LIVESTOCK RESEARCH GROUP

newsletter

GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

December 2018

Update from the Co-Chairs

Welcome to the December 2018 edition of the Livestock Research Group's newsletter.

This newsletter brings you a farewell and a welcome, as well as a round-up of a number of Livestock Research Group (LRG) activities.

It is with sadness that we farewell Martin Scholten from the co-chairs' team. Martin, as many of you will know, has been co-leading the LRG since its first meeting in 2010. In that time, the group has grown from 21 countries to 52 – spanning a wide range of livestock production systems, climate change and development priorities. Martin has been a steady hand at our helm and we will miss his wisdom and skill in bringing our diverse group together, delivering outcomes for individual members as well as the wider GRA. Rest assured, however, he is not lost to the GRA! Martin is moving on to lead the GRA's newly created Circularity Flagship on behalf of the Dutch Government (see page 2).

While we will very much miss Martin, we are delighted to welcome Dr Sinéad Waters from Teagasc in Ireland to the co-chairs team. Sinéad brings a wealth of experience in livestock research (for more, see page 3) and has been an active member of the LRG's Rumen Microbial Genomics Network. Our thanks both to the Government of Ireland and to Teagasc for enabling Sinéad to take on the co-chairing role in the LRG. We look forward to her involvement in the group.

The breadth of LRG efforts are reflected in this month's newsletter - from capability building to research to updates from our partners. However, there are four key dates that we particularly wish to bring to your attention:

1. Applications for the US Borlaug Fellowship programme close on **31 December 2018** - see page 15
2. The review period for the IPCC's Special Report on Climate Change and Land closes on **14 January 2019** - see page 5
3. A joint research call is open to several LRG countries, with proposals due on **31 January 2019** - see page 8
4. Registrations and the call for abstracts for the 2019 Greenhouse Gas and Animal Agriculture (GGAA) conference have opened - see page 4

These opportunities are a way for us to showcase the LRG's efforts to the world, helping strengthen the science-policy interface and build global capability. We strongly encourage you to get involved.

As we close off another year, we wanted to thank all of you – our LRG community – wherever you are in the world for your contribution to the Global Research Alliance during 2018. Your individual input helps the LRG's global pursuit of solutions for reducing livestock greenhouse gas emissions to be more connected, more inclusive and more effective.

Best wishes for the New Year,

Harry

This month's newsletter brings you:

Farewell from Martin Scholten

Dear GRA Livestock Research Group friends,

For almost 10 years I have served as co-chair of the GRA, next to Harry Clark responsible for governing the Livestock Research Group. Connecting experts in livestock and climate all over the world in an inspiring and strong network with impact. Your active participation, valuable contributions and ambitious drive was the key to the success that we have as LRG. Highly relevant as livestock are considered a problem in the climate change, but from our joint actions we could also identify and amplify significant and feasible options for mitigation. Very important as from a sustainable nutrition perspective based on resource use efficiency, livestock is essential for converting human inedible biomass in healthy food. Livestock is the heart of a circular food system making use of all agri-biomass produced, so as to keep the carbon footprint naturally low.

The LRG is widely acknowledged by what we as a global community of experts have achieved and delivered, with respect for the global diversity in food production, food consumption, natural conditions and societal demands.

I am proud of that, and retire from being your co-chair with a bit of pain in my heart and soul. I realise that there is much more to do, and the LRG is expected to make the difference in the global dialogue on the role of livestock in climate smart food production: 'noblesse oblige'. Harry and our co-chairs support team will stay on your side in the next steps. I am so happy that Sinéad from Ireland will take over my role. And I hope that we soon can welcome a third LRG co-chair from Africa, Asia or Latin America.

I will take up another role in the GRA, as my Minister asked me to help with energising a GRA Flagship on "Circular Food Production". This will also need aligning with the LRG given the role of livestock in circularity. So hopefully I can stay connected with you.

It remains for me to sincerely thank all of you for your work in the LRG, the co-chairs support team for their support over the years (Andy, Henk, Laura, Sinead, Jacques), all the network coordinators for their ground work, and last but certainly not least: my reliable mate and good friend Harry Clark.

Best wishes,

Introducing Dr Sinéad Waters

The LRG has a new co-chair, Dr Sinéad Waters – Principal Scientist in the Animal and Bioscience Research Department at Teagasc in Ireland. We asked Dr Waters a few questions to help the LRG community get to know her a little better...

We're delighted that you're joining the LRG. Can you tell us a little about your research interests and background?

I have long admired the tremendous work of the LRG and the GRA. It is impressive how it brings together scientists, policy makers and partners from countries across the globe, developing critical mass in addressing the global challenge of agricultural greenhouse gas emissions. I am very much looking forward to being a part of this vital community and hope that my skills and experiences will be useful in the LRG's collaborative efforts.

I have spent over 14 years leading research programmes applying molecular biology to addressing key issues in agriculture. Much of my recent work has focused on the role of the rumen microbiome in improving nutrient utilisation from feed and reducing greenhouse gas emissions such as methane from the host animal. Manipulation of the rumen via animal breeding and dietary supplementation is also a key interest.

I have published over 84 peer-reviewed papers and 120 conference proceedings, am on the editorial board of the journal 'Scientific Reports', and am a Principal or Lead Investigator in a number of internationally funded projects. I have acted as an expert reviewer on many international funding calls including Genome Canada. I have good industry links in Ireland, including having been a member of a working group with national and international partners that designed a novel SNP chip for dairy and beef cattle genomic selection for the Irish Genomic selection breeding programme.

Have you been involved in any LRG activities?

I was a contributing scientist to the LRG's ground-breaking Global Rumen Census project in 2016 that found that the same groups of methanogens dominate in nearly all rumens across a wide variety of livestock species and diets. I am an active member of the LRG's Rumen Microbial Genomics Network and am currently involved in two related projects funded by FACCE-JPI, RumenStability and RumenPredict. I work closely with Prof Gary Lanigan at Teagasc who has represented Ireland at LRG meetings in the past, and of course Prof Frank O'Mara is my Director of Research at Teagasc.

Irish suckler cows

New LRG co-chair, Dr Sinéad Waters: Sinead.Waters@teagasc.ie

Tell us a little about Ireland's livestock production system and priorities for greenhouse gas emissions research...

Similar to several other countries in the LRG, Ireland's livestock production systems are largely grass-based. Ireland's GHG emissions profile is unique among EU Member States, with the highest national proportion of agriculture emissions. This presents particular challenges for Ireland in meeting future GHG emission reduction targets. Ireland's production systems are already at the higher end of efficiencies in terms of efficiency per unit production thus highlighting the challenges faced by the sector to identify further cost-effective measures to limit emissions.

What about when you're not being a scientist?

When I'm not at work, I am a busy mother to three young children. I am a native Irish speaker, originally from County Galway in the west of Ireland and raised on the shores of Lough Corrib. As such, my husband and I, along with our three children, enjoy the outdoors, spending time walking in the mountains, boating and fishing on the lake. The children are involved in dancing and sport, particularly our national sports, hurling and gaelic football – hence our weekends are busy!

2019 GGAA and LRG meetings combined

Join us in Foz do Iguassu, Brazil in August 2019 for the 7th international Greenhouse Gas and Animal Agriculture (GGAA) conference and the 10th meeting of the Livestock Research Group.

Five Latin American research institutions are teaming up to hold the 2019 GGAA from 4-10 August in Brazil. They are Brazil's Agricultural Research Institute (INIA), and Argentina's National Agricultural Technology Institute (INTA).

The GGAA is the world's premier conference on livestock emissions research. Every three years it brings together leading scientists and policy makers to review current knowledge and present significant new developments and advances in measuring, modelling and mitigating greenhouse gas emissions from animal agriculture. The last GGAA was held in Australia in 2016 and previous events have taken place in Ireland (2013), Canada (2010), New Zealand, Switzerland and Japan.

The 2019 GGAA spans four scientific sessions:

- Technical advances from genomics to precision agriculture that will address aspects relating to measuring and modelling GHGs (covering nitrous oxide, methane, soil carbon, carbon dynamics/ balance, modelling)
- Farm level low carbon initiatives, addressing mitigation and adaptation strategies to provide more resilient production systems


Photograph by **Phil Whitehouse**

- Regional low carbon initiatives, including landscape, regional management and national commitments
- International low carbon initiatives, including examples from the IPCC, UNFCCC, FAO, World Bank etc.

The call for abstracts closes on 20 April 2019. Guidelines are provided on the GGAA website: www.ggaa2019.org.

Foz do Iguassu is home to the internationally famed Iguassu Falls, right on the border of Brazil, Argentina and Paraguay. It is also home of the Itaipu dam, the world's second largest hydroelectric plant in power generation (after the Three Gorges Dam in China). It provides approximately 15% of the energy consumed in Brazil and 86% of the energy consumed in Paraguay.

Visit the GGAA website for more information on the conference and its stunning location, and to access the early bird discounted registration fee (available until 20 March 2019).

2019 Livestock Research Group meeting

The 2019 LRG meeting will take place from 9-10 August in the Hotel Golden Park Internacional Foz do Iguassu at the conclusion of the GGAA. Several of the LRG's research networks are also likely to meet that week, making the most of such a large international gathering of scientists and policy makers working on livestock and climate change issues. Further details will be provided early in 2019 to enable LRG members and partners to plan their travel to both the GGAA and the LRG, and take advantage of the early bird discounts.

Supporting the work of the Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. Critical work is underway and the LRG community is encouraged to actively engage.

> We wrote this report
> at your request, and with care.
> Will you listen, please?
>
> We're at 1 degree
> now and will hit 1.5
> within three decades.
>
> Past emissions will
> warm the Earth for centuries –
> but there's still a choice.
>
> ***A selection of haiku by Dr Andy Reisinger, Vice Chair of the IPCC's Working Group III, summarising the IPCC's recently published Special Report on Global Warming of 1.5 Degrees (Twitter: @ReisingerAndy)***

In early October, the IPCC approved its **Special Report on Global Warming of 1.5 Degrees** – receiving extensive global media coverage. Of particular relevance to the LRG, apart from the overall scale and urgency of the challenge, is the finding that in pathways that limit warming to 1.5 degrees, agricultural GHG methane emissions reduce globally by about 35% relative to 2010 levels (but with wide variations across different models, reflecting different assumptions about future mitigation potentials and costs). There is an increasing narrative around the importance of managing food demand and dietary change to help achieve climate change objectives (and some of those emissions reductions in models that limit warming to 1.5 degrees include substantial demand changes). The report will be a key scientific input into the UN's annual Climate Change Conference, taking place this month in Katowice, Poland, where governments are reviewing the Paris Agreement.

A second order draft for the IPCC's Special Report on Climate Change and Land was released for global expert and government review on 19 November 2018. Reviewers must be registered by 7 January 2019, with all comments back by 14 January 2019. ***Input from the LRG community to this draft will be important***, particularly on the 'Summary for Policymakers', Chapter 5 (Food Security), the cross-cutting issues Chapter 6 (Interlinkages between desertification, land degradation, food security and GHG fluxes: synergies, trade-offs and integrated response options), and Chapter 7 (Risk management and decision making in relation to sustainable development). Please register as a reviewer here: **https://apps.ipcc.ch/comments/srccl/sod/register.php**

The GRA's focus on reducing the emissions intensity of food production can serve as a key entry point to more comprehensive mitigation action by countries, designed to address multiple challenges of enhancing food security, reducing emissions and increasing the climate-resilience of food systems. However, if researchers engaged in the GRA do not participate in IPCC peer review processes, then our work risks going unnoticed by IPCC authors.

In other IPCC news, the process for drafting the full 6th Assessment Report has begun – scheduled for completion in 2021. Working Group III, looking at mitigation, will meet in April 2019. Dr Harry Clark, LRG co-chair, has been selected as a Working Group III Lead Author for the chapter on mitigation in agriculture, forestry and other land uses.

New tools for measuring, reporting and verifying livestock greenhouse gas emissions and mitigation

Accounting for greenhouse gas emission and emission reductions is essential to achieve climate change mitigation. In response to needs expressed by many countries, the GRA and the CGIAR's Research Program on Climate Change, Agriculture and Food Security (CCAFS) are working together to help countries strengthen how they measure, report and verify (MRV) agricultural greenhouse gas emissions and mitigation.

Why is MRV in the agricultural sector important?

Agriculture contributes to around 11% of global greenhouse gas emissions. In addition, agricultural emissions are significant at national levels; agriculture contributes an average of 35% of emissions in developing countries and 12% in developed countries. Technical mitigation potential in the agricultural sector is high; there are many low and no-cost options to reduce greenhouse gas emissions, including by improving the efficiency of production.

Just over 100 countries include agriculture in their Nationally Determined Contributions (NDCs) under the Paris Agreement and are working to identify and implement mitigation solutions. However, many countries cannot document emission reductions achieved through productivity gains and more efficient farm management because national greenhouse gas inventory reporting systems and supporting data are insufficiently developed. Countries need more robust MRV systems for agricultural greenhouse gas emissions to accurately reflect their national circumstances and transparently demonstrate mitigation. Tools and resources to help countries tailor MRV to their production systems and policy priorities are critical.

This need has been identified by a number of LRG countries, and is reflected in the LRG's year-on-year adoption of a capability building focus on (i) supporting countries to work towards Tier 2 inventories and strengthened MRV systems for livestock emissions and mitigation, and (ii) enhancing countries' readiness to engage in projects that improve livestock productivity and reduce emissions.

The GRA and CCAFS have been working with MRV and greenhouse gas inventory experts, practitioners and policy-makers from both developing and developed countries to produce a range of resources to help strengthen MRV systems for agricultural greenhouse gas emissions and mitigation actions. The resources are initially focused on MRV specific to livestock, reflecting the fact that 60% of global agricultural greenhouse gas emissions come from that sector. MRV resources for other agricultural sectors and cross-cutting issues will be developed over time.

The new MRV tools

MRV Platform for Agriculture:
www.agMRV.org

The MRV Platform for Agriculture provides information to guide MRV systems for agricultural emissions and mitigation, such as for NDCs and Nationally Appropriate Mitigation Actions (NAMAs).

The platform houses a wide range of tools, approaches and case studies about how to design and implement MRV of GHG emissions and mitigation actions in the livestock sector. The platform will expand to include other agricultural sectors over the next year.

Tier 2 inventory approaches in the livestock sector: a collection of agricultural greenhouse gas inventory practices

A core part of the MRV Platform for Agriculture is a new collection of case studies and information on improving Tier 2 approaches for estimating livestock GHGs in national inventories. This collection details how countries have used different data sources, methods, approaches and institutional processes to adopt and continually improve their Tier 2 inventories, divided into six areas:

1. Understanding Tier 2 approaches for livestock greenhouse gas inventories
2. Planning Tier 2 inventories
3. Data collection and compilation of Tier 2 inventories
4. Implementing QA/QC procedures
5. Assessing the uncertainty of a Tier 2 inventory
6. Continual improvement of Tier 2 inventories

The collection can be accessed interactively via **www.agMRV.org** or downloaded as a standalone PDF.

Dealing with data gaps: a guide for improving Tier 2 estimates of national livestock emissions and mitigation

This guide will document practical methods for estimating activity data (e.g. animal numbers, feed intake, etc.) for measurement and reporting of national livestock emissions and emission reductions using the IPCC Tier 2 approach, where data is missing, incomplete or of insufficient quality. Includes:

- Common gaps and shortcomings in activity data and the extent to which they limit effective MRV of agricultural greenhouse gas emissions and mitigation
- Low-cost, robust ways of filling activity data gaps, including options that countries are already using and new options suggested by inventory experts
- Guidance and simple tools for making transparent and traceable decisions about how to handle missing, incomplete or sub-standard data and data uncertainty

The guide will be available in July 2019 via **www.agMRV.org**, as well as the **GRA** and **CCAFS** websites.

Making trees count: measurement, reporting and verification of agroforestry under the UNFCCC

A review of how agroforestry is addressed in national MRV systems, with recommendations for improving MRV of agroforestry, including:

- Accessible approaches for representation of lands with agroforestry
- Carbon stock change and emission factor data and databases relevant for reporting requirements
- Research and practical guidelines on linking national and project-level MRV

This review is available from the **CCAFS website**.

Measurement, reporting and verification of livestock GHG emissions by developing countries in the UNFCCC: current practices and opportunities for improvement

A 2017 publication on current MRV practices can be downloaded **here**. This report is also available in **French** and **Spanish**. A summary brief is available **here**.

Livestock development and climate change: the benefits of advanced greenhouse gas inventories

A 2016 publication covering the benefits of advanced greenhouse gas inventories available **here**.

These MRV tools may be useful if you are involved in:

- Better understanding and estimating agricultural greenhouse gas emissions and mitigation
- Developing climate change policy or projects including NDCs and NAMAs
- Assessing options for mitigating greenhouse gas emissions
- Tracking trends or improvements in agricultural productivity
- Working out how agriculture can contribute to the UN Sustainable Development Goals
- Seeking international support to implement mitigation options for the agriculture sector
- Developing sustainability agreements or implementing private sector certification schemes
- Responding to market demands for sustainable products

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

Updates from the LRG's networks

Animal Health Network

The Animal Health and Greenhouse Gas Emissions Intensity Network (AHN) is a forum for researchers investigating the connections between animal diseases and GHG emissions intensity. They are also exploring possible GHG mitigation opportunities through disease control.

AHN members came together at two recent conferences to discuss a project consortium on animal health and GHG emission intensity:

- 2-6 September 2018 at the 10th International Symposium on the Nutrition of Herbivores in Clermont-Ferrand, France. For conference outcomes, see here: **https://symposium.inra.fr/isnh2018/**
- 10-13 September 2018 at the International Conference on 'Agricultural GHG Emissions and Food Security - connecting research to policy and practice' in Berlin, Germany. For conference outcomes, see here: **https://www.agrighg-2018.org/program/output-of-the-conference/**

For more on the AHN or to join, please contact its coordinator **Dirk von Soosten**, Federal Research Institute for Animal Health, Germany.

Animal Selection, Genetics and Genomics Network

Breeding as a long-term strategy to reduce livestock GHGs is the focus of the Animal Selection, Genetics and Genomics Network (ASGGN), along with identifying how other genetic traits can affect mitigation.

As reported in the June 2018 LRG newsletter, the ASGGN has a major project underway in the GRA's Enteric Fermentation Flagship. The 'Rumen Microbiomes to Predict Methane' project aims to develop a method for rapid and low-cost profiling of cattle rumen microbiomes to identify low emitting animals. Rumen fluid from a wide range of cattle around the world, but particularly from tropical systems, will be sequenced to understand the heritability of microbial communities and structures. Countries are invited to contribute to the project by submitting rumen samples and accompanying methane emissions data. For more information, contact Suzanne Rowe (details below).

There are opportunities for new members and ways to use the network through the **European SMARTER project on sustainable ruminant production**. The ASGGN also plans to meet in 2019, possibly at the GGAA conference in Brazil and/or at the annual meeting of EAAP in Belgium (see page 15 for details on these conferences).

For more on the AHN or to join, please contact its coordinator **Suzanne Rowe**, AgResearch, New Zealand. You can also follow the ASGGN on Twitter: **@ASGGN_GHG**

JOINT CALL OPEN:

'Novel technologies, solutions and systems to reduce GHG emissions in animal production systems'

Three European ERA-NET research initiatives – Sustainable Animal Production (SusAn); Monitoring and Mitigation of Greenhouse Gases from Agriculture and Silviculture (ERA-GAS); and Information and Communication Technologies and Robotics for Sustainable Agriculture (ICT-AGRI) – have coordinated and aligned efforts in areas of mutual interest and established a joint transnational funding programme in the field of agricultural GHGs, focusing on emissions from livestock production. The objective of the Joint Call is to contribute to the development of novel technologies, solutions and systems to reduce the GHG intensity of animal production systems in Europe and beyond. The call involves 24 countries: Belgium, Canada, Chile, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Romania, Slovakia, Spain, Sweden, Turkey, UK and Uruguay. Its themes are:

1. 'Holistic': agro-ecological approach to whole animal production systems
2. 'Technical': technical options for the monitoring and mitigation of GHG emissions from animal production systems
3. 'Societal': social and/or economic approach to livestock production and consumption of animal products

The deadline for proposals is now extended until **31 January 2019**. See the updated **Joint Call Announcement** for more details, or visit: **http://ict-agri.eu/node/39163**

Feed and Nutrition Network

The Feed and Nutrition Network (FNN) is a collaborative forum for scientists working on ways to reduce GHG emissions via nutritional means.

One of the network's key achievements has been the **Global Network project** that aims to address issues with the available global data on the impact of feed and nutrition on livestock GHGs. FNN scientists have been involved in three new papers associated with the project that are due to be published in the coming months:

- Prediction of enteric methane production, yield and intensity of beef cattle using an intercontinental database
- Evaluation of the performance of extant mathematical models predicting enteric methane emissions from ruminants as affected by animal category and dietary mitigation strategies
- Nitrogen in ruminant nutrition: a review of measurement techniques

These papers come on top of the Global Network project's delivery of more accurate models for estimating the amount of enteric methane produced by dairy cattle (**see page 8 of the June 2018 LRG newsletter**), as well as four other papers:

- Niu, M., Kebreab, E., Hristov, A., Oh, J., Arndt, C., Bannink, A., ... Yu, Z. (2018). Prediction of enteric methane production, yield and intensity in dairy cattle using an intercontinental database. **Global Change Biology, 24(8), 3368-3389. doi: 10.1111/gcb.14094**
- Hristov, A., Kebreab, E., Niu, M., Oh, J., Bannink, A., Bayat, A., ... Yu, Z. (2018). Symposium review: Uncertainties in enteric methane inventories, measurement techniques, and prediction models. **Journal of Dairy Science, 101(7), 6655-6674. doi: 10.3168/jds.2017-13536**
- Yáñez-Ruiz, D., Bannink, A., Dijkstra, J., Kebreab, E., Morgavi, D., O'Kiely, P., ... Hristov, A. (2016). Design, implementation and interpretation of in vitro batch culture experiments to assess enteric methane mitigation in ruminants—a review. **Animal Feed Science and Technology, 216, 1-18. doi: 10.1016/j.anifeedsci.2016.03.016**
- Hammond, K., Crompton, L., Bannink, A., Dijkstra, J., Yáñez-Ruiz, D., O'Kiely, P., ... Reynolds, C. (2016). Review of current in vivo measurement techniques for quantifying enteric methane emission from ruminants. **Animal Feed Science and Technology, 219, 13-30. doi: 10.1016/j.anifeedsci.2016.05.018**

Another area of work for the FNN, building on the Global Network project, is the project 'Capturing Effects of Diet on Emissions from Ruminant Systems (CEDERS). The project aims to extend international knowledge of ruminant dietary effects on GHG emissions and sustainable production, and improve GHG accounting methodologies. It is part of the FACCE-JPI ERA-GAS research call. For more, see the **project information page** on the LRG website.

For more on the FNN or to join, please contact its coordinator **Alex Hristov**, Penn State University, USA.

Manure Management Network

The Manure Management Network (MMN) is focused on reducing livestock GHGs through manure management.

A major MMN project was launched in October 2018. The Chinese Academy of Agricultural Science (CAAS) is working with CCAFS, the Sino-Dutch Dairy Development Centre (SDDDC), Wageningen University and Research, and the GRA to improve:

(a) Tracking emissions from livestock

(b) Assessment of climate impacts of improved livestock management practices

Two other assessment projects being developed in China may also be of interest:

- Tier II MRV of livestock emissions in China: developing guidance for implementation at the provincial level – this is being done in conjunction with the GRA and CCAFS and will address emissions from pigs (manure management), as well as dairy cattle (enteric fermentation and manure management)
- Carbon Footprint Assessment and Mitigation Options of Dairy under Chinese Conditions

Dataman, another project delivering on the MMN's objectives, commenced earlier in 2018. This will establish a global manure management database to help refine national GHG inventories and improvement understanding of key variables affecting nitrous oxide, ammonia and methane emissions from manure, including housing, storage, land application and direct deposition by livestock.

For more on the MMN or to join, please contact its coordinator **Hongmin Dong**, Chinese Academy of Agricultural Sciences.

Updates from the LRG's networks cont.

Rumen Microbial Genomics Network

The Rumen Microbial Genomics Network (RMG) is a forum for researchers using genomics approaches to understand enteric methane emissions and how they might be reduced without compromising animal health or productivity.

The RMG met earlier this year in June to discuss recent advances and challenges in the field of rumen microbiology. This took place in Scotland in conjunction with wider meetings of RMG scientists (Rowett-INTA gastrointestinal tract meeting) and was attended by 80 delegates. The meeting opened with an update from RMG network coordinator Dr Sharon Huws (Queen's University Belfast). Delegates also heard from the leaders of several major projects involving RMG scientists, including:

- **RumenPredict**: Dr Ruth Exposito Gomez presented the aims of this project and the outcomes from the first six months. RumenPredict brings RMG members together to generate the necessary data to link rumen microbiome information to host genetics and phenotype and develop feed based mitigation strategies. Helpfully, the project also supports administration of the RMG network.
- **RumenStability**: Professor Richard Dewhurst gave an update on RumenStability, which is focused on assessing early life interventions as mechanisms of obtaining beneficial long term ruminant host phenotypic effects (e.g. higher production with lower environmental impact). RumenStability is nearing completion with the data seeming to suggest that early life interventions had varying success and possibly may not provide global solutions for ruminant production and environmental challenges.
- **Hungate1000**: Dr Graeme Attwood gave an update on the LRG project 'Hungate1000', which successfully managed to genome sequence more than 500 rumen microbes, a huge task that has led to major advancements for stakeholders in this field. The project datasets were recently published in **Nature Biotechnology** and were discussed in the June 2018 LRG newsletter.

Updates on work by other RMG members were also provided, including a network for anaerobic fungi research (for more see: **https://anaerobicfunginetwork.wordpress.com/**).

More recently, RMG members have been busy on the following:

- Launch of a new journal '**Animal Microbiome**', a sister journal to Microbiome
- Publication of a review paper: Huws, S., Creevey, C., Oyama, L., Mizrahi, I., Denman, S., Popova, M., ... Morgavi, D. (2018). Addressing Global Ruminant Agricultural Challenges Through Understanding the Rumen Microbiome: Past, Present and Future. Frontiers in Microbiology (25 September 2018). doi:10.3389/fmicb.2018.02161
- Closure of the special research topic in Frontiers in Microbiology, '**Metaomic Approaches to Study the Rumen Microbiome: Challenges and Innovation**' (led by Dr Sharon Huws), with 39 published articles authored by 255 people from around the world
- Launch of two new Frontiers in Microbiology research topics encompassing ruminant microbiome research:
  - '**Gut Microbiome Modulation in Ruminants: Enhancing Advantages and Minimizing Drawbacks**'
  - '**Advances in the understanding of the commensal Eukaryota and Viruses of the herbivore**'
- Launch of the 'Rumen Microbiome' project under the GRA's Enteric Fermentation Flagship, led by Dr Suzanne Rowe of AgResearch, New Zealand. This was featured in the June 2018 LRG newsletter and involves sequencing rumen fluid from cattle around the world in order to understand the heritability of microbial communities and structures.

For more on the RMG or to join, please contact its coordinator **Sharon Huws**, Queen's University, Belfast, UK.

Using science to inform low emissions policy development and implementation in East Africa

The LRG was involved in a regional engagement workshop on 'Low Emissions Livestock: Supporting Policy Making and Implementation through Science in East Africa' held at the UN Economic Commission for Africa in Addis Ababa, Ethiopia from 2-4 July 2018.

Farmers and their cows in Ethiopia

The workshop was organised by the GRA, CCAFS, the Food and Agriculture Organization of the United Nations (FAO), the World Bank and the African Climate Policy Centre (ACPC). It attracted more than 60 participants from across East Africa and created a platform for senior government, policy and science representatives working in the livestock sector to:

- Discuss countries' ambitions for livestock development and climate change, and understand the challenges
- Showcase relevant ongoing work of the GRA, CCAFS, FAO and the World Bank that is focused on:
  - Improving the efficiency of livestock production
  - Reducing greenhouse gas emissions and enhancing resilience
  - Strengthening national MRV for low emissions livestock systems
- Understand how science underpins this work, including helping to support countries' NDCs
- Identify ways that the GRA, CCAFS, FAO and the World Bank can help build regional and national capacity and contribute to project implementation through tailored initiatives in the future

The workshop discussed the future of pastoralism in East Africa, inequality and poverty reduction in the context of the livestock sector, the need for integrated efforts and the need to move from Tier 1 to Tier 2 reporting for livestock greenhouse gas emissions for all countries. Three overarching regional challenges and priorities were identified:

1. MRV for low emissions livestock systems
2. Identifying options to reduce emissions in the context of the broader development and food security agenda
3. Awareness raising of low emissions and climate-smart livestock systems

Participants committed to move forward together and to share their learnings from the workshop with their colleagues and incorporate the learnings into their strategies.

Where to from here?

Follow-up discussions between the GRA and East Africa workshop participants took place in late October and plans are underway to develop a regional capability building project during 2019.

THE GRA IN AFRICA

A new partnership between the GRA and the African Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) was launched at the RUFORUM biennial meeting that took place in Nairobi, Kenya, 22-26 October. The partnership will include a Graduate Research Grant programme, funded by the Netherlands and New Zealand and administered by RUFORUM. More information will be provided in due course.

The RUFORUM meeting was also an opportunity for the GRA to meet with key regional partners to discuss potential regional capability building activities emerging from the East Africa workshop that took place in July.

Further low emissions livestock development workshops are planned for West Africa and Southern Africa in March/April 2019. Based on the highly successful East Africa workshop held in July 2018, these new workshops will bring together government, researchers and regional organisations to understand regional needs, livestock production systems and priorities for climate change and development. The aim is to better understand countries' needs for improving MRV of livestock emissions and to support NDCs.

For more information, contact secretariat@globalresearchalliance.org.

GRA Council meeting in Berlin, Germany, September 2018

Highlights from the GRA Council meeting

The eighth annual meeting of the GRA's Council took place from 10–11 September 2018 in Berlin, Germany and was attended by 31 of the GRA's now 52-strong member countries, and 11 partner organisations.

The Council is the representative body of all GRA member countries. It oversees the work of the GRA's four Research Groups, implementation of the 2016-2020 GRA Strategic Plan and relationships with key partner organisations. This year's meeting was held alongside an international conference on 'Agricultural GHG Emissions and Food Security – Connecting Research, Policy and Practice', jointly organised by the GRA and the European Commission's Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI), in partnership with CCAFS.

GRA Research Group co-chairs at the 2018 Council meeting

Main outcomes from the Council meeting

The Berlin Council meeting saw the handover of Council Chair from Japan to Germany and the introduction of Indonesia as Vice-Chair.

Council members agreed that the GRA should support the UNFCCC's Koronivia Joint Work on Agriculture, a process underway to develop activities for agriculture. This will include assessment methods for soil carbon sequestration, water management, nutrients, manure, livestock, as well as the consideration of socio-economic and food security issues. A timeframe for submissions on the various topics has been set, with workshops then held to discuss submissions and agree a way forwards. The topic areas are:

- Soil carbon – submissions by 6 May 2019
- Nutrient use and manure management – submissions by 30 September 2019
- Livestock (and socio-economic and food security dimensions of climate change) – submissions by 20 April 2020

The Council agreed that the GRA could help by mapping Research Group activities against the Koronivia timeframe, identifying existing and future GRA tools and resources of relevance, raising the visibility of GRA capability building activities, encouraging GRA members to make submissions to the process and to participate actively in Koronivia workshops etc. LRG members interested in this work should contact their Council representative.

GRA Special Representative, Hayden Montgomery, addressing the AgriGHG2018 conference that took place alongside the GRA Council meeting

The Council reviewed progress against the four GRA Flagship programmes that were agreed to at the 2016 meeting:

- **Soil Carbon Sequestration**: flagship closely aligned with existing CIRCASA initiative, including shared funding to allow for coordination across the flagships. Next steps are to develop regional projects, activities with the Global Soil Partnership and a workshop on carbon offsets.
- **Reducing GHG Intensity of Rice Systems**: four projects underway on improved water management techniques (Americas), on-farm assessment of integrated management techniques (Asia), low-emitting high-yielding rice cultivars, and sustainable rice production (Latin America).
- **Enteric Fermentation**: two projects underway on 'Rumen Microbiomes to Predict Methane' and 'Feed/Methane Relationships'. See the June 2018 LRG newsletter for details.
- **GHG inventories**: individual activities happening across GRA Research Groups that relate to inventories (for example, pages 6-7 of this newsletter for example) but otherwise slower progress in this flagship.

The Council also agreed on two new GRA Flagships:

- **Circular Food Production**: aims to understand the effect of circular agricultural systems on GHGs, identify best practices and how these can be scaled up. This flagship will be led by Martin Scholten on behalf of the Netherlands (see page 2).
- **Nitrogen**: aims to develop and implement mitigation solutions for nitrous oxide emissions and improve its quantification. This flagship will be led by the US.

On capability building, the Council received an update on the GRA's engagement in Africa and the new relationship being developed with RUFORUM (see page 11). Members were encouraged to support the GRA's capability building efforts by providing resourcing and also initiating new activities.

To access Council meeting presentations and other documents, please see **here**.

International Conference on Agricultural GHG Emissions and Food Security

The international conference ('AgriGHG2018') that took place alongside the Council meeting was attended by around 300 scientists and other stakeholders from over 50 different countries. Presentations and discussions focused on a single question:

What are the options and longer term visions to mitigate greenhouse gases and enhance carbon sinks in the agricultural sector while ensuring food security?

Some of the key messages included:

- A greater focus is needed on how to act on scientific findings and implement recommendations, in particular how to increase investment in:
  - Demonstration sites to test findings
  - Knowledge brokerage, extension services and technical assistance to translate scientific findings into practical and scalable solutions
  - Technology transfer and good practice exchange
- Move to a science of implementation, not just of options or measurement
- Bolder policy design is needed – larger scale initiatives and learning
- Co-designing solutions with farmers, investors, input suppliers, advisory services etc to maintstream mitigation
- Prioritise the reduction of loss and waste (of food and other resources) – circularity an important way forwards

To download the final report from the conference, please see **here**.

Partner Update:
Highlights from CCAFS

CCAFS is the CGIAR's Research Program on Climate Change, Agriculture and Food Security. Its research aims to develop and scale up agricultural practices and policies that are adaptive to climate change, reduce greenhouse gas emissions and increase farmers' resilience. Over 200 scientists working in five regions of the developing world are part of the CCAFS program. CCAFS is an important partner for the LRG, with many shared priorities.

Recent research highlights from CCAFS

The vast majority of GHG emissions from food companies come from agricultural production, yet few companies assess and disclose those emissions and even fewer set targets to reduce them. CCAFS, together with Ceres and CDP, has released a report that aims to help companies improve disclosure and mitigation of supply chain emissions in the food sector. The report describes select tools and methods for managing and disclosing supply chain (also called Scope 3) emissions generated by food system suppliers. Scope 3 emissions include those from agricultural production, such as fertiliser use, and associated land-use change including deforestration. To download a copy of the report, please see **here**.

Collectively, 63% of world fertiliser consumed is reported at higher Tier 2 and Tier 3 national GHG inventories. However, countries reporting at the Tier 1 level for direct nitrous oxide emissions from fertilisers still predominate, accounting for 180 of the total 191 reporting countries. CCAFS' scientists have published a working paper to help address this, providing an overview of the UNFCCC reporting process for national GHG inventories with a particular focus on the methodology used for estimating direct nitrous oxide emissions from mineral fertiliser. See **here** for a copy of the paper.

A CCAFS Info Note, published in October 2018, aims to provide multilateral development banks (MDBs) with an understanding of the decision-support tools available to help them invest in projects and practices that can sequester soil organic carbon. Linked to this, the paper also aims to help facilitate their tracking of investments in climate change mitigation and adaptation. See **here** for a copy of the Info Note.

'**Invest in climate change and agriculture**' is a one-stop-shop for all of CCAFS' economic analyses and business cases for achieving climate change mitigation in agriculture. Multiple resources are available; this is the newest: Gromko D, Abdurasalova G. 2018. **Climate change mitigation and food loss and waste reduction: Exploring the business case**. CCAFS Working Paper no. 246.

@Luis Alfonso Otega (Ecohabitats)

Most greenhouse gas emissions from food come from agricultural production, but few large food companies disclose emissions from agriculture.

Other interesting publications

- Hajjar R, Newton P, Adshead A, Bogaerts M, Maguire-Rajpaul VA, Pinto LFG, McDermott CL, Milder JC, Wollenberg E, Agrawal A. 2019. Scaling up sustainability in commodity agriculture: Transferability of governance mechanisms across the coffee and cattle sectors in Brazil. Journal of Cleaner Production, 206:124-132. **https://doi.org/10.1016/j.jclepro.2018.09.102**
- Sapkota T, et al. 2019. Cost-effective opportunities for climate change mitigation in Indian agriculture. Science of the Total Environment. **https://doi.org/10.1016/j.scitotenv.2018.11.225**
- Teutscherova, Nikola, Vazquez, Eduardo, Arango, Jacobo, Arevalo, Ashly, Benito, Marta, & Pulleman, Mirjam (2018). Native arbuscular mycorrhizal fungi increase the abundance of ammonia-oxidizing bacteria, but suppress nitrous oxide emissions shortly after urea application. Geoderma, 1-9 p. **http://doi.org/10.1016/j.geoderma.2018.09.023**

International fellowship opportunities

2019 USDA Borlaug Fellowship

The United States Government is pleased to continue providing fellowship opportunities to GRA members through the US Department of Agriculture's (USDA) Borlaug International Agricultural Science and Technology Fellowship Program. The Borlaug Program promotes food security and economic growth by providing training and collaborative research opportunities for fellows from developing and middle-income countries. Fellows will work with a mentor at USDA's Agricultural Research Service or a US university for up to 12 weeks on resilient agricultural research. The US mentor will later visit the fellow's home institution to continue collaboration.

Targeted research areas for 2019 are:

1. Developing tools for GHG and carbon sequestration assessments
2. Reducing GHG emissions intensity in crop production systems
3. Reducing GHG emissions intensity in livestock production systems
4. Developing databases and strategies for synthesis, integration and decision support to manage GHG emissions and carbon sequestration in agricultural systems

Eligible countries: Colombia, Costa Rica, Egypt, Ghana, Honduras, Indonesia, Malaysia, Mexico, Nicaragua, Panama, Peru, Philippines, Thailand and Vietnam.

Applications for the 2019 program close on Monday 31 December 2018.

For more information, please see: **https://www.fas.usda.gov/newsroom/accepting-applications-2019-borlaug-global-research-alliance-fellowships**

LEARN Awards

LEARN is an awards scheme sponsored by the New Zealand Government to build international capability in livestock emissions research. It is part of New Zealand's support for the GRA.

LEARN is focused on:

- Supporting technical staff and scientists from developing countries and GRA member countries to work alongside New Zealand colleagues
- Sharing knowledge on livestock greenhouse gas emissions measurement, modeling and mitigation practices to increase the level of scientific skills and technological capabilities internationally.
- Supporting strategic research and capability building activities that align with the priorities of the GRA as well as relevant New Zealand science priorities.
- Advancing common research interests between countries and building enduring relationships.

There are currently two LEARN awards on offer:

- LEARN Technical Training Award
- Global Research Alliance Senior Scientist (GRASS) Award

These awards are assessed on a quarterly basis, following a two stage application process. The next two closing dates for full applications are 31 January 2019 and 30 April 2019. All applications must be developed in close collaboration with a New Zealand research institution. For more information, please see **www.livestockemissions.net**

Please note that applications for LEARN Co-funded PhD Scholarships and LEARN Postdoctoral Fellowships are not being taken at this time.

Upcoming events

11th Global Forum for Food and Agriculture: 'Agriculture goes digital – smart solutions for future farming

The Global Forum for Food and Agriculture (GFFA) is an international conference addressing key questions concerning the future of the global agri-food industry. It gives representatives from the worlds of politics, business, science and civil society an opportunity to share ideas and enhance understanding on a selected topic of current agricultural policy.

Date: 17-19 January 2019
Location: Berlin, Germany
Website: https://www.gffa-berlin.de/en/

Third meeting of the GRA's Integrative Research Group

The IRG will meet in 2019 immediately before the first annual meeting of the global soil carbon project, 'CIRCASA'. Both events are hosted by the International Center of Tropical Agriculture (CIAT) (see also next event).

Date: 4-6 February 2019
Location: Cali, Colombia
Contact: secretariat@globalresearchalliance.org

First annual meeting of CIRCASA

CIRCASA aims to strengthen the coordination of European and global research on soil organic carbon (SOC) sequestration in agricultural soils, and identify new synergies. It brings together the research community, governments, research agencies, international, national and regional institutions and private stakeholders in order to: (i) take stock of the current understanding of carbon sequestration in agricultural soils; (ii) identify stakeholders' knowledge needs; and (iii) foster the creation of new knowledge. The intent is that this will lead to an improved understanding and scientific basis to target ambitious practices required to preserve and enhance SOC.

Date: 6-8 February 2019
Location: Cali, Colombia
Website: https://www.circasa-project.eu/Home/News-and-events/CIRCASA-First-Annual-Meeting

Advanced course on 'Livestock and Climate Change: Assessment of emissions, mitigation options and adaptation strategies'

The GRA is contributing to an advanced course for professionals run by CIHEAM Zaragoza. The FAO, the International Center for Agricultural Research in the Dry Areas (ICARDA), the Red REMEDIA (science network for GHG mitigation in the agroforestry sector) and the 4 per 1000 initiative are also involved. Providing over 20 hours of in-class training and 14 hours of practical work and debate, this course offers a holistic view of the available tools to support informed decision-making.

Date: 11-15 February 2019
Location: Zaragoza, Spain
Website: http://www.iamz.ciheam.org/en/news_and_events/news/one?event=new-advanced-course-on-livestock-and-climate-change&id=96

8th International Symposium on Non-CO2 Greenhouse Gases

The NCGG8 conference brings together scientists, engineers, decision-makers and other stakeholders to support the development of technologies and policies aimed at decreasing the impact of non-CO2 greenhouse gases and indirect gases and aerosols. The scope of NCGG8 is global challenges and local solutions, paying particular attention to: (i) sources, sinks and atmospheric processes; (ii) mitigation options and emission reduction approaches; (iii) policies and measures; and (iv) science-policy-industry interface.

Date: 12-14 June 2019
Location: Amsterdam, Netherlands
Website: https://www.ncgg.info/

7th Greenhouse Gas and Animal Agriculture (GGAA) conference

The world's premier science conference on greenhouse gas emissions from animal agriculture will take place for the first time in Latin America, co-organised by Brazil, Argentina and Chile.

Date: 4-10 August 2019
Location: Foz do Iguaçu, Paraná, Brazil
Website: http://www.ggaa2019.org/

2019 GRA Livestock Research Group meeting

The LRG will hold its 2019 meeting in Brazil in the margins of the GGAA. More information will be provided in due course.

Date: 9-10 August 2019
Location: Foz do Iguaçu, Paraná, Brazil
Contact: secretariat@globalresearchalliance.org

70th Annual Meeting of the European Federation of Animal Science (EAAP)

The EAAP is an international organisation aiming to improve the knowledge and dissemination of research results of domestic animal farming.

Date: 26-30 August 2019
Location: Ghent, Belgium
Website: https://www.eaap2019.org/

Contacts

Co-chairs of the LRG:

Dr Sinéad Waters sinead.waters@teagasc.ie

Harry Clark harry.clark@nzagrc.org.nz

LRG co-chairs team:

Laura Kearney laura.kearney@nzagrc.org.nz

Sinead Leahy sinead.leahy@nzagrc.org.nz

Henk van der Mheen henk.vandermheen@wur.nl

For information or to provide an article for the newsletter, contact:

Laura Kearney laura.kearney@nzagrc.org.nz