, Italy from May – October 2015.

EXPO MILANO 2015

FAO/LRG Collaboration

to better quantify global agricultural mitigation potential

Considerable effort by a number of organisations has gone into obtaining more accurate predictions of agricultural greenhouse gas emissions (GHG) at the global and regional scale. These efforts have resulted in a number of databases and models now being available that can be used to calculate emissions for specific agricultural systems using standard methodologies and standard publicly available data sources (e.g. FAO, EDGAR).

In contrast, when it comes to the better quantification of the potential of agriculture to contribute to the GHG mitigation (both technical and economic potential), the same progress has not been made. The IPCC Fifth Assessment Report found that the most cost-effective mitigation options in agriculture were in cropland and grazing land management and restoration of organic soils. Based on a range of studies, the IPCC estimated a global mitigation potential of up to 1.6 Gt CO_2e in 2030 at a cost up to US$20/$tCO_2$e, and up to 4.6 Gt CO_2e at a cost up to US$100/$tCO_2$e.

However, these estimates rely in many cases on studies that considered mitigation options in isolation; the report also noted the difficulty of estimating accurately the regional distribution of future mitigation potential. It is therefore critical to improve our knowledge of the technical mitigation potential of individual mitigation actions, and their relevance to specific agricultural systems; and there is a growing realisation that mitigation actions cannot be considered in isolation; true mitigation potential needs to consider 'baskets' of actions assessed in terms of impacts on multiple gases and synergies or trade-offs between individual actions.

Over the past 3 years, the Animal Production and Health Division of FAO developed the Global Livestock Environmental Accounting Model (GLEAM). GLEAM pulls together the existing knowledge on production practices and emissions pathways to create a framework for disaggregation and comparisons of emissions on a global scale. The model is developed for six animal species (cattle, buffalo, sheep, goats, pigs, chickens) and related edible products. It recognizes two farming systems for ruminant species (mixed and grazing), three for pigs (backyard, intermediate and industrial) and three for chicken (backyard, industrial egg and industrial meat). Altogether, this amounts to over 14,000 supply chains, defined here as unique sets of commodity, farming system, country and climatic zone. The physical area corresponding to each of these sets is further decomposed in cells in a Geographical Information System.

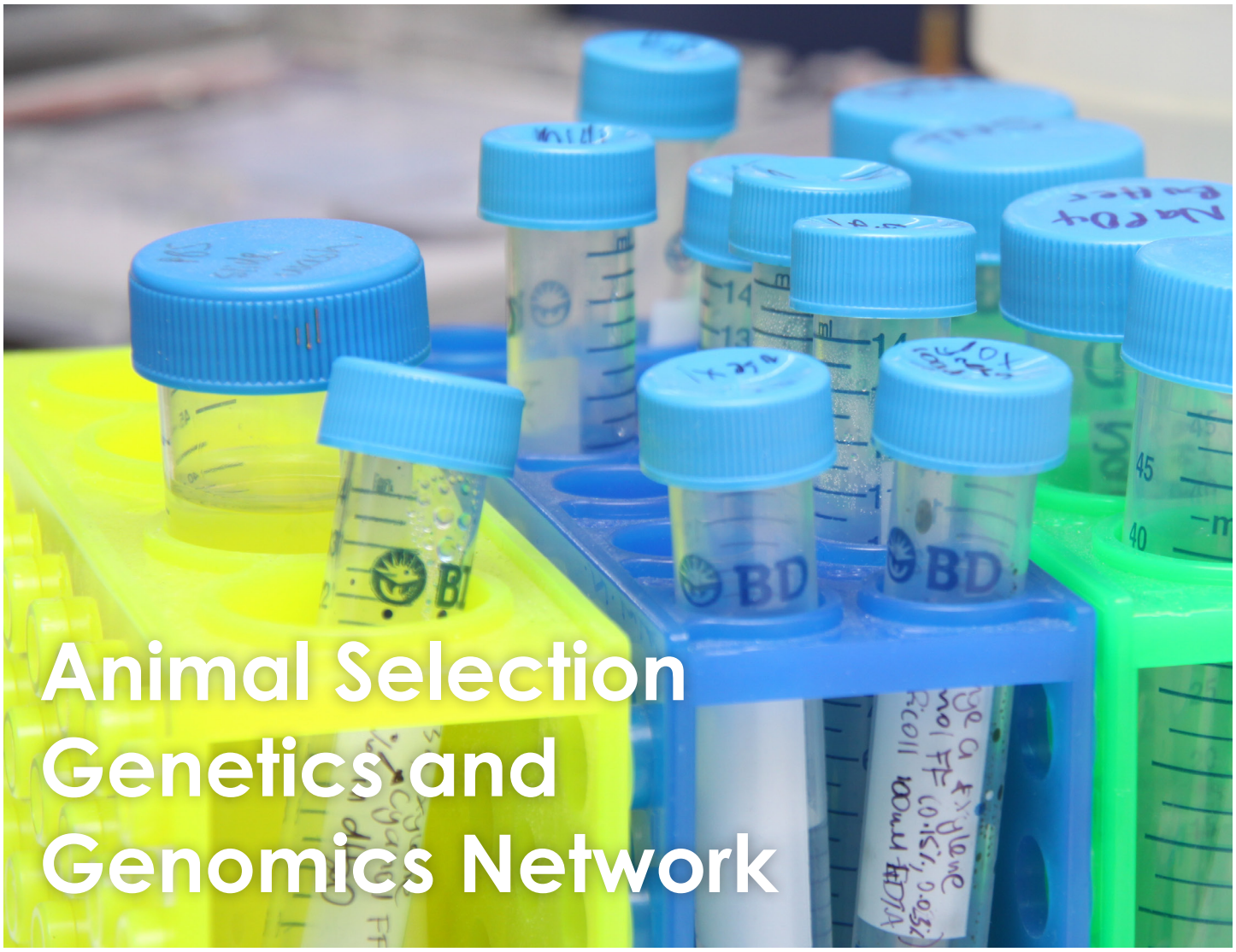
A unique strength of the Alliance is that it can harness the collective knowledge of scientists with specific experience of agricultural GHG mitigation across a diversity of systems and environments. Combining a model like GLEAM and the expertise in GHG mitigation available within the Alliance countries provides an opportunity to update estimates of technical and economic mitigation potential by combining country-specific estimates in a coordinated global modelling approach. These updated estimates would be underpinned by a far more rigorous methodological approach and, for the first time, assess mitigation potential in a system specific and multi-action framework.

The project, which will combine the resources of FAO and the Global Research Alliance to better quantify global agricultural mitigation potential, has a project coordinator funded by the New Zealand Government based at the FAO in Rome. The work will proceed as follows:

- A list of individual mitigation actions will be drawn up for enteric methane emissions (direct and indirect) and methane emissions from manure management.
- Mitigation effectiveness of single technologies will be assessed at country, system and climatic zone scale using GLEAM. The input data for these mitigation assessments will be obtained by utilising the expertise of researchers from across the LRG science networks with specific system and mitigation expertise. The results will be aggregated as far as possible to quantify total mitigation potential at country, system, and macro-regional scales.
- Further expert assessment will be used to identify 'packages' of synergetic mitigation options suited for specific production systems and conditions. Their effectiveness will be assessed using GLEAM. The results will be aggregated to quantify mitigation opportunities at country, system, and macro-regional scales based on 'packages' of complementary mitigation approaches. This will avoid double-counting some mitigation potentials, help manage trade-offs, and obtain mitigation potentials that are not based on simple additive assumptions.

For those people interested in receiving more detail about this project, or learning how to be involved please contact the project coordinator Victoria Hatton Victoria.Hatton@nzagrc.org.nz

Updates from the Research Networks



Animal Selection Genetics and Genomics Network

At the latest meeting of the Livestock Research Group in Yogyakarta, Indonesia, the progress of the Animal Selection, Genetics and Genomics Network (ASGGN) was presented by Yvette de Haas, the current convenor of the network.

The main aim of ASGGN is to provide a forum to foster discussion and debates to reach agreement on a variety of topics, like:

(1) The methane phenotype,
(2) An international database, and
(3) Synergies between adaptation and mitigation strategies.

The Methane Phenotype Working Group searched the literature for definitions of methane emissions, published existing variations in methane emissions between animals, but also during a day or lactation, the relations to feed intake, methods for methane measurements, and the potential change in methane emission by genetic and genomic selection. The conclusions were that methane emissions are heritable, and that emissions can be measured with many different systems, but they have different strengths and requirements. The outcomes will be published in a literature review in "Animal".

The International Database Working Group has joined with the International Committee for Animal Recording (ICAR) and set the structure for data that needs to be collected in order to perform international analyses and meta-analyses. Important data included data on the animal identity plus pedigree, animal information (e.g., date of birth, species, herd, sex etc.), the measured trait (e.g., description, unit etc.), measuring information (e.g., method, date, frequency etc.), and related traits (e.g., live weight, time fed etc.). The next step is to actually fill the international database with some data and perform analyses.

The Adaptation Working Group will work on a white paper addressing questions related to the livestock systems in developing countries, low quality diets, heat stress, disease resistance, parasitism, resilience etc. The results will be presented at the next ASGGN meeting at the GGAA conference to be held in Melbourne, Australia, in February 2016.

If you want to learn more about the network, participate in the debates or contribute with data, please contact Yvette de Haas Yvette.deHaas@wur.nl. More information can also be found at www.asggn.org

Animal Health Network

This Network brings together researchers (in veterinary science, epidemiology, animal science, modelling, GHG research and food security) to explore links and synergies between animal diseases and GHG emissions intensities, and possible mitigation through disease control.

The Network is coordinated by Professor Ilias Kyriazakis (Newcastle University, UK) and Tim Robinson (International Livestock Research Institute (ILRI), Kenya) and supported by the UK-based Network Secretariat and Network Champions. There are currently 58 members from 18 countries.

The inaugural Network workshop was held in March 2014 (see the workshop report at globalresearchalliance.org/updates/2014/animal-health-network-dublin-workshop-report). The Network priorities include facilitating the interaction of relevant research communities via workshops and online fora, complementing other GRA LRG Networks, linking with relevant organisations and initiatives, identifying research funding opportunities, standardising modelling methodology, improving accuracy of data collections (incorporating numbers from developing countries), and exploring the potential for regional subgroups.

The Network recently launched an Africa subgroup at its first regional workshop held in Ethiopia in the margins of ILRI@40 and alongside the regional meeting of the Global Strategic Alliance for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonosis (STAR-IDAZ). The workshop, held on 5 November 2014, brought together 19 delegates to discuss relevant current research and research gaps and to understand key drivers for funding research in Africa. Discussions also covered the potential human health and nutrition benefits of animal health improvements, alongside mitigation of GHG emissions.

The Network is actively creating linkages with the Agriculture, Food Security and Climate Change Joint Programming Initiative (FACCE-JPI), the FACCE-JPI Knowledge Hub on Modelling European Agriculture with Climate Change (MACSUR), STAR-IDAZ and the Global Agenda for Sustainable Livestock (GASL).

The Network is promoted via the 'UK Agri-Science & Innovation Newsletter', on the GRA website, on Twitter @AHGHGN, and through presentations delivered at relevant events around the globe.

For further information, please contact animalhealthnetwork@adas.co.uk

Rumen Microbial Genomics Network

The Rumen Microbial Genomics Network (RMG) provides a forum for global collaboration of researchers using microbial genomics approaches to develop methane mitigation and rumen adaptation technologies. The Network held its last meeting as a joint Ruminomics/RMG/ECO--FCE workshop on 15 June 2014 ahead of the main Rowett-INRA gut microbiology conference. This was a hugely successful conference with the number of sessions being so large that a change of room was required at the last minute to accommodate all participants. This illustrates the importance of rumen microbiology to the global agricultural challenges.

The Hungate 1000

The Hungate1000 (Principal Investigator: Bill Kelly, hungate1000.org.nz seeks to provide genome sequence information for rumen microbes along with information on their metabolic potential and functional role. The project has generated 251 genome sequences from cultures (238 bacteria, 5 methanogens and 7 bacteriophage), and sequences of ~670,000 individual genes. All data is publically available at img.jgi.doe.gov.

The Fungal 1000 project

The Fungi1000 Project is a collaborative effort among Joey Spatafora, Jason Stajich, Igor Grigoriev, and the JGI. As the name of the project implies their goal is analogous to the Hungate1000, to sequence 1000 fungal genomes. This is a great opportunity for all of us. If you have one or more fungal isolates and can extract sufficient high quality DNA you are encouraged to provide samples for sequencing. To do this visit the JGI fungal site at genome.jgi.doe.gov/programs/fungi/index.jsf in the top left hand corner of the page you will see "Nominate New Species". We look forward to your contributions.

Global Rumen Census

The Global Rumen Census (Principal Investigator: Gemma Henderson, globalrumencensus.org.nz) has determined the composition of the rumen microbial community across a wide range of countries, animal species and diets, providing reference information on microbe prevalence and abundance. This is a culture-independent study based on sequencing ribosomal RNA. Sequencing is now complete in this project and the data is being shared with the collaborators and prepared for publication.

The RMG network has gone 21st century! Follow us on:

facebook.com/RumenMicrobialGenomicsNetwork

@RMG_network

For more information about the RMG network please contact Sharon Huws hnh@aber.ac.uk

The Feed and Nutrition Network

The Feed and Nutrition Network (FNN) has undertaken several projects, which are also integrated in the FACCE-JPI-funded GLOBAL NETWORK project:

(1) developing a rumen methane mitigation database - this initiative will provide information on the most effective methane mitigation practices based on published research data;
(2) developing of a rumen methane mitigation and nitrogen efficiency database, which will be based on individual animal data and is intended to provide information for more robust prediction models;
(3) publishing a review paper summarizing recommended practices for conducting in vitro experiments aimed at rumen methane mitigation
(4) publishing a reviewer paper on recommended experimental design and methods for conducting in vivo trials aimed at rumen methane mitigation.

For further information contact Alex Hristov anh13@psu.edu

The Manure Management Network

The manure management network (MMN) was established to facilitate international collaboration between scientists focusing on reducing greenhouse gas emissions from livestock through improvement of manure management. Progress to date of the planned network activities shows that focus on greenhouse gas emissions only is not enough to achieve the expected collaboration between countries. Instead, a more integrated approach focusing on the negative impacts of manure management, and also on the value of manure as a resource is needed.

The main achievement of the MMN this year was the introduction of the Manure Knowledge Kiosk (MKK). The MKK is an initiative of the Food and Agricultural Organization of the United Nations (FAO), as partner of the Global Agenda for Sustainable Livestock (GASL), and the MMN, and is a project funded by the Climate and Clean Air Coalition (CCAC).

The action plan of the MMN for the coming months will be:

- To reframe the main scope of the network, to consider manure as a resource with valuable components as nutrients and organic matter rather than waste or a source of emissions.
- To strengthen focus on technical means and practices; to improve communication with farmers and other stakeholders interested in learning more information about how to mitigate greenhouse gas emissions and increase the value of manure. The following actions will be undertaken:
  - Develop a best practice guide on how to measure greenhouse gas emissions from manure management
  - Make a compilation of practical mitigation options for farmers and policy makers, and select the top 10 options per country
- To consolidate and expand the MKK

The Manure Management Network is currently being led by Theun Vellinga from the Netherlands, and professor La Van Kinh from Vietnam. To stimulate participation of other members of the network, the MMN is considering the possibility to rotate leadership among other countries.

If you are interested in this opportunity please contact Theun Vellinga theun.vellinga@wur.nl

Grasslands Research Network

The GRN had its first meeting in Madrid (2014) in the margins of the AnimalChange open science conference where it was agreed that the scope of the network would be to:

- Focus on both rangelands and pastures
- Explore synergies between adaptation and mitigation strategies
- Develop best management practices related to carbon sequestration at farm level and the potential for carbon sinks in different farming systems
- Improve understanding of the implications of soil organic carbon losses and degradation
- Identify knowledge gaps and opportunities for research collaboration between grasslands systems and rangelands systems
- Build capacity.

The GRN is currently undertaking a stock take of research activities of GHG emissions from grasslands. Latin America has four countries engaged in the stock take, Brazil, Chile, Uruguay and Argentina; between them, 46 projects include studies of carbon sequestration and GHG quantification. A workshop will be funded by INIA-Uruguay in mid-2015 to further discuss the stock take and how future research can be guided by the information already available.

During the next 12 months, the network will engage with other regions to take stock of existing knowledge and research related to grasslands, build relationships with other networks and global activities, and identify areas where the GRN can make the biggest contribution, recognising the priorities and opportunities may differ substantially between regions.

For more information about the network contact Veronica Ciganda vciganda@inia.org.uy

Launch of the SF_6 Tracer Technique Guidelines

Sulphur hexafluoride (SF_6) is an inert gas that has a very low concentration in the background atmosphere. Such properties have made SF_6 a tracer of choice in air-dispersion experiments and indoor ventilation studies over several decades.

SF_6 was first recommended as a tool to quantify bovine ruminant CH_4 emissions in 1993 by a research team at Washington State University, who published their seminal paper in 1994. The technique has since been adapted to measure emissions from sheep, alpacas and deer, and emission estimates using the technique compare favourably with those using respiration headboxes and chambers.

The SF_6 tracer technique enjoys wide acceptance, but with a variety of implementations. This variety arises from different equipment and hardware designs, and variations in innovative hardware developments, as well as differences in experimental protocols and data analysis.

The *"Guidelines for use of sulphur hexafluoride (SF_6) tracer technique to measure enteric methane emissions from ruminants"* offer a comprehensive, citable, peer-reviewed reference to the theory and practice of the SF_6 tracer technique.

The guidelines present the combined expertise and experience of leading practitioners from around the world and recommend standard and/or best practice approaches without being prescriptive: a recognition that the approach chosen will reflect the particular circumstances of the experiment, such as the availability of skills and equipment, or the nature of the national livestock industry.

The guidelines are written to help researchers:

- Understand the fundamental principles behind the SF_6 tracer technique, and the concepts around its effective use.
- Get up and running as quickly as possible with minimal experience of the technique (aided by the technical manual by Johnson et al. (2007)).
- Decide on an implementation, or adapt an existing implementation, to suit their circumstances (access to skilled personnel or laboratories, etc)
- Cite a specific implementation, and credit its developer(s), rather than having to detail that implementation in a paper.
- Tap into the collective wisdom of researchers experienced in applying and/or adapting the technique.

The guidelines are the output of a project funded by the New Zealand Government. The contents are the collated work of individual scientists in Alliance member countries. The contributions from these scientists, their institutions, and funding agencies are gratefully acknowledged, and warm thanks extended for their contribution to the guidelines.

The guidelines can be downloaded at globalresearchalliance.org/research/livestock/activities/knowledge

USDA Borlaug Fellowship Program

United States Department of Agriculture
National Institute of Food and Agriculture

The **Norman E. Borlaug International Agricultural Science and Technology Fellowship Program** aims to promote food security and economic growth by increasing scientific knowledge and collaborative research to improve agricultural productivity. It accomplishes this by:

- Providing training opportunities for early and mid-career researchers and policymakers from developing and middle-income countries;
- Fostering collaborative research to improve agricultural productivity;
- Facilitating the transfer of new science and agricultural technologies to strengthen agricultural practices
- Addressing obstacles to the adoption of technology, such as ineffectual policies and regulations.

The program is administered by USDA's Foreign Agricultural Service.

Priority Research Areas

Areas of training and research can be in any agriculture-related field including plant pathology, entomology, veterinary sciences, microbiology, agricultural economics, food safety, sanitary and phytosanitary topics, natural resources management, agricultural biotechnology, global climate change, and agricultural policy. Allowable training topics vary by country and year and can be found in the country-specific application announcements posted on the website.

Eligibility for the Borlaug Fellowship Program:

- Citizens of country in which the Borlaug Fellowship Program is offered
- Early to middle stage of their professional career
- Good working knowledge of the English language
- Minimum of a Master's degree
- Two or more years of practical work experience and currently employed in an university, government, non-profit, or private agricultural research entity in the recipient country.
- Demonstrate intention to continue working in the home country after completing their Borlaug fellowship in the U.S

For more details refer to the Borlaug Website:
fas.usda.gov/programs/borlaug-fellowship-program

Or email: Susan.Sadocha@fas.usda.gov

Capability Building Opportunity

Global Research Alliance Senior Scientist (GRASS) Award

Supporting research in Agricultural Greenhouse Gases

The New Zealand Government has announced funding for senior scientists to participate in an exchange programme to enhance collaboration and the building of mutually beneficial research partnerships between New Zealand and other Global Research Alliance countries.

Focus areas

- The New Zealand Government has announced funding for senior scientists to participate in an exchange programme to enhance collaboration and the building of mutually beneficial research partnerships between New Zealand and other Global Research Alliance countries.

Eligibility

To be eligible, you must:

- Have a PhD or be a scientist with at least five years of experience participating in/leading major projects that align to the priorities of LEARN, the Alliance or other relevant national strategies.
- Demonstrate impact and leadership in your professional field.
- Be able to contribute to scientific research and its application in your home region and the larger Alliance network, based on your networking record.
- Work in collaboration with a New Zealand research organisation.
- Be resident and normally employed on a permanent contract by a research organisation in an Alliance member country.
- Be fluent in English.

Funding

The exchange must be between 6 weeks and 6 months duration.

- Up to $30,000 for 6 months (pro rata for less than 6 months) will be provided to recipients to cover actual and reasonable living expenses.
- Up to $5,000 will be provided for economy airfares and travel/medical insurance.
- Up to $5,000 will be awarded for associated research costs.

For more details refer to the LEARN Website:
livestockemissions.net **or email** enquiry@nzagrc.org.nz

Upcoming events

Global Science Conference on Climate Smart Agriculture

The 3rd Global Science Conference on Climate Smart Agriculture will be held in Montpellier on 16 to 18 March 2015.

Please visit the conference website at csa2015.cirad.fr to find out additional and regularly up-dated information, such as the conference program and invited/confirmed keynote speakers, conference venue and much more!

Date: 16-18 March 2015
Location: Montpellier
Email: csa2015.montpellier@agropolis.fr
Website: csa2015.cirad.fr

Expo Milan 2015

The theme chosen for the 2015 Milan Universal Exposition is "Feeding the Planet, Energy for Life". This embraces technology, innovation, culture, traditions and creativity and how they relate to food and diet.

Date: 1 May to 31 October 2015
Location: Milan, Italy
Website: www.expo2015.org

Seventh Livestock Research Group meeting

Date: 23-24 June 2015
Location: Lodi (near Milan)
Email: enquiry@nzagrc.org.nz

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