Spanish Presidency 2023-24

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

HIGHLIGHTS 2023-2024

GRA COUNCIL CHAIR

Esther Esteban Rodrigo

Dear GRA Members and Partners,

I am honoured to present to you the GRA's inaugural annual report for 2023-2024. As Council Chair, I am delighted to reflect on the progress and achievements made by our Alliance in addressing the critical issue of agricultural greenhouse gases in the global research landscape.

In a world increasingly concerned about climate change, it is imperative that we foster innovative solutions and promote global collaboration to balance emissions reduction with food security and sustainability.

Spain's Role and Key Initiatives

As we conclude our term as Chair, I extend my heartfelt appreciation for the opportunity to lead the GRA. Over the past year, Spain, under the Spanish GRA presidency, has played a pivotal role in advancing our mission. The Spanish presidency, coordinated by the National Institute for Agricultural Research, INIACSIC, has overseen a range of impactful initiatives aimed at enhancing research, training, dissemination, and communication within our Alliance.

During our tenure, we championed the creation of a new GRA flagship on Agroforestry, titled "Agroecology and Agroforestry: adapting systems and mitigating against climate change." This initiative, approved at the GRA Council meeting in Madrid, underscores our commitment to exploring innovative approaches to greenhouse gas mitigation in agriculture.

Additionally, Spain has been instrumental in fostering regional collaboration, including the creation of a new Mediterranean Network on Greenhouse Gases in Agriculture. This collaborative effort, involving INIA, CIHEAM, and the REMEDIA Network, aims to facilitate knowledge exchange and cooperation among Mediterranean countries, as evidenced by the successful preparatory meeting held in Zaragoza in November 2023.

GRA COUNCIL CHAIR

The Spanish presidency has also been proactive in supporting existing GRA initiatives, such as the "Feed additives to reduce methane" flagship and has facilitated the kick-off of the "Science to Policy" working group, which aims to improve communication between GRA researchers and policymakers.

Training and dissemination efforts have been a cornerstone of Spain's presidency, with initiatives such as the advanced course on greenhouse gas emissions in agriculture hosted by CIHEAM in Zaragoza and the hosting of the GRA Council Annual Meeting in Madrid, which saw fruitful discussions and exchanges among GRA members and partners. Additionally, Spain has continued its support for the CLIFF-GRADS program, offering opportunities for young researchers to contribute to our collective efforts.

Furthermore, Spain's presidency coincided with its assumption of the presidency of the Council of the European Union, allowing for synergies between GRA activities and EU-level initiatives such as the extension of the PRIMA program, which addresses sustainable agricultural research and innovation in the Mediterranean region.

The 2023 GRA Council meeting was held on 24-25 April in Madrid, hosted by Spain.

In conclusion, Spain has coordinated a fruitful presidency and is pleased to hand over the reins to Ireland. As we transition to a new leadership, let us reaffirm our commitment to collaboration, innovation, and sustainability. Together, we will continue to make meaningful strides in shaping a more resilient and sustainable agricultural sector.

Thank you for your unwavering dedication and support.

Warm regards,

Esther Esteban Rodrigo
Council Chair

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

CSIC-INIA

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

Updates for 2024

1 New Member Country

1 New Partner Organisation

2 Research Calls

3 Research Group Meetings

13 Newsletters & Publications

16 Webinars

61 Fellowships awarded

Special Representative

Dr. Harry Clark

Advancing Towards Agricultural GHG Reduction Together

It was a pleasure to continue my involvement with the GRA during 2023, this time in my role as the GRA's Special Representative. Building on the strong foundation laid by my predecessor, Hayden Montgomery, my aim during the last year has been to continue advancing the GRA objectives of increasing global research collaboration, building research capacity, and building strong partnerships. In the coming year I am looking forward to working more closely with our Research Groups and Networks to support the development of additional Flagship Projects.

Engagement Through International Events:

The GRA has continued to actively participate in international events, and I've had the opportunity to represent us in a couple of significant ones. I served as a keynote speaker at the FAO's Sustainable Livestock Transformation Conference in Rome where I highlighted the challenges climate mitigation and adaptation pose for the livestock sector globally, the diversity of approaches needed to tackle these challenges, and importance of addressing barriers to uptake when assessing mitigation potential of the sector. At COP28, the GRA engaged in discussions and events organised by GRA Members and Partners on topics ranging from capability-building with our CLIFF-GRADS fellowships to reducing emissions from dairy supply chains alongside the Global Dairy Platform, to facilitating North-South exchange on mitigation and adaptation at the side event with the German Federal Ministry of Food and Agriculture and the Ban Ki-moon Centre for Global Citizens. Furthermore, the GRA has contributed to UNFCCC processes by submitting its views on the elements of the Sharm el-Sheikh joint work on implementation of climate action on agriculture and food security.*

**The GRA submission can be found at this link.*

Special Representative

Strategic Collaborations to Enhance Collective Impact:

Establishing relationships with initiatives such as the Agricultural Breakthrough Agenda and the FAST initiative has amplified our collective influence and recognises the role of the GRA to provide science expertise. We have strengthened our partnerships in the dairy sector via GRA Member involvement in the Pathways to Dairy Net Zero Project and through collaborating with leading dairy companies on the MILCA project which is developing standard protocols for the incorporation of mitigation technologies into dairy life cycle analyses. Participation alongside the Global Methane Hub, a new GRA partner, in the Greener Cattle Initiative has provided crucial support to innovative projects such as accelerating methane mitigation via animal breeding and searching for approaches that combine mitigation of enteric methane with improved animal performance, something that has proved elusive so far.

In the rice sector, the GRA is collaborating with the International Rice Research Institute (IRRI) on a successful pilot regional MRV system for rice in Vietnam—"RiceMoRe". Demonstrating the benefits of investing in robust measurement systems, this project has recently received additional funding interest from the World Bank, expansion plans for Cambodia and Laos and will be part of the CGIAR's big regional development project 'Asian Mega-Deltas'.

New Partnerships & Future Prospects:

The GRA continues to explore new partnerships and funding opportunities to advance our mission. The greater role of philanthropic organisations like the Global Methane Hub in climate change mitigation has the potential to enhance the global mitigation effort and provides a new opportunity for the collective strength of the GRA to play a major role in this enhancement. We will pursue this opportunity vigorously in the coming year.

In conclusion, I would like to express my appreciation to all Members and Partners for their contributions to our shared goals. Our joint efforts have greatly advanced the move towards agricultural GHG mitigation. I anticipate further progress and continued collaboration as we move forward.

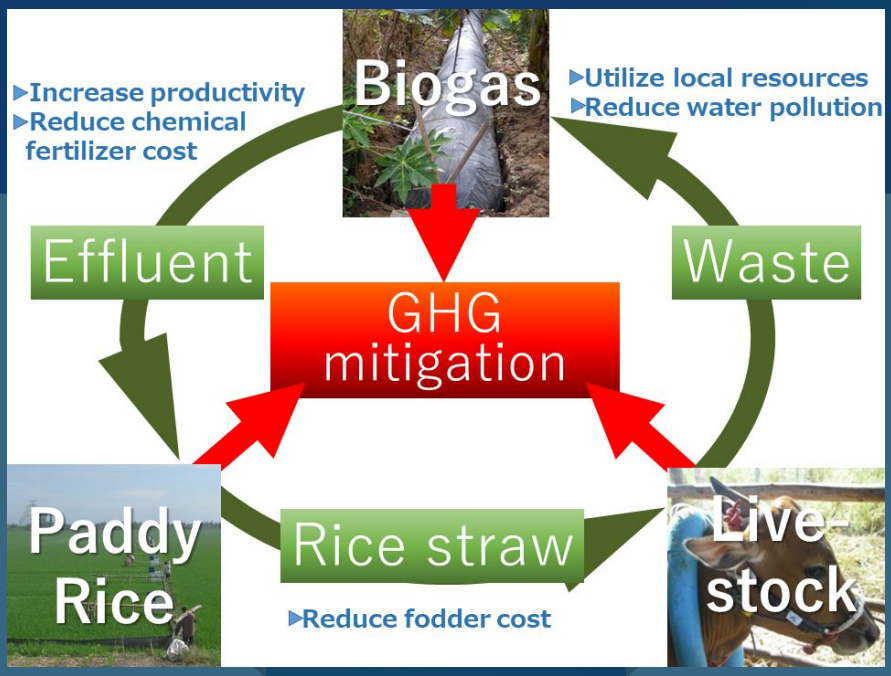
Dr. Harry Clark, GRA Special Representative

GLOBAL RESEARCH ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

Scientific Highlights

Development of greenhouse gas mitigation technologies economically beneficial for the small-scale farmers in Southeast Asia



Project description:

This project tackles two critical challenges faced by Southeast Asian rice and livestock farmers: greenhouse gas emissions and waste management. We're developing innovative methods for rice cultivation that combine deep-rooting rice varieties with efficient water management, aiming to reduce emissions without sacrificing yields. In parallel, we're creating a system to improve livestock waste treatment, minimising environmental impact, and offering farmers the potential to create valuable resources. The project is working with partners in Vietnam and the Philippines, and successful methods will be shared with other countries in Southeast Asia. This collaborative effort seeks to pave the way for a more sustainable future for Southeast Asian agriculture.

Involved members/partners: National Agriculture and Food Research Organization (NARO), Japan International Research Center for Agricultural Sciences (JIRCAS), Nihon University

Paddy Rice Research Group

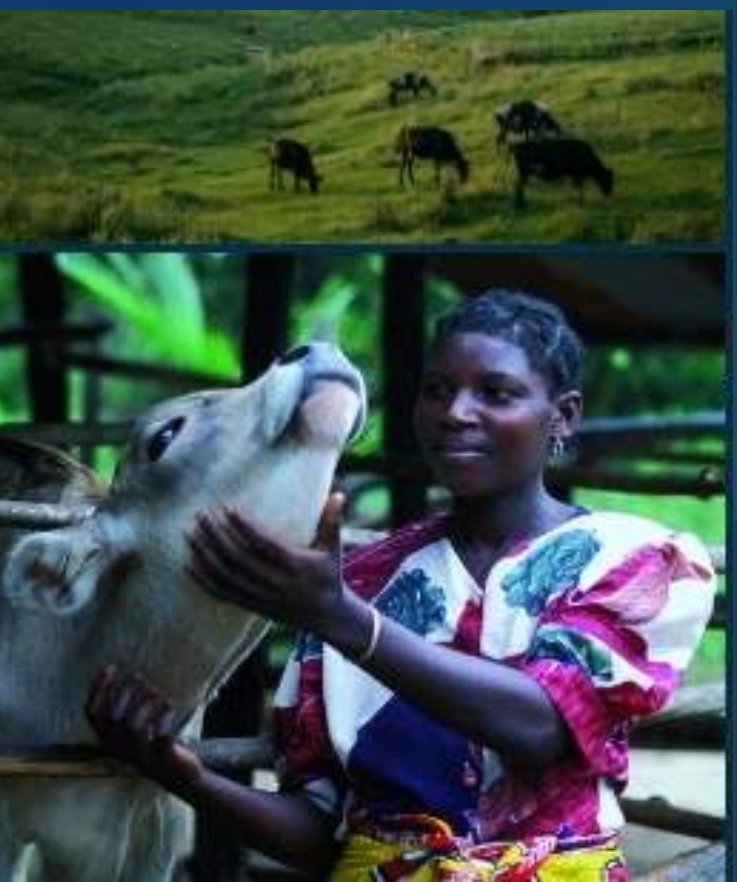
The GRA is a Knowledge partner for the Global Dairy Platform's:

'Pathways to Dairy Net Zero'

Project description:

This work sought to provide an overview of the main typologies in the global dairy system; its greenhouse gas (GHG) emissions; potential mitigations and predicted uptake of mitigations; as well as effects of dairy GHG emissions on global warming to 2050. Work has included:

- Classification of GHG mitigation options, grouping together similar methods;
- Description of dairy systems (typologies) in a series of country case studies, with countries selected to exemplify the range of dairy production systems encountered globally;
- Evaluation of mitigation options and potential for uptake of mitigations for each of the dairy systems in the case study countries; this included an evaluation of the main barriers to adoption (or incentives required to increase adoption) in the case study countries;
- Estimating the range of potential GHG mitigation in each dairy system and scaling up to global estimates;
- Modelling the effects on global temperature of 'business as usual' and projected maximum and minimum mitigation of emissions for each gas.



Involved members/partners: FAO, NZAGRC, Scotland's Rural College (SRUC), Cornell University, Australian National University

Find out more:
https://pathwaystodairynetzero.org/

Livestock Research Group

Estimating the effect of diseases on cattle productivity and GHG emission in smallholder dairy systems of low and middle-income countries

Project description:

Understanding the link between livestock and our well-being is crucial. Cattle, for instance, are a significant source of methane, a greenhouse gas that impacts climate change. Yet, livestock are also vital for nutrition, especially in low- and middle-income countries where animal products are key to combating malnutrition. Our project addresses this paradox by focusing on animal health, which can lead to more sustainable livestock production and lower greenhouse gas emissions. Healthier animals mean more efficient production, fewer production losses, and subsequently less environmental impact. In Tanzania, reducing abortions on cattle could prevent the loss of essential protein for a million people. Similarly, in Kenya, reducing calf mortality can significantly decrease greenhouse gases and address nutritional deficits for millions of Kenyans. By enhancing livestock health, we are not only improving food security but also contributing to a healthier planet and population. This project is a step towards a future where environmental care and human health go hand in hand.

Involved members & partners:

GRA's Animal Health and Greenhouse Gas Emissions Intensity Network, Edinburgh Napier University, the International Livestock Research Institute (ILRI), ILRI's Mazingira Centre, the Centre for Tropical Livestock Genetics and Health, the Roslin Institute, Washington State University, the Nelson Mandela African Institute of Science and Technology, Mekelle University, the FAO, the GRA, and the Environmental Defense Fund (EDF).

Funding:

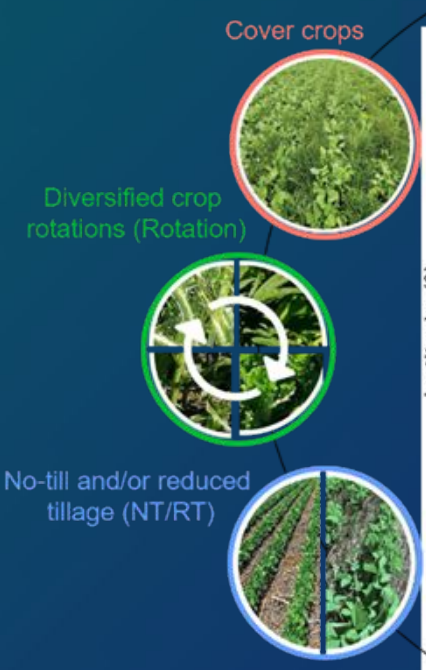
This work received funding from Environmental Defense Fund with support from the Wellcome Trust and built on a study funded by the Bill & Melinda Gates Foundation.

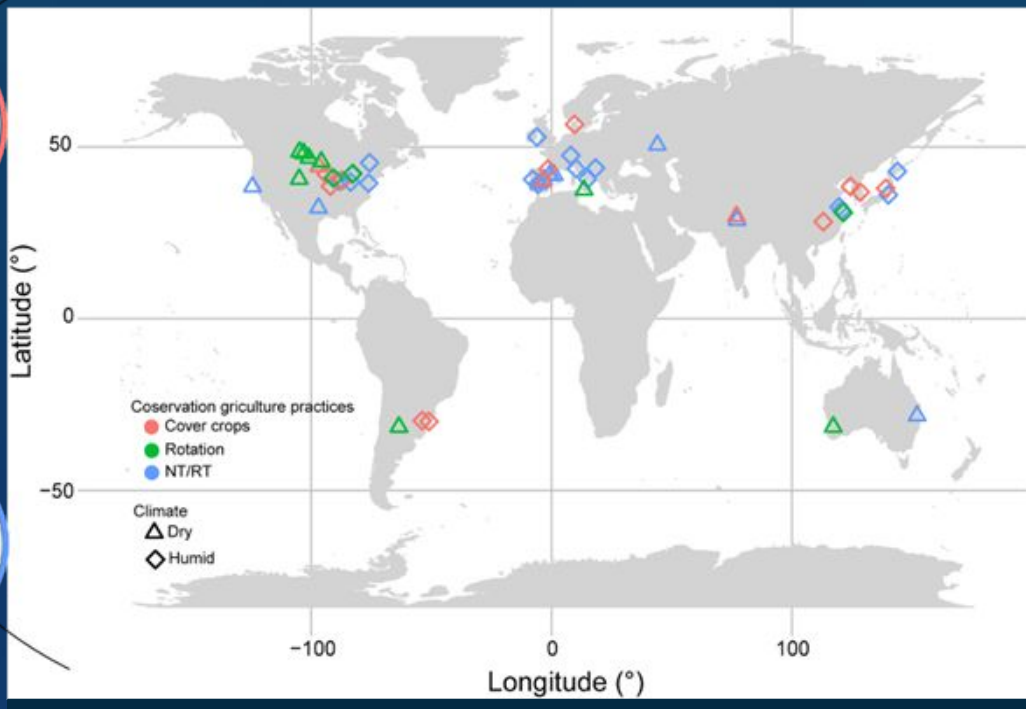
Find out more:
https://whylivestockmatter.org/articles/improving-animal-health-key-sustainable-livestock-production-and-better-human-health

Research brief:
https://cgspace.cgiar.org/server/api/core/bitstreams/f475ccb4-cb15-4d8d-ac85-95e55ae5391a/content

Livestock Research Group

The role of conservation agriculture practices in mitigating N2O emissions: A meta-analysis





Project description:

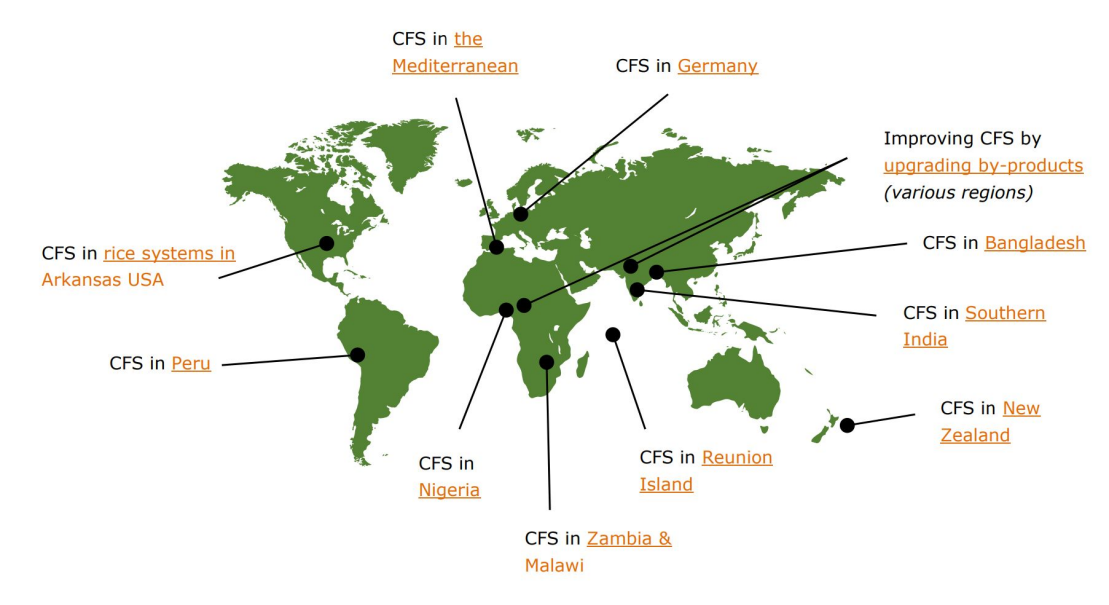
Conservation agriculture can improve environmental outcomes, including climate change mitigation through soil carbon storage. However, less is known concerning the effects of conservation agriculture on emissions of nitrous oxide, a powerful greenhouse gas. Results from published studies were compiled and summarized to better understand how nitrous oxide emissions varied in response to three conservation agriculture practices: cover crops, diversified crop rotations, and no-till and/or reduced tillage. Averaged across all comparisons, no-till and/or reduced tillage consistently decreased nitrous oxide emissions by 11% compared to conventional tillage. Adoption of cover crops and diversified crop rotations led to variable effects on nitrous oxide emissions. Cover crops were more likely to reduce nitrous oxide emissions at near-neutral soil pH and intermediate levels of soil total nitrogen and organic carbon. Diversified crop rotations tended to increase soil nitrous oxide emissions in temperate regions and neutral to alkaline soils. Results from this analysis provide a framework to better understand environmental tradeoffs associated with the adoption of conservation agriculture practices.

Involved members/partners: Yue Li, Ji Chen, Diego Abalos, Craig F. Drury, Zhaozhi Wang, Mark Liebig, Jane M., F. Johnson, Hao Feng

Find out more: https://link.springer.com/article/10.1007/s13593-023-00911-x

Croplands Research Group

Circular Food Systems around the world: exploring concepts, ideas and opportunities



Project description:

Are circular food systems (CFS) part of future agrifood systems that tackle the challenge? How are CFS defined and how do CFS differ per region? How to measure or monitor the impact of CFS? And can it contribute to food and nutrition security while reducing emissions of greenhouse gasses?

This report aims to provide an overview of, as well as sharing, the different ideas that exist on circularity in agrifood systems worldwide. The report constitutes eleven short communications by scholars from all over the world, that have been submitted to the kick-off workshop of the Circular Food Systems Network in 2021. They underline the different concepts of circular practices in agriculture, and together they provide an overview of current state-of-the-art research and practices of circularity and identify the knowledge questions and gaps to further advance our knowledge and understanding on CFS. Core questions that this compilation report addresses are:

1. What do circular food systems mean in different parts in the world?
2. What are the opportunities for a sustainable agrifood system? What are the foreseen benefits for GHG mitigation and other benefits or trade-offs?
3. What are the next steps to advance CFS research, knowledge sharing and implementation?

Funding: Funding support provided by the Dutch Ministry of Agriculture, Nature and Food Quality

Find out more:
https://research.wur.nl/en/publications/circular-food-systems-around-the-world-exploring-concepts-ideas-a

Integrative Research Group

FLAGSHIPS

The Rumen Gateway project

Launched by Queen's University Belfast on October 20, 2023, this flagship project unites experts from leading institutions globally to create an extensive and comprehensive open-access database of rumen microorganisms.

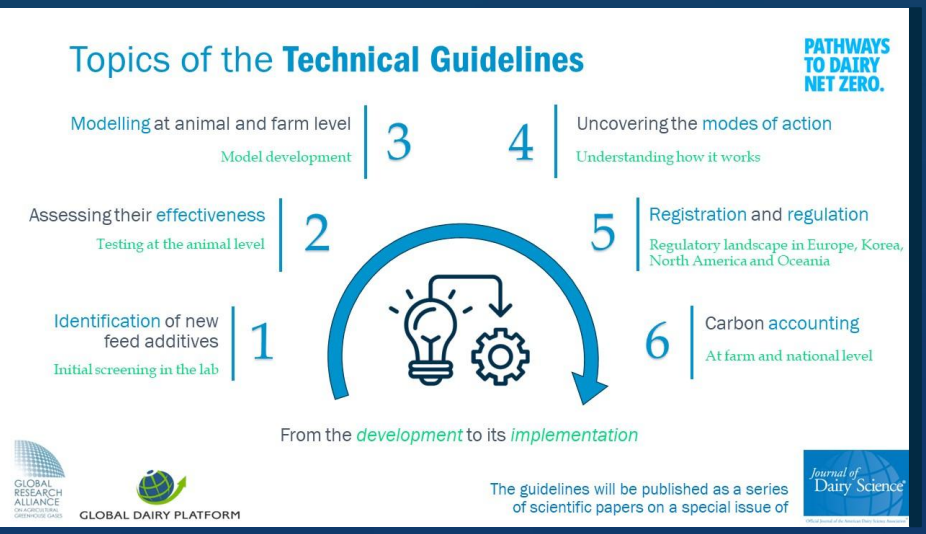
This initiative aims to deepen the understanding of the rumen ecosystem, a key factor in reducing livestock methane emissions.

Additionally, the project's outcomes are expected to significantly enhance Food Safety and Security and support the One Health initiative by developing sustainable technologies for healthier and more productive livestock. Currently, the project is finalizing the initial formalization agreements among 22 international institutions, notably including the Joint Genome Institute (JGI), responsible for genome sequencing and database creation. An initial census of 16S rRNA gene sequence databases is ongoing, aiming to showcase the microbial diversity already present across individual biobanks worldwide to facilitate the initial selection of candidates for genome sequencing.

The development and validation of methods and protocols are underway for isolating, identifying, genotyping, and phenotyping new isolates, including bacteria, archaea, and fungi, as well as viruses. Efforts are also being made to establish standardized metadata templates to streamline data collection and integration. As the project progresses, it remains open to incorporating new collaborators, continually broadening its scope and impact including targeted outreach and engagement initiatives to enhance the project's influence and scope within the scientific community.

Feed additives to reduce methane

The Feed Additives Flagship Project aims to provide the scientific community and livestock sector technical guidelines on good practice on how to identify and test feed additives to reduce enteric methane emissions.



The guidelines will also address the current situation of the registration and regulation process of such feed additives and the methodology to account for the reduction in enteric methane at various scales.

The guidelines will be published as a series of scientific papers on a Special Issue in the Journal of Dairy Science.

Each paper will provide technical recommendations for the development and implementation of anti-methanogenic feed additives at different levels: i) identification of bioactive compounds; ii) testing at animal level; iii) model development (animal, farm); iv) uncovering the mode of action; v) registration and regulation; and vi) carbon accounting.

The project relies on the contribution of over 60 researchers from 21 countries, which represents a globally active network of scientists covering different expertise in investigating anti-methanogenic feed additives.

NEW FLAGSHIP

Agroecology and Agroforestry:

adapting systems and mitigating against climate change.

This flagship was endorsed during the 2023 Council Meeting in Spain. It aims at developing a portfolio of agroforestry and agroecology best practices, and their respective value chains, which are clearly linked to their capacity to increase carbon sequestration and/or reduce GHG emissions.

Flagship Lead:
María Rosa Mosquera Losada

Key partners:
AF4EU, UNDERTREES, AE4EU,
Argentina: FONTAGRO,
UK: SENSE project,
Brazil: EMBRAPA,
Colombia: Agroforestry project,
USA: GRACEnet,
Canada: EJP Project with diversified crop rotation sites.

BUILDING CAPABILITY

RUFORUM
Capability Building in Agriculture

Round 2

8 projects supported
- 16 Master students
2 PhD projects supported in collaboration with ILRI.

8 projects were selected for the second Round of the GRA-GRG Programme, to keep on building the capability of African graduate and post-graduate students to conduct applied research on Agricultural GHG. Each project will train two master's students. For this Round of the GRA-GRG, **two PhD projects** were also awarded in collaboration with ILRI.

Launch of the GRA-RUFORUM Alumni Network:

GRAN-Afrique

In November 2023, during the RUFORUM annual technical committee, five recipients of the first Round of the GRA-GRG Programme launched the GRA-RUFORUM Alumni Network named GRAN-Afrique.

This network aims at promoting networking among the Alumni, promoting the development of their professional careers, building their involvement and commitment in GRA and RUFORUM activities and facilitating cooperation in agricultural GHG research and development, including through community projects.

GRAN Afrique
GRA-RUFORUM ALUMNI NETWORK

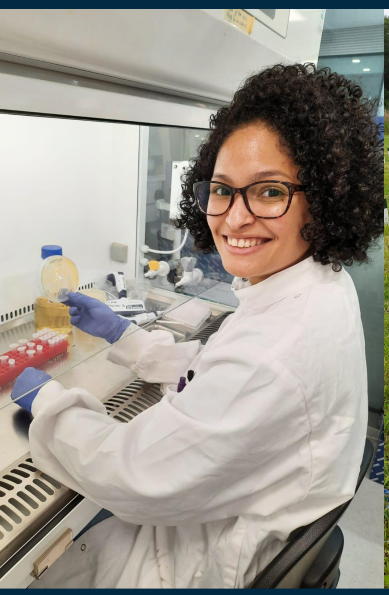
Climate, Food & Farming, Global Research Alliance Development Scholarship

CLIFF-GRADS Programme

Round 6

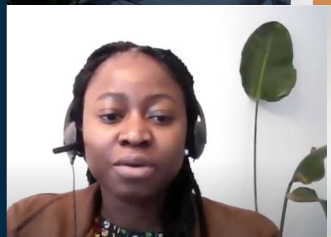
39 awardees guaranteed to PhD students from **19 developing countries.**

This year again, the **CLIFF-GRADS programme** was really popular among PhD students, with more than 300 application received. **39 awards** were granted to PhD students from developing countries to keep on building their capability to conduct applied research in agriculture in GHG emission, quantification and mitigation. The list of selected candidates and projects is available **here.**




COP28 - The role of youth in capacity building for climate action in the Global South

CLIFF-GRADS alumni, Glory Edwards and Mary Ngaiwi, alongside Harry Clark (GRA Special Representative) actively participated in a COP 28 event organised by CGIAR. The event focused on the crucial role of youth in capacity building and policymaking for climate action in the Global South. Exploring avenues for influencing policies and mobilising youth networks, the event served as a platform for sharing knowledge, experiences, and best practices.




CIHEAM - Advanced courses

Out of 40 participants, 12 were supported by the GRA.

Advanced Course - Greenhouse Gas assessment and mitigation in agriculture: concepts, methods and simulation tools. Zaragoza, Spain - 16-20 October 2023

In 2023, ***CIHEAM Zargosa***, in partnership with the GRA , held an advanced course on Greenhouse gas assessment and mitigation agriculture. This course marked a significant milestone in the collaborative efforts to address environmental challenges posed by the agricultural sector. With the participation of **40 professionals** from more than **25 countries**, the course aimed to equip attendees with the essential knowledge and skills required to navigate the complexities of GHG in agriculture.

Thai and NZ Māori connecting for the first time online

Thai delegation on New Zealand soil for the first time

NZ delegation on Thailand soil for the first time

“My tribe on the other side of the world”

The Indigenous Research Network has its first partnership project being co-developed between Whareponga Whenua Collective (Pahiitaua Incorporated) and Agri-Nature Foundation Thailand (Mab Aung Natural Agriculture Learning Centre). This will be framed as an on-farm demonstration project in Ruatoria, New Zealand facilitating and incorporating agroforestry and nature-based solutions in transitioning towards low emissions farming (pastoral farming, food production, participatory reforestation while facilitating local livelihoods and wellbeing). A Thai delegation travelled to New Zealand to meet with the Whareponga Collective in May 2023 and NZ Māori delegation travelled to Thailand in March 2024 to strengthen this relationship.

Indigenous Research Network

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

LOOKING FORWARD 2024 & BEYOND

Recent Research Opportunities – The GRA continues to be involved in the development and funding of international research calls with our Partner organisations. This year members participated in joint research funds in Latin America through the Fontagro 2024 call; researchers from Ireland and New Zealand submitted proposals for the joint research initiative; and in Europe the Green ERA HUB is coordinating projects on sustainable crop and livestock production systems with the opportunity for global participation.

Spotlight on Africa – The GRA is strengthening regional networks across Africa and developing joint research collaborations working with our Partner organisations. In Southern Africa the GRA is working with Future Africa and the University of Pretoria to launch the Qinisa regional initiative to strengthen collaboration in agricultural greenhouse gas research.

Food loss and waste is a new focus in the region and the GRA has been working with members to support activities on this topic, including a recent workshop “Food Loss and Waste Prevention in Sub-Saharan Africa” in Kenya.

Key Events - Look out for the GRA at the "International Research Symposium on Agricultural GHG Mitigation – from Research to Implementation" which will take place in Germany in October 2024. The event will bring together GRA researchers and policy makers to discuss options for both climate change mitigation measures and low-emission development strategies in agricultural food systems, as well as their implementation and win-win solutions for combating climate change and enhancing food security. A number of GRA meetings will be held alongside this symposium, making it a key event for the year.



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Glossary

- CGIAR - formerly the Consultative Group for International Agricultural Research
- CIHEAM - International Centre for Advanced Mediterranean Agronomic Studies
- CLIFF-GRADS - The Climate, Food and Farming, Global Research Alliance Development Scholarships Programme
- COP28 - Conference of the Parties (COP) to the UNFCCC
- EDF - Environmental Defense Fund
- FAO - Food and Agriculture Organization of the United Nations
- FAST - Food and Agriculture for Sustainable Transformation Initiative
- GHG - Greenhouse Gases
- GRA - Global Research Alliance on Agricultural Greenhouse Gases
- GRA-GRG Programme - The GRA-RUFORUM Graduate Research Awards
- Green ERA HUB - European Research Area (ERA)
- ILRI - International Livestock Research Institute
- INIA - The National Institute for Agricultural and Food Research and Technology, Spain
- INIACSIC - INIA, a National Center integrated into the State Agency Higher Council for Scientific Research (CSIC), Spain
- IRRI - International Rice Research Institute
- JGI - Joint Genome Institute
- JIRCAS - Japan International Research Center for Agricultural Sciences
- MiLCA - Protocol for including Mitigation actions in Agricultural Lifecycle Assessment
- MRV - Measurement, Reporting and Verification
- NARO - National Agriculture and Food Research Organization
- NZAGRC - New Zealand Agricultural Greenhouse Gas Research Centre
- PRIMA program - addresses sustainable agricultural research and innovation in the Mediterranean region
- REMEDIA Network - a national scientific network focused on climate change mitigation in the agroforestry sector, Spain
- RiceMoRe - pilot regional MRV system for rice in Vietnam
- SRUC - Scotland's Rural College
- UNFCCC - United Nations Framework Convention on Climate Change

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Livestock Research Group

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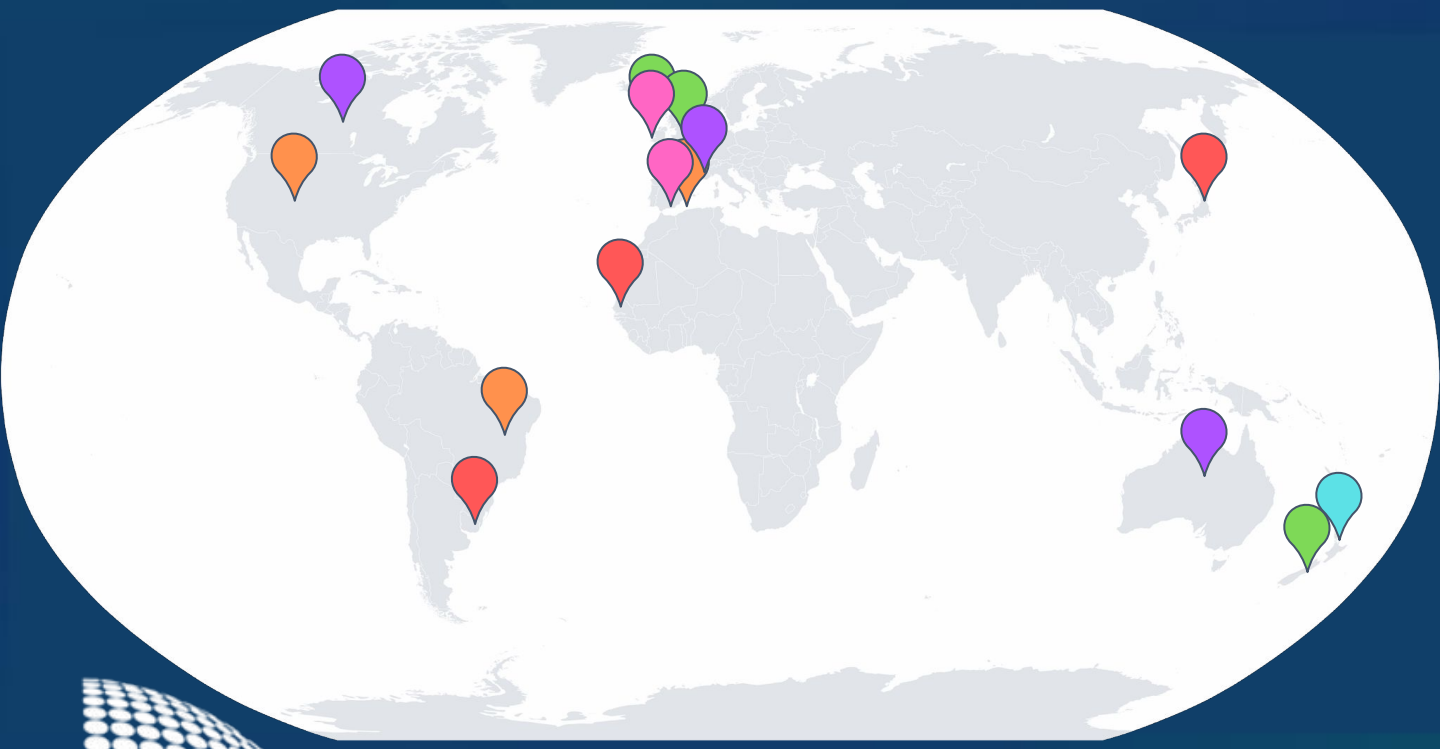

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

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