

Livestock Research Group Meeting

Salão America and Mercosul, Golden Park International Convention and Events Centre

Foz do Iguassu, Brazil

9-10 August 2019

MEETING OUTCOMES AND REPORT

The 11th annual meeting of the Livestock Research Group (LRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was hosted by Brazil from 9-10 August 2019. It was attended by representatives from 31 countries, three of the LRG's research networks and six partner organisations.

OUTCOMES

The meeting, which reviewed the changing context of livestock sector production and consumption systems, member nations' evolving needs and contributions, and the achievements and lessons learned over the past ten years, agreed the following LRG priority actions:

- Take stock, catalogue outputs and achievements and assess opportunities for enhanced impact.
- Ensure new and ongoing activities are framed within the broader social, economic and environmental context of the Global Agenda 2030.
- Strive towards increasing the global nature of dialogue, networks, partnerships and knowledge sharing by addressing differences in capabilities, techniques and standards.
- Explore increased linkages to and engagement with multi-stakeholder and policy processes aligned to sustainability.
- Facilitate the preparation of a science-based manuscript on the place and role of livestock in sustainable agri-food systems.
- Work with member nations on the establishment of a 'roster' of countries and organizations offering to share relevant GHG inventory, MRV and NDC expertise (at marginal costs) and countries who are interested (and where there are incentives) to move Tiers.
- Work with LRG partners on the development of a facility to ensure the inclusion of relevant GHG and climate expertise and research into the appraisal and design of livestock sector investment portfolios.

- Explore opportunities for the mentoring of new member countries, the tailoring of capacity building to specific regional needs, and the set-up of LRG Regional chapters and new thematic areas.
- Facilitate actions to rekindle Animal Health and Manure Management networks.
- Encourage member countries to prepare and regularly update their country pages on the GRA website.

MEETING REPORT

1. This report is a summary of key discussions, outcomes and action points from the meeting. Presentation slides and background papers are provided separately on the GRA website (<https://globalresearchalliance.org/library/livestock-research-group-meeting-foz-do-igaussu-august-2019/>).

PARTICIPANTS

2. The meeting was attended by representatives from 28 GRA member countries and three observer countries, three of the LRG's research networks, and six partner organisations:
- **Countries attending:** Argentina, Australia, Belgium, Brazil, Cameroon, Canada, Chile, Colombia, Cote d' Ivore, Denmark, France, Germany, Ghana, Ireland, Italy, Japan, Kenya, Netherlands, New Zealand, Nigeria, Norway, Senegal, Spain, South Africa, Taiwan, Thailand, Tunisia, Uganda, Uruguay, USA, Zimbabwe.
 - **LRG network coordinators attending:** Animal Selection, Genetics and Genomics Network; Feed and Nutrition Network; and Rumen Microbial Genomics Network.
 - **Partners attending:** Tropical Agricultural Research and Higher Education (CATIE), Climate and Clean Air Coalition (CCAC), International Centre for Tropical Agriculture (CIAT also representing CCAFS), European Commission, UN Food and Agriculture Organisation (FAO), World Bank.
3. The meeting was co-chaired by Harry Clark (New Zealand Agricultural Greenhouse Gas Research Centre) and Sinead Waters (Teagasc, Ireland). Refer to Appendix 1 for the full participants' list.

SCENE-SETTING CO-CHAIRS OVERVIEW

4. Sinead Waters, LRG Co-Chair Ireland welcomed the group to the 11th meeting of the Livestock Research Group. Ireland has stepped into the Co-Chair position following the Netherlands (Martin Scholten, Wageningen University and Research) leaving this position. The aims of the two-day meeting were to:
- Review LRG achievements, progress and changes since the last meeting;
 - Review the implications of recent global agreements and other developments for the LRG and its activities;
 - Evaluate and discuss the LRG's contribution to country requirements and the SDGs; and
 - Inform the future of the LRG and its activities by learning from the past 10 years.

SECRETARIAT UPDATE

5. The GRA Secretariat provided an update to the Group on activities of the GRA since the 2018 Council meeting, including new Members and Partners. The GRA now has 57 Member Countries, with Eswatini, Mongolia, Malawi, Namibia, Ethiopia, Uganda, and Cameroon joining in the year following the 2018 LRG meeting in Ho Chi Minh City, Viet Nam. The GRA now works with 21 Partner organisations, including the European Commission as a new partner attending these discussions.

6. Outcomes from the 2018 GRA Council meeting that are of relevance to the Livestock Research Group include:

- Germany and Indonesia took on the roles of Council Chair and Co-Chair.
- Senegal confirmed as the third Co-Chair for the Paddy Rice Research Group (PRRG).
- The LRG requested two new Co-Chairs, following the Netherlands announcement to step down as a Co-Chair, and Ireland has since agreed to take on a Co-Chair Position.
- Two new flagships were proposed by the Council; 1) Nitrogen – to better quantify nitrous oxide emissions and implement mitigation solutions and, 2) Circular Food Systems – to assess the feasibility and potential of decreasing greenhouse gas emissions from circular food systems. Co-Chairs emphasized the need for members to support flagships with people and resources if they are to succeed as intended.
- The Koronivia Joint Work on Agriculture (KJWA) will be hosting a series of workshops at the regular sessions of the Subsidiary Bodies of the United Nations Framework Convention on Climate Change (UNFCCC) focused on soil carbon, nutrient management, livestock, amongst other topics, and the Alliance hopes to be invited to attend as an expert presenter at these workshops.

7. The 2019 Council meeting will be held 6-7 October in Bali, hosted by Indonesia as the incoming Council Chair. Alongside the meeting will be the 5th global science conference on Climate Smart Agriculture.

LIVESTOCK RESEARCH GROUP UPDATE

8. The Membership of the LRG is growing, with the GRA, including an increasing number of members from Africa. As our membership becomes more diverse it becomes more difficult to organise activities that bring together and meet the needs of all members. One of the key purposes of this meeting is to consider the way we work together as a group.

9. Some of the highlights of what we have achieved includes finding new ways study methane production in the rumen, identifying what methanogens live on and how we can restrict these substrates. Building a reference group of rumen organisms through the Hungate 1000 project is something that only the LRG could have achieved, the diverse range of rumen samples that we were able to collect was only possible because of the multi-partner and country collaborations that have been formed through the LRG.

10. Good progress has been made on projects to improve livestock breeding and genetics, and manure management. The LRG research Networks have been essential in developing these projects and ensuring the widest possible collaboration. The ability to fund these multi-country projects through European joint research funding mechanisms such as ERA-GAS, which also allows for wider international participation, has allowed each country to support their own scientists and contribute to a larger project. A number of these joint collaborations have supported Postdocs and their

international mobilisation as a way of building science capability and allowing for wider participation from the LRG membership.

11. Capability building continues to be an important focus of the LRG, as countries need to increase and improve their data collection and management. A key challenge and opportunity is how we increase the diversity of the LRG and benefit all members.

INTERNATIONAL DEVELOPMENTS

12. Hayden Montgomery, the GRA Special Representative, provided context on the current challenges faced by the agriculture and livestock sector, as well as the discussions arising from international bodies such as the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC).

13. The GRA was first agreed in 2009 when a perfect storm of future challenges were identified as having implications on food security and agriculture. Countries agreed to work together under the GRA to address these challenges; the first organisation to work on agricultural greenhouse gas mitigation, adaptation and food security, although a number of organisations working on these topics were established in the years following.

14. Recently the call to prioritise food security, climate change and sustainable development has increased, and was explicitly mentioned in the Paris Agreement, which seeks to keep greenhouse gas emissions below 2°C.

15. Agriculture has now been brought into the UNFCCC discussions following the agreement of the Koronivia Joint Work on Agriculture (KJWA). The KJWA is seeking inputs over the next two years, including from technical experts on agricultural soils, livestock management and nutrient and manure management. The GRA is considering how to support the KJWA, identifying existing knowledge and products that may feed into the technical workshops, as well as identify future products that would support the discussions, and ensuring that GRA capability building activities are visible and can support the KJWA roadmap.

16. The goal to reduce total emissions to meet the below 2°C target will need to include the agriculture sector. By increasing productivity in the agriculture sector we have seen a reduction in emissions per unit of product, but we will need to do more than this, as future productivity improvements will not be sufficient. Over 100 countries identify agriculture as a priority under their Nationally Determined Contributions (NDC) but do have specific plans for implementation. How can the GRA support countries to meet their NDCs?

17. Agricultural mitigations from existing technical options and practices range between 21-40% of the mitigation indicated in the IPCC 1.5°C report (<https://www.ipcc.ch/sr15/>) and the IPCC Special Report on Climate Change and Land (<https://www.ipcc.ch/report/srcccl/>). To reach the targets indicated by these reports the cost of mitigation needs to be reduced, and additional research into mitigation technologies and practices to increase carbon sequestration in agricultural soils is required.

18. The agriculture sector is under increasing scrutiny from a variety of studies and reports, such as the EAT Lancet commissions report which emphasize that feeding a future population of 10 billion people on a healthy diet within planetary boundaries requires a significant reduction in the production and consumption of animal source foods.

Discussion

19. The meeting agreed that responding to some of these messages and reports should be high on the LRG agenda, and that science-based message on the place and role of livestock in sustainable agri-food systems would help members respond to some of the pressures they are facing.

NATIONAL CONTEXT FOR LIVESTOCK SECTOR PRODUCTION

20. Further to the discussion on the international actions and views on livestock production systems, a few members were asked to provide an overview of their national policies and recent national or regional developments and processes that are changing in response to discussions about livestock production and consumption.

Ireland - David Kenny

21. A growing global population has growing nutritional requirements and Ireland sees itself as being well positioned to respond. Agriculture is an important part of economy, and therefore contributes a disproportionate amount to national GHGs (33%) whereas the EU average for agricultural is 10% of total emissions. Ireland is a highly efficient dairy and beef producer in the EU context. A national plan outlines actions to respond to the commitments under Paris Agreement, a 30% reduction below 2005 levels by 2030. Teagasc has been tasked to come up with the options to respond as ruminants are responsible for 70% -80% of agricultural GHGs in Ireland. Approaches include: increased livestock efficiency (breeding – genomic selection); new technologies to reduce N₂O emissions (manure management, reduced synthetic fertilisers, move towards protected urea), reduced fossil fuel use, and improving management of grasslands for the dairy and beef sectors. An increasing proportion of animal feed is from pasture and therefore increasing pasture productivity is of high importance.

Costa Rica – Karla Mena

22. Costa Rica has a number of recent agro-environmental policy developments, such as the Decarbonisation plan. Institutional change in the 1980s and 1990s saw the commencement of public-private partnerships in livestock. In the past livestock production in Costa Rica was extensive, but is now more intensive, with more trees on farms and increased livestock numbers. The national GHG inventory was the starting point to calculate the total contribution of emissions from livestock (20%). A national strategy for Livestock and a NAMA has led an improvement of scientific studies to support this, as well as the technical and financial aspects to improve meat and milk production. Forest cover has increased and there will be no more pasture land, so farmers need to improve pasture management, and 'decouple' economy from the environment. Costa Rica has a high beef (50kg) and milk (212kg per year) consumption per capita for the region. The dairy sector aims to add value to their production, and increase exports to Central America and Europe.

Cameroon – Kingsley Etchu

23. In Cameroon the trend for both livestock production and consumption is increasing. Livestock products from Cameroon are consumed in the Central African Republic, Gabon and Nigeria. The Livestock sector from 2014 included 5 million cattle, 3 million sheep, 6 million goats as well as geese and chickens. Livestock contributes \$30 million to GDP and this is growing. Much of the population has low purchasing power, but also the need for increased protein from livestock products. The dairy production system is extensive grazing on poor quality pastures. This method of free grazing leads to uncontrolled stock rates, and pastures that are both under- and over-grazed.

The key areas that need improvement are animal health issues, pasture improvement and better practices for the management and intensification of dairy systems.

24. Expectations from joining the GRA include the development of technology to reduce emissions from livestock and maintain food production, improved practices and technology for feeding and diet quality, animal health and improving genetics.

CAPACITY BUILDING ACTIVITIES

25. A panel session provided a few member countries with the opportunity to showcase and discuss their recent LRG-related Capacity Building activities. The meeting thereafter discussed the priority for future LRG capability activities, and what support members could offer, including financial and in-kind (provision of technical experts) contributions.

CLIFF-GRADS – Hayden Montgomery

26. CLIFF-GRADS is a joint GRA and CCAFS scholarship programme for students from developing countries currently enrolled in PhD programs. It provides funding for short-term scientific training and research stays on topics related to measurement and management of greenhouse gas emissions and carbon storage in agricultural systems. The scholarship provides up to US\$12,000 for a research visit of up to six months, with GRA members and partners asked to provide in-kind support through hosting and supervision of students.

27. There have been two CLIFF-GRADS calls to date with a total of 42 scholarships awarded to students from 18 different countries. The third call has just opened and offers 33 research opportunities hosted by GRA members and partners. The programme plans to hold another two rounds – one late in 2019 and another mid-2020. The group was encouraged to identify research opportunities that support the activities of the LRG that could be advertised in the future calls.

South African Climate Change Centre – George Shole

28. The South African collaborative climate change centre on livestock brings together a number of partners from government, weather services and universities. The key objective of the centre is to develop advanced greenhouse gas inventories for different livestock based systems, restore grasslands and improve the management of pastures. Activities of the centre include:

- improved production of livestock systems;
- developing systems for carbon credits;
- mitigation of GHG using alternative feeds;
- addressing global warming and sustainable production;
- building capability to measure GHG emissions from livestock and soil carbon sequestration;
- improving water and waste management; and
- landscape development.

Kenya, Improved Dairy Inventory – Benjamin Kibor

29. Livestock is an important sector for Kenya, and in 2018 the decision was made to progress to a Tier 2 GHG inventory. A workshop was held to bring together all the actors responsible for compiling the national inventory from the Environment and Agriculture Ministries, the decision was made to focus on the dairy sector initially.

30. The Government of New Zealand provided expert support and training, including a week in New Zealand to learn from the agricultural inventory team. Support was also provided from CCAFS, FAO and Unique to develop the dairy inventory structure along with experts from research institutes, such as ILRI that have an understanding of the Kenyan dairy system.

31. Now that the Tier 2 inventory for dairy is complete, the focus is on the gaps in the existing data that need to be addressed before better emissions factors can be developed and identifying other key sectors to improve.

Senegal, Regional Workshop – Sega Ndao

32. A workshop on low emissions livestock development was organised in Dakar, Senegal in April 2019. Twenty countries from West and Central Africa attended, with representatives from GRA, CCAFS, FARA, FAO, and World Bank showcasing existing mechanisms from livestock development.

33. At the workshop, working groups addressed different issues on the role of livestock production, including the role of livestock at the national level, the key systems common across the region, activities already underway and the key challenges when undertaking livestock development initiatives.

34. The identified next steps following the workshop were:

- That West and Central African countries make an effort to join GRA.
- A local community of research will be created.
- Countries to better understand their baseline emissions.
- Focus on regional capability and capacity building, PhD and masters student training.
- National reports to identify the key emissions sources from countries and the ECOWAS region.
- Identify sources to support collaboration to connect universities and research institutes.

Uruguay, Regional Research Activities – Veronica Ciganda

35. The project to measure enteric methane and N₂O emissions from livestock production systems was supported by funding from the Inter-American Development Bank's agricultural research fund (FONTAGRO) and involved researchers from Argentina, Colombia, Chile, Dominican Republic and Uruguay (lead country).

36. One researcher from each participating country attended a training course in New Zealand for three weeks to learn about measuring enteric methane using the SF₆ technique. This was followed by further training using exchanges between the national research institutes involved e.g. Scientists from the Dominican Republic were hosted in Chile and in Uruguay. The project included international workshops on measurement techniques and data analysis and annual project meetings were held across the three years of the project to share results.

37. Each country had a different starting point and level of support from their institutes, as well as a range of interactions between scientists in-country. What was clear is that the stronger the collaboration in a country, the faster the progression of capability building.

38. The regional project was a key contributor to the first Latin American conference on Greenhouse Gases and Animal Agriculture (GALA) and the two subsequent conferences.

Discussion

39. The group discussed that the best support for countries wishing to move from Tier 1 to Tier 2 inventories is provided by experts from other countries that have already made this shift and work on national inventories. Both USA and Spain have networks that can provide help for countries interested in improving inventories and managing data and CCAFS is already working with the GRA in this area. A list of inventory experts will be developed of those willing to help countries improve their livestock inventories.

NETWORK UPDATES

40. The LRG has five science networks, focused on strengthening collaboration in the main areas of livestock GHG research. The coordinators of three of the Networks attended this meeting and provided an overview of Network activities. Hayden Montgomery presented the update on behalf of the Animal Health Network, no update was received from the Manure Management Network.

Animal Health and Greenhouse Gas Emissions Intensity Network (AHN)

41. In response to a [report](#) from the FAO and Dairy Sustainability Framework (DSF) on Climate Change and the Global Dairy Sector, the AHN has been in discussions with DSF to explore the impact from diseases and parasites on emissions intensity in selected dairying regions.

42. A concept note has been developed, for a project that will model animal health issues and impacts, quantify the benefits of managing these and evaluate the ease of monitoring different management options. For example, tracking the number of vaccines sold is easy to do, activities that relate to management practices at the barn or heard level may be more difficult to measure.

43. Diseases common to dairy and beef cattle will be looked at using a case study in the UK, quantified with a farm systems model. Other case studies from Kenya and Chile will contribute to the data collected. Three examples will be covered under the proof of concept study.

1. Reproductive performance: Pregnancy diagnosis
2. Single agent infectious disease: Bovine viral diarrhoea
3. Multifactorial or management disease: Mastitis in dairy cows

44. Although there is limited participation, the LRG views the work of this network as very important. Members with newly funded projects or an interest in this work should get involved in the Network activities.

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

45. The focus of the ASGGN is animal breeding to reduce greenhouse gas emissions. The Network is collating tools and protocols to share and manage data. The Network has a website (<http://www.asggn.org/>), but the GRA website page (<https://globalresearchalliance.org/research/livestock/networks/animal-selection-genetics-genomics-network/>) should also be consulted.

46. The objectives of the Network are:

- Bringing together scientists.
- Identification of new collaborations and connections.
- Defining traits and breeding objectives.

- Establishing the heritability of methane emissions and its genetic associations with other performance traits.
- Sharing data, methods and protocols for prediction.

47. Achievements to date:

- Publication on Consensus methods for breeding low methane emitting animals.
- Contribution to the international committee for animal recording – trait definitions and working group.
- Meeting in 2018 – expanded discussion beyond GHGs to microbial work and feed efficiency.
- Funding obtained for a project ‘Gas 2 Grass’ involving New Zealand, Uruguay, Ireland, Scotland, Tunisia, Norway, and Argentina. Predicting system and breed effects in sheep across these countries.
- The activities of the group are shared on social media (Twitter - @ASGGN_GRA).
- A Network meeting will be held at the upcoming EAAP conference in Ghent, Belgium.

48. Future work includes holding the annual meeting regularly alongside one conference rather than organising on an ad-hoc basis. Identifying funding to support the attendance of developing countries, and increase the participation of the group, as the datasets collected would be of use for all countries to access. Future research will be used to identify proxies in ruminant livestock that could point to climate change adaptation, emissions reduction and impact across all systems without needing the same high volume of data.

Feed and Nutrition Network (FNN) - Alex Hristov

49. The Network has an email list of contacts and tries to organise annual meetings that are associated with larger science meetings, it has been beneficial in the past when multiple networks were able to arrange meetings together.

50. 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 Network contributes to the Enteric Fermentation Flagship and has an Enteric Flagship and a South East Asia FEED/METHANE projects. The network also links to national projects, which may have their own funding.

51. Other activities of the Network have included:

- Methodologies developed to measure nitrogen and ammonia emission from ruminant systems.
- Developing databases for enteric methane emission prediction and mitigation strategies:
 - Individual animal database – dairy, beef, small ruminants.
 - Treatment means database.
 - Microbial databases.

52. The CEDERS project is mostly a collaboration of European countries, funded from the European Research Area Network on agricultural greenhouse gases (ERAGAS). Other countries involved are supported by national funding. The three year project began in October 2017 and will end in November 2020.

Rumen Microbial Genomics (RMG) Network – Sharon Huws

53. The Rumen Microbial Genomics Network has an active twitter account (@RMG_network), where Network events, publications and activities are shared.

54. The Network focuses on methane mitigation by understanding microbial mechanisms, and has grown in success and numbers of participants. Recent workshops have been held alongside the Greenhouse Gas and Animal Agriculture (GGAA) Conference and the INRA microbiology meeting, with about 80-100 people attending each workshop.

55. 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 1000 project was instrumental to improving our understanding of the microbial community in the rumen.

56. Current 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.
- Organisation of Network workshops.
- Social media and newsletters.

57. Future activities:

- Through Network activities encourage more early career and postgrads to become involved.
- Also, progress a project on Culturomics. Few rumen microbes are able to be cultured, impeding our understanding of the rumen microbiome.
- Understanding the mechanisms of methane mitigation technologies.
- Build the participation of the Network, particularly increase the number of samples from tropical systems.

GRA FLAGSHIP PROJECTS

59. This session on GRA Flagship Projects, included an update on progress in the Taskforce to explore the development of a GRA Flagship Project on Circular Food Systems, and the way this might connect to the LRG. The Special Representative presented a proposal to restructure GRA Flagship Projects and clarify how these are different from Research Groups and Networks. Finally, the two existing projects under the LRG Enteric Methane Flagship provided an update on progress.

Update on the Circular Food Systems Taskforce

60. Martin Scholten, WUR presented to the LRG the outline of the Circular Food Systems Flagship, and the need for involvement by the Group. At the 2018 GRA Council meeting the Council agreed to the development of a Flagship on Circular Food Systems, and asked the Taskforce to report back on this at the 2019 Council meeting. The Taskforce is led by the Netherlands, Uruguay and Indonesia.

61. The circular food system idea is based on the need for food security to be connected to resource security. A lack of new resources available to bring into our food systems means that we

need to make use of all parts of the existing system. Livestock need to be included as a part of this system, as manure is particularly important to secure and return resources into the system.

62. Circularity also addresses climate change, and climate mitigation. The Netherlands is already comparing what can be achieved through circular systems versus traditional systems in terms of mitigation.

63. The Taskforce has been established to identify research topics that transfer this concept into practice. A survey has been provided for countries share their activities relating to the circular economy, thirteen countries have responded so far, and this can be shared again.

64. The concept of circularity is generally recognised by countries, however in most countries this is not as strongly based on food systems but rather the bio-based economy.

65. Next steps for the Taskforce:

- Summarise the outputs from the survey to produce a paper for the GRA Council.
- Expand the taskforce, including GRA Partners and Research Group representatives.
- Roadshow to collect commitment and support from countries.
- Recruitment of community of experts, linked to the GRA networks.
- Organise a launch event, linked to a global conference.
- Coordinate Global Flagship programme, with shared and joint projects.
- Identify how this Flagship would connect and coordinate across the GRA, with the LRG? Potentially through a Network?

Re-thinking GRA Flagship Projects

66. Hayden Montgomery, GRA Special Representative, presented on the Secretariat's proposal to re-frame the GRA Flagships. At the 2018 Council meeting, members asked for greater clarity and distinction between the organisation and role of GRA Research Groups, Flagships and Networks. The Research Group Co-Chairs also noted that it was not the intention to have Research Groups, and the Co-Chairs of these, lead the GRA Flagships as well as coordinate Research Group workplans.

67. Research Groups and Networks are mentioned in the GRA Charter. Research Groups are required to meet annually and develop a work plan of activities. Networks sit under a Research Group, and are more open in their participation, including technical experts and representatives from non-member countries.

68. The GRA Flagships were developed as topics or ideas that meet certain characteristics and could be elevated above Research Groups or Networks to be "owned" by the GRA Council. The Council selected a number of identified topics as those of highest priority across the membership.

69. The Secretariat, with input from the Research Group Co-Chairs have reviewed and reinforced the criteria for Flagship Projects, so that these are distinct from the workplan of the Research Groups. A proposed process for the development, support from GRA Council Members and Partners, and list of criteria for the Council to consider before new GRA Flagship Projects are endorsed. The proposed criteria for GRA Flagship Projects are:

1. Project Scope
 - Project timeline (defined end date) specified.
 - Project outcome defined.

- Globally applicable.
2. Project Participation
 - Benefits from GRA wide collaboration.
 - Provides a range of collaboration opportunities – including low cost e.g. data, sample or knowledge sharing.
 3. Research
 - Will the project generate new knowledge, high scientific impact?
 - Identified community of experts within the GRA Membership (i.e. proposed by a RG or Network – or key coordinators identified if cross-cutting).
 4. Resourcing
 - Flagship project lead identified.
 - Funding confirmed for Flagship project lead and core project activities (Minimum 30%, cash or in-kind contributions of total project costs).
 - Proposed funding mechanisms for additional activities and contributions identified (i.e. fellowship fund, workshop funding, or research call).

70. Discussion during the meeting focussed on the proposed Council Flagship approval process, which suggested that this may require additional consideration prior to the GRA Council meeting in Bali, when agreement to the revised approach will be sought.

Enteric Fermentation Flagship, Rumen microbiome Project – Suzanne Rowe

71. Dr Suzanne Rowe, AgResearch New Zealand is leading this Flagship Project to develop a high throughput predictor to identify low emissions livestock. The work is already underway for sheep, and this project takes the same approach to predict low CH₄ emissions cattle.

72. The project has a Postdoc focusing on the low-cost microbial predictor by comparing microbial populations across cattle species and to compare with sheep data.

- Greater understanding of the rumen microbiome.
- Collaboration.
- Challenges – are developing the protocols, sharing agreements – across countries, importing different types of samples.

Enteric Fermentation Flagship, FEED/METHANE RELATIONSHIPS – Alex Hristov

73. The objective of the project is to fill in gaps for livestock feeds from regions under-represented in the databases developed by the Global Network project. This project has a focus on Latin America and South Asia, including systems relying on by-products for feed. Outcomes will be to:

- Identify and recommend methane mitigation technologies for the livestock production systems in the Latin America and South Asia, using the improved databases.
- Develop methane yield (Y_m) values for local feeds to improve national greenhouse gas inventories.
- Identify nutritional measures that can be captured in national greenhouse gas inventory methodologies to demonstrate mitigation in the target regions.

74. The project has a Postdoc based in Colombia who is very active in collecting feed data from the region. A total of 120 potential collaborators from across 20 countries have been contacted since April 2019, and the data is now being entered into the database. The project is in the process of hiring a Postdoc that will undertake similar activities in South East Asia.

FUNDING AND PARTNERSHIPS

75. Ahead of the meeting members had been asked share any information they were aware of regarding funding opportunities, including national, regional, and international related to climate change and research. Sinead Leahy, NZAGRC presented the summarised results to the Group, and the complete excel spreadsheet was shared with participants.

76. Responses were received from Argentina, Canada, Ghana, Senegal, Spain, Tunisia and USA. Collectively 38 potential funding opportunities were identified. It was noted that several of those identified funding opportunities come from GRA partner organisations.

77. The Partners attending were then asked to outline the opportunities and activities underway, for supporting the work of the LRG, or for collaboration with members of the LRG.

European Union – Jean-Charles Cavitte

78. The EU is completing research activities funded under the Horizon 2020 programme, and preparing for a new round of funding under Horizon Europe. Within the EU the Directorate-General for Agriculture and Rural Development undertakes activities that are the most relevant to the LRG, and are responsible for implementing research and development, under Societal Challenge 2 of Horizon 2020.

79. Climate Change and Agriculture is a priority under Horizon 2020. Compared to the previous Framework 7 programme where livestock and climate change projects were specific rather than across the programme, Horizon 2020 embeds climate change within other issues such as sustainability, and is not only a focus for agriculture.

80. A number of LRG projects have been supported from European Research Area Network (ERA-NET) funding, particularly the call on Monitoring and Mitigation of Greenhouse Gases from Agri- and Silvi-culture (ERA GAS), a second call of this network has been organised with two other ERA NETS co-funds, ERA-NET SusAn (Sustainable Animal Production Systems) and ICT-AGRI 2 (Information and Communication Technologies and Robotics for Sustainable Agriculture), and successful projects should be announced soon.

81. Carbon Sequestration is also a key focus and is managed under the forthcoming European Joint Programme on agricultural soils, which is broader than livestock systems. Already the CIRCASA project aims to foster coordination of international research cooperation on soil carbon sequestration in Agriculture.

82. Funding opportunities from other parts of Horizon 2020 include the Marie Skłodowska-Curie Actions Research Fellowship Programme (https://ec.europa.eu/research/mariecurieactions/node_en), or infrastructures (see SMARTCOW project- <https://www.smartcow.eu/>).

83. Capacity building and development activities are managed by other Directorates, particularly the Directorate General for International Cooperation and Development, which coordinates activities in Africa and other parts of the world.

84. The Horizon Europe 2021-2028 programme is still being agreed by the Europe Parliament, but it will include a focus on agriculture and livestock, with opportunities for large partnerships.

Other focus areas are likely to be agroecology, biodiversity, water quality and animal welfare. A number of Missions are under development under this programme, including one on soil health and food, which will mobilise substantial Horizon Europe budget, as a special funding package.

85. Capacity building under the Horizon Europe programme is still to be agreed. There are joint activities with other partners, including with CGIAR. The EU contribution to the LRG and GRA still needs to be discussed.

FAO – Henning Steinfeld

86. On-going activities in the climate change division of the FAO support the international discussions through the UNFCCC and the 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 greenhouse gas 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.

87. The FAO developed Global Livestock Environmental Assessment Model (GLEAM) is being used by countries to understand the environmental impacts of livestock management and practices. This tool needs to be reviewed to ensure that it is useful for those developing policy, and new technologies. There is no process yet for this review, but the LRGs contribution to a review would be valuable for the future development of the model. However, GLEAM is increasingly being used to assess different production systems for which, it was not designed to analyse and thus has weaknesses in this area. (<http://www.fao.org/gleam/en/>)

88. 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. These are available on the FAO website (<http://www.fao.org/partnerships/leap/en/>).

89. 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. The group are developing a consensus based model to identify and define sustainability, through action nine networks focused on specific issues related to livestock production.

90. There are opportunities for the FAO and LRG to work together more closely to understand the relationship between livestock and climate change, improved production and emissions intensity, increased soil carbon in pastures, circularity and the connections to healthy diets. The other opportunity is at the country level, the FAO has the models to connect to research within countries. The models need to have quality research behind them, rather than the traditional development approach. (<http://www.livestockdialogue.org/>)

World Bank – Pierre Gerber

91. 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.

92. Activities that are of interest to the LRG include the improvement of monitoring and guidance instruments. Collaborations with organisations such as the GRA is important to include research in these actions.

93. The World Bank has been involved in the regional workshops which the LRG has led in Africa (Ethiopia and Senegal), which has been a useful forum for awareness raising and dissemination of guidance.

94. Future collaboration could be at the implementation stage, increased expertise is required to develop these projects. Also working with researchers to discuss how we pass on the results and knowledge from projects, a pool of experts interested in being involved from the GRA would be useful.

95. Capacity development activities that could support project design elements would be something of interest in the short term, and then how this could support projects in the longer term.

96. There is an interest to include new/innovative opportunities within projects, such as testing cutting-edge technologies and approaches. Much of the work the bank funds is traditional approaches to improve production, novel ideas and new technologies such as mitigation technologies and practices (e.g. feed additives and measurement techniques for MRV) would be of interest to the Ministries and Institutes involved.

97. Activities of the World Bank also generate plenty of data, which could be used to support the development of databases. Investment activities are not designed as research, although there may sometimes be research grants for applied activities. For example the development of a livestock knowledge platform in Bangladesh, provides access to training manuals, and policy papers used by the service.

Climate and Clean Air Coalition (CCAC) - Catalina Etcheverry

98. 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.

99. The CCAC works with 65 partner countries, 35 of which are also members of the GRA. The contact is generally through Environment Ministries, but may be with others. The project work cuts across sectors to develop the tools and capacity to impact policies and attract large scale funding. The CCAC supports the proof of concept activities used to develop the large scale projects.

100. The Agriculture initiative has \$9.5 million in funding. The Majority of this supports livestock activities and identifies partners and organisations that are complementary to work with, such as the GRA, and help deliver the projects.

101. Collaborative activities with the GRA include a project understanding baseline enteric methane emissions from ruminants, involving 13 countries in Sub-Saharan Africa, South America, and South Asia. This project focused on opportunities for mitigation that could also increase productivity, and used the FAO GLEAM model to assess and identify key activities in each region.

102. The third phase of this project, now under development, will be to work directly with countries to address the challenges with NDCs. The focus countries will be from Central America, East Africa, and South East Asia in collaboration with the GRA and FAO. Champions from the key countries will be chosen and share their experiences. Regional workshops will be held to identify the key actions on improving MRV and agricultural GHG inventories.

CIAT-CCAFS - Jacobo Arango

103. CCAFS has been working with the GRA since 2016 to provide support for improved agricultural GHG inventories, using Tier 2 methods to better estimate mitigation impacts on agricultural production systems. The CGIAR, is a research organisation, not a donor and works with organisations like the GRA in a way that we can make the most use of our limited resourcing. Joint activities between the LRG and CCAFS include:

1. Work in China to improve the national accounting of livestock with Dr Dong Hongmin.
2. Developing guidelines for improving MRV, working with Unique.
3. CLIFF-GRADS fellowships, the CLIFF programme was established by CCAFS and the GRA has expanded this.
4. Developing partnerships for regional research work, through CGIAR centres ILRI and CIAT.

TOWARD THE 2030 AGENDA

104. The LRG divided into regional breakout groups (Africa, Asia/Oceania, Europe, North and Latin America) and a further group for Partners to identify some of the key lessons from the past 10 years of the LRG, and then looking forward how the LRG might position itself for the next 10 years. A summary of the breakout group discussions is provided in Appendix Two. Following the report back from the breakout session the Group discussed some of the common themes.

105. The point was raised that it is time for the LRG to take stock to enable the wider dissemination of its results through audience-specific briefs, outreach seminars and workshops. This proposed LRG dissemination strategy may require the framing of available scientific results within a broader system context which would require additional work, resources and capabilities.

106. Some of the other themes discussed were:

- The identification of new ways of working across the Flagship Projects and Networks to ensure the participation of additional member countries.
- The need and opportunities for the establishment of LRG regional chapters.
- The establishment of teams of experts to assist member countries to improve GHG inventories and in the assessment of appropriate mitigation action in different production systems.
- The requirements for an independent evaluation of the LRG to inform and shape the LRG's strategy and contribution towards the Global Agenda 2030.
- The further exploration of LRG links to regional mechanisms and commissions.
- The adoption of an integrated system approach and the exploration of opportunities to improve collaboration with the GRA's Integrative Research Group.
- The use and utility of the GRA website and social media to remain up-to-date on the activities of the LRG and its networks.

OUTCOMES

107. The Co-Chairs presented to the group a summary of proposed actions that they had heard over the previous two days:

- Take stock, catalogue outputs and achievements and assess opportunities for enhanced impact.
- Ensure new and ongoing activities are framed within the broader social, economic and environmental context of the Global Agenda 2030.
- Strive towards increasing the global nature of dialogue, networks, partnerships and knowledge sharing by addressing differences in capabilities, techniques and standards.

- Explore increased linkages to and engagement with multi-stakeholder and policy processes aligned to sustainability.
- Facilitate the preparation of a science-based manuscript on the place and role of livestock in sustainable agri-food systems.
- Work with member nations on the establishment of a 'roster' of countries and organizations offering to share relevant GHG inventory, MRV and NDC expertise (at marginal costs) and countries who are interested (and where there are incentives) to move Tiers.
- Work with LRG partners on the development of a facility to ensure the inclusion of relevant GHG and climate expertise and research into the appraisal and design of livestock sector investment portfolios.
- Explore opportunities for the mentoring of new member countries, the tailoring of capacity building to specific regional needs, and the set-up of LRG Regional chapters and new thematic areas.
- Facilitate actions to rekindle Animal Health and Manure Management networks.
- Encourage member countries to prepare and regularly update their country pages on the GRA website.

Next Meeting

108. The location for the next meeting has not yet been decided, any members who are interested to host the 2020 LRG meeting, please contact the Secretariat.

APPENDIX ONE: Participants List

Country	Name	Organisation	Email
LRG Co-Chair New Zealand	Harry Clark	New Zealand Agricultural Greenhouse Gas Research Centre	harry.clark@nzagrc.org.nz
LRG Co-Chair Ireland	Sinead Waters	Teagasc	Sinead.Waters@teagasc.ie
Argentina	María Julia Cabello	Secretary of Agroindustry	mcabello@magyp.gob.ar
Argentina	Patricia Ricci	INTA	ricci.patricia@inta.gob.ar
Australia	Richard Eckard	University of Melbourne	rjeckard@unimelb.edu.au / Richard.Eckard@unimelb.edu.au
Australia	Harry Campbell- Ross	ACIAR	Harry.Campbell-Ross@aciarc.gov.au
Belgium	Nico Peiren	Flanders Research Institute for Agriculture, Fisheries and Food	nico.peiren@ilvo.vlaanderen.be
Brazil	Alexandre Berndt	EMBRAPA Southeast Livestock	alexandre.berndt@embrapa.br
Cameroon	Kingsley Agbor Etchu	Institute of Agricultural Research for Development	etchu74@gmail.com / etchukingsely@yahoo.com
Canada	Karen Beauchemin	Agriculture & Agri- Food Canada	karen.beauchemin@agr.gc.ca
Chile	Francisco Salazar	INIA Chile	fsalazar@inia.cl
Colombia	Olga Mayorga- Mogollón	Corporación Colombiana de Investigacion Agropecuaria- Agrosavia	lmayorga@corpoica.org.co
Costa Rica	Karla Maria Mena Soto	Ministry of Agriculture and Livestock	kmena@mag.go.cr
Denmark	Peter Lund	Aarhus University	peter.lund@anis.au.dk
France	Diego Morgavi	INRA	diego.morgavi@inra.fr
France	Maguy Eugene	INRA	maguy.eugene@inra.fr
France	Mohammed Ben-Aouda	INRA	mohammed.ben-aouda@inra.fr
Ghana	Emmanuel K. Adu	CSIR-Animal Research Institute	nhyrapapa@yahoo.com
Ireland	David Kenny	Teagasc	david.kenny@teagasc.ie
Ireland	Paul Smith	Teagasc	Paul.Smith@teagasc.ie

Italy	Giacomo Pirlo	Council for Agriculture & Economics (CREA)	giacomo.pirlo@crea.gov.it
Japan	Koki Maeda	Japan International Research Center for Agricultural Science	k_maeda@affrc.go.jp
Japan	Satoshi Tobita	Japan International Research Center for Agricultural Science	bita1mon@jircas.affrc.go.jp
Netherlands	Andre Bannink	Wageningen University & Research	andre.bannink@wur.nl
Netherlands	Martin Scholten	Wageningen University & Research	martin.scholten@wur.nl
New Zealand	Jeroen Dijkman	NZAGRC	jeroen.dijkman@nzagrc.org.nz
New Zealand	Sinead Leahy	NZAGRC	sinead.leahy@nzagrc.org.nz
New Zealand	Victoria Hatton	Ministry for Primary Industries	Victoria.Hatton@mpi.govt.nz
New Zealand	Jess Anderson	Ministry for Primary Industries	Jessica.Anderson@mpi.govt.nz
Norway	Angela Schwarm	Norwegian University of Life Sciences	angela.schwarm@nmbu.no
Norway	Vibeka Lind	Norwegian Institute of Bioeconomy Research	vibeke.lind@nibio.no
Senegal	Sega Ndao	Institut Sénégalais de Recherches Agricoles	ndaosega@gmail.com
Spain	David Yanez-Ruiz	Spanish Research Council, CSIC	david.yanez@eez.csic.es
South Africa	George Shole	Department of Agriculture, Forestry and Fisheries	GeorgeS@daff.gov.za / morweng.shole@gmail.com
South Africa	Georgette Pyoos	Agricultural Research Council	pyoosg@arc.agric.za
South Africa	Michiel Scholtz	Agricultural Research Council	GScholtz@arc.agric.za
South Africa	Nelly Thuli Chabalala	Agricultural Research Council	ChabalalaN@arc.agric.za
South Africa	Susanna Grobler	Agricultural Research Council	mgrobler@arc.agric.za
South Africa	Abubeker Hassen	University of Pretoria	abubeker.hassen@up.ac.za
Thailand	Kalaya Boonyanuwat	Department of Livestock Development	osutida@hotmail.com
Thailand	Warocha Jamparat	Department of Livestock Development	j_varocha@yahoo.com
Tunisia	Hajer Ammar	Higher Agriculture School of Mograne	hjr.mmr@gmail.com

Uganda	James Kakungulu	Ministry of Agriculture, Animal industry and Fisheries	jameskakun@gmail.com
Uruguay	Verónica S. Ciganda	Instituto Nacional de Investigación Agropecuaria	vciganda@inia.org.uy
USA	April Leytem	USDA Agricultural Research Service	april.leytem@ars.usda.gov
Zimbabwe	Andrew Chamisa	Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement	chamisa121a@yahoo.com
Zimbabwe	Walter Svinurai	Marondera University of Agricultural Science and Technology	wsvinurai@gmail.com
LRG Network coordinators			
Feed and Nutrition	Alexander Hristov	Penn State University, USA	anh13@psu.edu
Rumen Microbial Genomics	Sharon Huws	Queen's University Belfast, (Institute for Global Food Security), UK	s.huws@qub.ac.uk
Animal Selection Genetics and Genomics	Suzanne Rowe	AgResearch, New Zealand	suzanne.rowe@agresearch.co.nz
Observer countries			
Côte d' Ivoire	Abdoulaye Cisse	Ministry of Higher Education and Scientific Research	abdoulayeciss@rocketmail.com
Kenya	Benjamin Kibor	Ministry of Agriculture, Livestock, Fisheries, and Irrigation	bkibor2001@yahoo.com
Nigeria	Clarence Ayodele Lakpini	National Animal Production Research Institute	camlakpini@gmail.com
Partners			
CATIE	Claudia Arndt	CATIE	arndt.claudia.ca@gmail.com
CCAC	Catalina Etcheverry	Climate and Clean Air Coalition (CCAC) to Reduce Short-Lived Climate Pollutants	catalinaetche@gmail.com
CIAT & CCAFS	Jacobo Arango	International Center for Tropical Agriculture	j.arango@cgiar.org
European Commission	Jean-Charles Cavitte	European Commission	Jean-Charles.Cavitte@ec.europa.eu

FAO	Henning Steinfeld	FAO	henning.steinfeld@fao.org
World Bank	Pierre Jean Gerber	World Bank	Pgerber@worldbank.org
World Bank	Jeanne Massé	World Bank	Jmasse1@worldbank.org
GRA Secretariat			
Secretariat	Deborah Knox	Ministry for Primary Industries	deborah.knox@mpi.govt.nz
GRA Special Representative	Hayden Montgomery	Ministry for Primary Industries	hayden.montgomery@globalresearchalliance.org