

Croplands Research Group Meeting

Embrapa Soils Centre, 1024 Rua Jardim Botânico, Rio de Janeiro, Brazil

11 August 2018

Meeting Report

OVERVIEW

The tenth meeting of the Croplands Research Group (CRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) was held at Embrapa Soils Centre, Rio de Janeiro, Brazil, on 11 August 2018, preceding the 21st World Congress of Soil Science. The GRA meeting was chaired by USA (Dr Jane Johnson, USDA-ARS) 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. PDF's of the presentations can be downloaded from the resource library on the Global Research Alliance website.

PARTICIPANTS

The meeting was attended by 20 participants, representing 12 GRA member countries, and invited experts.

- **GRA Members attending:** Argentina, Brazil, Canada, China, Denmark, Germany, New Zealand, Norway, Republic of Korea, Poland, Sweden, USA.
- **Secretariat:** New Zealand.

MEETING OUTCOMES

The meeting achieved the following outcomes:

- Identified activities to support the Networks and align with the GRA Flagships.
- Developed further understanding of the GRA Flagships and discussed possible topic areas and methods of engaging with the Nitrous Oxide Flagship.
- Shared 12 country updates, informing the group of respective capacity building, research network, flagship, and inventory activities. Country updates on funding and meeting opportunities were also shared.
- Reviewed the activities and leadership of the networks, and agreed to merge the Agroforestry and Integrated Crop Livestock Systems networks.
- Agreed that the group, and its networks, would seek participation in the peatlands management stakeholder questionnaire of the PeatWise Project.

SUMMARY OF DISCUSSIONS

OPENING REMARKS

1. The tenth meeting of the Croplands Research Group was opened by Dr Jane Johnson from USDA-ARS as Co-Chair of the Group. Dr Johnson then introduced the Co-Chair of the Group, Dr Ladislau Martin of Embrapa, Brazil, who welcomed the Group to Brazil.

Overview of the Group

2. Dr Johnson presented the Group with an update of activities since the 2017 meeting in Hatfield UK, including a review of the outcomes of the 2017 meeting:
 - Reviewed the activities and leadership of the Networks.
 - Updated the CRG work plan and identified how activities fit with the new Research Group framework.
 - Identified activities to support the Networks and align with the GRA Flagships.
 - Developed a plan for communication and coordination among Co-Chairs, Networks and Members

SECRETARIAT UPDATE

3. The GRA Secretariat provided an update to the Group on activities of the GRA since the 2017 Council meeting, including new Members and Partners, changes to the Science Networks, and an overview of the new flagships. A brief on the upcoming 2018 Council meeting was also provided.
4. The GRA now has 50 Member Countries, with the Democratic Republic of Congo, Senegal and Zimbabwe joining in the past year. Since the 2017 Council meeting, three organisations have become new partners of the GRA:
 - International Soil Reference and Information Centre (ISRIC);
 - Global Agri-business Alliance (GAA); and
 - World Business Council on Sustainable Development (WBCSD).
5. Other relevant outcomes of the 2017 Council meeting were reiterated, including:
 - Germany's confirmation as Vice-Chair of the GRA Council;
 - Council determination that regional capability-building activities are best coordinated at the Research-Group level; and
 - Livestock and Paddy Rice Research Groups call for Members to support a 3rd Co-Chair of each Group.
6. An overview was provided of the upcoming 2018 GRA Council meeting, to take place 10-11 September in Berlin, Germany. The agenda includes: Research Group Reports; an update on existing and new GRA flagships; an update on regional capability building activities; an overview of the United Nations Framework Convention on Climate Change (UNFCCC) Koronivia work plan on agriculture; and how to align capability building amongst GRA partners. At the Council meeting, Germany will take on the role of Council Chair from Japan.
7. As part of the broader 2018 Council meeting a two-part International Conference will be held on *Agricultural GHG emissions and Food Security: Connecting research to policy and practice*. This will be hosted by the Thünen Institute, and jointly organised by GRA and

European Joint Programming Initiative on Food Security, Agriculture and Climate Change (FACCE-JPI), in partnership with the CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS). A Science Conference will occur at the same time as the Council meeting (10-11 September); and a Stakeholder Conference will occur on 11-12 September. The Stakeholder Conference will provide an opportunity to communicate research outcomes of the GRA, FACCE-JPI and CCAFS to policy makers, research coordinators, NGOs, industry and farmer organisations.

COUNTRY ACTIVITIES

8. One representative from each attending country provided a five minute report on country activities, capability-building opportunities within and across countries, and flagship involvement. Associated presentations are available on the GRA website.

Argentina

9. An update of relevant publications and doctoral theses was provided. This research relates primarily to nitrous oxide emissions, carbon management, and tillage impacts on soil.
10. In relation to GRA flagship activities, Argentina shared the Latin American and Caribbean cooperation platform for Sustainable intensification of livestock systems with legumes (2018-2020). This Platform is being funded by PROCISUR, FONTAGRO and the New Zealand Government. Eight countries are involved (Argentina, Brazil, Chile, Ecuador, Nicaragua, Paraguay, Dominican Republic, and Uruguay). The objectives of the platform are to promote the sustainable intensification of Latin American and Caribbean livestock systems by using forage legumes and improving biological nitrogen fixation; and to increase soil carbon stocks in pastoral systems. Main activities: Biological nitrogen fixation by legumes in grazed livestock systems, impact of soil carbon, and greenhouse gas (N₂O and CH₄) emissions.
11. Argentina also noted that, as of 2018, the Argentinian Agriculture Ministry and INTA are working to assist the Organisation for Economic Co-operation and Development (OECD) to update its information on livestock and croplands nitrogen and phosphorus balance of soils. Argentina is providing expertise from its croplands areas of Buenos Aires, Santa Fe, Córdoba, and Entre Ríos, to support OECD technical experts.

Brazil

12. Brazil informed the group about its major research organisations and plans which relate to the CRG, including:
 - FLUXUS – led by Embrapa Rice and Beans, FLUXUS research focuses on the emission of Greenhouse Gases (GHG) and carbon-balance in Brazilian grain production systems;
 - Pecus – led by Embrapa Southeast Livestock, Pecus research focuses on dynamics in Brazilian livestock production systems;
 - Rede Clima - the Brazilian Network for Research on Global Climate Change which supports Research and Development activities of the National Climate Change Plan to meet national knowledge needs on climate change, including for the development of public policies.
 - The National Plan for Low Carbon Emission in Agriculture, or ‘Low Carbon Agriculture’ (ABC) Plan – a new multi-Ministry lab for ABC monitoring, recently launched in Jaguariúna, Sao Paulo.
13. Brazil shared information about a Sustainable Farming and Smart Crop Protection Sandpit Workshop, held in 2017. The Workshop was divided into two groups – Smart Crop

Protection, and Soils and Sustainable Systems. This was an Alliance for Sustainable Agriculture Initiative (ASA). The ASA a body which consolidates the relationship between Embrapa and Rothamsted Research into an initiative.

14. The Sao Paulo FAPESP Research Foundation Joint project call under SPRINT (São Paulo Researchers in International Collaboration) was noted, along with a FAPESP visiting researcher program.

Canada

15. Canada noted relevant funding initiatives including:
 - Federal Studies - International Funding Initiative (2017-2020): \$190,000 provided to existing Canadian (AAFC) research projects to support collaboration with the GRA
 - Universities - Agricultural GHG Gases Program 2 (2016-2021): A \$27 million, five-year program which supports non-government research projects, aimed at enhancing the understanding and accessibility of agricultural technologies, BMPs and processes that can be adopted by farmers to mitigate agricultural GHG emissions. This consists of a total of 20 research projects - 15 of which are related to the work of the CRG and its Research Networks.
 - The AAFC 2018-2019 call for projects identified the GRA as an international science co-operation priority. Ten associated research projects are related to the work of the CRG and it's Research Networks; two projects identify direct linkages to GRA and the CRG.
16. Canada also provided an overview of its Federal projects (field/regions studies and spatial, temporal and modelling studies) for the 2018-2021 period.

China

17. China noted work towards implementing the GHG_{from} NSFC-UNEP project relating to nitrogen, including work to start N₂O measurements in Kenya, and a framework for quantifying GHG footprints.
18. Models used to simulate GHG emissions, including for tea plantations, were presented. This included work to adapt the models to seasonal freezing and permafrost regions. Work to revise the DNDC model, including revising ammonia related process modelling, was noted.
19. Opportunities relating to the CRG, and associated GRA flagships, included the
 - NSFC-NUEP project: CNY 3m grant for 5 years in the fields of climate change, ecosystem management & livelihood nexus. Proposals were received in mid-March, with release of results in September.
 - Bilateral joint projects between National Science Foundation China (NSFC) and other foundations: 4-year research projects, CNY 2m co-funding for focused joint calls. Proposals are received in mid-March, with the release of results in September.
 - Ministry of Science and Technology international cooperation project: CNY 2–5m grant for 5-year projects.
20. The International N₂O Conference (INOC) for the Nitrous Oxide Flagship, held every 4 years, was identified as a useful event for CRG members. China raised the possibility of countries considering the possibility of supporting the organisation of the event.
21. Chinese scholarships and fellowships were identified. CRG members were invited to visit <http://english.ucas.ac.cn/index.php/admission> to view associated details.

Germany

22. Germany noted the success of the International Conference on Soil Organic Matter (May 2018). In partnership with the 4p1000 initiative, 13 countries contributed to discussions around the potential and limitations of organic matter sequestration.
23. Germany noted that it will complete its first national inventory on agricultural soils in 2018 at an 8x8km scale, with a focus on soil organic matter stocks. This will become part of the Germany's national report and will be repeated at 10-15 year intervals. It will cover total carbon, and sub samples at sites recorded via GPS. The methodology for this programme has only been published in German at this stage. Notwithstanding, other countries noted interest in the methodology, and Germany was invited to share this.
24. German Research Programme – Mitigation of GHG emissions from agriculture and adaptation to climate change, funded by the German Federal Ministry of Food and Agriculture (BMEL), was presented. This involves 33 funded joint projects funded, starting in August 2018 for 3 years. These projects relate to cropland (N efficiency, new diseases and pests), soils (soil organic matter, remote sensing, NO₂ and NH₃ reduction), and livestock (feeding strategies, slurry management, new pathogens).

Republic of Korea

25. Korea indicated its plans to produce a GHG inventory in the agricultural sector by applying the 2006 Inter-Governmental Panel on Climate Change (IPCC) guideline starting in 2020. In order to apply the 2006 IPCC guideline, national GHG emission factors have been developed and national authorized activity data has been constructed. Korea also noted it is providing incentives to farmers who reduce GHG emissions by using low-carbon agricultural technology (such as water management and slow-release fertilizer).

New Zealand

26. New Zealand noted that the International Symposium on Soil Organic Matter meetings may be of interest to the CRG. The last such meeting took place in Rothamsted, UK, 3-8 September 2017. The next will be in Adelaide, Australia on 6-11 October 2019 (<http://som2019.org/>), with a possible side-tour to New Zealand to consider research on soil carbon and nitrous oxide mitigation.
27. Work underway in relation to deep inversion tillage pasture renewal to accelerate soil carbon sequestration was discussed, including initial results from the first year of research.

Norway

28. Norway noted relevant proposals under preparation, including bids for tender to Norwegian Agricultural Agency on improving soil carbon binding capacity; and on GHG emissions from restored peatlands, as well as proposals for participation to European Joint Programme (EJP) Soil and contribution to the Joint Programming Initiative – Technical Advisory Panel (JPI-TAP) Soil group.
29. Capacity building needs included a need to improve national GHG estimates from Norwegian territory; alternatives for mapping agricultural soils; ecosystem modelling; measurement techniques; and a blueprint for conducting soil carbon inventories for agricultural lands in Norway.

Poland

30. Poland provided an overview of activities and accomplishments since the last CRG meeting, including:

- An overview of a 'Pot experiment' impact assessment of urea-based fertilisers with urease inhibitor on physico-chemical and microbiological properties of soil, ammonia emissions and maize productivity;
- The ongoing work of a team of experts for environmental protection and climate change implemented under the National Network for Rural areas – Action plan 2014-2020;
- A 2017 National conference on the 'Potential for reducing emissions of greenhouse gases, ammonia, and nitrates from agriculture – towards best practice'.

Sweden

31. Sweden noted its recent participation in:
- the Soil Carbon Sequestration (SCS) Network led by Denis Angers, Canada, and Claire Chenu, France;
 - the Integrative Research Group Meeting, Paris, 17 January 2018; and
 - presentations at several national and international meetings about systematic reviews on soil carbon changes, financed by Sweden through the Mistra Council for evidence based environmental management (for example 'What are the effects of agricultural management on soil organic carbon in boreo-temperate systems?').
32. Sweden presented information on its Systemic world map of 735 long-term experiments over 10 years; including 320 long term trials regarding tillage.
33. Sweden noted that carbon stocks in agriculture are increasing overall in Sweden and that Sweden has recently completed its 3rd inventory.
34. Opportunities and plans include:
- completed reviews on tillage;
 - ongoing work (selected crop rotations (perennial, legumes, monocultures), time series, yields vs. soil organic carbon, fertilizers, organic amendments); and
 - planned work within the Soil Carbon Sequestration Flagship and Soil Carbon Sequestration Network (Paris meeting 2018): Systematic global review of management practices on soil carbon.

USA

35. USA updated the group on CRG Co-Chair changes, and broader GRA engagements including:
- Mark Liebig taking over as Co-Chair from 1 October 2018 for the Croplands Research Group;
 - The first USA cross-GRA member meeting to take place at the end of August 2018 in St Louis, USA.
36. USA relevant capacity building activities were presented, including:
- The continued use of Regional Climate Hubs to deliver science-based knowledge and practical information to farmers, ranchers and forest landowners on a regional basis to support their decision-making related to climate change;
 - AgData Commons (of the USDA National Agriculture Library) continues to be a helpful open-source database for researchers; and

- Agricultural Collaborative Research Outcomes System (AgCROS) - ‘network of networks’ designed to host, support, and query agricultural research databases as an investment in tomorrow’s food, feed, fiber, fuel and environmental research.
37. Ongoing relevant US Research networks of relevance to the CRG include:
- The Long Term Agroecosystem Research (LTAR) Network – research to address longer-term questions related to condition, trends, and sustainability of agricultural systems and resources across USA;
 - Greenhouse gas Reduction through Agricultural Carbon Enhancement network (GRACEnet) – program to assess soil carbon sequestration and greenhouse gas mitigation by agricultural management;
 - Resilient Economic Agricultural Practices network (REAP), with a focus across a broad range of stakeholders on soil carbon, soil health, GHGs and Life-cycles analyses;
 - Nutrient Use and Outcome Network (NUOnet), with a vision for ‘Efficient use of nutrients to optimize production and product quality of food for animals and humans, fuel, and fibre in a sustainable manner that contributes of ecosystem services’; and
 - The Soil Health Partnership private network - over 120 farmers have enrolled in network. Those farmers provide input data, and strip trials over 5-10 years. The network includes consideration of soil health and carbon and large farms (replicated strips). It was noted, however, that the network doesn’t cover N₂O.
38. In terms of stocktaking and inventories, it was noted that the US GHG inventory is on-going; and that the US Global Change Research Program State of the Carbon Cycle Report (SOCCR-2) now has an anticipated release date of November 2, 2018.
39. USDA-NIFA, US-AID PEER, and Borlaug Fellowship opportunities were noted – internet links with further information on these opportunities can be found in the USA country update presentation on the GRA website.
40. The USA also noted relevant upcoming meetings including the Agronomy Society of America (4-7 Nov 2018), American Geophysical Union (10-14 Dec 2018), and Soil Science Society of America meeting (6-9 January 2019).

INVITED PRESENTATION - Platform of Brazilian Low Carbon Agriculture Plan: Opportunities to Cooperation with GRA

41. Co-Chair Ladislau Martin-Neto of Embrapa, Brazil, showcased Brazil’s ‘**Platform of Brazilian Low Carbon Agriculture Plan: Opportunities to Cooperation with GRA**’. This was on behalf of Renato de Aragao Ribeiro Rodrigues, Secretary of Intelligence and Strategic Relations for Embrapa and the President of the ICLF network council. This outlined Brazil’s journey towards sustainable agriculture, including:
- **First Agricultural Revolution:** This involved the transformation of acidic, poor soils into fertile land. Tropicalisation of crops (corn, wheat, soy bean), and animal production systems were demonstrated. The difference in unproductive natural soil versus phosphorus and biological nitrogen fixation production was noted. Over the period 1976 to 2016, technology-driven efficiency and nurtured land has resulted in 3.3 times more productivity in Brazil.
 - **Second Agricultural Revolution:** the Brazilian Forestry Code (limiting expansion of agricultural land) and the Low Carbon Agricultural Plan (conservation practices for low GHG emissions) were discussed.

- Lastly, the approach to the sustainable intensification of land use, including the benefits of using integrative systems (crop and livestock cycling) – especially for the management of degraded land - were presented.
42. Under the Brazilian Low Carbon Agriculture Plan 2010-2020 Agriculture commitment, it is estimated that GHGs will be reduced by between 133.9 to 162.9 million tons CO₂ equivalent by 2020. The six subprograms contributing to this reduction are: recovery of degraded land, Integrated crop-livestock-forest, no-tillage systems, biological nitrogen fixation, planted forests, and treatment of animal waste. Recovery of degraded land will make the biggest contribution to reducing GHGs by 2020, contributing between 83 and 104 million tons of CO₂ equivalent towards the total reduction.
 43. Many of the topics raised have direct relevance to some of the GRA flagships, including the nitrous oxide flagship. This includes biological nitrogen fixation, no-till systems, double-cropping systems, and Bio-based solutions for cropping systems, and integrated crop-livestock forest system. Brazil invites further opportunities to collaborate in these areas.

ACTIVITY UPDATES

MAGGnet

44. On behalf of Dr Mark Liebig, who was unable to attend, Dr Jane Johnson of the United States Department of Agriculture Agricultural Research Service – presented an update on Managing Agricultural Greenhouse Gases Network (MAGGnet).
45. Recent key achievements of MAGGnet include responding to two metadata requests; presenting at the 2017 SSSA annual meeting; the addition of new metadata, including 40 additional study sites; and the creation of an ArcView mapping feature, organised by cropping type. Once completed, it was proposed that access to the mapping feature could be made available via the GRA website.
46. Continued efforts will be made to reach out to the scientific community about the value that MAGGnet can bring to meta-analyses and modelling efforts – the next MAGGnet presentation is due in Berlin at the *International Conference on Agricultural GHG Emissions and Food Security* in September 2018.
47. The meta-database will continue to be expanded, with the call for new metadata being pushed to October 2018. Meanwhile, options need to be sought to develop an online interface for collection and retrieval of metadata. The approach of using Excel spreadsheets needs to be retired in favour of an on-line portal that allows researchers to easily upload or retrieve metadata, initially requiring considerable design and programming resources.
48. Opportunities for MAGGnet at the upcoming GRA Council were discussed, including:
 - Possibilities to increase engagement among underrepresented GRA countries and regions in MAGGnet (Africa, South America, Eastern Europe, and most of Asia). Compiling such information by country or region could serve as a supplemental task for a CLIFF-GRADS student project;
 - Identifying and securing resources to build the online interface for metadata collection and retrieval for MAGGnet. Achieving this would align with broader efforts of Global Open Data for Agriculture & Nutrition (GODAN) – a GRA partner.

Literature Database

49. Dr Chuck Rice of Kansas State University presented an update on the Croplands Literature Database (<http://www.lib.k-state.edu/gracroplands/>). The database is hosted by the library

at Kansas State University and brings together published literature related to greenhouse gas emissions from cropping systems. The database is searchable by croplands crop, country, climate et cetera.

50. Due to an incident at the library, progress has been delayed. Notwithstanding, there are now an estimated 3-4000 available articles (USA has 1600 entries, Brazil 436, Australia 329, Canada 382, etc). The CRG is welcome to provide references, or their own reference libraries for inclusion in the database – contact Livia Olsen (livia@ksu.edu).

NETWORK UPDATES

Not attending: irrigation efficiency, nutrient management, agroforestry

51. Network leaders attending the meeting provided an overview of activities since the 2017 meeting, and presented on the next steps planned for each Networks. Co-Chair Dr Jane Johnson noted the excellent progress the networks have made over the last year.

Peatlands Management

Network Leader: Hanna Silvennoinen, Norway

Countries Participating: Finland, Germany, Denmark, Canada, Norway, Sweden, Switzerland, UK.

52. The Peatlands Management Network now has 8 member countries. Since the 2017 CRG meeting, the Peatland Management Network has had meetings in November 2017, March 2018 and April 2018.
53. Although countries with tropical peatlands are not currently represented, there is a possibility that two south-east Asian countries may join the Network (Indonesia and Malaysia). Efforts will continue to expand the network to other South-East Asian countries, USA, Brazil, and Baltic countries.
54. In 2018, the Network organized a Workshop titled “Sustainable use of Northern organic soils” in March 2018 in Norway jointly with MYR and Peatwise projects. The Network action plan includes holding another such stakeholder workshop in Norway in Spring 2019.
55. A proposal for a joint session at the European Geosciences Union (EGU) General Assembly 2019 (Vienna, Austria, 7-12 April 2019) was also noted. The peatland management session would be delivered jointly with Global Peatlands Initiative, Greifswald Mire Center, Thünen Institute, RePeat- and PeatWise –projects.
56. The Network will also participate in the first GRA and FACCE-JPI International Conference on Agricultural GHG emissions and Food Security (Berlin, September 2018) and the conference of International Peat Society (Rotterdam, September 2018).
57. Other activities being further explored by the Network include finding ways of collaborating with the United Nations Food and Agriculture Organisation (FAO) Mitigation of Climate Change in Agriculture (MICCA) Programme; and potential joint activities with Global Peatlands Initiative (in either late-2019 or 2020).
58. During the discussion, assistance was sought from the group, and its networks, to participate in the peatlands management stakeholder questionnaire of the PeatWise Project (<http://www.eragas.eu/index.php/research-projects/peatwise>). PeatWise seeks broad stakeholder participation in the questionnaire, including by farmers, NGOs, and government agencies.

Landscape Management of Agricultural Systems

Network Leader: Xunhua Zheng.

Countries Participating: China, France, Germany, Spain, UK, USA.

59. Dr Xunhua Zheng incorporated the Landscape Management of Agricultural Systems (LMAS) Network update with the China country update presentation.
60. The LMAS Network is developing and testing the hydro-biogeochemical model -- the Catchment Nutrients Management Model – De-Nitrification-De-Composition (CNMM-DNDC) as the core of a decision-supporting system for identifying the best landscape management strategies. In relation to this, a modelling research team is being built under the LMAS Network within the Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP-CAS). Efforts will be made towards establishing two catchment-based demonstrations of research and applications of landscape management.
61. Further detail was provided regarding the IAP-CAS modelling research team, for the LMAS network. The team will consist of a fulltime fixed-position senior scientist; a part-time fixed-position senior scientist; two 6-year post-docs of IAP-CAS as scientist modellers; and a fulltime senior scientist modeller from 2020.
62. During the presentation Dr Zheng noted that the IAP-CAS team is seeking substantial cooperative research projects under the GRA umbrella, especially where such research aligns with the LMAS network and the Nitrous Oxide Flagship.

Integrated Crop-Livestock Systems

Network Leader: Alan Franzluebbbers.

Countries Participating: Argentina, Australia, Brazil, Canada, China, France, Germany, USA.

63. A GHG Mitigation Summary for the ICLS Network, updated in August 2018, of the potential mitigation of GHG emissions and adaptation to climate change with integrated crop-livestock systems (ICLS) was presented.
64. Similarities between the Integrated Crop-Livestock Systems Network and the Agroforestry Network were discussed. Specifically, a need was identified to have one network to cover the full spectrum of animal and cropping systems – from forestry, through tree borders, shelter belts and other variations among livestock, crops and perennials. This led to agreement of those present that there would be benefit in merging the networks, especially in view of the limited resource commitment to the activities of the respective networks.
65. To implement this decision, leads of the respective existing networks will give further thought to:
 - What existing partnerships could be provided to support the new network;
 - Sharing and exchanging experiences and projects to begin the merger;
 - How to make best use of the pooled, yet still limited resource of the new group;
 - Develop a joint statement for posting to a new GRA-CRG-Networks webpage;
 - Confirm a new network theme name (possibly: ‘Integrated Crop-Livestock-Forestry Systems’);
 - Developing a set of work activities, taking into consideration existing respective network activities;
 - Propose and select a team leader for the proposed ICLF Network; and
 - Network membership.

Conservation Agriculture

Network Leader: Craig Drury, Canada.

Countries Participating: Argentina, Canada, Denmark, Germany, Italy, Spain, Sweden, USA.

66. The Network has 19 members and has coordinated activities during the year through email and phone discussions. Two key-activity updates were given:
- Progress on a conservation agriculture meta-analysis: using the MAGGnet database as a starting point, this has so far included 60 peer reviewed papers, covering 18 countries, and five best management practice areas (crop rotation, conservation tillage, cover crops, irrigation, and residue management). The meta-analysis considers, inter alia, the effect of tillage and the effect of cover crops on N₂O and CO₂ in relation to soil acidity and soil texture.
 - At the upcoming Soils Science Society of America International Soils Meeting (San Diego, 6-9 January 2019), the Network will look to host a topic session on conservation agriculture practices and GHG emissions. Associated with this, the Network may explore the possibility of a special journal issue, if a sufficient number of submissions are received.

FLAGSHIPS PRESENTATION

67. GRA Special Representative, Hayden Montgomery, gave the Group an overview of the four existing and two new GRA Flagships, and associated opportunities for the CRG. The general approach of the flagships is to quantify GHGs; develop mitigation options; and promote adoption.
68. Examples of successful resource mobilisation were presented to the group, for consideration and prompting of ideas in the context of advancing the Nitrous oxide flagship. Examples were presented for the following flagships:
- Low emissions rice: success in acquiring APEC Agricultural Technical Cooperation Working Group funding to support regional activity in Asia and Latin America.
 - Enteric fermentation: Extension of ERAGAS project CEDERS - Improved quantification of the effects of feed and nutrition on enteric methane emissions from cattle managed under a wide range of production conditions and environments.
 - Soil carbon sequestration: links to EU funded CIRCASA to coordinate activities.
69. Looking forward to the upcoming GRA Council meeting (September 2018), there is a need to provide Council with elaborated proposals and concrete project ideas for the new Nitrous oxide and circular food systems flagships.
70. The Nitrous oxide flagship is relevant to more than one research group. However, it has particular relevance to the CRG. In this context, the CRG will give consideration to how it can best contribute to the flagship including, if time permits, elaboration on the flagship at the upcoming Council meeting.

FLAGSHIPS DISCUSSION

Circular food system

71. The group sought clarity around the expectations and the points to be addressed by activities under the Circular food systems flagship.

72. Discussions at the upcoming Council meeting will elaborate on the GRAs relevance and role in relation to circular food systems. The scope is likely to include many elements which relate to CRG networks. For example, competition of land-use, improved soil use, and the utilisation of manure. Alongside the Council meeting, a workshop will further develop the concept of the flagship, and refine its focus.

Nitrous oxide

73. There was general discussion about the form and focus of the flagship. The list of 18 persons who have so far indicated their desire to engage with the flagship was shared. Although the Nitrous oxide flagship is of particular relevance to the CRG – hence Dr Johnson’s flagship coordination role – it was clarified that the flagships straddle multiple Research Groups.
74. Although the CRG can play a leading role in the Nitrous oxide flagship, it will not be the only contributing research group. Contributions from the CRG to Council discussions could consist not only of existing or new formal project proposals, but also of concept notes or plans regarding areas to focus potential future research.
75. Participants expressed interest in how the CRG could progress projects considering any new projects would create a need for funding. During the ensuing discussion, there was clarity that thinking should be focussed, in the first instance, on issues or potential projects aligned with the flagship. The Council, and the GRA Special Representative would, in turn, seek and mobilise funding.
76. The group was informed that a flagship can consist of multiple contributing projects which, as a whole, have a coordinated direction or set of objectives. Multiple strands of both existing and new projects can form a flagship, as opposed to one single, new project.
77. This prompted brainstorming about the links of existing work within the CRG group with links to the Nitrous oxide Flagship, including:
- Connections to the work of the conservation network (soil quality, resilience, biomass management, water management, land-use management);
 - China’s modelling work, as referred to in the LMAS Network update;
 - MAGGnet meta-analysis which has already been completed; and
 - Possible proposals around nitrogen inhibitors.
78. The discussion produced some questions which the flagship could potentially address, including:
- Where in agricultural systems can we identify the best mitigation options for N₂O?
 - What are the priority areas, where mitigation intervention can have the most impact? Can the priority areas be ranked?
 - When nitrogen-fixing, how much of the nitrogen goes into the soil?
79. Thought was given to whether the flagship text could consist of a framework of such questions. Concurrently, it was noted that the Nitrous oxide Flagship, and the CRG in-particular, cover a broad spectrum of geographical, and substantive differences making it difficult to incorporate relevant issues into a single framework of questions.
80. Notwithstanding, there was some agreement that any document for Council, on how to progress the flagship, should remain broad enough for everyone to participate – and therefore encourage the provision of funding.

81. Near the end of discussion, the group focussed on two particular potential areas of research which could link to the flagship:
- **Modelling:** Measuring nitrous oxide emissions needs to continue, but there is a strong need to emissions modelling. For example, models in the US and Brazil are very different. Although there are some ongoing model comparisons, views were expressed that there is no cross-cutting nitrous oxide modelling activity which could be used for broader model comparison. Questions were raised as to whether this links to the work Tim Parkin and Soren Peterson have underway; and whether there may be country specific emissions factors or modelling exercises that might simply be brought together. Germany offered to link its nitrous oxide work to any international such activity.
 - **Fertilizer-use efficiency:** Thought was given to the possibility of increasing fertiliser-use efficiency by using Platt scaling to develop an emissions curve showing crop yield versus fertiliser use, in order to show the point at which a farmer would gain maximum return on nitrogen investment. There has been some research out of Iowa, USA, whereby a fertiliser to yield response curve can result in less crop yield, but overall savings due to less expenditure on fertilisers. The group expressed interest in this work, noting that the rate of fertiliser application is key to fertiliser-use efficiency. Moreover, there is a need to look at systems holistically to avoid pollution swapping. The group agreed that providing farmers with information about fertiliser use efficiency will naturally incentivise less fertiliser use and therefore result in decreased nitrous oxide emissions.
82. It was agreed that the flagship coordinator, Dr Jane Johnson, would discuss an approach for a basic flagship framework with the flagship taskforce at the next opportunity. During the Council meeting, and during side meetings, the form of the framework will be further progressed, including how to overcome areas within cropping systems where there is lack of a unified theme.

NEXT MEETING

83. A proposal to hold the 2019 meeting in San Antonio, Texas, USA alongside the US ASA/CSSA/SSSA¹ 'tri-societies' was presented to the Group by Co-Chair Dr Jane Johnson. The tri-societies meeting is currently scheduled for 10-13 November 2019. The suggestion would be to hold the CRG meeting before or after the tri-societies meeting. The group accepted the proposal, noting that necessary approvals need to be finalised.

¹ American Society of Agronomy, Crop Science Society of America, Soil Science Society of America.

MEETING OUTCOMES

Action	By who
Share and respond to the Peatland management survey questionnaire	All Members
Connect Chinese experts with the US LTAR programme (links to carbon modelling), in relation to the Landscape management of agricultural system network	Xunhua Zheng, Jane Johnson, Alan Franzluebbbers
CRG members to share awareness of, link to, and consider supporting relevant international nitrogen conferences (eg 8th International Nitrogen Initiative conference, Berlin, Germany TBC late 2019/early 2020)	All members, Xunhua Zheng (INOC)
Take necessary actions to merge the Integrated Livestock Systems Network and Agroforestry Network. Ensure there is communication among expert groups.	Co-Chairs Network leaders.
Each Network to complete a document providing a brief overview of the Networks aims, activities, contact/leader.	Network leaders
Regular communication (calls or emails) to be organised within Networks	Network leaders Network members
Network to report quarterly to the Co-Chairs	Network leaders Co-Chairs
Co-Chairs to liaise (eg teleconference) on next steps for the CRG for the 2018 GRA Council meeting, and the 2019 CRG meeting	Co-Chairs
Co-Chairs to formulate specific messages for the 2018 GRA Council meeting	Co-Chairs
Handover between incoming and outgoing Co-Chairs	Jane Johnson and Mark Liebig
Development of a Nitrous Oxide Flagship <ul style="list-style-type: none"> • CRG to contribute to the Taskforce • Members to identify other contacts that should be involved – including to lead. • Identify other projects (CRG, regional or national) that align with/contribute to the Flagship. 	Co-Chairs All Members
Members to share success stories from their countries	All Members
Contact country council representatives to inform of CRG outcomes, and ask about country support for Flagships.	All Members

APPENDIX 1: Participants list

Country	Attendees
GRA Member Countries	
Argentina	Miguel Angel Taboada: INTA (taboada.miguel@inta.gob.ar) Marcelo Javier Beltrán: INTA (Beltran.marcelo@inta.gob.ar)
Brazil	Ladislau Martin: EMBRAPA (ladislau.martin@embrapa.br) Madari Beata Eموke: EMBRAPA (beata.madari@embrapa.br) Robert Boddey: EMBRAPA (robert.boddey@embrapa.br)
Canada	Craig Drury: Agriculture and Agri-Food Canada (craig.drury@agr.gc.ca)
China	Xunhua Zheng: IAP-CAS (xunhua.zheng@post.iap.ac.cn)
Denmark	Lars J Munkholm: Aarhus University (Lars.munkholm@agro.au.dk)
Germany	Heinz Flessa: Thünen Institute (heinz.flessa@thuenen.de)
New Zealand	Mike Beare: NZ Institute for Plant and Food Research (mike.beare@plantandfood.co.nz) Marta Camps Arbestain: Massey University (M.Camps@massey.ac.nz)
Norway	Hanna Silvennoinen: NIBIO (hanna.silvennoinen@nibio.no)
Poland	Magdalena Borzecka: IUNG-PIB (mborzecka@iung.pulawy.pl)
Republic of Korea	Sun-II Lee: National Institute of Agricultural Sciences (silee83@korea.kr)
Sweden	Thomas Katterer: Swedish University of Agricultural Sciences (thomas.katterer@slu.se)
USA	Jane Johnson: USDA-ARS (jane.johnson@ars.usda.gov) Charles Rice: Kansas State University (cwrice@k-state.edu) Alan Franzluebbers: USDA-ARS (alan.franzluebbers@ars.usda.gov)
Secretariat: Alessandro Aduso (alessandro.aduso@mpi.govt.nz)	