

Croplands Research Group Meeting

Hilton Palacio del Rio
San Antonio Texas, USA

14 November 2024

Meeting Report

OVERVIEW

The fifteenth meeting of the Croplands Research Group (CRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was held 14 November 2024. The GRA meeting was chaired by USA (Dr Hero Gollany, USDA-ARS), Spain (Prof. Rosa Mosquera-Losada, University of Santiago de Compostela) and Brazil (Dr Ladislau Martin, Embrapa) as Co-Chairs of the Group.

This report is a summary of the key discussions and outcomes of the meeting. Presentations may be viewed in the resource library on the Global Research Alliance website.

(<https://globalresearchalliance.org/library/>)

PARTICIPANTS

The meeting was attended by 17 participants, representing 10 GRA member countries.

GRA Members attending: Bangladesh, Brazil, Canada, China, Denmark, Germany, Japan, New Zealand, Spain, USA

MEETING OUTCOMES

The meeting achieved the following outcomes:

GRA ORGANISATION

- Contribute to the upcoming Survey on the GRA Strategic Plan and Research Priorities.
- Participate in the upcoming CCAC Food and Ag Emissions report webinars and survey
- Develop a CRG form for participants to identify areas of interest and contribution
- Suggestion for a combined Research Group scientific conference

NETWORKS

- Conservation Agriculture Network – call for a co-lead
- Modelling webinar from the Landscape Management of Agricultural Systems Network

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SUMMARY OF DISCUSSIONS

WELCOME

1. Participants of the Croplands Research Group were welcomed to the USA and San Antonio by Dr Marlen Eve, Deputy Administrator USDA-Agricultural Research Service. The Agricultural Research Service (ARS) is based in 95 locations across the US and supports approximately 600 base funded projects. Developing collaboration and partnerships is critical for the work of ARS. The greenhouse gas research is undertaken within the Natural Resources and Sustainable Agriculture Systems programme and includes research on soil and nutrient management and models, data sets and tools.

2. Dr Adam Wilke, USDA- National Institute of Food and Agriculture (NIFA) is a national programme leader, responsible for the Sustainable Agriculture Ecosystems and Climate Hubs partnership. NIFA focus on the sustainability of agriculture, forests, and rangelands.

SECRETARIAT UPDATE

3. The GRA Secretariat provided an update to the Group on recent activities of the GRA, including outcomes of the 2024 Council meeting. The most recent member of the GRA is Tonga, with three Pacific Island nations recently joining the GRA we need to ensure the GRA is meeting the needs of a broader membership. To support this the partners we work with are increasingly important and the GRA is looking to form new partnerships with organisations that work regionally across the Pacific and also Latin America and the Caribbean.

4. As Special Representative, Harry has been involved in key industry partnerships, such as the pathways to dairy net zero initiative. Involving countries and large dairy companies, this project, is exploring the pathways for dairy production to become more sustainable and identifies how future mitigations may be incorporated. The project supports a Postdoc researching the inclusion of methane inhibitors in dairy systems.

5. The Climate and Clean Air Coalition (CCAC) has included GRA expertise on a report on how Nitrous Oxide contributes to climate change, the ozone layer and air quality. The report highlights the importance of N₂O as a significant atmospheric pollutant.

6. An upcoming report, being developed for COP30, on agriculture and food systems is requesting feedback from the GRA. Invites have been sent to attend upcoming webinars and survey to provide GRA feedback.

7. The 2024 GRA Council meeting was held online as an extraordinary session on 11 September. The meeting established working groups to develop the next Strategic plan and review the structure of the GRA Research Groups and Networks. Members will be asked to contribute to both reviews ahead of the next GRA Council meeting in June 2025.

8. The Council meeting also provided an update on the Science to Policy communication Working Group. The Working Group has developed an annual and long-term workplan, both of which were agreed by Council. The group will also develop a GRA Communication note on the metrics used for measuring greenhouse gases to explain the science behind this for policymakers. Th

GROUP OVERVIEW

9. The Croplands Research Group Co-Chairs provided an overview of the Group and it's activities as well as future directions for discussion during the meeting. The group has presented four webinars in the past year:

- Stacking 4R practices with conservation agriculture to mitigate nitrous oxide emissions: Craig Drury (Agriculture and Agri-Food Canada) and Diego Abalos (Aarhus University, Denmark)
- Research on field scale soil organic carbon modeling using longer agricultural experiments and the process-based CQESTR Model
- Co-benefits and trade-offs of agriculture mitigation and adaptation in rice-based cropping systems, with AGMIP: Roberto Valdivia (Oregon State University, USA), Sonali McDermid (New York University, NASA-GISS, USA), Tao Li (International Rice Research Institute, IRRI, Philippines), Erik Mencos (Columbia University, NASA-GISS, USA).
- Measuring Greenhouse Gas Balance of Peatland: Lessons from the Tropics and the North Prof. Fahmuddin Agus (National Research and Innovation Agency, Indonesia) and Dr. Junbin Zhao (NIBIO, Norway)

10. Four CLIFF-GARDS students were hosted by Hero Gollany at USDA-ARS from Ethiopia, Pakistan, Tanzania and Argentina. Two further students are expected early 2025. Norway has also hosted CLIFF-GRADS students from Kenya on the topics of Biochar fertilizers and GHG measurement and analysis. A CLIFF-GRADS student from Nigeria is currently in Brazil hosted by EMBRAPA.

11. Adam Wilke from USDA-NIFA spoke about the research activities of USDA. USDA programmes provide \$20 million for research, education and extension. NIFA launched the partnership with the National Science foundation to establish the AI climate artificial institute for climate-land interactions, mitigation, adaptation, trade-offs and economy. NIFA also supports the Agriculture and Food Research Initiative and is developing the National Climate Change Roadmap, a 10 year framework to inform climate smart research and education.

12. Brazil was please to host the 13th meeting of the G20 Meeting of the Chief Agricultural Scientists (MACS), with organizations including the FAO and GRA invited to participate. It was an important opportunity for Brazil to host this meeting, which was led by Embrapa and Ladislau presented on the importance of agricultural science to drive innovation in tropical countries and the importance of international cooperation. Brazil is also looking forward to hosting COP30 in 2025, the meeting will be held in Belem City, Para State.

13. Research underway in Brazil includes a large project looking at carbon balances and foot print on soybean and maize involving 1800 farms. Another project is bringing together data from across the country into a database on living labs soils sites.
14. In Europe a number of related research projects are currently underway including:
 - GRASS-Roots – a project working directly with Farmers
 - CLIMALACT – LCA main dairy producers in Spain to benchmark emissions from farm systems
 - ASH4SOIL – fertilisers from the forest biomass industry.
15. The CRG is also developing a paper on Land Management and Soils and has been involved in meetings of the European Commission on innovation in practices.
16. The next Croplands newsletter is scheduled for December.

NETWORK AND FLAGSHIP UPDATES

17. The Networks provided an update of activities to the Group ahead of the meeting and responded to questions during the live session. The Peatlands Network was unable to provide a report of their activities ahead of this meeting.

Conservation Agriculture Network and Nutrient Management

18. Craig Drury, Agriculture and Agri-food Canada presented the activities of the Conservation Agriculture and Nutrient Management Network. A paper developed by the Network was published in January 2024. The paper takes a pipe and leaks approach to help farm community understand the N-Cycle and how practices can be valves to help shut off losses in “leaky pipes”. The paper also identifies the trade-offs that may occur from certain practices and the need to have a system of management practices to balance this.

19. In June the Network hosted a webinar “Stacking 4R practices with conservation agriculture to mitigate nitrous oxide emissions” the webinar was presented to 50 people online and has since been viewed 180 times.

20. A Carbon Sequestration Review Paper (Maria Rosa Mosquera Losada, lead) has been prepared and submitted for the review of Conservation Agriculture and Carbon Sequestration

21. Possible new topics for the Network to consider include overcoming obstacles with cover crops to enhance carbon sequestration and reduce N₂O emissions in cropland.

22. Craig is looking for a co- lead to support the work of the Network

Integrated Crop-Livestock Systems

23. The activities of the Integrated Crop-Livestock Systems Network were presented by Ladislau Martin, Embrapa. A project of the Network is to develop new tools for MRV and monitoring GHG emissions for integrated and intensified systems on farm. The project is identifying improvements that can be made in the biological system, through organic inputs added and fine-tuning of the Microbiome, using soil organic matter analysis.

24. A database of low carbon farming practices is being developed by Embrapa and Universities in Brazil using the model CQESTR. This will be made available to share once completed.

25. The Integrated Crop Livestock Forest Network – formed by Embrapa with cooperative and companies in 2012. 17,430,000 hectares in Brazil are now included in the network as part of the Low Carbon Agriculture Plan from the Ministry of Agriculture in Brazil. The Network supports training field days and technical meetings for farmers learn from each other.

Landscape Management of Agricultural Systems

26. The Landscape Management Network update was presented by Xunhua Zheng, CAS. The Network has continued to make update to the Catchment Nutrient Management Model - Denitrification-Decomposition (CNMM-DNDC) Model. In the last year the model has been updated to include forest bio-geochemistry and manure DNDC model. The model has also been converted from Windows to work in the Linux systems, allowing for larger scale and higher resolution for the simulation modelling. Model updates are being applied by local governments in China for water quality and net GHG balance.

27. The Network has submitted two research publications on the development of the model and the tool is being used in six ongoing projects and used as a module in the Earth Lab simulator in China – launched in 2023. Training activities are underway with including a national workshop in China and training for students from China and Laos.

28. Research Priorities for the Network include further validation of the model, including through the GRA membership and the improvement and addition of new functions.

Agroforestry Network – Rosa Mosquera-Losada, University of Santiago de Compostela

29. The Agroforestry Network activities were presented by Rosa Mosquera-Losada, University of Santiago de Compostela. The network is contributing to an ecosystems services assessment project, Undertrees, bringing together Europe, Ghana, Africa, and South America.

30. The AFCLIMA project is developing a farmer decision tool to understand farm-level carbon emissions including the trees and pasture on-farm and the inputs provided by farmers (e.g. fertiliser) to understand the carbon balance across soils and forests as well as farm emissions.

31. The Agro-Forestry 4 EU Network is promoting agroforestry value chains and extension services across nine countries in the EU and working with 12 Partners. The Network has produced a handbook sharing the development and implantation of new knowledge practices. The knowledge cloud and alive handbook will be linked to the GRA website and available next year.

Agroecology and Agroforestry Flagship

32. The GRA Flagship project on Agroecology and Agroforestry was agreed at the 2023 GRA Council meeting and is based on research projects in Europe and Latin America. Creating impact for policy makers is an important aspect of the Flagship to understand the practices that may be deployed at the plot, farm and landscape levels.

33. The project is looking at a range of practices including crop diversification and conservation agriculture across five different farm systems:

1. silvopastoral
2. silvoarable
3. home gardens
4. linear buffer strips

5. forest farming

34. A review has been conducted to identify the European countries already supporting agroforestry practices, showing that agroecology is well spread across the continent and that biodiversity promotion is less common.

35. The next objective for the project is to strengthen methods and support FAO statistics with further definitions of agroforestry practices. A workshop will be held with FAO in Brazil (early December) to develop a survey.

36. Future activities will be to work with the FAO and GRA to grow the Flagship project, including identifying pilot sites and methodologies. Each country will their own practices and systems, the Flagship aims to link with what countries are already doing.

NITROGEN SESSION

37. The Group then discussed the opportunities to connect with existing and planned activities managing nitrogen in agricultural systems, including the existing Flagship Project on **Reducing N2O emissions and improving accounting**. Marta Alfaro and Tony van der Weerden, both from AgResearch New Zealand, presented the activities of the Nitrogen Flagship. The Flagship was endorsed by GRA Council in 2018 acknowledging that key advances had been made globally, but there was a gap in understanding direct emissions and indirect following nitrogen fertiliser application to soils. The role for the GRA was to identify Emission Factors (EF) for synthetic fertilisers that reflect the country conditions.

38. The project is expanding an existing database (Dataman) and collecting information that is already available. The Dataman project collected EF from manure management practices, which is now expanded to include N-fertilisers.

39. The Flagship is based around two key research activities, the first is funded by New Zealand and Ireland, refining EF for inventory reporting by developing Tier2/3 EF for fertiliser and inhibitor use in temperate pastures. The project includes field work and modelling over 4 years. Data has also been collected from the Netherlands, Australia and the UK. The project is also looking to for data to include tropical and crop systems in the database as well.

40. The second research activity is funded through FONTAGRO and involving several countries in Latin America. This 4 year project is considering cropping and pastoral production with field activities beginning in March/April 2025. A capacity building workshop will take place in January 2025 in Chile and bring together all partner countries and others from the region.

41. The Flagship is seeking further collaborators, with a focus on collecting data from crop and pasture systems. Expertise on modelling and statistical would be welcomed, – data on crops and pasture. A webinar is planned for March 2025 to present the activities of the Flagship.

42. Harr Clark presented a proposal for a project on **Biological Nitrogen Inhibition (BNI)** which could build on an existing project between Ireland and New Zealand. This has the potential to become a GRA Flagship if expanded. The project is focused on breeding grasses for pasture systems, but the scope could be expanded to include crop systems.

43. The project is already developing international collaborations to understand the process including 41 researchers from 15 countries.

Discussion

44. The group was interested to know how they could share the Nitrogen Flagship project with others and bring collaborators into the Flagship. Some researchers have existing data and would be interested in contributing. A template has been developed and will be circulated to the group. Both Marta and Tony would be happy to speak to colleagues interested in getting involved.

45. There are a number of nitrogen use efficiency projects underway in GRA countries, Brazil has existing projects on BNI as well as efficient N-use in soybean systems. The US have cover crop projects to reduce N-losses. Spain has activities on residues as organic fertilisers and biochar.

46. There are overlaps with existing Networks – particularly the conservation agriculture Network on cover crops. Where the GRA can add value is to synthesise experiences from across its membership.

RESEARCH GROUP REVIEW

47. The GRA Council is conducting a review of the operation and efficiency of the GRA's Research Groups and Networks. The working group aims to understand how well the existing structure of the GRA groups is meeting the needs of members, identifying the current research needs and priorities and to understand what support is needed to continue to have successful networks of the GRA.

49. The Council is also developing the new GRA Strategic Plan, and so are taking the opportunities to look at the Research Group organisation in concert with this. A survey will be sent out shortly with questions that contribute to both activities. The GRA is about building collaborations, even if we don't make changes to the structure, we need to make sure the conversations happen across the groups.

Discussion

50. The group felt that the Integrative Research Group that deals with cross-cutting topics was not always aware of activities underway in other groups, and this was needed as many benefits come from the interface between science disciplines. The Integrative Research Group has moved beyond the accounting, data and assessment where it was initially focussed.

51. The most useful aspect of the CRG was the ability to convene larger meetings, especially when combined with the Integrative Research Group. If each group meets separately, you do not see the benefits that come from larger/combined meetings. There is also less enthusiasm for long online meetings. The Group proposed bringing together the Research Groups regularly (every 2-3 years) for a combined meeting, in the style of a conference.

52. There is benefit to having Flagships aligned with Networks or Research Groups to strengthen the collaborations developed. Flagships should become an integrator, bringing together Research Groups Research Groups and Networks. Flagships are more like a research programme and can bring in new topic areas over time, providing flexibility. But needs to be well connected to the GRA groups, as people have limited time and may not be able to contribute to both a Flagship and a Network.

53. Participation from countries in tropical regions has been reduced in recent years, it is an issue if the GRA has almost 70 Members but attendance is limited. Understanding how the participation in the GRA works could be an area to improve. Official representation is limited to governments at the Research Group level, how can we open this to include more researchers.

54. The role of Council members is also crucial for country participation, it can be difficult to maintain activities membership, especially if the country representative changes. What is the role of Council members to coordinate activities and encourage participation in their country and be involved when a meeting is hosted in their country.

55. The role of the CRG is to provide clear communication on the objectives of the group and reach out to country contacts to reconfirm involvement and priority research topics. This could be through a survey form or a communications plan. Not all participants are directly involved in Research, some have a role in sharing this information with Networks. Webinars and newsletters help keep members engaged, and focused workshops on specific topics can effectively bring together researchers with shared interests from different member countries.

APPENDIX 1: Participants list

Country	Attendees
GRA Member Countries	
Bangladesh	Ashraf Biswas, Chattogram Veterinary and Animal Sciences University
Brazil	Ladislau Martin-Neto, Embrapa
Canada	Craig Drury, Agriculture & Agri-Food Canada
China	Xunhua Zheng, Institute of Atmospheric Physics, Chinese Academy of Sciences
Denmark	Lars Munkholm, Aarhus University
Germany	Nina Grassnick, Thuenen Institute
Japan	Ayaka Kishimoto-Mo, National Agriculture and Food Research Organization
New Zealand	Marta Alfaro, AgResearch Tony van der Weerden, AgResearch
Spain	Rosa Mosquera-Losada, University of Santiago de Compostela Marisa Tello, INIA Javier Rodriguez-Rigueiro, University of Santiago de Compostela
USA	Hero Gollany, USDA-ARS Marlen Eve, USDA-ARS Adam Wilke, USDA-NIFA
Secretariat: Harry Clark, GRA Special Representative Ms Deborah Knox, GRA Secretariat	