

Livestock Research Group Meeting

Virtual Meeting

18-19 September 2020

MEETING REPORT

1. The 12th annual meeting of the Livestock Research Group (LRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was held virtually for the first time, given the current travel restrictions imposed by the COVID-19 pandemic. The meeting took place over two days and was chaired by Jeroen Dijkman, 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.lrg2020.com/>).

PARTICIPANTS

3. The meeting was attended by 93 participants, representing forty-two member countries of the GRA and seven partner organisations. Refer to Appendix 1 for the full participants' list.
 - **Countries represented:** Argentina, Australia, Belgium, Bolivia, Brazil, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Cote D'ivoire, Denmark, Dominican Republic, Ecuador, Eswatini, Finland, France, Germany, Ghana, India, Indonesia, Ireland, Italy, Japan, Kenya, Lithuania, Malaysia, Mongolia, Netherlands, New Zealand, Nigeria, Norway, Peru, Poland, Senegal, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, Uganda, United Kingdom, United States of America, Uruguay and Zambia.
 - **Partners represented:** Climate and Clean Air Coalition (CCAC), CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), European Commission, International Centre for Tropical Agriculture (CIAT), UNIQUE Forestry and Land Use GmbH, United Nations Food and Agriculture Organization (FAO), World Bank.

MEETING OUTCOMES

4. The meeting included identifying a series of research priorities for the LRG and the next steps to develop these as a group, or through the Networks of the GRA. Participants also ranked the science capability needs by region (Africa, Asia, Latin America and Europe/Oceania/North America), and shared the outcomes and experiences of the LRG activities that have occurred throughout the previous year. The LRG also agreed the following priority actions:
 - Developing closer collaboration with the Integrative Research Group (IRG);
 - Increase training opportunities and managing interface of networks;
 - Greater participation in Networks – members should contact the coordinators with related work;
 - Hold an annual workshop for each Network;

- Identification of Science priorities – including carbon sequestration and land use, adoption of technologies, data collection for inventories;
- Identification of what the barriers are to the adoption to practise change;
- Identification of Network priorities and funding mechanisms; and
- Prioritisation of science capability needs across the LRG and by regions (Africa, Asia, Latin America and Europe/Oceania/North America).

SUMMARY OF DISCUSSIONS FROM THE ON-DEMAND PRESENTATIONS

SCENE-SETTING CO-CHAIRS OVERVIEW

5. The meeting was co-chaired by Jeroen Dijkman, Sinead Waters and Richard Dewhurst, who welcomed participants to the virtual meeting. They discussed the structure of the live plenary sessions and the ability to collaborate virtually in the face of COVID-19. The aim of the two-day virtual meeting was to explore the assistance countries may require moving towards meeting part of their commitments to the Paris Agreement and the Koronivia Joint Work on Agriculture, by focussing on issues such as:
 - Development of detailed baselines for livestock sector emissions to support NDCs;
 - Approaches and tools to support Monitoring, Verification and Reporting (MRV);
 - Preparation of context-specific mitigation plans and policies;
 - LRG achievements and progress since our last meeting and future priorities.

UPDATE FROM THE SECRETARIAT

6. The GRA Secretariat provided an update to the Group on activities of the GRA since the 2019 LRG meeting, including new Members and Partners. The GRA has 62 Member Countries, with Benin, Cote d'Ivoire, Nigeria, Turkey and Zambia joining in the year following the 2019 LRG meeting in Foz do Iguassu, Brazil. The GRA now works with 23 Partner organisations, the Greenhouse Gas Management Institute (GHGMI) joining as a new partner.
7. Outcomes of the 2019 GRA Council meeting that are of relevance to the LRG include:
 - Indonesia and Australia took on the role of Council Chair and Co-Chair.
 - The reframing of GRA Flagship projects was approved (see Appendix Two).
 - The Terms of Reference for Enhanced Secretariat and Special Representative was approved and will continue to be hosted by New Zealand.
 - A Working Group was established to develop the 2021-25 Strategic Plan; with delegates from Australia, Canada, China, Germany, Indonesia, Netherlands, New Zealand, Tunisia and Zimbabwe.
 - Regional Secretariat support provided by Uruguay and Germany.
8. The 2020 Council meeting will be held 24-25 March 2021 in a virtual event, hosted by Australia as the incoming Council Chair.

NETWORK UPDATES

9. The LRG has five science networks, focused on strengthening collaboration in the main areas of livestock GHG research. The coordinators of each of the Networks provided on-demand presentations on the Network activities since the 2019 LRG meeting and answered questions from participants on the live plenary session of Day One.

Animal Selection, Genetics and Genomics Network (ASGGN) – Suzanne Rowe

10. The ASGGN is a forum for scientists exploring the impact of genetic technologies for managing livestock greenhouse gas (GHG) emissions. The Network has a [website](#) but the [GRA website](#) should also be consulted. There are 72 members of the Network.

11. Achievements to date:

- The activities of the group are shared on social media (Twitter - @ASGGN_GRA).
- A Network workshop was held in August 2019 prior to the EAAP Conference in Ghent, Belgium. The meeting focussed on Breeding for sustainable, efficient, environmentally friendly livestock: paths to animal production of the future.
- Enteric Fermentation Flagship – bring together of microbomes across bovine across global that have been measured for GHG emissions for feed intake and feed efficiency and the similarities and predictions moving forward.

12. Future Activities:

- 2021 Meeting at the International Conference Quantitative Genetics in Brisbane.
- Build Network links across globe.
- Identify funding for attendance for developing countries.
- Review paper refresh and interested parties to contribute.

Animal Health and Greenhouse Gas Emissions Intensity Network (AHN) – Dirk von Soosten

13. 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](#).

14. Achievements to date:

- First alliance between the Dairy sustainability Framework and the AHN was established. The interested parties came together at FAO (Rome) in April 2019 to discuss future collaborations.
- FLI researchers published a [review](#) relating to the AHN issues about the associations between dairy cow health and GHG.
- Virtual Network meeting was held on 1 September 2020 attended by 15 participants with outcomes:
 - Network members agreeing to start the preparations of a review by using the previous work of the Network as a starting point.
 - Developing knowledge products on animal health and GHG mitigation for use in Southern Africa.
 - Building connections to other Networks within and outside of the GRA. This includes the Feed and Nutrition Network of the LRG.

15. Challenges for the Network:

- Long-term funding for the Network.
- Secure funding for research projects.
- Enable more countries to participate in Network activities.

Rumen Microbial Genomics (RMG) Network – Sharon Huws

16. The Network focuses on methane mitigation by understanding microbial mechanisms and has grown in success and numbers of participants. The Rumen Microbial Genomics Network has an active twitter account (@RMG_network), where Network events, publications and activities are

shared. Further information about the Network can be found on the [GRA website](#). There are more than 200 scientists registered as members of the Network.

17. Achievements to date:

- The Network has coordinated two large collaborative projects, The Global Rumen Census and Hungate 1000. These projects and subsequent publications have really developed and grown the community.
- The Hungate Collection was a significant milestone in understanding the rumen microbiome. However, there are still gaps in available cultured rumen microbes and plans should concentrate on securing funding for the consortia to focus on culturing these missing microbes.
- Initial thoughts on proposal for hubs of activity for culture rumen microbes to be sent from Network members, partners to central location to target missing links and providers would be authors. At this stage, the capacity and funds are not available.
- Launch of Animal Microbiome in 2019, which is a community focussed open access journal welcoming all animal microbiome studies.
- Recently published a book on Rumen Function and understanding the microbes.

18. Activities of the Network are:

- Funded collaborative projects – RumenPredict, and MASTER (Horizon 2020).
- Publication of a review article covering the past, present and future of the rumen microbiome, which has been well received and cited.

19. Future Activities:

- The 9th RMG Network meeting will be held virtually in September 2020.

[Feed and Nutrition Network \(FNN\)](#) - Alexander Hristov

20. The Network focuses on ruminant feed and nutrition issues in relation to GHG emissions. There are more than 30 members of the Network and membership continues to grow. Further information about the Network can be found on the [GRA website](#).

21. Andre Bannink of Wageningen University & Research, Netherlands has the role of FNN Chair with a two-year term supported by co-chairs Alex Hristov of Penn State University and David Yanez-Ruiz of Estación Experimental del Zaidín.

22. Achievements to date:

- Two major review papers published in Animal Feed Science & Technology on in vitro and in vivo techniques for assessing nutritional strategies to reduce methane emissions.
- A symposium review published in the Journal of Dairy Science 'Uncertainties in enteric methane inventories, measurement techniques and prediction models.
- The Network contributes to the Enteric Fermentation Flagship and has an Enteric Flagship Latin America and a South East Asia FEED/METHANE projects. The network also links to national projects, which may have their own funding.
- Methodologies developed to measure nitrogen and ammonia emission from ruminant systems.
- The Network has coordinated two large projects Global Network and Capturing Effects of Diet on Emissions from Ruminant Systems (CEDERS). However, procuring funding is always a priority to develop future activities. The Global Network Project was a 4-year collaborative project to advance research into nutritional means to mitigate methane emissions and nitrogen losses from ruminants. CEDERS is a running 3-year project which

ends in 2021. FNN scientists have published three new papers associated with the project. This includes the development of two enteric methane mitigation databases:

- Mitigation database: the main goal is to summarise and recommend science-based enteric methane mitigation options to stakeholders
- Prediction database: consists of individual animal data and aims to support the development of robust enteric methane emission prediction models for various ruminant species and nutritional, animal and farm management scenarios.

23. Future activities:

- Finalizing database on Nitrogen and perform meta-analysis (Global Network Team).
- Finalizing meta-analysis databases of Latin America partners.
- Starting construction and meta-analysis of database from South-East Asian partners.
- Publishing results from the CEDERS project (experimental, modelling, dissemination).
- Extension of FNN membership.
- Interacting/exchange with national (EPA's) and international stakeholders.
- Development of new initiatives and activities.

Manure Management Network (MMN) – Tony Van Der Weerden

24. The Network is a global forum for scientists focused on reducing greenhouse gas emissions from livestock production systems and increasing the nutrient use efficiency of manures through the improvement of manure management. Further information about the Network can be found on the [GRA website](#).

25. A project that aligned with the MMN is DataMan, a GRA Nitrogen flagship project (2018-2021). The project aims to provide access to the most up-to-date knowledge on GHG emissions from manure management. The DataMan GHG Database is publicly [available here](#) and contains over 5600 emission factors; from 184 studies conducted in 25 countries.

26. Future activities:

- 2020 'Revival' virtual meetings.
- Expand the Network membership.
- Identify needs for experimental protocols.
- Encourage researchers/policy makers to utilise knowledge and data within MMN, including DataMan database.
- Extend DataMan/MELS beyond 2022.
- Update list of minimum Reporting of GHG flux and metadata for journal articles to facilitate future meta-analyses and modelling.
- Ensure current information is available to researchers/policy advisors via MMN website.

27. Cross-cutting issues across the LRG Networks:

- Funding mechanisms for Network activities. Discussed the approach to facilitated objectives of the Networks from existing funding.
- Networks are well-defined but there is a need to encourage cross-Network collaboration.
- Enhance new membership.
- One workshop per year for each Network.
- Funding support for members unable to attend workshops/events.

PARTNER UPDATES

28. Four partners of the LRG provided on-demand presentations to showcase their LRG-related portfolios and discuss updates, future priorities and new opportunities for collaboration. LRG partners also answered questions from participants on the live plenary session of Day One.

[World Bank](#) – Pierre Gerber

29. There is a strong commitment to support climate change objectives through projects funded by the World Bank, both adaptation and mitigation actions are mainstreamed within operations.

30. Activities that are of interest to the LRG include:

- A project in Kazakhstan that seeks to support beef production in export and is aimed at converting Kazakhstan's natural grassland resources into an international trade advantage while reducing GHG emissions. The implementation phase is still under preparation with a proposed start date by early 2021.
- The livestock sector readiness to access climate finance project which aims to increase the readiness of public and private entities within the animal protein sector to access climate finance towards a low-carbon transformation of the sector. The initiative is led by the Agriculture Global Practice of the World Bank, supported by the Forest Carbon Partnership Facility (FCPF) and the BioCarbonFund (BioCF). A conclusion of the preparation work will be made available to the public.
- A regional program on climate smart livestock systems in Africa. The project is being implemented in cooperation with the International Livestock Research Institute (ILRI) and the German Society for International collaboration (GIZ) and focuses on the combination of scientific data collection and solution-led field research on climate-smart livestock production. The results are being mainstreamed via large-scale investment projects.

[FAO](#) – Henning Steinfeld

31. On-going activities in the climate change division of the FAO support the international discussions through the UNFCCC and the Koronivia Joint Work on Agriculture (KJWA). Under the livestock division there are a number of activities relevant to the work of the LRG, including the development of models to assess GHG emissions and the options countries could use to monitor NDCs. There are also a number of tools and methodologies that have been developed that are used to validate these options, and build consensus with stakeholder groups, through the Global Agenda for Sustainable Livestock.

32. The Global Agenda on Sustainable Livestock is a multi-stakeholder platform, one of its focus areas is the impact of climate change on livestock production. A key action network within the Global Agenda is the [Livestock Environmental Assessment and Performance \(LEAP\)](#) partnership brings together civil society, private sector and government. This Partnership has successfully developed environmental standards, methodologies and guidelines for livestock production best practice.

33. The FAO recently released a publication, [Five practical actions towards low-carbon livestock](#), that can be implemented in integrative and sustainable ways, taking account the diversity of livestock systems and enhancing synergies and managing trade-offs with other sustainable development objectives.

CCAFS – Lini Wollenberg

34. CCAFS is a cross-cutting program of the CGIAR and focuses on adaptation and mitigation with an outcome-focus for development. CCAFS was established in 2010 and will be replaced in 2021 by what is currently called the CGIAR 2-Degree Initiative.
35. The work of CCAFS in the livestock sector includes eight countries and Global initiatives with core projects in China, East Africa and Colombia. The research undertaken seeks to improve livestock and pasture management, supply chain efficiency, MRV, sustainability standards and finance. Joint activities between the LRG and CCAFS include:
- Publication on Livestock Activity Data Guidance in partnership with the GRA, FAO and UNIQUE Forestry and Land Use.
 - AgMRV website (www.agmrv.org) is an online platform that includes MRV methodologies for livestock, case studies on lessons learned for improving MRV and other resources.
 - CLIFF-GRADS fellowships, the CLIFF programme was established by CCAFS and the GRA has expanded this.
 - Developing partnerships for regional research work, through CGIAR centres ILRI and CIAT.
36. Upcoming research and opportunities:
- The CGIAR 2-Degree Initiative is currently in the design phase, concurrent with One CGIAR reforms and will cover up to eight geographically focused challenges led by CGIAR Centres. Two challenges of relevance to the LRG is the Landscape and Livestock in Latin America led by ICRAFT and CIAT, and the circular bioeconomy in periurban areas led by CIFOR.

CCAC – Catalina Etcheverry

37. The CCAC focusses on short-lived climate pollutants, including from agriculture (enteric methane from livestock, methane from manure and paddy fields, and black carbon from burning crop residues). The activities are based on scientific assessment, with the organisation linked to UNEP.
38. Collaborative activities with the GRA include a project on supporting countries identify low-cost strategies to reduce enteric methane emissions from ruminant systems. The CCAC also supports complementary efforts in the livestock sector more specifically on improvements to livestock GHG inventories. In early 2020, GRA facilitated a consultative workshop on the role of modelling in national estimation of livestock emissions.
39. Future collaboration activities with the GRA include:
- Creating the enabling environment for enhanced climate ambition and climate action through institutional capacity building project and aims to address barriers countries' face in setting national mitigation targets.
 - Support inclusion of CH₄ mitigation from manure management in China's NDCs and 14th Five-Year Plan (2021-2025).
 - Co-organise a Ministerial roundtable with Ministries of Environment and Ministries of Agriculture. This is still in the early stages of planning.
 - Identify opportunities linked to GRA's regional strategies.

CAPABILITY BUILDING ACTIVITIES

40. Three on-demand presentations were provided from Country and GRA Secretariat representatives to showcase activities, outputs and outcomes of LRG/GRA capacity building activities.

CLIFF-GRADS – Hazelle Tomlin

41. The Climate, Food and Farming, Global Research Alliance Development Scholarships (CLIFF-GRADS) programme was presented by Hazelle Tomlin. There have been four CLIFF-GRADS calls to date with a total of 124 scholarships awarded to students completing PhDs from 32 different countries. The scholarship funds a research visit of up to six months, with GRA members and partners asked to provide in-kind support through hosting. Since 2017 the programme has seen an increasing number of applications and offers to host students.

LEARN Fellowship – Ashraf Biswas

42. The Livestock Emissions Abatement Research Network (LEARN) award was presented by Ashraf Biswas, one of the recipients of the LEARN award. An update on the current status of LEARN was provided to participants at the plenary session. It was noted that LEARN is currently on pause and was being re-evaluated. A new scholarship programme was launched earlier this year, the New Zealand Global Research Alliance Doctoral Scholarship (NZ-GRADS) which is focused on supporting science students from developing countries to complete their PhD at a New Zealand university.

LRG Modelling Workshop – Pamela Sangoluisa-Rodriguez

43. The LRG Modelling workshop was presented by Pamela Sangoluisa-Rodriguez of Ecuador. In early 2020, the GRA facilitated a workshop that brought together a diverse set of model and accounting software users and technical experts from different countries as a first step in making models and accounting software more accurate, transparent and useable. The GRA in close collaboration with the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) and the Food and Agriculture Organisation of the United Nations (FAO) and the additional financial support of the CCAC and United States Department of Agriculture (USDA), engaged representative countries to ensure a coordinated approach to develop accounting software and models, including the collection and sharing of improved activity data.
44. The workshop, hosted by the Indonesian Center for Animal Research and Development (ICARD), discussed next steps, including: mapping of countries' NDC livestock sector inclusion and subsequent actions; support and establishment of regional (virtual) networks, tool portals, and ways to exchange experiences and lessons learned; international support available and organisations involved, and assessment of the preparedness for inventory work concerning specific countries.

LIVESTOCK GHG INVENTORIES TO SUPPORT NDCS

45. On-demand presentations provided country representatives for Kenya and Indonesia the opportunity to discuss their country's progression to Tier 2 GHG emissions inventory.
46. The key challenges that were identified for Kenya included compiling data in preparation for inventory and engaging stakeholders, ministries, departments and scientists. In Indonesia, the

key challenge included collating different measurements across the varied provinces, as there is no industry involvement.

47. On-demand presentations provided country representatives for [United Kingdom](#) and [South Africa](#) the opportunity to discuss their country's progression to Tier 3 GHG emissions inventory.
48. The presenters discussed the various approaches to measuring and modelling national inventories. The need for a good representation of sites and crop/livestock selections to measure GHG inventories was discussed.
49. On-demand presentations provided country representatives for [China](#) and [Senegal](#) the opportunity to discuss their country's recent experience in building livestock GHG inventories.
50. In Senegal, collaboration across stakeholders enhance the development and collection of data. Collaboration will also be key under the new development model in Senegal, a strategy that constitutes the reference for economic and social policy in the medium and long term (2030).
51. In China, with the support from the GRA and CCAFS, the Chinese Academy of Agricultural Sciences (CAAS) developed MRV Guidance based on IPCC Tier 2. The Guidance can be used by provinces, cities, and companies to compile livestock GHG inventories based Tier 2 and to assess the effects of different technical options for reducing GHG emissions.
52. The group then discussed the benefits of improving national GHG inventories, including understanding the improvements to national livestock systems overtime and connecting field research activities and organisations with the inventory. Inventory improvements can be made gradually, and activity data can initially be found from a range of sources including identifying typical farms or activities and making use of existing surveys. Other datasets such as those from the FAO or neighbouring countries may be used.

OBLIGATIONS, PRACTICES, CHALLENGES / OPPORTUNITIES IN THE MRV OF LIVESTOCK GHG EMISSIONS AND EMISSION REDUCTIONS

53. An on-demand presentation by Andreas Wilkes, UNIQUE Forestry and Land Use discussed the [making of Livestock MRV Policy-Relevant through opportunities and challenges](#).
54. Andreas presented on the International MRV requirements for countries. Andreas also provided examples of three countries (Kenya, Ethiopia and China) who have shifted from Tier 1 to Tier 2 inventories and MRV methods.
55. The group discussed the need for inventory to be compiled using the best available data, and where there are data gaps use IPCC approved methods to fill the data gaps and then plan for improvements over time. The challenge of collecting reliable baseline when farmers conflict with herdsman was discussed and identified as an issue for several African countries and a discussion among countries with similar issues would be a valuable initiative. The role of the Government was also discussed by the group. The Government is obligated to report inventories and ensuring inventory reporting exists.

MODELLING FOR ESTIMATION AND MITIGATION OF GHG EMISSIONS

56. An on-demand presentation by Tim Robinson, FAO Italy discussed [modelling for estimation and mitigation of GHG emissions](#).
57. Tim presented on the use of models and the need to improve activity data, systems and EF in more detail in alignment with the IPCC guidelines. The FAO developed Global Livestock Environmental Assessment Model (GLEAM) is designed as a global model to explore livestock-environment interactions but can also be adapted to conduct more detailed national and sectoral assessments.
58. FAO is currently working on an improvement project with CCAC and GRA, which looks to develop a dashboard for countries to explore sources of their emissions. Once completed, countries should be able to add in their data which supports the GLEAM 4 model and countries can use to test options. The need to introduce confidence tracking to GLEAM 3 was discussed and identified that the GRA can help in this technical area.

RECENT EXPERIENCES IN IDENTIFYING OPTIONS FOR LIVESTOCK SECTOR GHG MITIGATION

59. Three on-demand presentations were provided by country representatives and provided the opportunity to discuss their country's recent experiences in identifying options for livestock sector GHG mitigation.

[Advances in Reducing the Carbon-Footprint of Cattle Production in Costa Rica](#) - Sergio Abarca

60. Strategies adopted by Costa Rica to reduce GHG emissions are primarily through carbon removals in a subtropical area. Livestock farms in Costa Rica maintain high biodiversity and absorb carbon through three processes:
- Tropical forest with secondary growth;
 - The soil of well-managed pasture areas;
 - Trees within pastures.

[National Abatement of Agricultural GHG and Ammonia: Current Strategy and Future Perspectives](#) - Gary Lanigan

61. The Irish approach to agricultural GHG and ammonia mitigation as pertained to the livestock sector was discussed. The current strategy has been focussed on using efficiency measures to limit the increases in methane associated with increases in production; decrease absolute emissions of nitrous oxide; increase carbon sequestration; displace fossil CO₂ via increased agri-based energy.
62. The potential for more carbon sequestration in Irish soils was discussed by the group. Pastures are generally only reseeded every 30 years which is close to the limit for a lot of soils. Keeping carbon in peat soils continues to be a large issue.
63. The key goal for Ireland is reducing emissions from organic soils by limiting agricultural methane emissions or N₂O to about 10% beyond this land use measures are required – 60-70 % is carbon.

Experiences in Identifying Options of Livestock Sector GHG Mitigation - Robin Mbae

64. The move from Tier 1 to Tier 2 for Kenya resulted in technical lessons learned and accuracies were improved by using Kenya specific activity data. Additionally, a taskforce of researchers with technical capacity will be key to accelerating use of accurate and advanced data in livestock emissions inventories. Policy contribution is also key to assist the country with direction and guidance to develop inventory.

FUTURE SCIENCE PRIORITIES FOR LRG

65. During day one of the live plenary sessions, Harry Clark, Director of the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) presented to the group in an open discussion on the future science priorities of the LRG and the ways of working together on those priorities. He discussed the need for processes that will enable the development of a portfolio of projects as the GRA expands and how to use those process to get outcomes and outputs to identify collaborative projects.

66. Harry presented on underlying principles for research projects with the principles largely based on the GRA adoption of flagship projects and a suggested process on short-listing priority projects and areas or research selected for further development. The group discussed the development of a list of possible topics for future discussion including:

- literature reviews;
- harmonising the science and research that support global discussions; and
- science support and building institutional capacity in countries to support countries MRV and NDC.

PARTICIPANT SURVEY ON SCIENCE CAPABILITY NEEDS BY REGION

67. A survey was conducted following the two-day live plenary sessions and participants were asked to rank the science capability needs by region (Africa, Asia, Latin America and Europe/Oceania/North America). These needs were summarised in the table below:

Science capability needs	Africa	Asia	Latin America	OECD	Total
Canvas members for GRA relevant project ideas	5	3	4	8	15
Integration of science opps networks	5	4	6	10	28
Soil carbon stock sinks – with IRG	-	3	5	9	21

Facilitate collection of activity data	3	4	-	8	21
Identification of barriers to practice and policy change policy	-	4	-	-	19
Share GHG inventory lessons learned	4	5	-	5	17
Contribute to model and GLEAM development	-	-	-	5	15

Next Meeting

68. The location for the next meeting has not yet been decided, any members who are interested to host the 2021 LRG meeting, please contact the GRA Secretariat.

APPENDIX 1: Country Updates

69. During the two-day online plenary sessions, LRG country representatives were provided with the opportunity to discuss their countries' national/regional MRV priorities, identify relevant ongoing and planned activities and reflect on opportunities/needs for LRG networking and capacity building.

Argentina - Andres Said

- Emissions related to cattle beef production in Argentina are reported in Tier 2. As an increasingly important sector, there is a growing need to continue improving inventories reporting.
- There is a need to reflect on production changes in emission factors each year and continue developing through a quality assurance process.
- There is a global consensus of the importance of grazing lands for the potential to sequester carbon, yet this is not addressed in the LRG networks. There is a need to consider the system's net global carbon balance of countries with majority of their livestock based on pastoral or silvo-pastoral and integrated systems.

Bangladesh – Ashraf Biswas

- A proposal was suggested to develop a LEARN Alumni to distribute knowledge learnings globally. Another proposal was that low-cost in vivo methane estimation is needed for developing countries.
- Bangladesh has recently joined the GRA and has little research to date on inventory reporting. There is a need for knowledge dissemination to developing countries and communities.

Chile - Marta Alfaro

- Peru will need to consider the limitations that we can achieve in direct integration of livestock systems. At the farmer level, their decisions are based on an integrated perspective on-farm considering livestock production as well as cropping systems.
- A way forward for Chile would be to adopt an integrated view of what can be achieved at a farmer level considering livestock production as well as carbon sequestration as mentioned by earlier speakers.

Finland - Matti Pastell

- Finland is currently working on animal breeding, feed efficiency and is working on updating Tier 2 for indirect methane and manure emissions. There is also work on moving to Tier 3 for indirect methane emissions.
- Soil carbon sequestration is a big issue for Finland and there are multiple ongoing research projects to quantify the sequestration potential. Organic soils represent 50% of Finland's national emissions and mitigation on organic soils is a challenge.

Ireland – Gary Lanigan

- The point was made for countries looking to shift Tier levels is that the need for activity data increases majorly. There is a need to move to Tier 3 models, reporting will need to be on a per farm/per land basis. There is a large opportunity to use remote sensing proxies to gather activity data.

Kenya – Benjamin Kibor

- The current priorities for Kenya are to move to other livestock from dairy and update the statistics for the dairy sector.
- There are plans to conduct a survey to improve categorisation of production systems.
- Research institutes that are monitoring and reporting GHG inventories require support to do research, surveys and technical work. Discussions have been held with UNIQUE Forestry and Land Use on improving Kenya's inventories.

Malaysia - Mohd Saufi

- The question was asked whether it is more important to have data collection improved by disaggregating animal data or moving to a Tier 2. Both have similar importance and advised to progress at a parallel.

Netherlands - Andre Bannink

- Livestock production will change significantly in the coming decades. There are issues of directing to more diverse grasslands. Circularity of the whole agricultural system is a big challenge for the Netherlands.
- There will be an increase in demand for on-farm tools to apply the measures to be taken by farmers and how do we ensure these measurements are accurately identified at a national level. There is the potential for the LRG to play a coordinated role in assembling methods and lessons learned from LRG countries as many of the same issues will arise in these countries.

Peru - Claudia Arndt

- Peru is currently in the process of shifting from Tier 1 to Tier 2 inventory for cattle. A key challenge is connecting the data to on-farm. The herd structure is also a challenge for Peru and what improvements to look at. There is limited livestock activity data impeding the accuracies for Tier 2 inventory and is a key area of improvement.

Senegal - Ndao Sega

- The collection of data in different stages of the approach was discussed in response to the question asked by the country representative of Malaysia. There is a need to consider all animal categories before progressing to Tier 2 or Tier 3.

Tunisia – Hajer Ammar

- In Tunisia, it is difficult to get accurate data to move to Tier 2 and identify mitigations options. Adaptation techniques is most considered by farmers including animal nutritional,

medicinal plants by using extracts to enhance rumen microflora which reduces methane by 50%. Easily adopted by smallholder farmers.

Zimbabwe - Walter Svinurai

- The challenge that Zimbabwe is facing in shifting from Tier 1 to Tier 2 is that the GHG emissions have been reported through the Zimbabwe Ministry of Environment so there has been little involvement from key institutions in the collection of activity data until recently.
- Current priority for the key institutions involved include developing a standardised template to address the GHG emissions to meet the IPCC reporting. Another key priority is to conduct a baseline survey of the drivers in the livestock sector which will be a national survey. The country will also look to develop a strategy for developing emission factors.

Appendix 2: Participants List

Country	Attendees
GRA Member Countries	
LRG Co-Chair (New Zealand)	- Jeroen Dijkman (Wageningen University & Research)
LRG Co-Chair (Ireland)	- Sinead Waters (Teagasc)
LRG Co-Chair (United Kingdom)	- Richard Dewhurst (Scotland's Rural College)
Argentina	- Andrés Said (National Direction of International Agrifood Relations, Ministry of Agroindustry) - Florencia Garcia (INTA Argentina) - Olegario Hernandez
Bangladesh	- Nathu Ram Sarker (Bangladesh Livestock Research Institute) - Sardar Muhammad Amanullah (Bangladesh Livestock Research Institute) - Ashraf Biswas (Chittagong Veterinary and Animal Science University (CVASU))
Belgium	- Sam De Campeneere (Research Institute for Agriculture, Fisheries & Food)
Brazil	- Alexandre Berndt (EMBRAPA Southeast Livestock)
Cameroon	- Etchu Kingsley Agbor (Institute of Agricultural Research for Development)
Chile	- Francisco Salazar Sperberg (INIA Chile) - Marta Alfaro (INIA Chile)
China	- Hongmin Dong (Chinese Academy of Agricultural Sciences) - Yue Li (Chinese Academy of Agricultural Sciences) - Zhang Yu (Chinese Academy of Agricultural Sciences)
Colombia	- Olga Lucía Mayorga (Corporación Colombiana de Investigación AgropecuariaAgrosavia)
Costa Rica	- Jorge Segura (Ministry of Agriculture and Livestock) - Sergio Abarca (INTA Costa Rica)
Cote D'ioivre	- Abdoulaye Cisse (Ministry of Higher Education and Scientific Research)
Denmark	- Peter Lund (Aarhus University Department of Animal Health and Bioscience)
Dominican Republic	- Gregorio Garcia Lagombra (Instituto Dominicano de Investigaciones Agropecuarias y forestales (IDIAF))
Ecuador	- Pamela Sangoluisa Rodriguez
Finland	- Matti Pastell (Natural Resources Institute)

France	<ul style="list-style-type: none"> - Diego Morgavi (INRA France) - Maguy Eugene (INRA France)
Germany	<ul style="list-style-type: none"> - Dirk von Soosten (Friedrich-Loeffler-Institut)
India	<ul style="list-style-type: none"> - Raghavendra Bhatta (National Institute of Animal Nutrition and Physiology)
Indonesia	<ul style="list-style-type: none"> - Bess Tiesnamurti (Indonesian Centre for Animal Research and Development (IAARD)) - Atien Priyanti Sudarjo Putri - Yeni Balitnak (Indonesian Research Institute for Animal Production)
Ireland	<ul style="list-style-type: none"> - Gary Lanigan (Teagasc) - John Harrison (Department of Agriculture)
Italy	<ul style="list-style-type: none"> - Giacomo Pirlo (Agricultural Research Council)
Japan	<ul style="list-style-type: none"> - Koki Maeda (Japan International Research Center for Agricultural Science) - Satoshi Tobita (JIRCAS)
Lithuania	<ul style="list-style-type: none"> - Rolandas Bleizgys (Vytautas Magnus University)
Malaysia	<ul style="list-style-type: none"> - Mardhati Mohammad (Malaysian Agricultural Research and Development Institute (MARDI)) - Mohd Saufi (MARDI)
Mongolia	<ul style="list-style-type: none"> - Sanaa Enkhtaivan (Environment & Climate Fund)
Netherlands	<ul style="list-style-type: none"> - Andre Bannink (Wageningen University & Research) - Henk van der Mheen (Wageningen University & Research)
New Zealand	<ul style="list-style-type: none"> - Harry Clark (NZAGRC) - Peter Ettema (MPI) - Sinead Leahy (NZAGRC) - Suzanne Rowe (AgResearch)
Nigeria	<ul style="list-style-type: none"> - Clarence Lakpini (National Animal Production Research Institute) - Eustace Iyayi (Nigerian Institute of Animal Science (NIAS))
Norway	<ul style="list-style-type: none"> - Angela Schwarm (Norwegian University of Life Sciences) - Vibeke Lind (The Norwegian Institute of Bioeconomy Research)
Peru	<ul style="list-style-type: none"> - Claudia Arndt (CATIE)
Poland	<ul style="list-style-type: none"> - Adam Cieslak (Poznan University of Life Science)
Senegal	<ul style="list-style-type: none"> - Ndao Segal (Senegalese Agricultural Research Institute (ISRA))
South Africa	<ul style="list-style-type: none"> - George Shole (Department of Agriculture, Forestry and Fisheries) - Linde du Toit (University of Pretoria) - Michiel Scholtz (Agricultural Research Council)

Spain	<ul style="list-style-type: none"> - Agustin del Prado (Basque Centre for Climate Change) - David Yáñez-Ruiz (Estacion Experimental del Zaidin (CSIC))
Sweden	<ul style="list-style-type: none"> - Rebecca Danielsson (Swedish University of Agricultural Sciences)
Switzerland	<ul style="list-style-type: none"> - Daniel Bretscher (Agroscope)
Tunisia	<ul style="list-style-type: none"> - Hajer Ammar (High Agriculture School of Mograne)
Turkey	<ul style="list-style-type: none"> - Aykut Ordukaya (General Directorate of Agricultural Research and Policies (TAGEM)) - Muhammed İkbâl Coşkun - Sezer Öz
United Kingdom	<ul style="list-style-type: none"> - Chris Creevey (Queen's University Belfast) - Paul Freeman (DEFRA) - Sharon Huws (Queen's University Belfast) - Laura Cardenas (Rothamsted) - Mark Jacob (DEFRA)
Uruguay	<ul style="list-style-type: none"> - Gonzalo Becoña (Plan Agropecuario) - Verónica Ciganda (INIA Uruguay)
United States of America	<ul style="list-style-type: none"> - Alexander Hristov (Pennsylvania State University) - April Leytem (USDA Agricultural Research Service)
Zambia	<ul style="list-style-type: none"> - Kabemba Mwambilwa (Ministry Fisheries and Livestock)
Zimbabwe	<ul style="list-style-type: none"> - Walter Svinurai (University of Zimbabwe Marondera College of Agricultural Sciences and Technology (UZMCAST))
GRA Partner Organisations and invited experts	
CCAC	<ul style="list-style-type: none"> - Catalina Etcheverry
CCAFS	<ul style="list-style-type: none"> - Lini Wollenberg
CIAT	<ul style="list-style-type: none"> - Jacobo Arango
European Commission	<ul style="list-style-type: none"> - Jean-Charles Cavitte
FAO	<ul style="list-style-type: none"> - Timothy Robinson
India	<ul style="list-style-type: none"> - Raghavendra Bhatta (National Institute of Animal Nutrition and Physiology)
Kenya	<ul style="list-style-type: none"> - Benjamin Kibor (Ministry of Agriculture, Livestock, Fisheries, and Irrigation) - Robin Mbae (Climate Change Unit of the State Department for Livestock)
UNIQUE	<ul style="list-style-type: none"> - Andreas Wilkes
World Bank	<ul style="list-style-type: none"> - Felix Teillard
GRA Secretariat	<ul style="list-style-type: none"> - Hayden Montgomery (Special Representative)

	<ul style="list-style-type: none">- William Aitkenhead (Secretariat)- Deborah Knox (Secretariat)- Nina Grassnick (Secretariat)- Kelsi Crown (Secretariat)- Chanjief Chandrakumar (Secretariat)- Hazelle Tomlin (Secretariat)
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