LIVESTOCK RESEARCH GROUP

newsletter

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

December 2016

Update from the Co-Chairs

Welcome to the December 2016 edition of the Livestock Research Group's (LRG) newsletter.

It's hard to believe but it has been seven years since the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and its LRG were first launched! Seven years of working together in pursuit of ways to raise livestock without raising their greenhouse gas emissions intensity. We are extremely proud of the LRG's efforts and wanted to take this opportunity to thank you all for your contributions over the years.

We have made significant progress on some key issues, progress that would not have been possible without the collaborative forces of the GRA. There is greater international awareness of the links between productivity and emissions intensity and how the two connect to deliver on countries' climate change and food security goals for the livestock sector. More countries are now taking steps towards Tier 2 inventories for livestock emissions, supported by and learning from LRG colleagues. Technological solutions to reducing livestock emissions are closer as a result of increased international collaboration and more efficient alignment of resources. The GRA's ability to bring countries together to work on these shared challenges is unique, particularly so given the lack of political progress in other forums.

We have big hopes for 2017. The recent GRA Council meeting agreed to the creation of flagship research programmes – including three of relevance to the LRG (see page 6) – and annual joint programming. We urge you to connect with your Council representatives so that you can be involved and help shape these important conversations. The flagships will also frame the agenda for the 2017 LRG meeting in Washington DC in April, and will be an important vehicle for us to engage our partners and broaden the resource base for GRA activities.

Best wishes for the new year, we look forward to seeing you in it.

Harry and Martin

This month's newsletter brings you:

Next LRG meeting: 10-12 April 2017

The next meeting of the LRG will be hosted by the US in Washington DC, 10-12 April 2017. This will take in a two-day meeting (10-11 April) plus a field trip to the headquarters of the USDA Agricultural Research Service on 12 April. Please put these dates into your diary now. More information will be circulated shortly but if you have any questions, please email secretariat@globalresearchalliance.org.

Measuring, reporting and verifying greenhouse gas emissions from livestock: developing a consistent approach

A joint project is underway between the LRG and CCAFS, working with the FAO and international consultants from UNIQUE Forestry & Land Use, to help countries improve the way they measure, report and verify greenhouse gas emissions from livestock.

Effective climate change mitigation depends on reliable and transparent information on greenhouse gas emissions (GHGs) and mitigation actions. Measurement, reporting and verification of GHGs – known colloquially by its acronym 'MRV' – is a key part of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), building on methodologies and good practice guidelines by the Intergovernmental Panel on Climate Change (IPCC).

While the IPCC guidelines set out some specific requirements for GHG inventories, they allow considerable flexibility in how they are implemented. This means countries can match their MRV systems to their policy goals, resources and capacity. Advanced approaches (e.g. Tier 2 and higher inventories) can better capture country-specific production systems and emission reductions arising from improvements in productivity and herd structures but they also demand more detailed information.

Many countries are challenged by the potential complexity of advanced GHG inventories and MRV for mitigation outcomes in the livestock sector – yet it is also well accepted that inventories can and will be improved continuously over time. No GHG inventory or MRV system will ever be perfect. So how good do MRV systems have to be at the outset and how does this depend on the policy context?

For developing countries, UNFCCC reporting requirements centre on the submission of national communications and Biennial Update Reports (BURs), but MRV is equally relevant when it comes to developing Nationally Appropriate Mitigation Actions (NAMAs) or specific mitigation projects for which countries seek climate finance.

The LRG is working with CCAFS and the FAO to review countries' experiences, expectations and barriers to the implementation of improved MRV systems for livestock GHGs.

Indonesian beef cattle.

This initiative is also looking at the approaches and institutional arrangements that have proven to be most supportive for countries seeking to improve their MRV systems. Together, we will:

- Characterise the current international requirements and expectations for MRV of livestock GHGs in different contexts, including views of donors (i.e. where MRV of mitigation outcomes is linked to climate finance)
- Identify the different approaches that countries are taking in terms of MRV for livestock in different policy contexts
- Survey countries and international experts to identify the drivers, barriers, enabling conditions and resource needs that affect countries' decisions regarding MRV
- Recommend ways to improve MRV of livestock GHGs, in the context of international requirements and countries' own climate change objectives

Initial findings will be summarised in a white paper. A first draft will be available in early February 2017 and will be discussed at a workshop for countries to share their MRV experiences on 20-21 February 2017 at the FAO in Rome. The white paper will be finalised after the workshop, including being discussed at the upcoming LRG meeting in April. It will include recommendations and priorities for actions that can help countries improve their MRV systems and give them confidence that their approach is consistent with international expectations.

Most recently, CCAFS and ILRI, in collaboration with the GRA, held a side event on MRV of livestock emissions at the UN climate change talks in Marrakech. You can read more about this on page 8.

For more information on this project, contact Andy Reisinger, NZAGRC and Lini Wollenberg (CCAFS) (andy.reisinger@nzagrc.org.nz **and** lini.wollenberg@uvm.edu**).**

This work is being implemented by CCAFS, the LRG and FAO, with support from CGIAR Fund Donors, USAID and the New Zealand Government.

Paul Boma, a scientist from Uganda, undertaking training in enteric methane measurement techniques in New Zealand.

Examples of questions that the MRV project will address:

Estimating emissions

- Collection of activity data – how can MRV systems build on existing monitoring systems such as agricultural surveys or production statistics?
- What is the role and acceptable use of models and expert judgments in MRV systems, especially where country-specific data are not available?
- Country-specific emission factors – how important is this and how can countries most efficiently prioritise measurements, and where are defaults 'good enough'?
- What are reasonable levels of uncertainty? How does this depend on the policy application or use of information (NAMA, LED, NDC, national emissions inventory)?

Estimating co-benefits

- Countries and donors are interested not only in GHG emissions. How can data collection and reporting be streamlined to integrate GHG reporting with indicators of productivity, food security and resilience?

Institutional arrangements

- Which institutional arrangements have most helped countries make progress?
- How do countries coordinate between agencies, including the public and private sector? What arrangements have led to good outcomes?
- What are the benefits and disadvantages in having a single MRV system for national inventories, (I)NDCs, NAMAs, and LEDS, as compared to having separate systems for different reporting obligation or projects?
- How costly are MRV systems, and how can MRV systems be used to prioritise investments into further improvements?
- What institutional arrangements make MRV systems sustainable and allow their continuous improvement?

Enteric methane: a review of *in vivo* techniques for measuring emissions from individual animals

There is no 'one size fits all' method for measuring enteric methane emissions from individual animals, and all methods require attention to detail, rigour and routine data quality assessment. These are the findings of a major review of *in vivo* studies, published recently by scientists from the LRG's Feed and Nutrition Network (FNN).

Understanding how much enteric methane (CH_4) individual animals emit and what affects those emissions is an important part of the global search for solutions to livestock's impact on climate change. This knowledge helps inform the development of mitigation and alternative management strategies, decrease uncertainties in national GHG inventories, and screen animals for breeding programmes.

Sheep wearing an SF_6 halter.

A variety of approaches have been developed for measuring enteric methane directly from the animal. These are known as '*in vivo*' techniques, as distinct from *in vitro* techniques, which take place outside the animal i.e. simulating rumen processes in the laboratory. Although *in vivo* experiments all rely on measuring the concentration of CH_4 in the air that the animal emits, they differ in their application, cost, accuracy and precision.

FNN scientists compared the merits and limitations of different *in vivo* techniques to help improve their use. The review focused on the measurement of CH_4 emission rates from individual animals – specifically via:

- Respiration chambers and enclosures
- Sulphur hexafluoride (SF_6) tracer technique
- Short-term (i.e. 'spot sampling') measurements:
  - Automated head chambers (GreenFeed)
  - Carbon dioxide as a tracer to estimate daily methane emission
  - Sniffer technique (sampling eructated CH_4 concentration in exhaled air)
  - Handheld laser CH_4 detector

The FNN paper identifies some key requirements for using these *in vivo* techniques to successfully estimate CH_4 emissions, for example accounting for the impact of feeding behaviour and the diurnal pattern of CH_4 emissions. The paper highlights important sources of variation and experimental error within the different techniques, the need to apply rigour at the design stage, and the need to pursue unbiased and routine self-assessment of the quality of data generated.

No single *in vivo* method is appropriate for all conditions and research objectives. Scientists need to choose the right method depending on an experiment's purpose as each has distinct strengths and weaknesses. For example, respiration chambers can be costly, labour intensive, and restrictive in terms of animal behaviour, but they can be highly accurate in their CH_4 results if used with rigour. Chambers are thus particularly useful for small numbers of animals and testing for specific mitigation effects (e.g. changes in diet), but they are less practical for strategic 'applied'

GreenFeed system in action in New Zealand.

research where large numbers of animals in their normal production environment need to be evaluated. Techniques based on short-term measurements of gas concentrations in samples of exhaled air (e.g. GreenFeed) can be applied to large numbers of animals under more 'normal' management conditions. Some techniques may however lack accuracy, repeatability and precision.

Dr Kirsty Hammond, who led the review, says "Being able to measure CH_4 emissions directly from animals in their normal environment is an essential part of the search for ways to reduce those emissions. *In vivo* techniques are great because they let us measure CH_4 being emitted by the animal directly, but it's important to make sure that the right technique is selected for the research objectives that are being pursued."

The paper's findings will help scientists improve the way they carry out *in vivo* experiments and interpret the data, and with comparing data from different *in vivo* studies. This will make for a stronger knowledge base from which to contribute to the global search for solutions to reducing enteric CH_4 emissions from ruminant livestock.

This work is part of the same GLOBAL NETWORK project that delivered a similar review of *in vitro* techniques, covered in the September 2016 LRG newsletter. The *in vivo* paper also builds on previous work by other LRG scientists that compiled information on respiration chamber design, the SF_6 tracer technique, and the GreenFeed system.

Because the *in vivo* review paper is not open access, the LRG co-chairs team will work with the authors to develop a simple fact sheet presenting the paper's key findings and recommendations. (This will form part of a 'Showcasing the Science' fact sheet series highlighting research conducted in support of the LRG's objectives).

For more information on the *in vivo* review paper, contact Dr Kirsty Hammond (kirsty.hammond@agresearch.co.nz**).**

For more information on the LRG, contact LRG-enquiries@nzagrc.org.nz **or visit** www.globalresearchalliance.org/livestock

Measuring enteric methane emissions in US dairy cows.

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GRA Council agrees to undertake annual joint programming and to explore flagship programmes on enteric methane, GHG inventories, soil carbon and rice

The GRA Council held a productive sixth annual meeting from 11-12 October 2016 in Mexico City, where it adopted a four-year Strategic Plan, progressed new partnerships with several international organisations, and agreed to develop flagship programmes in several areas of interest to the LRG.

The Council is the representative body of all GRA member countries. It oversees the work of the GRA's four Research Groups (including the LRG) and relationships with key partner organisations. This year's meeting saw the US hand over Council chairing responsibilities to Mexico, and Japan confirmed as the new Vice Chair.

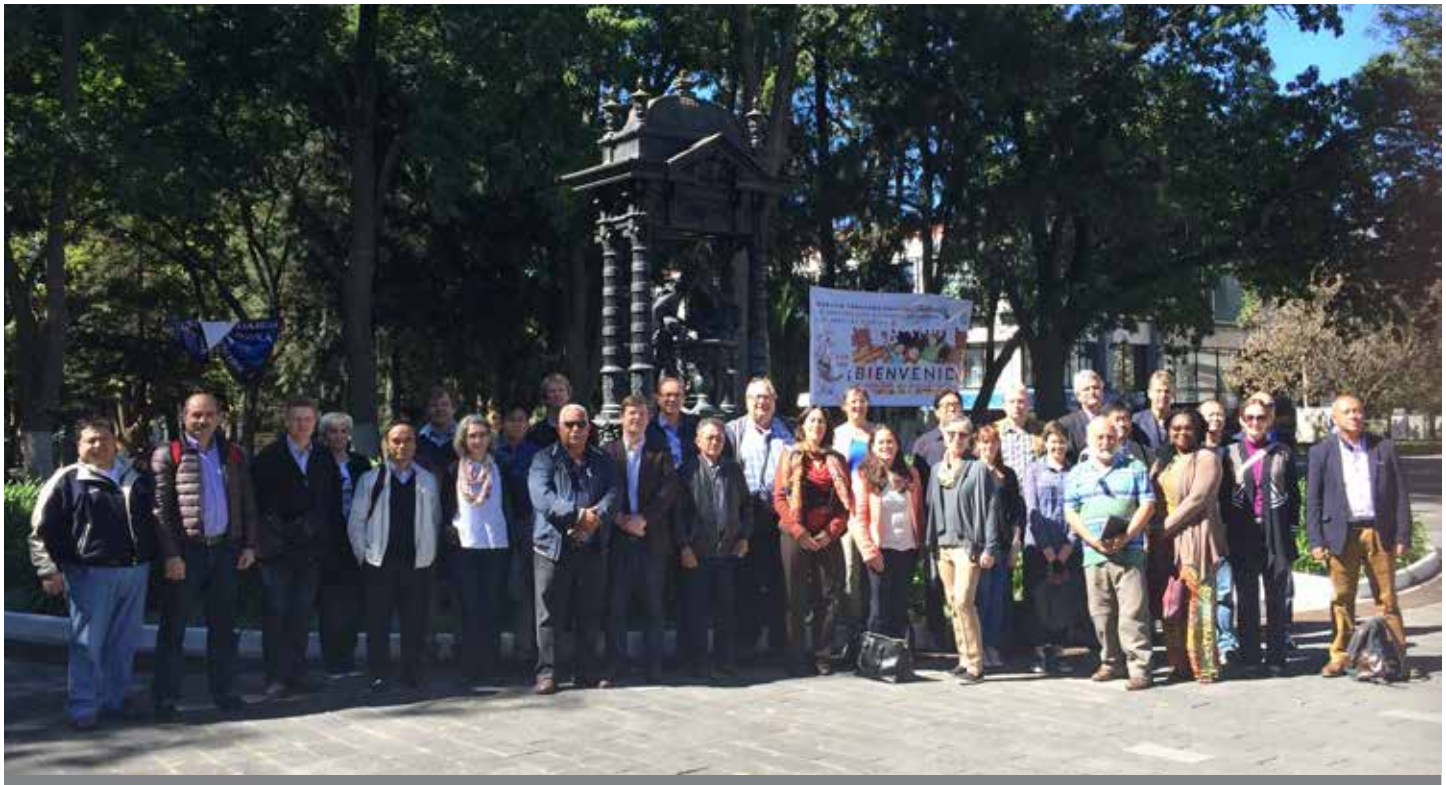
GRA Strategic Plan 2016-2020

A Strategic Plan for the GRA has been under development since the 2015 Council meeting and was finalised at the recent meeting in Mexico. The Plan centres on four key 'strategies' designed to accomplish the GRA's purpose and to track its continued effectiveness:

1. Further research collaboration
2. Foster outreach, knowledge sharing and information exchange
3. Build effective partnerships
4. Leverage financial and other resourcing

These are underpinned by nine strategic objectives and 50 'priority actions'. While most of these are procedural actions (e.g. encouraging member countries to report on their activities relevant to the Research Group work plans ahead of Research Group meetings), there are some new initiatives.

The Plan will see the GRA undertake joint programming on an annual basis, beginning in August 2017, with the aim of mobilising substantial cash and in-kind contributions to support collaborative research. Member countries and partners will be encouraged to align internal research activities and funding with GRA objectives where possible, with progress towards the funding goal to be reviewed at subsequent Council meetings.



GRA Council members attend a field trip to the International Maize and Wheat Improvement Center (CIMMYT), Texcoco, Mexico.

Flagship programmes

The Strategic Plan also includes a priority action to create GRA 'flagship projects'. The Council's criteria for these are that they must:

- Address a critical research and/or capability building need for the GRA
- Provide a focal point for countries and partners to align resourcing
- Deliver against GRA objectives in a way that goes well beyond business as usual
- Facilitate engagement by a broad range of GRA members and partners
- Have indicative resourcing identified and clearly defined milestones and deliverables

Ahead of the Council meeting, the Secretariat had worked with Research Group co-chairs and network coordinators to identify some preliminary ideas for flagship programmes. Nine were presented to the Council, with the following four adopted:

Flagship	Overview
Enteric fermentation mitigation hub	Accelerate the identification and adoption of practices that increase the productivity of livestock systems. This will comprise research projects, implementation and demonstration activities, and will develop or expand globally accessible databases on GHG emissions from different feeds and the rumen microbiome.
Improved greenhouse gas inventories – making them count	Provide guidance and training for countries to develop advanced inventories and improve emission factors and activity data to assist with the reporting of emissions and potential mitigation options. This flagship could also help incorporate improved emission estimates in global databases.
Soil carbon sequestration	Develop a suite of tools to help identify and implement land use and soil management practices that sequester carbon and restore soil quality.
On-farm assessment of multi-beneficial water management techniques in the rice sector	Identify rice production systems that can reduce production costs, water demand and net GHG emissions without yield penalties in different systems and climate zones in Asia and the Americas. Results will be co-validated and co-promoted with local farmers.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The Secretariat is establishing four 'taskforces' to develop the initial flagship concepts into full proposals. Council members and partner organisations have been asked to nominate experts to participate in each taskforce and to indicate their ability to provide operational funding (cash or in-kind support) for implementation.

The flagships will not replace the work the LRG has been doing to date as there will be some activities that are of high priority to the LRG but that don't fit into any of the flagships; nonetheless it will be critical for the LRG to engage. The flagships provide significant opportunities to demonstrate the value that the LRG can bring to countries' interests. We hope that the GRA Council will match its support for the flagships with increased resourcing so that successful programmes can be delivered.

The enteric fermentation, inventories and soil carbon flagships are of critical interest to the LRG and we are engaging as the co-chairs team as actively as we can. We encourage all of you to contact your Council representative if you are interested in being involved (contact your Council representative directly, or email secretariat@globalresearchalliance.org for details). You can expect to see these flagships as central agenda items for our discussions at the April 2017 LRG meeting.

New partnerships and other business

The Council agreed new partnerships with the European Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) and the Latin American Regional Fund for Agricultural Technology (FONTAGRO), both well known to the LRG. Another LRG partner, the Climate and Clean Air Coalition (CCAC) is now a formal GRA partner, and the Council also agreed to seek observer status with the IPCC.

Finally, the Council agreed to identify opportunities for a potential GRA science conference, and where the GRA might hold events alongside other international meetings. More will be known in the next year.

What next for agriculture after the Marrakech climate conference?

Food and farming were in the spotlight at the recently concluded UN climate talks in Marrakech, no surprise given that a large majority of countries' climate plans include actions on mitigation and adaptation in agriculture. The Moroccan conference hosts positioned this meeting as one of "action" – so what did it deliver for agriculture, and what happens next?

Steps toward implementing the Paris Agreement

Now that the Paris Agreement has come into force, discussions in Marrakech largely focused on how to put countries' 'Nationally Determined Contributions' (NDCs) into action and how to implement the Agreement's emphasis on transparency. For agriculture, however, there are still critical questions related to quantifying and measuring progress, and countries will need technical support to help them move towards their targets for mitigation and adaptation.

Many countries are taking steps on their own accord, seeking collaborations and partnerships to lay the groundwork for action at the national level. In addition, the international community is actively supporting action in the sector. By 2018, the World Bank's annual agriculture lending of around USD 8 billion will mainstream climate-smart agriculture approaches and practices. At the regional level, the Asian Development Bank has committed to double annual climate financing to USD 6 billion by 2020, of which nearly USD 2 billion will be for adaptation including through climate-smart agriculture.

Impasse on agriculture in formal negotiations

Despite this momentum, a formal decision on agriculture could not be reached at Marrakech. Agriculture has been an active agenda item in the UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) since 2011. This process was set to conclude in Marrakech, which generated hopes that a decision would deliver the much-needed support to the sector, including elements of finance, technology, knowledge sharing, and capacity building. However, countries were unable to reach a conclusion after the first week of negotiations, and the decision was postponed to May 2017.

Significant efforts have gone into the agriculture negotiation process in SBSTA over the past five years but countries were unable to agree on how mitigation in agriculture can be addressed, the differentiated responsibilities of countries, and fear over potential implications for trade in agricultural commodities. These issues will need to be resolved in order to reach a conclusion at the next SBSTA meeting in May 2017.

What does this mean for agriculture?

It's clear that there is already important momentum for action on agriculture at the country level. But in the absence of a COP decision, agriculture will continue to be dealt under different avenues within the UNFCCC. This could lead to a highly fragmented approach that does not address synergies and trade-offs for food security, adaptation and mitigation. It also adds to the uncertainty for countries seeking climate finance for agricultural activities, with the sector already receiving a lesser share of overall climate funds.

Despite these shortcomings, the overall forecast is positive, with countries leading the way, working closely with the international community to put plans into action. We saw an unprecedented focus on agriculture at COP22 from countries, international organizations and stakeholders. Even if the negotiations didn't show much progress, action is set to start at the country level, which is crucial for adaptation and mitigation in the sector and especially for farmers and their future livelihoods.

CCAFS research has found that mitigation often comes as a natural result of adopting better practices, so it does not necessarily have to be seen as a burden. It can also open up opportunities for funding to developing countries, as there is more funding in general for mitigation-related activities. For example, the Green Climate Fund has prioritized agriculture as a sector for investment and specifically calls for projects that combine adaptation and mitigation, and that aim for transformative change.

What did COP22 deliver for agriculture?

Livestock emissions and the Paris Agreement

Sixty-one countries plan to reduce livestock greenhouse gas emissions in their (I)NDCs, yet the methods most developing countries use to assess those emissions are not yet sufficient to capture the impacts of some climate change mitigation practices, particularly those related to improving productivity.

The LRG is working closely with CCAFS and the FAO to help countries improve the way they measure, report and verify emissions from livestock farming. You can read more about this joint project on page 2 of this newsletter.

Improved reporting for livestock emission reductions was also a focus of a side event hosted by CCAFS in Marrakech. Experts from five countries shared their innovations for improved reporting of mitigation in the livestock sector that demonstrate progress towards national climate commitments. You can read more about this side event, including accessing video footage and the presentations, here.

This article is an excerpt of a CCAFS blogpost, reproduced with the kind permission of the authors: Vanessa Meadu, Dhanush Dinesh, Anette Engelund Friis, Sonja Vermeulen and Bruce Campbell. You can read the full article here.

International fellowship opportunities

LEARN Awards (sponsored by the New Zealand Government)

LEARN is an awards scheme sponsored by the New Zealand Government to build international capability in livestock emissions research. It is part of New Zealand's support for the Global Research Alliance on Agricultural Greenhouse Gases.

LEARN is focused on:

- Supporting technical staff and scientists from developing countries and GRA member countries to work alongside New Zealand colleagues
- Sharing knowledge on livestock GHG emissions measurement, modeling and mitigation practices to increase the level of scientific skills and technological capabilities internationally.
- Supporting strategic research and capability building activities that align with the priorities of the GRA as well as relevant New Zealand science priorities.
- Advancing common research interests between countries and building enduring relationships.

There are four LEARN awards offered:

- Co-funded PhD Scholarship
  (annual application process, closing 30 June)
- Postdoctoral Fellowship
  (annual application process, closing 30 June)
- Technical Training Award (open application process)
- Global Research Alliance Senior Scientist (GRASS) Award
  (open application process)

All applications must be developed in close collaboration with a New Zealand research institution.

Please note that applications for LEARN Postdoctoral Fellowship and Co-funded PhD Scholarship Awards close 30 June 2017.

For more information, please see www.livestockemissions.net or email awards@nzagrc.org.nz

PEER Grant Program (sponsored by the US Government)

The Partnerships for Enhanced Engagement in Research (PEER) program is a competitive awards scheme sponsored by the United States Agency for International Development (USAID). PEER is part of USAID's Global Development Lab, bringing together a diverse set of partners to discover, test and scale breakthrough solutions to address critical challenges in international development. PEER provides funds to scientists in developing countries for research activities that support USAID development objectives.

PEER funding will be awarded to projects related to specified focus areas and/or countries. To be eligible, the developing country scientist must have a partner who receives US government funding (e.g. USDA). PEER funds are granted to the developing country scientist and can be used for their travel to a US government lab, fieldwork or sample collection, and other research activities.

Pre-proposal applications for the 2017 program close on 13 January 2017.

For more information including eligibility requirements, approved focus areas, US government partners, and other application details, please see: http://sites.nationalacademies.org/PGA/PEER/index.htm

Upcoming events

GRA Integrative Research Group meeting

The GRA's Integrative Research Group (IRG) deals with the management and estimation of greenhouse gas emissions within and across agricultural systems. The IRG will hold its inaugural meeting in January where it will review activities and discuss the work of its five networks: grasslands; soil carbon sequestration; field integration; farm and regional integration; and GHG inventories.

Date: 19–20 January 2017
Location: Rome, Italy
Contact: secretariat@globalresearchalliance.org

Global Symposium on Soil Organic Carbon 2017

GSOC17 is co-organized by FAO, GSP/ITPS, IPCC, UNCCD/SPI and WMO through the Intergovernmental Technical Panel on Soils. It seeks to attract 300-500 participants from all regions of the world, and aims to provide scientific and strategic evidence that highlights the critical role of soils and soil organic carbon in addressing climate change. Outcomes from this symposium will provide input to upcoming assessments by the IPCC and will also inform the GRA flagship on soil carbon.

Date: 21–23 March 2017
Location: Rome, Italy
Contact: Ronald.Vargas@fao.org

2nd Agriculture and Climate Change Conference: Climate ready resource use-efficient crops to food and nutritional security

The 2nd Agriculture and Climate Change Conference will focus on the likely impact of climate change on crop production and explore approaches to maintain and increase crop productivity into the future. Topics include increased agricultural uncertainty, effects of CO_2 on plant growth, impacts on nutrition, quality and resource use efficiency, and new crops for a new climate.

Date: 26–28 March 2017
Location: Sitges (near Barcelona), Spain
Website: www.agricultureandclimatechange.com

GRA Livestock Research Group meeting

The LRG will hold its 2017 meeting in Washington DC. More information on the agenda and related meeting activities will be circulated towards the end of 2016.

Date: 10–11 April 2017, field trip 12 April 2017
Location: Washington DC, USA
Contact: secretariat@globalresearchalliance.org

International symposium on emissions of gas and dust from livestock (EMILI 2017)

EMILI 2017 will be an opportunity to share the latest scientific advances in research on gas (ammonia, GHG, odors) and dust emissions from Livestock. It will help provide information that industry and governments need to achieve cost-effective gas and dust mitigation outcomes.

Date: 21–24 May 2017
Location: Saint-Malo, France
Website: https://colloque.inra.fr/emili2017_eng/

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