

## Livestock Research Group Meeting

### Virtual Meeting

### 6-7 October 2021

## MEETING REPORT

1. The 13<sup>th</sup> annual meeting of the Livestock Research Group (LRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was held virtually for the second time, given the on-going travel complexity and restrictions imposed by the COVID-19 pandemic. The meeting took place over two days and was chaired by Harry Clark and Jon Tanner, New Zealand, Sinead Waters, Ireland, and Richard Dewhurst, United Kingdom (co-Chairs of the LRG).
2. This report is a summary of the key discussions and outcomes of the meeting. The online on-demand materials that were prepared in advance of the meeting are of high quality and will serve as an ongoing publicly available resource (<https://www.livestockresearchgroup.com/>).

## PARTICIPANTS

3. The meeting was attended by 92 participants, representing forty-three member countries of the GRA and four partner organisations. Refer to Appendix 1 for the full participants' list.
  - **Countries represented:** Argentina, Australia, Bangladesh, Brazil, Cameroon, Canada, Chile, Colombia, Costa Rica, Cote D'Ivoire, Denmark, Dominican Republic, Eswatini, France, Germany, Ghana, Ireland, Italy, Japan, Kenya, Lithuania, Malaysia, Mexico, Namibia, Netherlands, New Zealand, Nigeria, Norway, Panama, Poland, Senegal, South Africa, Spain, Switzerland, Thailand, Tunisia, Turkey, United Kingdom, United States of America, Uruguay, Viet Nam, Zambia and Zimbabwe.
  - **Partners represented:** Climate and Clean Air Coalition (CCAC), Agriculture and Food Security (CAFS), European Commission, United Nations Food and Agriculture Organization (FAO).

## MEETING OUTCOMES

4. The meeting provided an excellent opportunity to reflect on the activities of the past year and to discuss future directions and collaborative opportunities. The key outcomes from the meeting were to:
  - Work with LRG networks to refine and seek support for Flagship Project proposals.
  - Encourage LRG networks to organise webinars and workshops linking research, knowledge exchange (KE) and policy. Also, to think about activities that could affect behavioural change and KE.
  - Promote collaborative activity between LRG networks. Examples mentioned included FNN/MMN (linking CEDERS and DATAMAN/MELS) and RMG/FNN/ASGGN (microbial genomes underpinning work on additive mechanisms and methane proxies).
  - Encourage LRG networks to look for opportunities to involve LMICs more, including exploring new funding opportunities like the recent ERA-NET calls.

- Work with the GRA Council to publicise resources that we have available within LRG networks (e.g., CEDERS and DATAMAN/MELS databases) to policy makers and industry in particular.
- Work with the GRA Council to develop ‘country’ pages on GRA website (e.g., the case studies presented during the Annual Meeting would be good content).

## SUMMARY OF DISCUSSIONS FROM THE ON-DEMAND PRESENTATIONS

### [Full Session One recording here](#)

(Links starting at the relevant place in the recording are provided in the notes below.)

### WELCOME AND LRG CO-CHAIR UPDATE

5. The meeting was opened by Harry Clark (New Zealand), on behalf of the co-Chairs. Harry welcomed the participants to the meeting and noted that he had attended every LRG annual meeting since the first in Banff in 2010. In that time, he has seen the LRG grow from less than 30 member countries initially, to over 60 now. He noted that it was unfortunate not to be able to meet in person, but that the virtual meeting format allowed the group to be more inclusive. The protocols for the meeting were discussed and interaction via the technology was encouraged.
6. Harry indicated that this would be his last meeting as co-Chair. Jon Tanner will be taking his place for New Zealand following this meeting.
7. Sinead Waters (co-Chair, Ireland) provided a [high-level update on the LRG on behalf of the co-Chairs](#) over the past 12 months.
  - Networks: The five LRG networks are the engine of the group and have successfully used webinars and conference calls to function over the past year. The recent activities and achievements of the networks were highlighted (and are detailed in the on-demand network presentations which are summarised below).
  - Flagship projects: The co-Chairs are hoping to develop more of these. An EOI was sent out to all Group members and during September two projects were shortlisted for further discussion at this meeting.
  - A number of papers and targeted science reviews and reports have been produced.
  - The Group continues to take advantage of opportunities to work collaboratively across organisations to avoid duplication. E.g., World Bank webinar in October 2020, factsheets with CCAFS, AgMRV.
  - The LRG presented to the GRA Council in March 2021.
  - Next meeting of the LRG planned to be alongside the GGAA 2022 conference in Florida, USA.
8. Discussion following Sinead’s presentation covered:
  - A discussion about whether the LRG was planning to contribute to countries net zero roadmaps. It was noted that, as a voluntary organisation, where LRG members are asked to get involved, and have the resources, help will be provided. There is currently work going on to help some countries improve their inventories and build capability to support their NDCs. In particular, in African and ASEAN countries. This has been funded by individual countries under the GRA banner.
  - A question about how to promote work that’s being done in LMIC countries. It was stated that GRA meetings and communications can help to raise the profile of this work. The LRG’s membership has grown over time and become more inclusive outside of the developed countries. However, it would be good to have more LMICs more actively involved.

## GRA Special Representative Update

9. The GRA Special Representative, Hayden Montgomery, provided an update to the Group on GRA activities since the last LRG meeting.
  - GRA membership continues to grow, with 65 countries now officially part of the Alliance and Cuba the most recent addition.
  - The capability of the GRA Secretariat has expanded over the past year with additional staff based in New Zealand, Europe and Africa.
  - An updated Strategic Plan (2021-25) was adopted at the GRA Council Meeting in March 2021, accompanied by an operational plan to be updated annually.
  - The Secretariat has been involved in a number of research calls. E.g., ERA-NET Cofund, EJP Soils and has continued to develop the relationship with FONTAGRO.
  - Connected into the CGIAR reform process, with new initiatives (which are aligned with GRA goals) expected to be up and running in early 2022.
  - Supporting the global dairy sector by undertaking a review of mitigation options and modelling scenarios out to 2050.
  - GRA identified as a priority initiative in the [Global Action Agenda](#) for COP26. Plus, a Knowledge Partner supporting the [Agriculture Innovation Mission for Climate](#) (AIM for Climate / AIM4C). It was noted that “Innovation” in this context can be interpreted quite widely. The goal is to increase investment in climate-smart agriculture and food systems related R&D.
10. Hayden reminded the Group that each Member country has a page on the GRA website that can be populated with relevant information. The Secretariat is happy to provide support to enable webpages to be updated.
11. It was noted that the relevance of the GRA continues to grow and that “the time has come for this network”. Relationships have been built up over a decade in some cases now. There is an increasing focus on agriculture and significant interest from governments globally. Plus, initiatives to reduce methane are being set up. The GRA is well positioned to engage with these and demonstrating key outputs to date should hopefully help to attract future funding.

## **CAPABILITY BUILDING AND PARTNER UPDATES**

12. Two capability building initiatives provided on-demand presentations to update the Group on recent developments.

### CLIFF-GRADS Programme – Charles Spillane

- Background to programme outlined. Originated from Climate Food and Farming (CLIFF) programme started in 2011 by CCAFS and since 2017 it has been a joint initiative between GRA and CCAFS. Funding provided by the New Zealand government and CGIAR Trust Fund (via CCAFS). Builds capability of early career scientists from developing countries and has a mitigation focus. Provides mobility funding for short research stays of up to 6 months in host institutions of GRA Members and Partners.
- Flagship for GRA capacity building with a goal of fostering a network of young professionals. Four rounds of awards to date, with year on year increases in numbers of students, countries and host institutions involved. 124 students involved to date from 32 countries.
- Range of additional activities provided for awardees including a webinar series where fellows can present their research to their peers and the alumni network. Plus, a buddy system to provide cultural and academic support. The fellowships provide more than an academic and research experience. Examples of testimonies can be found on the [CLIFF-GRADS website](#).

- Programme is run by a global team across the GRA. Further info can be found on the website or by emailing [cliffgrads@globalresearchalliance.org](mailto:cliffgrads@globalresearchalliance.org).

#### **RUFORUM Update - Anthony Egeru**

- RUFORUM is the Regional Universities Forum for Capacity Building in Agriculture in Africa. A network of 129 universities from 38 African countries. Started in 1992, founded by the Rockefeller Foundation, initially a consortium of 10 universities from 5 countries.
- Currently implementing its Vision 2030, underpinned by 4 flagship programmes. One of the flagships (TAGDEV) is about attracting young people into agricultural education. Funded by Mastercard Foundation.
- Goals to build human capital development and capacities for Africa by enhancing the educational value chain. Work at all levels, from school through to post-doctoral training.
- Focus on integrative and collaborative research, covering (i) Agricultural Productivity, (ii) Developing R&D Ecosystems, (iii) Environmental Sustainability and (iv) Value Addition, Agribusiness and Market Integration.
- Further information on [website](#), [blog](#) and [twitter](#).

13. Three partners of the LRG provided on-demand presentations to showcase their LRG-related portfolios and discuss updates, future priorities and new opportunities for collaboration.

#### **CCAFS - Ciriaco Costa Jr and Lini Wollenberg**

- Update on the CGIAR Research Program on Climate Change, Agriculture and Food Security ([CCAFS](#)). Global program that has been working across centres in 5 regions from 2010-21. Livestock and mitigation research has been done in 8+ countries, with core projects in China, East Africa and Colombia.
- CCAFS has developed and made available a range of resources, programs and new research. Have worked with the GRA on some of these (e.g., AgMRV website, CLIFF-GRADS, feed additives guidance).
- At a country-level, have current projects in China, Indonesia and Asia, E Africa, Colombia, Brazil and LATAM. These will be winding up during 2021 when CCAFS comes to an end.
- Over past 10 years, CCAFS has generated a wide range of livestock-related outputs, outcomes and impacts.
- When CCAFS wraps up, current projects will be handed over to CGIAR colleagues and new livestock initiatives are being designed under the new 'One CGIAR' banner, including:
  - Livestock Climate and System Resilience Initiative
  - Transforming food systems from net carbon sources to sinks
  - Agroecological Transitions – Digital Tools

#### **CCAC – Catalina Etcheverry**

- Update from the Climate & Clean Air Coalition ([CCAC](#)) secretariat covering their recently endorsed engagement strategy for the agriculture sector. CCAC now has 73 national governments and 100 stakeholders involved. When countries/organisations join they are committing to take action to reduce short-lived climate pollutants, including methane and black carbon from the agricultural sector.
- Main goals for agriculture:
  - By 2030, all CCAC partners take action to ensure that agricultural short-lived climate pollutants are fully considered in national climate policy plans, and that some have taken actions to contribute to a 20-25% methane reduction.

- By 2030, seek commitment and implementation plans from top 10 agricultural burning nations to eliminate unnecessary agricultural burning.
- Key actions:
  - Foster enabling frameworks, by raising political awareness, promoting peer to peer exchange of best practices and linking policy makers to tools, data and modelling related to agricultural emissions.
    - Advancing state-of-the-art manure management at large feedstock.
    - Curb agricultural burning.
    - Reduce rice paddy flooding.
  - Forge cross-linkages to net-zero climate mitigation strategies.
  - Advance market readiness of products to reduce enteric methane and promote emissions intensity.
  - Further info and Catalina's contact details [here](#).

### **[FAO](#) – Timothy Robinson**

- Update from Food and Agriculture Organisation of the United Nations ([FAO](#)) with respect to its collaboration with the GRA LRG.
- FAO has a new strategic framework (2022-31) with four objectives – Better Life, Better Nutrition, Better Production and Better Environment. The work on livestock and climate action feeds into all four of these, but mainly Better Environment.
- There is a [FAO strategy on climate change](#). Work falls under 4 main areas and includes the Global Livestock Environment Assessment Model (GLEAM) and Livestock Environmental Assessment and Performance (LEAP) Partnership.
- On-going collaboration with GRA has included:
  - Reducing Enteric Methane for improving food security and livelihoods in collaboration with CCAC and NZAGRC (13 countries)
  - Support to NDC implementation and GHG inventory – Indonesia, Kenya, Costa Rica
  - Support in development of country-based tools
  - Development of county-specific emission factors
  - Development of e-learning materials on livestock and climate change
    - As part of a CCAC project, to help with capacity development, creating a blended e-learning course covering a range of topics
- Further info about [GLEAM](#). GLEAM 4 is currently under development.
- Priority areas for collaboration with the GRA LRG are:
  - Pathways to Dairy Net Zero project
  - GLEAM 4 development and implementation

14. The LRG partners and Charles Spillane from the CLIFF-GRADS programme also participated in a [live session](#) during Day One, highlighting the key messages from their recorded presentations. Additional points that arose in the discussion included:

- CLIFF-GRADS is not looking to modify their current programme to provide longer term fellowships. However, the Secretariat is exploring existing scholarships that align with the GRA. (1) To see if these can be made more visible and (2) to see if it's possible to engage/work with other fellowship programmes.
- The CCAC is collaborating to help countries to reduce their methane and had a recent call for proposals. Short listed project from Panama. Usually work with Ministries for the Environment and can provide \$20K for expert assistance to help with livestock emission plans.

15. The session concluded by the Chair noting that there are plenty of opportunities to collaborate available. The GRA has a role in ensuring that clear information is available to those that might want to get involved.

## RESEARCH NETWORK UPDATES

16. The LRG has five science networks, focused on strengthening collaboration in the main areas of livestock GHG research. The coordinators of these Networks provided on-demand presentations on the Network activities since the 2020 LRG meeting and answered questions from participants during the live plenary session of Day One.

### [Animal Health and Greenhouse Gas Emissions Intensity Network \(AHN\)](#) – Dirk von Soosten

- The aim of the Network is to bring together researchers from various fields to identify links and synergies between the control of animal diseases and the reduction of GHG emission intensity. Further information about the Network can be found on the [GRA website](#).
- Recent activities include:
  - A webinar in June 2021 with 3 presentations and 32 participants. Topics included:
    - Global burden of Animal Diseases and how this relates to GHGs and the environment.
    - Challenges, opportunities and alternative methods for studies linking animal health and GHG emissions.
    - Modelling animal health and GHG emissions using GLEAM.
    - A group discussion was held at the end of the webinar.
- Dirk announced that he had been coordinating the AHN for almost 4 years and that it was time to pass the role on. He noted that he had learnt a lot from this role and believes the work of the GRA to be very important. Dirk introduced Nick Wheelhouse from Edinburgh Napier University as the new coordinator, with Seyda Özkan from FAO as a potential co-lead.

### [Manure Management Network \(MMN\)](#) – Tony Van Der Weerden

- The scope of network covers 4 key areas of interest:
  - Development of standardised measurement and modelling approaches across the global scientific community.
  - Quantify and identify mitigation options for GHG (N<sub>2</sub>O, CH<sub>4</sub> and NH<sub>3</sub>) emissions from the 'extended' manure management chain.
  - Identify and address trade-offs and co-benefits of GHG mitigation, e.g. on nitrate leaching, crop available N (N balance) and P losses to water.
  - Promote sustainable manure management practices to improve nutrient utilisation and soil organic matter content and reduce environmental losses.
- Recent activities include:
  - A webinar in Feb 2021 which introduced the DATAMAN and MELS (Mitigation Emissions from Livestock Systems) projects. This can be viewed on the [GRA website](#).
- Examples of recent and current research activities:
  - DATAMAN (N-flagship project) – ends 30 Sept 2021
    - Aim: To provide access to the most up-to-date knowledge on GHG emissions from manure management.
    - Outcomes: (i) Publicly accessible database (access [here](#)); (ii) Revised NH<sub>3</sub> and N<sub>2</sub>O emission factors; and (iii) Guidelines for improving inventories (access [here](#)).
  - MELS – focus on Housing and Storage systems – continues to Dec 2022
    - Extension of DATAMAN project.
    - Data expected to be released publicly in next few months. Currently being analysed to generate revised emission factors and investigate relationships

between emissions and key variables. Also assessing current decision support systems, developing a new open-access DSS and conducting a cost/benefit analysis.

- Abating Ammonia in Agriculture (Triple-A): Slurry storage and landspreading research – Ireland, 2 year project
  - Objectives: (i) Quantify ammonia emissions and abatement from LESS (low emission slurry spreading) and slurry amendments; (ii) Model current and predicted ammonia emissions and concentrations in Ireland; and (iii) Identify barriers to uptake of abatement measures.
  - Two main research components, plot and field scale work.
- Many other research activities underway across the globe, ranging from refinement of national inventories, investigating mitigation technologies, improving nutrient use efficiency, and assisting with policy development.

### **Rumen Microbial Genomics (RMG) Network – Sharon Huws**

- The RMG Network started in 2011 as an initiative of the LRG and has its ten-year anniversary this year. The key purpose is to get people together to collaborate on this global issue, to be stronger together, and to enhance communication of what the scientists in the network are doing to reduce climate change. Together we can attract more funding, be more integrated and more international – and have more impact on GHGs. There is a big element of training with exchanges of students, technicians and staff. The CLIFF-GRADS programme has been excellent in assisting with this.
- There has been one RMG meeting per year since 2011. The 10<sup>th</sup> meeting is coming up later this month aligned with the INRAE-RRR Gut Microbiology virtual conference. The RMG meeting is on the last afternoon of the conference and anyone who has registered for the conference will get an invite. A lot of early career researchers will be presenting their work.
- The RMG network has conducted some very successful collaborative projects over the years. In particular, the [Global Rumen Census](#) and [Hungate1000](#) projects. These important projects set the foundations for further collaborations being funded including: EU ERA-NET Gas Cofund [RumenPredict](#) which is coming to an end shortly, and the follow on [EU Horizon 2020 MASTER](#) project, which has 2 years left. Recently have won further EU Horizons funding for Holoruminant, which is being led by INRAE and will start in October 2021.
- The RMG wrote a [review article](#) in 2018. There have been numerous review articles since which have further helped our understanding of this area. Is it time for an update, or not quite yet?
- A book titled '[Improving rumen function](#)' was published in 2020. Edited by Chris McSweeney and Rod Mackie.
- Sharon is Editor-In-Chief of the journal 'Animal Microbiome', which was launched in 2019. Many members of the network are also editors. This provides a good place to publish work. Able to commission articles (at no charge) if any network members are interested in this opportunity.
- Currently:
  - >200 scientists registered as part of the RMG.
    - As some scientists move on, it would be good to assess this list at some point soon.
  - Well attended workshops (>80 people per meeting) with very good feedback.
  - Social media has been very good recently, especially Twitter.
    - Unfortunately, the person who has been helping has stepped down, so looking for an early-stage researcher who may be interested in assisting with running the [RMG Twitter account](#).
  - Communication by email has improved, as Sharon was able to employ someone to assist.

- This person has recently moved on, so Sharon will be doing her best to maintain communications.
- Further vision:
  - Have been successful to date in securing EU funding, but need to be more active in bringing in funding to allow more active involvement from LMIC countries, PhD students and early-stage post-docs. The workshops are focussed on bringing in these younger researchers and assisting with their career progression and growing their networks.
  - Also need to develop global flagship projects, to ensure that the LMIC countries can participate.

### **Feed and Nutrition Network (FNN) – André Bannink**

- FNN Mission: A global network for collaboration and cooperation on research and mitigating livestock related GHG emissions.
  - Interact with international institutions and platforms.
  - Main focus has been on ruminants and enteric methane. More recently, also working on excreta and N emissions.
  - Links to MMN and RMG networks.
- Membership tends to overlap with the density and intensity of GHG emissions from ruminant livestock across the globe. Most main regions are covered, but still have gaps in Africa, the Middle East and Eastern Europe.
- Activities:
  - Reviews on methodological aspects.
    - 2016 – 2019, reports / papers on (i) in vitro and (ii) in vivo measurement methodologies, (iii) uncertainties in enteric methane inventories, measurement techniques and prediction models and (iv) nitrogen measurement methodologies. Current plans for a paper on the effectiveness and role for feed additives to mitigate methane.
  - Joining forces to conduct research.
    - 2 successful projects to date (i) FACCE-JPI Global Network (2014-19) and (ii) ERAGAS CEDERS (2016-21).
    - 2021 Submissions to Joint ERANET Cofund.
    - Activities initiated by FNN members without joint funding e.g. (i) assembling database on cow CO<sub>2</sub> production to evaluate CO<sub>2</sub> production equations and (ii) a meta-analysis of data on nitrogen excretion from dairy cows.
    - NZAGRC-funded Flagships on enteric methane (Latin-America - 2019-21, SE Asia - ongoing).
  - Recommend mitigation options / accounting and inventory.
  - Discuss / share ideas and views in discussions at international level.
  - Organising workshops on a regular basis.
- Future plans include:
  - Extending FNN membership.
  - Picking up new relevant topics e.g. methane mitigating feed additives
  - Presenting results from Global Network, CEDERS and Flagships in FNN webinar in October 2021 and during workshop at GGAA 2022.

### **Animal Selection and Genomics Network (ASSGN) - Suzanne Rowe**

- Forum for scientists exploring the impact of genetic technologies for managing livestock GHG emissions. Focus is on breeding for low methane, plus involved in feed intake / feed efficiency.
- Goals:
  - Identification of new collaborations and connections.



- Defining traits and breeding objectives.
- Establishing the heritability of methane emissions and its genetic associations with other performance traits.
- Sharing data, methods and protocols for prediction.
- Strong global community of well over 150 members. Important in this area where we need big numbers and good collaboration.
- Communicate via [website](#), with a very strong focus on in-person workshops. Not possible this year, an online discussion forum was held instead in June 2021. 3 hr session, 11 talks, single session across the globe. Well attended. Lots of discussion. [Video here](#). Focus on proxies for enteric methane emissions of ruminants which covered:
  - Alternative technologies: PAC, Sniffer, LMD, SF6, Greenfeed.
  - Indirect productivity data: Milk or meat yield / comparison.
  - Direct productivity data: Feed intake, liveweight.
  - Physiological indicators: Rumen, blood, urine, faeces.
- Planning a review article based on the 2021 forum.
- Website was a challenge when organising / promoting the forum, so have been working to improve this.
- Currently organising a session at the [World Congress on Genetics Applied to Livestock Production](#) (Rotterdam, July 2022). Aiming to meet in person at this.

17. Sinead Waters chaired the [Research Networks Update Q&A session](#). The discussion covered:

- Sampling protocols for methane proxies. These aren't currently available. There are some IP implications in different countries, but need to come up with a way to share better. An international dataset for methane proxies will be important, plus validation datasets.
- Collaborating in Africa and whether there are any barriers to doing more. Likely to be due to people and/or financial limitations currently, but the GRA is coming up with ways to work around these.
- Webinars have been successful over the past year. As we work on climate change its good not to have to travel. Great to see more involvement of LMIC countries. One of the few positives on the pandemic.
- Some challenges with the Animal Health Network as its very small (about 20 active people). The webinar went well and attracted some new interested people. Would be good to promote the network more widely. New contacts are important, each person that joins has new contacts and helps the network to grow. The topic is very important, needs to be emphasised more. A website could be helpful. Has been for ASGGN. Plus funding is always useful.
- MMN – need to see manure as a nutrient source, not a waste source. DATAMAN is being continued via MELS (which ends next year). MELS lends itself to more developed systems (with facilities that have a roof). Want to see how to increase reach to LMIC countries. Circularity call has been successful – so this will allow things to continue.
- FNN – also successful in circularity call (announced overnight).
- Sharing information via a website (ASGGN) has been a key way for new members outside of the group to make a connection. Tend to use existing animal breeding networks to keep connected. Mailing list is important to bring people in. Twitter is good to get new information out quickly. RMG also has a twitter account and is looking for someone who would like to help with this.

## LRG FLAGSHIP PROJECT IDEAS

18. Richard Dewhurst chaired the Flagship Project Ideas session, which he began with a short, pre-recorded overview presentation.
- In 2018, the GRA Council considered Flagship Projects and identified the criteria that they should fulfil. Key criteria include that the project idea should:
    - Be time bound;
    - Be relevant to multiple GRA member countries and benefit from GRA-wide collaboration;
    - Provide an opportunity for multi-country participation at low individual cost; and
    - Lend themselves to being developed and implemented through Research Groups or Networks.
  - A good example of a previous project is the [Global Rumen Census](#), which was sponsored by the New Zealand government. This looked at rumen microbiome samples from 34 countries and involved 140 scientists from 73 organisations. There were global benefits and no one country could have delivered this project alone.
  - In advance of this meeting, the LRG co-Chairs issued a call for ideas for new potential flagship projects. Eight proposals were received. Not all of the proposals met the key criteria for a GRA Flagship Project, with the main issues being global relevance and low entry costs for developing countries. This doesn't preclude these projects being suitable for pursuing via alternative avenues as projects of the LRG. Two proposals were selected for discussion at this meeting and Richard presented an overview of these.

### **Proposal 1 from the Feed and Nutrition Network:**

- Lead proposer – André Bannink (Wageningen University)
- Title – “Collaboration on the evaluation of efficacy and potential of enteric methane mitigation feed additives across a wide range of regions and production systems”
- Proposal to evaluate nutritional interventions with feed additives in terms of efficacy, trade-offs/synergies and cost-effectiveness across geographical locations and types of livestock operations.
- Work limited to well-established and well-documented additives.
- Plan to start at GGAA 2022 and run for 2 years.
- Funding required for post-doc fellowship including costs for publishing, travelling and attending meetings.

### **Proposal 2 from Rumen Microbial Genomics Network:**

- Lead proposer – Sharon Huws (Queens University Belfast)
- Title – “Hungate Collection: The Second Coming”
- Aims are to isolate, phenotype and genotype novel rumen bacteria from cultures or samples sent from as many GRA member countries as possible.
- Lots of potential for student exchanges and training.
- Could start ASAP and run for 3 years.
- Funding required for post-doc fellowship. The costs of culturing and initial sequencing could be met from existing funds.

19. Following the pre-recorded presentation, André and Sharon were given the opportunity to provide further information, and answer questions, about their proposals.

### **Proposal 1: Evaluation of feed additives for methane mitigation**

- André highlighted that there has been a lot of positive information about additives in the past five years, but there are still lots of questions including:

- Efficacy and impact on animals and manure production?
- Effectiveness in regions and systems that are outside of those where the testing has been done?
- Limitations on usage?
- Standard testing methodologies?
- Accreditation?
- Accounting for additive use in different regions and systems?
- This proposal does not include any new experimental work or a meta-analysis. Evaluation of methodologies and modes of action planned. Plus networking activities. The intended outputs are papers, methodological reports and increased links to other networks.
- For feed additives with unknown modes of action, could indicate further information that's required prior to usage.
- As some feed additive data is commercially funded, it may be difficult to access this. The team can approach companies, but may have to rely on well documented trials and peer reviewed publications.
- An output could be recommendations for policy makers on how to account for additive use at a farm and national level (qualitatively rather than quantitatively).
- Range of feed additives, and whether to include concentrated plant extracts, diverse species swards, etc, not confirmed yet.

### **Proposal 2 – “Hungate Collection: The Second Coming”**

- Sharon indicated that there has been an explosion in “culturomics” research for human gut health, but not for the rumen yet. The Hungate project provided a step-change for the scientific community and is a major resource. However, many bacterial families are missing in the current culture collection which is hampering progress and innovation.
  - The [CowPi](#) tool has been developed to allow functional predictions to be made from 16S rRNA samples from the rumen microbiome. The proposed project would help to enhance the culture collection and allow further development of CowPi to improve its impact.
  - Work has already started on extending the culture collection and culturing “unculturable” samples in Sharon’s Belfast lab. The plan for this Flagship would be to have a main hub in Belfast, building on existing funding, with co-hubs in AAFC Canada, Agrosavia Columbia, WUR Netherland and possibly AgResearch in NZ. The project would welcome more co-hubs, but these countries have already indicated a willingness to put their own funding in to support the project. If countries don’t have the infrastructure to process their own samples, they could be sent to the closest hub.
  - The aim is to work in similar way to the previous Global Rumen Census and Hungate projects, where people submitting samples were also co-authors on the publications generated.
  - The project is a great opportunity for CLIFF-GRADS and to help to train the next generation of rumen microbiologists. Sharon already has a student coming to Belfast next month who will be focussing on this.
  - There is already funding available to do the sequencing etc. However, funding is required for a post-doc (from an LMIC if possible) to manage the project and collate the data. It is envisaged that Year 1 would be involve getting samples, culturing and initial identification. Leading on to phenotyping, sequencing and developing CowPi in Year 2.
  - The data generated would allow expansion past 16S and help other metagenomic tools. Without enough baseline data, can struggle to identify how a feed or additive is working.
20. Following the discussion, the Member country representatives present were asked to vote on whether each of the two proposals were suitable to be taken forward as Flagships for the LRG. The results were:
- Proposal 1 – Yes: 95% No: 5%
  - Proposal 2 – Yes: 95% No: 4%

21. A brief wrap-up of Day 1 was then provided, and attendees were thanked for their participation and engagement.

## WELCOME TO DAY 2

### [Full Session Two recording here](#)

(Links starting at the relevant place in the recording are provided in the notes below.)

22. Sinead Waters welcomed participants back to the second day of the meeting with a brief overview of day one. She noted that the vote on the two Flagship Project ideas presented had indicated >95% approval from members and that the Co-Chairs will continue to work with the networks to progress these proposals.

## PUTTING RESEARCH INTO PRACTICE

23. Three on-demand presentations were provided to promote discussion about the need to ensure that GRA research is put into practice. The first to set the scene, followed by two case studies.

### [How are we working towards putting research into practice?](#) - Harry Clark

- Harry opened with a challenge. After a decade of the LRG, how much of a difference have we really made? The aims of the GRA are to find ways to grow more food, while reducing emissions. However, when we look globally, emissions from livestock are going up. Is this due to the fact that emissions per animal have gone down, but an increase in animal numbers has overtaken this? Or are technologies not being implemented on-farm? If not, do we need to consider changing what we do?
- There are lots of scientific papers which say there is significant potential to reduce agricultural GHGs, but is this happening in practice? As scientists, are we at a stage where we can tell farmers what to do to reduce their GHGs? If not, are we too far down the pipeline at the discovery end and not near enough to the practice end?
- As an example, in New Zealand, there has been interest in condensed tannins for years. There has been lots of research, but it has been hard to find a plant which has the right agronomic properties to be integrated into NZ farming systems. Are we thinking about practical aspects of our research enough?
- It wasn't easy to find examples of research being put into practice for this session. When thinking about where to focus for the next decade, we need to ensure that we don't just work on research which shows great potential, but then that potential isn't able to be realised in practice. We need to provide solutions that farmers and policy makers can take up. Plus, make sure that the work that we're prioritising in the LRG is contributing to the overall aims of the GRA.

### [Case Study: Mitigation in practice \(Latin America\)](#) - Marta Alfaro

- Marta presented a project which involved Chile, Argentina, Bolivia and Costa Rica and aimed to increase agricultural yield and persistence to increase profitability. Barriers to adoption of the strategies were investigated and cost/benefit analysis was conducted.
- The study included a range of areas prone to drought and flooding, some semi-arid or humid, and some where the climate is predicted to change in the future.
- Site specific strategies were identified with different species / mixes and the team were successful at increasing agricultural yield, decreasing N fertiliser use, increasing animal

production and reducing GHGs. The time to recover capital costs for the range of strategies was calculated to be 1-4 years.

- The barriers to adoption identified included a lack of (i) technical capabilities, (ii) local validation and (ii) information about cost implications.
- The project has generated a wide range of scientific, extension and dissemination outputs, including 26 field days/seminars with 706 participants. Plus, has contributed to the national strategies of the countries involved.
- The study has highlighted the value of local validation and cost-benefit information in promoting adoption. Livestock systems from different environments face similar challenges. There are opportunities for integrated and coordinated efforts.

#### **Case Study: The Signpost Programme (Ireland) - Tom O'Dwyer**

- Tom presented an overview of the [Signpost Programme](#) which was launched in Ireland in November 2020 with the aim of supporting Irish farmers to take climate action.
  - Putting science into action takes time and enabling behaviour change isn't easy, especially related to climate change. Farming activities generate GHGs, but alongside this farmers are "custodians of the land". There is a need to transform how we farm while continuing to produce food. Plus, a need to put research into practice at pace and scale.
  - Knowledge brokers are key and create a bridge between research findings and users. The Signpost team are providing a knowledge broker role.
  - The Teagasc Greenhouse Gas [Marginal Abatement Cost Curve](#) (GHG MACC) for Irish Agriculture is the "toolbox" of the programme. 14 practices for reducing GHGs were analysed, including a cost evaluation. A campaign was required to share the knowledge generated by producing the MACC and put it into action.
  - Two main elements to the programme, (1) a network of 100 demonstration farmers, and (2) an advisory campaign.
  - About 50 partners involved including all of the main meat and dairy producers, government agencies etc. There is a multi-actor, co-design approach. The project is working with individual farmers to come up with solutions for their farms. The farms can then showcase the science-based technologies which are reducing their emissions and act as hubs for the advisory campaign. A network has also been set up to measure carbon sequestration.
  - There is a comprehensive plan with the signpost farmers at its centre. These farmers have a major role to play in (1) application of scientific findings and new technologies, and (2) spreading of best practices and innovative farming approaches. The goal is to spread the messages to all farmers.
  - Tom presented a case study from some farmers that have been a demonstration farm since 2018 and have made several on-farm changes. He ended by reminding the attendees that for farmers – seeing is believing.
24. The pre-recorded presentations were followed by a panel Q&A session. The topics discussed included:
- Further details about the multi-country study in Latin America, including the level of uptake of the diets, the range of GHG reductions achieved and which countries have agricultural targets in their NDCs.
  - Details about how often the MACC is updated to reflect economic changes, what measurements are taken on Signpost farms and the key skills required by farm advisors.
  - Whether incentives are being used in the Signpost programme.
    - Historically financial incentives have been used to encourage farmers to join knowledge transfer groups. Research has shown that these farmers are more likely to adopt technologies and have more profitable farms.
    - There is an EU trend to reward farmers for results (results-based payments). Based on what they do, developing buffer zones, etc, the farmers can get financial payments.

- How the Signpost programme could be implemented elsewhere, in particular in LMIC countries.
  - The programme was launched last November but was built on about 25 years of this type of programme between Teagasc and partner organisations. There are strong relationships involved and it would be hard to go from zero straight to this type of programme. There was also a broad consensus of a need for action in this area from all of the partners and they are keen to work together. Availability of funding is important. There is industry funding involved this programme. Additionally, which may be a plus point, Teagasc has 3 parts to it which span research to practice, so can carry out knowledge transfer process within one organisation.
  - Largely true that the farmers trust the researchers in Ireland. For farmers that don't, the aim is to engage with them. Invite them to see trials, try to get them involved, help them to address one of their on-farm problems to build trust.
- Other examples of how GHG research is being put into practice, including better emission factors and improved inventories.
- The need to ensure that absolute emissions from agriculture start decreasing.
  - Whilst reducing emissions intensity is ok in LMIC, more developed countries need to reduce their absolute emissions. Are farmers getting the right signals from policy makers that it's worth doing this?
  - The Signpost farms currently have an emissions intensity reduction target. The overall programme has the government target of reducing absolute emissions by 15%. Teagasc has good relationship with policy makers in Ireland.
  - Does the LRG need more work focused on the sort of policy that is required to ensure that solutions are taken up?
  - Are we making any efforts for countries to have agricultural targets / policies? Looked a while ago. Some with targets, but lots don't have policies to get there. Could we do something here?
- Understanding what drives farmers decisions is important. Practices which look to be profitable aren't always adopted for various reasons.

## FUTURE OPPORTUNITIES

25. Five on-demand presentations were provided to outline forward looking perspectives on opportunities for collaboration. The session was chaired by Richard Dewhurst.

### New capability building opportunities – Peter Ettema

- The current range of capability building activities range from global networks, regionally and country-specific data (moving from Tier 1 to 2), to individuals (training/exchange, e.g. CLIFF-GRADS). The question is whether these lead to GHG reductions? A key driver of reducing emissions is enabling behaviour change. Does sharing knowledge on its own support policy development and change?
- The GRA shouldn't stop what it's doing, but there is a need to build on existing activities. Mitigation options need to be locally relevant and emphasise co-benefits. Building farmer-farmer and science-farmer networks is important.
- GRA networks need to be well connected and link to inventory compilers, researchers, policy and extension agents. Tier 2 GHG inventories are required, and changes need to be reflected in these.
- There is an opportunity to think about bring more applied science, social science and indigenous knowledge into the GRA networks and projects.

26. The network co-Chairs were given the brief to think about future research collaboration opportunities. Four short on-demand presentations were provided.

#### **New Research Collaboration Opportunities: FNN – André Bannink**

- To date, FNN collaborations have been carried out in an in-kind fashion. This means that it can often be challenging to fit in alongside other commitments.
- Opportunities for funding collaborative projects are most likely to come from international public funds. There isn't much country level or private funding available. Joint programming has been the most feasible to date and scholarships for visiting scientists can also work. However, need to ensure that goals of funding and GRA project/collaborators are aligned.

#### **New Research Collaboration Opportunities: ASSGN – Susanne Rowe**

- The ASSGN is interested in facilitating collaboration to enable large data to be collected from across the globe to help breeding. Generally, hold workshops and feed into ICAR with protocols and practical knowledge.
- To get involved register at the [website](#), attend a meeting or join a forum
- Going forwards, the plan is to remain practically focussed and share knowledge and protocols. Would be good to set up a regular meeting at a major meeting – e.g., EAAP, WCGALP – so that researchers know where the network is going to be every year and can plan accordingly.
- Publications and comms wise, there is a global review on proxies planned for early 2022, a repository of SOPs would be a great idea, online field days, looking for global validation, international review, etc.

#### **New Research Collaboration Opportunities: MMN – Tony van der Weerden**

- Reducing livestock GHG emissions through diet manipulation and manure management. This would involve linking with FNN and aligning the CEDERS and DATAMAN databases. This would provide opportunities to design farm practices that increase nutrient use efficiency and reduce GHGs.
- New/updated experimental protocols. Similar to paper on N<sub>2</sub>O chamber methodology guidelines. A few options for this.
- Develop a list of variables for minimum reporting of GHG emission and metadata
- Ensure current information is available to researcher/policy advisors via MMN website.

#### **New Research Collaboration Opportunities: RMG – Sharon Huws**

- 'Culturomics' - building on the Hungate Collection. Less challenging now to culture underrepresented microbes. Timing is good to fill in the gaps.
- This could be used to generate novel strategies to improve production and reduce GHGS. Improve understanding of rumen function. Biotechnological resource.
- Opportunities for this involve building on existing funding, setting up a GRA flagship, EU Cost Action, etc. Bigger project allows more LMIC countries to get involved.
- Open to other opportunities.

27. The pre-recorded presentations were followed by a [panel Q&A session](#) involving the presenters and LRG co-Chairs. The topics discussed included:

- What could GRA do differently to deliver to some of the challenges of putting research into practice?
  - There is a desire to share knowledge across networks and through to the farm gate. Not easy to do, but we need to be reaching out to policy people and extension colleagues to explain what the GRA is doing. Need the whole system working together.

- What role could the GRA take in a more systemic way? Voluntary organisation, so not everyone has time to reach out to people. However, there could be specific things that we could do. E.g., have a process for developing case studies etc built into the GRA workplan. Case studies would show practicalities of research. Still just knowledge though, need tools to share the messages.
- The GRA is well placed to work across disciplines and policy makers.
- The knowledge broker role is an important one. Seems to be a feeling that some researchers should be doing extension as their part time job. However, it's a specialist role.
- Opportunities to focus on younger farmers as they may be more open to change. Even going down to the school level. Farmers today have a lot more things to think about. Understanding what drives their decisions is important.
- Should we be evaluating whether the technologies that we are working on will be acceptable to consumers? E.g., feed additives could mean potential issues for animals and consumers. Food safety / ethics need to be considered, but also LCA and the whole system – costs, benefits etc. Difficult for scientists to assess what consumers will choose. But need to provide objective information. In US, consumers are driving change in the agricultural sector.
- There is growing interest from global dairy companies etc in our research. How do we best engage? Some LRG members have been working with the global dairy platform. These groups are looking for the best science. Should we invite them into network meetings etc? Seem to be wanting to work non-competitively.
- Do we need to move from discrete interventions to implantation at scale? Should we be promoting that we have these databases so that they can be used by others. And summarising info that's in them so that it's applicable to others. Be more outwardly focused? Should we be filling these gaps?
- Commercial organisations can put out info which isn't very scientific. Need to ensure that farmers aren't getting unsubstantiated information.
- Do we have the luxury for taking 20-30 years to get from research to on-farm impact now? Pressing issue for farms to reduce their GHGs. Dealing with Covid has shown what science can do very quickly. The climate doesn't currently have the same urgency from policy makers. Important to have that backing.
- How do we engage LMIC countries more actively in projects? Feed additives, especially natural ones, could be relevant to LMIC. Not every additive can be used in every system. Open invitation to provide perspective from other countries.
- Opportunities to work across networks. ASSGN has a way to look at rumen microbiome samples, RMG is looking to fill in the gaps, FNN want to see the impacts of additives on the rumen.
- DATAMAN has been put online and is publicly available. May need to go outside of the GRA extension networks to get greater awareness of the tools that have been developed.
- MMN are still accepting data, but only analyse it at certain points and there is a QA process. Contact the network for further info. The MMN are finding it challenging to understand needs of researchers across the globe to decide where to go next. Have been getting a smaller coordination group together. Would be good to shoulder tap someone from ILRI in Kenya.
- ASSGN and RMG have social media pages. Need to be posting everything that's happening in the projects and relevant papers. If not social media, need a public profile. These platforms are global, free to use, and there's no restrictions on what we do. Can be good roles for younger researchers.



28. Sinead wrapped up the meeting on behalf of the co-Chairs by thanking everyone for their input. The co-Chairs will be talking to the network coordinators to develop the Flagship projects. Plus, it was reiterated that it's more important now than ever to involve LMIC countries in GRA work. Sinead encouraged everyone to keep active in the networks and to contact the co-Chairs if they have queries. The hope is to meet in person next year.

### **Next Meeting**

29. The location for the next meeting will be alongside the [GGAA 2022](#) conference in Orlando, Florida, USA in June 2022.

## Appendix 1: Participants List

Country	Attendees
<b>GRA Member Countries</b>	
<b>LRG Co-Chairs (New Zealand)</b>	- Harry Clark and Jon Tanner (NZAGRC)
<b>LRG Co-Chair (Ireland)</b>	- Sinead Waters (Teagasc)
<b>LRG Co-Chair (United Kingdom)</b>	- Richard Dewhurst (Scotland's Rural College)
<b>Argentina</b>	- Claudia Faverin (Instituto Nacional De Tecnología Agropecuaria (inta) Y Universidad Nacional) - Maria Paz Tieri (Inta) - Patricia Ricci (Inta Argentina)
<b>Australia</b>	- Roger Hegarty (University of New England)
<b>Bangladesh</b>	- Biswas Ashraf (Chattogram Veterinary and Animal Sciences University)
<b>Belgium</b>	- Sam De Campeneere (Ilvo)
<b>Brazil</b>	- Ladislau Martin-Neto (Embrapa Instrumentação)
<b>Cameroon</b>	- Etchu Kingsley Agbor (Institute of Agricultural Research For Development)
<b>Canada</b>	- Karen Beauchemin (Agriculture and Agri-food Canada) - Tim McAllister (Agriculture and Agri-food Canada)
<b>Chile</b>	- Francisco Salazar (INIA) - Marta Alfaro (INIA)
<b>Colombia</b>	- Olga Mayorga (Agrosavia-Corporacion Colombiana de investigacion Agropecuaria)
<b>Costa Rica</b>	- Jorge Segura Guzmãin (Ministerio de Agricultura y Ganaderia) - Karla Soto (Ministerio de Agricultura y Ganadería)
<b>Cote D'Ivoire</b>	- Abdoulaye Cisse (Ministère de L'Enseignement Supérieur et de la Recherche Scientifique)
<b>Denmark</b>	- Peter Lund (Aarhus University)
<b>Dominican Republic</b>	- Gregorio Lagombra (Instituto Dominicano De Investigaciones Agropecuarias Y Forestales)
<b>Eswatini</b>	- Samkele Tfwala (University of Eswatini) - Sizwe Mabaso (University of Eswatini)
<b>France</b>	- Marguy Eugene (Inrae)

<b>Germany</b>	- Dirk von Soosten (Friedrich-Loeffler-Institut)
<b>Ghana</b>	- Christopher Antwi (Knust)
<b>Ireland</b>	- Charles Spillane (Ryan Institute, National University of Ireland Galway) - Pat Kelly (DAFM) - Sinead Waters (Teagasc) - Tom O'Dwyer (Teagasc)
<b>Italy</b>	- Giacomo Pirlo (Council for Agricultural Research and Agricultural Economy Analysis)
<b>Japan</b>	- Keiichi Hayashi (Jircas) - Koki Maeda (Jircas)
<b>Lithuania</b>	- Ramūnas Antanaitis (Lithuanian University of Health Sciences) - Vaidas Oberauskas (Lithuanian University of Health Sciences)
<b>Malaysia</b>	- Azizi Azmin (Malaysian Agricultural Research and Development Institute) - Mardhati Mohammad (Malaysian Agricultural Research and Development Institute)
<b>Mexico</b>	- Dan Jafhet Bolaños López (Sader)
<b>Netherlands</b>	- Andre Bannink (Wageningen Livestock Research) - Henk van der Mheen (Wageningen University and Research)
<b>New Zealand</b>	- Ackim Mwape (NZAGRC) - Andrea Pickering (NZAGRC) - Jessica Somerton (NZAGRC) - Peter Ettema (Ministry for Primary Industries) - Sandy Zhang (Ministry for Primary Industries) - Sinead Leahy (NZAGRC) - Suzanne Rowe (AgResearch) - Tony van der Weerden (AgResearch) - Trish Ranstead (Ministry for Primary Industries)
<b>Nigeria</b>	- Clarence Lakpini (National Animal Production Research Institute)
<b>Norway</b>	- Vibeke Lind (NIBIO)
<b>Panama</b>	- Audino Melgar (Agricultural Innovation Institute of Panama)
<b>Poland</b>	- Adam Cieslak (Poznan University of Life Sciences)
<b>Senegal</b>	- Segá Ndao (NZAGRC)
<b>South Africa</b>	- George Shole (DALRRD)
<b>Spain</b>	- David Ruiz (CSIC)

<b>Switzerland</b>	- Sanaa Enkhtaivan (Self-employed, former staff of Mongolian Climate Change Project Implementing Unit)
<b>Thailand</b>	- Vanida Khumnirdpetch (Bureau of Foreign Agricultural Affairs, Ministry of Agriculture and Cooperatives)
<b>Turkey</b>	- Mesult Yildirim (General Directorate of Agricultural Research and Policies) - Muhammed İkbal Coskun (International Center For Livestock Research and Training)
<b>United Kingdom</b>	- Nick Wheelhouse (Edinburgh Napier University) - Sharon Huws (Queens University Belfast)
<b>United States of America</b>	- Taina Silvestre Moreira (Penn State University)
<b>Uruguay</b>	- Nicolás Costa (Ministry of livestock, agriculture and fishery) - Verónica Ciganda (Instituto Nacional de Investigación Agropecuaria) - Virginia Pravia (Instituto Nacional de Investigación Agropecuaria)
<b>Viet Nam</b>	- Le Hoang Anh (Ministry of Agriculture And Rural Development Of Vietnam)
<b>Zambia</b>	- Ann Kantanga-Sikazwe (Ministry of Fisheries and Livestock) - Ellison Musimuko (Ministry of Fisheries and Livestock) - Kabemba Mwambilwa (Ministry of Fisheries and Livestock)
<b>Zimbabwe</b>	- Walter Svunirai (Marondera University of Agricultural Sciences and Technology)
<b>GRA Partner Organisations</b>	
<b>CCAC</b>	- Catalina Etcheverry
<b>CAFS</b>	- Ciniro Costa - Lini Wollenberg
<b>European Commission</b>	- Jean-Charles Cavitte - Valerio Abbadessa
<b>FAO</b>	- Timothy Robinson
<b>GRA Secretariat</b>	- Hayden Montgomery (Special Representative) - William Aitkenhead (Secretariat) - Deborah Knox (Secretariat) - Chanjief Chandrakumar (Secretariat) - Hazelle Tomlin (Secretariat) - Heather Went (Secretariat) - Ekaterina Bessonova (Secretariat) - Veronica Ellis (Secretariat)