

Livestock Research Group Meeting Virtual Meeting 18-20 October 2022

MEETING REPORT

1. The 14th annual meeting of the Livestock Research Group (LRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was held virtually for the third time. The meeting took place over three days and was chaired by 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. Recordings of the meeting are of high quality and will serve as an ongoing publicly available resource (link to video recordings [HERE](#)).

PARTICIPANTS

3. The meeting was attended by 106 participants, representing 38 member countries of the GRA and five partner organisations. Refer to Appendix 1 for the full participants' list.
 - **Countries represented:** Argentina, Australia, Bangladesh, Belgium, Brazil, Canada, Chile, Colombia, Cote D'Ivoire, Denmark, Ecuador, Ethiopia, Ghana, Indonesia, Ireland, Italy, Japan, Kenya, Lithuania, Malaysia, Mali, Netherlands, New Zealand, Nigeria, Norway, Poland, Rwanda, Senegal, Spain, Switzerland, Tanzania, Thailand, Turkey, Uganda, United Kingdom, United States of America, Uruguay, and Zambia
 - **Partners represented:** Consultative Group on International Agricultural Research (CGIAR), Environmental Defence Fund (EDF), the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), the World Bank and 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:
 - Methane metrics – be very careful about your choice of metrics – what question are you trying to answer?
 - Livestock systems are complex and underpin the livelihoods of the world's poorest – we need to be very careful about applying blanket solutions/global regulation.
 - At the same time, supply chains are also complex and transboundary – we need to be very careful about countries trying to “go it alone” (a message to politicians).

- Solutions also need to consider land/water/people – solutions need to come from holistic, systems’ approaches. In the context of GRA, we need to maintain awareness of opportunities at the livestock/crop interface, circularity etc. with Croplands RG and Integrative RG.
- In tackling livestock GHGs we need to be aware of obvious productivity-lifting interventions – feed quality, animal health – how can these be used more effectively - what are the incentives for uptake? We are also not starting from scratch and need to adopt/adapt previous approaches.
- Collaboration is key – particularly in the sharing and use of data. Networks should look at potential to share data across the ASGGN flagship dataset, FNN and MMN datasets and RMN culturomics work.
- We need less competition in research and more coordination. GRA provides some good working examples of support for “team effort” such as involvement in ERANETs and the recent NZ-Ireland call. AHN are planning a COST application next year.
- The private sector can play a much stronger role in the GRA and we should look for ways to include industry in our network activities.
- Webinars will continue to provide a good way to allow lots of people to participate in discussions. There is also great value in F2F meetings, particularly when aligned with other international meetings. Networks should consider organising a working group/meeting in Africa to take stock of existing work and highlight large issues and opportunities in Africa – for example in nutritional systems and animal health.
- Ideas to help participation from LMICs included: continuing to offer opportunities for CLIFF-GRADS alumni to take roles within networks (e.g. communications); setting up co-supervision arrangements to support local supervisors of PhD students (esp. in Africa); network co-chairs being selected from LMICs (there was a volunteer to co-chair RMG); supporting development of measurement capability in LMICs.
- Don’t forget language barriers. Important papers are being published in all major languages.
- Networks are the engine-room of the LRG – they are healthy and growing. We should provide clear locations on the LRG website where people can sign up to join the different LRG networks. Our GRA Flagships welcome and facilitate collaboration with work extending from the fundamental to the marketplace – and should facilitate LMIC involvement (e.g. in providing samples).

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 Jon Tanner (co-Chair, NZAGRC, New Zealand), on behalf of the co-Chairs. Jon welcomed the participants to the meeting and indicated that 57 of the 66 GRA member countries, and over 200 participants, were registered to attend over the next 3 days.
6. Sinead Waters (co-Chair, Teagasc, Ireland) and Richard Dewhurst (co-Chair, SRUC, Scotland) also welcomed everyone to the meeting.
7. Richard provided a high-level update on the LRG on behalf of the co-Chairs over the past 12 months.
 - Networks: There has been a move back to face-to-face meetings over the past year after the virtual meetings held during the pandemic. Of the five LRG Networks:

- Animal Selection, Genetics & Genomics (ASGGN) met in July in Rotterdam.
 - Animal Health (AHN) has new leadership and had a workshop linked to GGAA2022 (USA) in May.
 - Rumen Microbial Genomics (RMG) held a workshop in Oct 2021 linked to the INRA-Rowett meeting and have been involved in a number of large projects.
 - Feed & Nutrition (FNN) held a workshop linked to GGAA2022 and continue to produce important global review papers based on consolidated data sets.
 - Manure Management (MMN) also held a workshop linked to GGAA2022 and are continuing to work on MELS database.
 - Flagship projects: Two of the projects that were proposed at the LRG meeting last year were then confirmed at the GRA Council Meeting in February 2022. The Feed Additives project has secured funding for a post doc and is now progressing rapidly. Finding funding for the 'Culturomics' project is looking very positive.
 - Key activities of the Networks involve developing databases, targeted science reviews/reports, developing tools (FAO is a key partner and working together on development of the GLEAM model) and promoting collaborative funding to share knowledge and avoid duplication across organisations (and supporting involvement of LMICs to participate).
 - Pathways to Dairy Net Zero programme: The GRA is working with FAO and the Global Dairy Platform to develop a roadmap for 'net zero' dairy production. This involves use of the GLEAM model. The project has had a major presence at COP and other global meetings. It was launched at COP26, interim work will be presented at COP27 this year, with an aim to have results ready for COP28.
 - Opportunities/Gaps: The LRG is always looking for better ways to engage low and middle income countries (LMICs) in activities. Plus, to link with other GRA research groups (in particular the IRG) and across the LRG networks to avoid silos. Need to ensure that research activities are structured to elicit behavioural change and knowledge exchange.
8. The co-Chairs acknowledged the support of their roles provided by their relevant government ministries.

GRA Special Representative Update and Q&A

9. Harry Clark (NZAGRC, NZ) provided this update. Harry was a co-Chair of the LRG from its inception until last year, is involved in the IPCC and is internationally recognised as an expert in this area. Harry is currently the Acting GRA Special Representative.
10. Hayden Montgomery has been the only GRA Special Representative to date. He was appointed in 2016 to act as GRA spokesperson and to work to promote GRA activities globally. Hayden has recently moved on to be the fund manager on agricultural issues at the Global Methane Hub. He has been transitioning into this role over the past six months. The GRA will maintain a good relationship with Hayden in his new job.
11. New Zealand has committed to providing the Special Representative until 2024. A process is underway to appoint a permanent successor to Hayden. Harry is a temporary, part time replacement and his main aim to provide continuity between Representatives. Harry's first activity as the GRA Special Representative will be attending COP27 next month. He currently has some time free in his calendar, so if any LRG members would like GRA representation at COP27, please get in contact with him.
12. Update provided on behalf of the GRA Secretariat:

- The GRA now has 66 member countries, with Kenya joining in the past year. There are 27 formal partners, with EDF and SAI the most recent to join. There are increasing numbers of GRA activities, fellowships and collaborative projects.
 - In keeping with increased activities of the GRA, the Secretariat has increased in size with additional staff based in NZ, Europe, Africa and Latin America.
 - The current GRA Chair is Chile, with Spain as the vice-Chair. NZ continues to host the Secretariat and support the Special Representative role.
 - Research Stocktake project has continued in recent year.
 - New Flagship projects are underway. Information can be found on the [GRA website](#). The criteria and approval process were described for those who have ideas and may be interested in proposing a new Flagship. Flagship Webinar series underway, with the next session coming up in [November](#).
 - The next CRG/IRG meeting in January 2023
 - The Agricultural Greenhouse Gas (GHG) National Inventory training programme is available on the [GRA website](#).
 - Fellowships: The results of round 5 of the CLIFF-GRADS programme will be available next month and announced at COP27. Likely to be a further round of RUFORUM fellowships in Africa.
13. Harry 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.
14. Hayden's significant contribution to the GRA was acknowledged.
15. It was noted that there has never been a more important time for scientists to be involved in policy and political processes. The Group needs to ensure that the work being carried out will lead to information that can be used to inform policy.

[Keynote: Methane, metrics, and mitigation: Insights from IPCC reports and recent literature](#)

16. Andy Reisinger (NZ Climate Change Commissioner, NZ) presented the keynote address and began by highlighting that metrics have become quite a contentious issue over the past few years. The use of different metrics appears to lead to quite different policy responses.
17. It is uncontested that carbon dioxide (CO₂) and methane (CH₄) dominate observed human-induced warming to date. Therefore, reducing emissions of these gases is pivotal to decreasing warming. The two gases differ in their warming. Tonne for tone, methane is more important. Even though it is short lived, it has a more powerful effect.
18. Andy explained the difference between the GWP100 and GWP* metrics and how they are used. The GWP100 approach considers the average warming effect over 100 years. Whereas GWP* is a metric that has been designed to be applied to a time series of emissions, not an individual pulse.
19. Why does this cause issues? We just want to know how much emitting a given quantity of CH₄ contributes to climate change compared to a given quantity of CO₂. The key problem is that this question can be interpreted in two ways:
- How much warmer is the future climate with these emissions, compared to without those emissions? OR
 - How much warmer is the future climate with these emissions compared to some reference level?

Andy went on to show the different answers that these questions can lead to depending on which metric is used.

20. Take home messages:

- What we do about agriculture matters. If we want to limit global warming to 1.5 degrees, we need to mitigate agricultural non-CO₂ emissions. If this doesn't happen, CO₂ emissions from fossil fuels need to be reduced very significantly in order to stay below 1.5 degrees.
- Every tonne of CH₄ is worth avoiding if we possibly can.
- There is no 'right' GHG metric, each one is perfect for what it was designed for.
- GWP100 and GWP* measure different things. Think carefully about what your question is when deciding which metric to use.

21. The Q&A session covered:

- Messaging to policy makers: How best to balance methane mitigation versus potential negative impacts of this on the livestock sector. For example, New Zealand farmers are protesting this week about the impacts of being charged for their GHG emissions in the future.
 - CH₄ is a powerful GHG gas. Limiting it is a good idea. Nations shouldn't try to reach zero, not because of the metrics, but because of food security, protecting livelihoods and other important factors. The metrics don't account for social and economic factors. Not every sector needs to reach net zero emissions. Need to have mature discussion about what our goals are.
- Ireland has challenging emission reduction targets to reach by 2030 and is pooling all the GHGs by using GWP100. Would it be better to have a different target for methane?
 - It is useful and feasible to set different targets for different gases. New Zealand has done that in their litigation. However, whilst this removes ambiguity, doing this loses flexibility. If you have separate targets, you can't balance out CH₄ by planting trees, for example. The CH₄ emissions must be reduced to hit the target. This means the livestock sector is limited in what it can do.
- What the implications are of reducing emissions intensity versus total emissions?
 - This is a different type of metric issue. If the goal is to limit emissions to get near to 1.5 degrees, total methane emissions must be reduced. However, different countries / sectors could do different things, as long as it adds up in the end. The climate doesn't care how much meat or milk we produce, it cares about absolute emissions. Focusing on intensity might not get us to where we want to be.
- Question about whether CH₄ eventually plateaus over time.
 - Policy relevant message is that it lasts longer than 12 years in the atmosphere. There is a lot of uncertainty once you get into multi-century time frames.
- Discussion about trade-offs of CO₂ and CH₄. It was noted that all action on CH₄ is predicated on the fact that CO₂ emitters will be playing their part in reducing their emissions as well.

[Scientific challenges global organisations are facing to respond to the challenge of climate change](#)

22. Donald Moore (Executive Director of Global Dairy Platform) presented first in this session.

- A background to the Pathways to Dairy Net Zero project (P2DNZ) was provided. It was noted that dairy, like all agricultural commodities, must do more to look after the natural environment. However, sustainability is not just about GHG emissions. We must ensure that we don't cause other issues when reducing GHGs.

- The Dairy Sustainability Framework was launched in 2013. This tracks economic, social and environmental dimensions. “Can’t mitigate what you don’t measure”. Currently ~32% of global milk production is going through this system.
- In 2018 GDP engaged with FAO to understand dairy’s emissions. This led to the ‘[Climate change and the global dairy cattle sector](#)’ report’ (2019). This showed that emission intensity had been going down (11%), however the amount of dairy had increased (30%), leading to absolute emissions going up by 18%. Absolute emissions from dairy need to be addressed to ensure that the global dairy industry maintains its social licence to operate.
- The P2DNZ project involves GDP, FIL IDF, DSF, SAI Platform and IFCH. The GRA is a knowledge partner, and the project is supported by FAO. About 150 other organisations are supporting the initiative, including small and big companies and governments.
- The 2019 report showed that ~80% of emissions are coming from the emerging dairy economies. Need to focus here to make changes.
- 2022 actions:
 - Research, analysis, tools & methods – describe the plausible solution pathways and their climate impact. Estimate that a 40% reduction could be achieved if best practice was implemented everywhere. With an extra 35% reduction possible if new technologies are implemented.
 - Execution, delivering results – build momentum, demonstration progress across both developed and emerging dairy economies.
- Challenges: In the developed dairy sector, targets are being put in place to reduce emissions. This may lead to reduced production. Could potentially lead to nutritional security in the markets that these developed countries supply into. Need to think about these challenges at a global level. Scientifically, companies under immense pressure to respond to questions quickly. E.g. related to emerging science. Don’t have the tools to measure things as quickly as required.
- Private sector is an important partner for the GRA. Can leverage the capability and the resources that they have. Working together can be beneficial for everyone.

23. Pania King (Award winning sheep & beef farmer from New Zealand) presented next.

- An overview of the Māori approach to farming and looking after the land was provided. “Look after the land, the water and the people and all will look after you”.
- Pania’s farm plan has short term and long term (multi-generational) goals. Profitability, sustainability, and a range of other key principles are taken into account including: health and positive role modelling, guardianship, adaptation to adverse events, climate change.
- Documentation of land uses is important.
- Regulation and compliance are not felt to be an issue. The rules are ever changing, and we all need to be accountable.
- Priorities: Weave Māori principles and western science together to suit what is being done on farm and in rural communities. Need good communication. Outside the farm gate, resilience is important. Farmers need recognition for the good work that they do as food producers. Support required to keep up with the compliance requirements.

24. Ruairaidh Petre (Executive Director, Global Round Table on Sustainable Beef) was the final speaker in this session.

- The beef industry is very varied and covers many different production systems and environments. Have regional and national initiatives that feed into global goals.
- Established in 2012, global goals by 2030
 - Animal health and welfare: *Provide cattle with an environment in which they can thrive through best practice*
 - Climate: *Reduce the net global warming impact of beef by 30% (per kilo)*

- Nature positive: *Ensure the beef value chain is a net positive contributor to nature*
- 2/3 of large ruminants in the world are in Africa and Asia, therefore need to focus on all regions.
- Impacts of climate change on livestock. Marginal production systems will bear the brunt. The quality and quantity of feed, and improving animal health and welfare, are important.
- The efficiency gap needs to be closed and we need to produce more with the same resources. Key focus areas are: Improve animal health. Husbandry (breeding and genetics). Grazing management to improve productivity. Silvo-pastoral systems.
- Mitigation strategies – enteric and carbon sequestration.
- Need to take a holistic approach.
 - At a national level: animal health services, extension services, access to markets for small scale producers, etc.
 - Regional level: trade between countries (finding a balance between domestic and export), disease control and vector awareness. Need to have foresight and look at potential global impacts when developing national policies.
 - Global level: balance consumption with need.
- A holistic and inclusive approach is required Food and agriculture are at the heart of climate solutions. Sustainable livestock can create a better life for billions of people. Need to work proactively to improve what we've got, not to legislate it out of existence.

25. The Q&A session covered:

- Tracking and reporting. We can't reduce what we can't measure, how can we come up with some solutions in this area?
 - The dairy sector has put their own processes in place to be able to measure changes over time. Prior to this, they were just getting snapshots. Is it possible to open up access to the data that is being used? The GLEAM model update was launched last week. How could the data that the commercial sector holds be better linked into these processes?
 - Looking at LCA for carbon sequestration.
 - Methane: hearing about satellites to measure methane, will this type of emissions tracking help make change? Might be another distraction, if mainly focussed on feed lots.
 - Need to recognise what farmers are doing. No one wants to destroy the land for future generations. Policy needs to be based on good data.
 - Beef sector has launched LCA guidelines. Beef farmers need to report their numbers etc. Need to have access to data in order to be able to do this. Need to get recognition for good work that's being done on C sequestration.
 - Pania's community are actively collecting data on their farms, and looking at the resilience of their communities. Measurement needs to be kept real.
- Geopolitical situation: Is this headed in the wrong direction? E.g. A reversal of globalisation and more of a focus on local food. A reduction in development funding.
 - In developing countries, quick wins could be made for livestock production by improving animal health. How does this happen? In the past, development funding provided help here. Will that continue?
 - Potential of reducing livestock in Ireland to reduce their NDC. Ireland exports a lot of milk currently. What happens to importers? The impact of Ukraine reducing their agricultural output recently has been significant. Will Ireland create a bigger problem than they set out to solve? Ireland is an efficient producer. Will the market be filled by less efficient production? Ireland needs to meet it's 2030 targets though.
- Improved animal health: Is there a role for government in the control of endemic disease, rather than the farmer dealing with this?
 - Yes. Vaccine campaigns need to be rolled out and include sufficient numbers to make these effective. Animal health practitioners are required everywhere.
- Biodiversity and the link to nature: Do farmers need more help to become more resilient?

- Some farms are doing well, however it would be good to support all farmers to develop their own comprehensive plans.
 - How do dairy and beef producers feel about feed additives etc coming onstream and how they can be implemented?
 - There are challenges in the commercial sector mainly related to a fear of investing too much in them until the science behind them is really solid. Don't want to be accused of green washing. Good report from last year summarising the state of the science.
 - Need to ensure new technologies are tested well before people will take them up. Commercial companies are already testing some of these products themselves e.g. DSM, red seaweed, and getting different results. Need to look at how these results can be shared, so that better informed decisions can be made.
 - There are still questions about how feed additives can best be used in extensive vs intensive systems. How they can be administered in a grazing system. Etc.
 - The products need to be cost effective.
 - The DSM product can't be used to make claims about GHG reductions yet. It needs to be able to be incorporated into GHG accounting systems. Until this happens, little benefit to producers to use it.
26. The day was wrapped up by thanking all of the speakers. It was noted that the livestock sector supports many, many livelihoods, that coordinated global science is needed, and the LRG has a key role to play.

WELCOME TO DAY 2

Full Session Two recording [here](#)

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

27. Richard Dewhurst opened the second day of the LRG annual meeting with key takeaways from day one:
- Livestock is just part of a global food system that impacts on health and livelihoods, so we need to think more carefully about the global food system e.g., countries taking separate individual measures against GHG reduction policies may not give us the best solutions globally.
 - A large proportion of emissions from livestock come from low- or middle-income countries. There are big opportunities to mitigate these through improvements in feed quality and animal health, but large constraints such as availability in funding.
 - The need to care for the land, the water, and the people, the next generation, taking a holistic approach rather than a narrow focus.
 - Need for better access to data especially for carbon sequestration which leads us to our first presentation today about data sets.

[Presentation: Bringing together big data sets](#)

28. Richard Tiffin (Chief scientific officer of Agri-metric in the UK) presented his experiences bringing together data sets from multiple different sources.
- Richard explained the challenges in bringing big data sets together because it is something that our community has to deal with, and it is necessary to use data sets effectively with minimum human intervention.
 - Formatting the data set, and adding or removing additional data, is a huge challenge to do without disturbing the data. Richard introduced a new way to represent data and display it.

He provided examples such as the 'Smart Car' – a project where they have linked and visually represented many different data sets. These data sets, while comprehensive, can be joint creating a unified set.

- Richard displayed an example of conceptualising data differently by using non-tabular, visual, representations of the data.'
- Richard demonstrated how to simplify and unify data in a unique way by encoding knowledge about things on the data set, describing properties, creating connections as well as taking different views of the dataset by re-adjusting it and making it more adaptable to the needs of the researcher through SPARQL Query & Update (a website used to show the 'how').
- Key points from the presentation were:
 - Don't attempt to reengineer existing data into a bigger version of the same thing: give yourself a framework of how to link
 - Adopt flexible extendable approaches to:
 - Representing and organising data.
 - Harmonising (not standardising) data, properties, and language.

Capability Building and Partner Discussion Panel

29. Tim Robinson (FAO, Senior Livestock Policy Officer) is responsible for climate and natural resources, leading the livestock information branch housing the technical side of livestock emissions.

- Update from Food and Agriculture Organisation of the United Nations ([FAO](#)) with respect to its collaboration with the GRA LRG.
- The FAO strategy on Climate Change:
 - Supporting countries to integrate Climate Change in their national programmes.
 - Supporting countries with NDC implementation.
 - Convening inter-sectoral dialogues on Climate Change.
 - Sharing knowledge and building capacity.
- Tim gave updates about his main work areas: GLEAM - Global livestock environment assessment model: current version of GLEAM published through a dashboard, accessible on a regional level. As well as a brief update on LEAP Livestock Environmental Assessment and Performance (LEAP) Partnership.
- Projects with GRA collaboration:
 - 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 country-specific emission factors.
 - Development of e-learning materials on livestock and climate change.
 - Capacity development (e-learning course) – adaptation, finance.
- Priority areas for collaboration with GRA-LRG:
 - Support Global Methane Pledge - (LEAP report)
 - Pathways to Dairy Net Zero - (P2DNZ, GHG mitigation)
 - GLEAM development and implementation (peer review by GRA networks)

30. Ciniro Costa Jr: (climate specialist, Alliance of Biodiversity and CIAT, CGIAR)

- Update on the CGIAR Research Program on Climate Change, Agriculture and Food Security ([CCAFS](#)). CGIAR has developed many different initiatives related to livestock:
 - Livestock mitigation project.

- Livestock and Climate initiative: focused on working with public and private actors to adapt livestock agri-food systems to climate change and reduce GHG emissions.
- Agroecological transitions: manoeuvring technical systems by using digital tools.
- Carbon markets for incentivising and de-risking a transition to low carbon beef.
- Emissions factors to supporting climate commitments to reduce emissions from beef production: with the help from private sectors.
- Good practices for the Amazon region (reviewing tools and designing and improving these tools with the help of farmers in region), working with Brazil and Columbia through CIAT.
- Ciniro has seen a large opportunity for soil carbon sequestration.
- Gathering a significant amount of data. Under these projects, developing over 100 new emissions factors from production systems across six countries in Latin America.

31. Majaliwa Mwanjalolo: (environmental studies professor, and RUFORUM manager)

- RUFORUM is the Regional Universities Forum for Capacity Building in Agriculture in Africa. Majaliwa discussed the different languages they work with including, Arabic, French, English, and Portuguese.
- Supporting 8 teams working on emissions through the GRA.
- Over last 10 years they have sponsors over 50 teams working on Climate Change and GHG emissions.

RESEARCH NETWORK UPDATES

32. The LRG has five science networks, focused on strengthening collaboration in the main areas of livestock GHG research.

33. Feed and Nutrition Network (FNN), presented by David Yáñez-Ruiz.

- Objectives:
 - Summarise and evaluate the available stats on mitigating GHG emissions of ruminants by nutritional means (current focus: methane)
 - Develop sound recommendation on methane mitigation by nutritional means for stakeholders
 - Identify gaps in knowledge and focus research on priority issues.
- CEDERS/Feed & nutrition network meeting (hybrid meeting)
 - ERA-NET-Integrity project is a new project by Patricia Ricci
- FNN as a network:
 - New colleagues joined = 18 new members from 7 countries.
 - Missing still is Eastern Europe, Africa, Middle East.
- FNN activities:
 - Projects: Global network (2014-2017), CEDERS (2017-2021), Integrity (2022-2026)
 - LAC and Southeast Asian projects of methane production
 - Also, many other FNN members contributed in-kind
 - Outputs: Position papers, databases and meta-analyses, treatments mean databases

34. Animal Selection Genetics & Genomics Network (ASGGN), presented by Suzanne Rowe.

- The ASGGN is a 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.
- ASGGN has over 200 members and a broader representation.
- Goals:
 - Identification of new collaborations and connections
 - Defining traits and breeding objectives

- Establishing the heritability of methane emissions and its genetic associations with other countries
 - Suzanne displayed images of their website and recognised that social media, in particular Twitter, is their biggest platform to discuss and share information.
 - ASGGN-GRA livestock network meeting at the World Congress in Genetics in the Netherlands - great way to include everyone. There were 75 participants from 25 countries with a mixture of expertise. 8 talks covered a mixture of sheep, beef and dairy cattle, variety of technologies and methods.
 - After collating over 1000 samples from all over the world, lessons learnt include the following:
 - Genetics need to go hard and go early
 - Partnerships are very important
 - Milking robots are in and sniffers are back
 - Infra-red technology will be innovative, and a key contribution
 - Some countries are just getting started
35. Manure Management Network, presented by Tony van der Weerden.
- Research update:
 - Focused on reducing GHG emissions from livestock production and increasing the nutrient use efficiency of manures and soil organic matter by the improvement of excreta management.
 - Objectives:
 - Experimental protocols for measuring N₂O, CH₄ and NH₃ fluxes
 - A directory/long list of mitigation strategies
 - List of minimum reporting of GHG flux and metadata for journal articles
 - Consistent approaches for quantifying N fertiliser replacement values
 - Policy recommendations for improving manure management to support SDG
 - Recent Webinar: Development of bio-based fertilisers for a circular bioeconomy (120 participants)
 - Increasing interest in circular bioeconomy
 - Increasing cost of mineral fertilisers
 - Increasing utilisation of animal manures
 - Examples of current research activities:
 - ERA net/GRA project (MELS) 'Mitigating emissions from livestock systems'
 - Builds on DATAMAN project - housing and storage emissions
 - Stocktake of GHG manure management projects
 - Identifying potential collaborators
 - Awareness of current research efforts - gap filling knowledge
 - Collating key info and modelling research projects
 - Collated 124 active projects spread over 17 countries!
 - Creating an excel based template to be circulated and will be on the GRA website.
36. Animal Health Network (AHN), presented by Nick Wheelhouse
- The AHN brings together researchers to discuss and find inter-disciplinary approaches to understand and tackle the impact of climate change on animal health.
 - There are currently 54 members in this network from 18 countries, unfortunately they lack members from key areas such as Asia and Africa.
 - Nick wants to consolidate membership that may not have been very active in the past.
 - AHN hosted a hybrid workshop with 45 attendees including several from countries where we don't have active members, this shows opportunity for a growing membership.

- The AHN have made use of our CLIFF-GRADS programme with 2022 alumnus Deysi Ruiz Llontop - National Agrarian University La Molina creating the Animal Health Network newsletters.
 - Nick displayed a few of their key policy relevant publications (acting on methane and the role of animal health in national climate commitments).
37. Rumen Microbial Genomics Network (RMG), presented by Sharon Huws.
- The RMG Network started in 2011 as an initiative of the LRG with the purpose of enhancing communication and collaboration between research groups to be stronger together.
 - The RMG Network has successfully held 10 network meetings with their next upcoming meeting in June 2023.
 - Sharon displayed a review article the RMG Network wrote on the understanding of microbiome which has had over 200 citations, alongside many other publications including their ongoing report on sustainable use and conservation of microorganisms of relevance to rumen digestion.
 - The RMG Network has many collaborative projects including:
 - Global rumen census
 - Hungate1000
 - EU ERA-NET gas Co-fund: (Rumen Predict, Co-fund Sea solutions, and Integrity)
 - EU Horizon 2020: (MASTER, Holoruminant)
38. Update on two current [GRA Flagship projects](#) were then presented.
39. 'Expansion, Analysis and Exploitation of the Hungate Rumen Microbial Culture Collection'
- Leader – Sharon Huws
 - Global efforts to enhance the Hungate collection.
 - The concept is to culture, phenotype and genotype as many more rumen microbes as possible (called culturomics).
 - Explosion in culturomics for all ecosystems recently but little effort on the rumen.
 - Correlative styles to test key hypothesis.
 - There are new technologies and resources to get out many microbials.
 - Hungate collection provides a major step change for the community.
 - Hungate collection illustrated that many bacterial families are missing in culture collections.
 - Key to innovation:
 - Improving 16S rDNA inference tools e.g., CowPI - something they creates.
 - Development of direct fed microbials for redirection hydrogen.
 - Major genetic resources for industrial applications.
 - High impact publication where everyone who's been involved contributes.
 - Sharon went on to talk about how they will do this:
 - Having cohorts across the world with a number of countries confirmed as co-hubs, covering all continents.
 - Send samples to their closest hub, main hub will be Queen's University Belfast in the UK.
 - Next steps: funding under discussion, JGI have agreed to open the Hungate collection sequencing project covers sequencing of 600 microbes.
40. Feed Additives Flagship Project Update, presented by David Yáñez-Ruiz
- Technical guidelines to develop feed additives to reduce enteric methane coordinated by David, André Bannink (WUR), and Florencia García.
 - Background: Increasing interest in developing feed additives to reduce enteric CH₄ emissions worldwide
 - Extensive research effort over the last decades that has not resulted in many additives in the market.

- Questions to ask ourselves: can we accelerate the development of feed additives to reduce CH₄?
- Facilitate the development of the use of feed additives to reduce enteric methane emissions
 - Provide the scientific community and livestock sector technical guidelines on good practice on how to test and develop feed additives.
 - Facilitate the registration across of feed additives (different regulatory contacts) and accounting for reduction in emissions in GHG inventories (different scales).
- Showed some publications relevant to this GRA flagship
- 2-year plan:
 - Define structure and sections of technical guidelines (COP27 in Egypt)
 - Allocate contributions for each section to participating partners (not only FNN members)
- Working groups
 - Data gathering, processing, discussion, and writing
 - Deliver technical guidelines and position scientific papers on feed additives.
- Structure is in two blocks (lab experimental and modelling)
 - Experimental
 - Identification and screening of new bioactive compounds
 - Testing at animal level
 - Uncovering their mechanisms of action
 - Modelling
 - Registration and accounting
 - Conclusion:
 - Project conceived to help both academy and industry
 - Ambitious wide range of expertise needed
 - Open for new collaborators

41. A brief wrap-up of Day 2 was then provided, and attendees were thanked for their participation and engagement.

- There's no need to start from scratch to develop these data sets, we can use what we have make them flexible, extendable and adapt what we currently have.
- The key role and support of the GRA, sharing, bringing people together and bridging gaps of expertise.
- There is too much competition for existing funding and resources, so we need to work together particularly across those involved in capability building.
- We need to engage more with private industries to support these capability building projects.
- Language barriers emerging in some of these areas is a challenge that we will investigate more.

WELCOME TO DAY 3

Full Session Three recording [here](#)

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

42. Sinead Waters welcomed back the participants for the last day of the LRG annual meeting, with a brief overview on what had been presented on day two. She highlighted the key take-home messages from the previous session:

- It is crucial to be careful about the choice of metrics for methane and understand the questions researchers are trying to answer when choosing a metric.

- Livestock systems are complex and they underpin the livelihood of the world's poorest. Therefore, blanket solutions and global regulation should be carefully applied.
- Supply chains are also complex and transboundary. Policy makers need to understand the impact of their regulations on other countries.

[Live Discussion: 2023 LRG Workplan](#)

43. The Network leads shared their plans for 2023.
44. David presented the objectives for the [Feed & Nutrition Network](#):
 - Summarise and evaluate the available data on mitigating GHG emissions from ruminants by nutritional means (current focus: methane)
 - Develop sound recommendations on methane mitigation by nutritional means for stakeholder
 - Identify gaps in knowledge and focus research on priority issues.
45. The [ERANET Integrity](#) project presents itself as a good opportunity to boost the activity on the feed additives activities. The project gathers information from different countries in three continents.
46. A [paper on mitigation strategy](#) has been published using the treatments means database. This database is a precious resource and needs to be kept running.
47. The network is focusing on the Feed Additives Flagship project. Participation from all GRA members is encouraged.
48. Going forward, the FNN would like to attract and involve more members from Africa. It is crucial for the project to be more attractive to African members.
49. Two main issues with the database:
 - Where can we keep the database? Need to discuss with the GRA how to best host the database and then set up rules on accessibility.
 - How to keep the database alive? So far, the database was funded through research projects. It might be necessary to keep funding it through new projects. On-going discussion with the US to maintain the database, but they are more dairy focused, and the idea is to keep the database broad.
50. How to attract African members in FNN and LRG?
 - Need to make direct contact with the researchers from African institutions.
 - Establish relationships with colleagues met during GGAA and other conferences.
 - Organise workshops and/or webinars on topics of interest for African countries.
51. Should we build a global team in nutrition management, as feed additives are not relevant for low- and middle-income countries?
 - Feed additives project is one component of the network, but we should not forget the nutrition side of the network.
 - Work within region.
52. Tony presented the workplan for the [Manure Management Network](#). Principal focus will be on the DATAMAN Database. This database is central for the network, as it captures studies from around the world. A disparity between countries has been observed, and members were encouraged to submit their data on the platform. Data will be made public only once papers have been published.
53. The network is looking for volunteers for the webinars they would like to organise this year. Themes of the three webinars are going to be:

- Modelling of nutrient flows within livestock systems, including manure management systems.
 - Better use of manure nutrients – development of rapid nutrient content testing.
 - Current research from the four corners of the globe.
54. Melynda Hassouna (melynda.hassouna@inrae.fr) is reviewing the guidelines on “Measuring emissions from livestock farming” and she is looking for volunteers to help.
 55. Opportunities to be involved in the development of a GRA flagship, ReLive project, Stocktake project on studies addressing diet and manure emissions.
 56. How to maintain the database?
 - Importance of having an IT support.
 - Uncertainties on how long the IT support would be financed.
 - Need for project and funding to maintain, and add feature to the database.
 - Meeting with FNN and MNN to discuss how the two databases can support each other.
 57. Suzanne presented the [Animal Selection Genetics & Genomics Network](#).
 58. Annual ASGGN meeting might be held alongside EAAP event in Lyon.
 59. The website and network communications require more work. The help of a CLIFF-GRADs alumni would be appreciated.
 60. The network is involved in the following collaborative projects: Flagship, Grass to Gas and Methane Predict (NZ and Ireland).
 61. Opportunities are available now that methane mitigation is becoming a priority for numerous countries.
 62. Sharon presented the [Rumen Microbial Genomics Network](#).
 63. The 10th RMG Network meeting will be held in June 2023, alongside with the INRAE-RRI conference. Volunteers are needed to help with the event preparation.
 64. The network would like to develop some webinars to facilitate participation of members from around the globe and engage with the other networks.
 65. The social media page needs a new administrator.
 66. The network is looking for one or two deputy chairs to support Sharon while she focuses on the Flagship project.
 67. How do we increase the geographical reach?
 - Encourage colleagues from Africa and South East Asia to be involved in the network.
 - Build relationship with researchers from these countries. Sharon will soon have a meeting with researchers from Africa.
 - Need to design a more targeted approach.
 68. Nick presented the [Animal Health Network](#).
 69. Reconsolidation of the network has led to 54 members from 18 countries. There is a major geographical gap in Africa, South East Asia and Latin America.
 70. The network would like to have one of the network leads in Africa, but difficult due to the lack of members.
 71. The network wants to attract members from more diverse backgrounds. This should help getting funding.
 72. Collaboration with the EMiFa Flagship, and discussions with Claus Deblitz are planned to clarify the involvement of the network in this Flagship.

73. The network is planning on organising regular webinars and is looking for volunteers.
74. Cost application did not go ahead this year. Aim to try again in the future.
75. Discussion about how to enhance global reach for the AHN?
- The issue is present for all the networks. Is it due to the process to join the GRA? Or is it a visibility issue for the GRA and the networks in Africa?
 - Improve the way potential members can join the network?
 - There are three official languages in Africa: English, French, and Portuguese. The GRA should work on information accessibility by adding a translation function on the website.
 - Using projects to improve/increase connections with African institutes.
 - Issues addressed by the networks are northern hemisphere centred, and not relevant for African countries.
 - More capability is needed in Africa, importance of Rurforum.
 - It would be good for students in Africa to also have a supervisor from the global north. Members from the north can then be more involved in African projects and have a better understanding of the needs.
 - Mix crop + livestock: not the priority in Africa.
 - Meeting and inviting people from Africa, understand what they need, and show them how the network can be relevant to their activities.
 - Stocktake on African projects?
76. A wrap up of the day was provided by Richard Dewhurst.
- All the networks have been doing well.
 - The networks should be working together more, and exchange information where possible.
 - Define areas where co-Chairs can support the networks.
 - The GHG emissions from livestock in low- and middle-income countries are high, but mitigation opportunities are also high.
 - Global Dairy industry reinforced this message (see above).
 - Members want more face-to-face meetings.
 - Building more relationship with the private sector is important.
 - Highlighted the importance of the different databases and to link them together.
 - FNN and MNN to work together on a shared webinar.
 - African initiative: have more webinars and encourage colleagues from low- and middle-income countries to be involved.
 - Reduce duplication of work.
 - Appropriate nutrition to reduce GHG.
 - A stocktake of existing work in Africa.
 - Contribution to CLIFF-GRADS to assist with running the networks.
 - Language and translation material; to increase visibility and accessibility.

Next Meeting

77. The next LRG annual meeting will be held alongside the WAAP/EAAP meeting in Lyon (France), in August/September 2023 (those meetings are 26th August to 1st September).

Appendix 1: Participants List

Country	Attendees
GRA Member Countries	
LRG Co-Chair (New Zealand)	- Jon Tanner (NZAGRC)
LRG Co-Chair (Ireland)	- Sinead Waters (Teagasc)
LRG Co-Chair (United Kingdom)	- Richard Dewhurst (Scotland's Rural College)
Argentina	- Andrea Enriquez (INTA) - Andres Said (Ministry of Agriculture) - Florencia Garcia (Universidad Nacional De Córdoba, Facultad De Ciencias Agropecuarias) - Jorge Martínez Ferrer (INTA - EEA Manfredi) - María Cerón Cucchi (INTA - Castelar) - Patricia Ricci (INTA) - Silvio Cravero (INTA- Biotech Institute) - Sofia Hara (INTA)
Australia	- Sharon Aarons (Agriculture Victoria Research, Department of Jobs, Precincts and Regions)
Bangladesh	- Ashraf Biswas (Chittagong Veterinary and Animal Science University)
Belgium	- Nico Peiren (ILVO) - Sam Decampeneere (ILVO)
Brazil	- Lívia Chagas de Lima (Gpep/ufrgs, Aliança Sipa)
Canada	- Cheikh Ly (Académie Des Sciences Et Techniques Du Sénégal)
Chile	- Emilio Ungerfeld (Instituto de Investigaciones Agropecuarias) - Marta Alfaro (Instituto de Investigaciones Agropecuarias) – GRA Chair
Colombia	- Olga Lucía Mayorga (Agrosavia-Corporacion Colombiana de inve)
Cote D'Ivoire	- Abdoulaye Cisse (Ministry of Higher Education and Scientific Research)
Denmark	- Peter Lund (Aarhus University Department of Animal and Veterinary Sciences) - Søren O. Petersen (Aarhus University, Department of Engineering)
Ecuador	- Ginger Briggithe Merino Galvez (Inicio Universidad Nacional de Loja) - Nelson Jhoel Ortiz Sinche (Universidad Nacional De Loja) - Vinicio Alvarado (Universidad Nacional De Loja)
Ethiopia	- Abraham Abera Feyissa (Addis Ababa University) - Tsegay Teklebrhan Gebremariam (Haramaya University)

Ghana	- Nana Ama Boahemaa Boadu (Kwame Nkrumah University of Science and Technology)
Indonesia	- Yeni Widiawati (Indonesian Research Institute for Animal Production)
Ireland	- Emily Roskam (Teagasc) - Paul Smith (Teagasc) - Sabine Scully (Teagasc) - Stephen Nolan (Glasport Bio)
Italy	- David Meo Zilio (Consiglio Per La Ricerca In Agricoltura E L'analisi Dell'economia Agraria (CREA))
Japan	- Keiichi Hayashi (Japan International Research Center for Agricultural Sciences (JIRCAS)) - Koki Maeda (Japan International Research Center for Agricultural Science)
Kenya	- Anne Atieno (Maseno University) - Bernard Kimoro (State Department for Livestock, Moalfo) - Brenda Kipkorir (Maseno University) - Orembe Jared (Maseno University)
Lithuania	- Vytautas Ribikauskas (Lithuanian University of Health Sciences (LSMU) Veterinarijos akademija, Maisto saugos ir kokybės katedra)
Malaysia	- Mardhati Mohammad (Malaysian Agricultural Research and Development Institute (MARDI)) - Tuan Poy Tee (Universiti Putra Malaysia)
Mali	- Amobo Waïgalo (University of Ségou) - Kaoussarath Adamou (University of Ségou)
Netherlands	- Henk van der Mheen (Wageningen University and Research)
New Zealand	- Ackim Mwape (NZAGRC) - Andrea Pickering (NZAGRC) - Jessica Somerton (NZAGRC) - Katerina Porou (Ministry of Primary Industries) - Lee Nelson (NZAGRC) - Matthew Johnson (Ministry for Primary Industries) - Nilusha Ubeynarayana (Ministry for Primary Industries) - Roger Hegarty (NZAGRC) - Sandy Zhang (Ministry for Primary Industries) - Sinead Leahy (NZAGRC) - Suzanne Rowe (AgResearch) – ASGGN Lead - Tony van der Weerden (AgResearch) – MNN Lead - William Aitkenhead (Ministry for Primary Industries)
Nigeria	- Clarence A. Lakpini (National Animal Production Research Institute) - Marvellous Jayesimi (Lautech)

	- Nnaemeka Success Esiobu (Department Of Agricultural Economics; Imo State University Owerri)
Norway	- Hendra Nur Cahyo (Norwegian University of Life Sciences) - Vibeke Lind (NIBIO)
Poland	- Adam Cieslak (Poznan University of Life Science, Dep. of Animal Nutrition and Feed Management)
Rwanda	- Emmanuel Ahidukuye (No organization)
Senegal	- Aminata Beye (Université Cheikh Anta Diop De Dakar) - Séga Ndao (Senegalese Agricultural Research Institute - ISRA)
Spain	- David Yanez-Ruiz (Estacion Experimental del Zaidin (CSIC)) – FNN Lead
Switzerland	- Giovanni Iazzari (Agroscope) - Sanaa Enkhtaivan (Independent consultant)
Tanzania	- Misheck Mulilo (Livestock Training Agency) - Shedrack Bwatota (NM-AIST)
Thailand	- Nguyễn Thanh Vân (Institute Of Animal Sciences For Southern Vietnam)
Turkey	- Muhammed İkbâl Coşkun (International Center for Livestock Research And Training)
Uganda	- Majaliwa Mwanjalolo (Makerere University)
United Kingdom	- Frances Ryan (Supporting Evidence Based Interventions In Livestock (SEBI-L) at The University of Edinburgh) - Nick Wheelhouse (Edinburgh Napier University) – AHN Lead - Richard Tiffin (Agrimetrics) - Sharon Huws (Queen's University, Belfast) – RMG Lead
United States of America	- April Leytem (USDA Agricultural Research Service) - Fabian Gutierrez Oviedo (Cornell University) - Ken Casey (Texas A&M AgriLife Research)
Uruguay	- Elly Navajas (Inia - Uruguay) - Maria Baccino (Climit)
Zambia	- Kabemba Mwambilwa (Ministry Fisheries and Livestock)

GRA Partner Organisations	
CGIAR	<ul style="list-style-type: none"> - Ciro Costa Jr - Claudia Arndt
Environmental Defense Fund	<ul style="list-style-type: none"> - Joe Rudek - John Tauzel - Peri Rosenstein
FAO	<ul style="list-style-type: none"> - Timothy Robinson
RUFORUM	<ul style="list-style-type: none"> - Selma Ndapewa Nghituwamhata
The World Bank	<ul style="list-style-type: none"> - Kadhija Fongod
GRA Secretariat	<ul style="list-style-type: none"> - Harry Clark (Acting GRA Special Representative) - Deborah Knox - Heather Went - Joanne Monjol - Nicolás Costa - Shiloh Babbington
Invited Speakers	<ul style="list-style-type: none"> - Andy Reisinger (Independent Expert) - Donald Moore (Global Dairy Platform) - Hayden Montgomery (Global Methane Hub) - Pania King (Eugene and Pania King farm Kiriroa Station) - Ruairidh Petre (Global Roundtable for Sustainable Beef)