GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

Paddy Rice Research Group Meeting

EMBRAPA Clima Temperado, Pelotas, RS - Brazil

20-21 February, 2015

Meeting Report

OVERVIEW

The Second Meeting of the America's Sub-Group of the Paddy Rice Research Group of the Global Research Alliance on Agricultural Greenhouse Gases ("the GRA") was held at EMBRAPA Temperate Agriculture Research Centre, in Pelotas, RS - Brazil on 20 and 21 of February 2015. The GRA meeting was chaired by Uruguay (Mr Gonzalo Zorrilla, INIA) as Co-Chair of the Paddy Rice Research Group and Dr. Walkyria Bueno Scivittaro as research leader of rice gas emissions at EMBRAPA.

This report is a summary of the key discussions and outcomes of the meeting.

PARTICIPANTS

The meeting was attended by 40 participants, representing 9 GRA member countries and partner organisations (Figure 1).

- **GRA Members attending:** Argentina, Brazil, Chile, Colombia, Paraguay, Uruguay.
- **Partner Organisations attending:** CIAT, CCAFS, PROCISUR.

Figure 1. Participants

MEETING OUTCOMES

The meeting achieved the following outcomes:

- Overview from the Alliance Secretariat on the Global Research Alliance on Agricultural Greenhouse Gases and aims of the Council and other Research Groups.
- Updated a list of researchers and national contacts of the Paddy Rice Research Group in the Americas and identified countries that should be invited to join.
- Update on research advances in different countries in the region.
- Targets for a concept note and proposal for a multi-site/country experiment were identified: 1. gas emission comparison among regions, climates and production systems; 2. modelling of gas emission in different systems; 3. better understanding of the soil microbiology related with GHG emissions from rice paddies.
- Identified the next steps for the Group and date for the next meeting.

FIELD DAY

The first morning of the program was dedicated to a field visit to EMBRAPA Temperate Agriculture Low Land Research Station where research sites measuring greenhouse gases (GHGs) were toured. Dr. W. Scivittaro and colleagues explained studies going on this season and fruitful discussions on methodologies, practical tips, and research topics happened among participants (Figures 2 and 3).

Figure 2. GHG measurements in rice and soybean fields

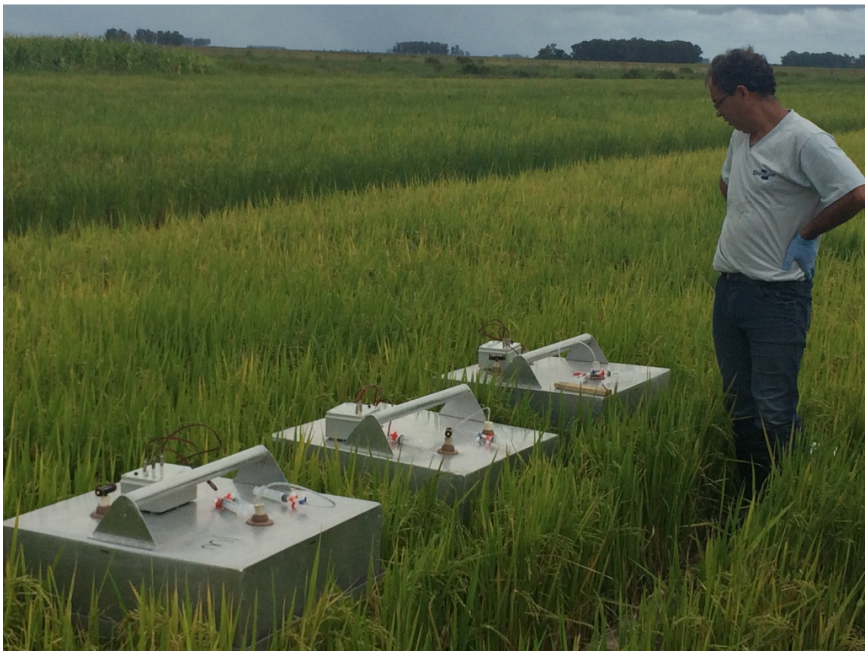

Figure 3. EMBRAPA Chambers for GHG measurements in rice fields

The tour ended with an overview of other research conducted this season by EMBRAPA team on rice.

SUMMARY OF DICUSSIONS

The Second Meeting of the America Sub-Group of the Paddy Rice Research Group was opened by Dr Clenio Pillon, Director General EMBRAPA Clima Temperado, José Terra – Research Coordinator of the Sustainability Platform at PROCISUR, and Gonzalo Zorrilla as PRRG Co-Chair.

SECRETARIAT OVERVIEW

Gonzalo Zorrilla on behalf of the Secretariat presented general information on the Global Research Alliance for meeting participants who are new to the Alliance. The Alliance now has 45 member countries, with Paraguay as the latest member from Latin America.

Main outcomes of the last GRA Council Meeting in The Hague were highlighted:

1. Alignment with other global platforms and initiatives: including identifying new Partners;
2. Expanding membership and outreach beyond Members;
3. How to strengthen cooperation with Partner organisations; and
4. Increasing impact at the policy level and transfer of knowledge to farmers.

The Secretariat presentation ended with a review of activities and news from other Research groups.

OVERVIEW OF THE PADDY RICE RESEARCH GROUP

Gonzalo Zorrilla made a presentation prepared jointly with Dr Kazuyuki Yagi, as Co-Chairs of the Paddy Rice Research Group updating aims and activities of the Group which has five action plan topics:

Action Plan 1 – Standardize measurements

The Group is making a comparison of measurement protocols at different countries and experts are analyzing automated measurement data for the closed chamber technique. From these exercises, the Group plans to publish the Guidelines for measurement techniques. It also aims to identify "good practice" options for each region and climate. Version-zero of the Guidelines is under review and version one will be published in August, all activities under MIRSA project. After that, the guidelines will be open for review among PRRG participants and a version two with specifications for different regions and systems will be prepared.

Action Plan 2 – Database

A new proposal to develop a database (DB) of experimental sites was endorsed at the 5th Group Meeting. The DB compiles metadata from experimental sites throughout the world where greenhouse gas fluxes are monitored, and it replaces previous plans for the stocktake revision and the literature/expert database. This activity collaborates with the MAGGnet activity of the Cropland Research Group.

Action Plan 3 – Increasing Participation

The Group collaborates with partners (IRRI, CIAT, CCAFS, AfricaRice) and other international networks (MARCO, PROCISUR, FluxNet). Some rice experts from non-member countries are actively participating in the Group's activities. The Group endorsed to collaborate with the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) to their new agricultural component focusing on mitigating methane emissions from paddy rice. Intend to incorporate USA and Europe delegates to the Americas Sub-Group of PRRG.

Action Plan 4 – Multi-Country Experiments

MISRA project for Southeast Asia was launched in 2013 and it is underway. Similar project for Americas is being discussed by these Sub-Group members.

Action Plan 5 – Mitigation and Adaptation Synergies

Possible options for mitigation and adaptation synergies related to paddy rice were identified. The Group agreed to consider the discussion of the synergy activities and the review of current activities underway in the work plan within the Network created. Vietnam, with the support of Indonesia and other experts coordinate the development of this framework.

COUNTRY REPORTS

Each member presented to the Group their research underway, particularly the measurement of greenhouse gas emissions.

Argentina – D. Kurtz, INTA

Rice is an important crop for some provinces but a minor one at national level. Only 0.3 % of CH4 emissions in Argentina come from rice fields. Initial efforts were placed on quantification of GHG emissions from paddy fields, to estimate totals and by region. The DNDC model has been adapted and good correlations with measured emissions were found. Modelling could be an alternative for studying gas emissions in Argentinean rice systems where budgets are expected to be small for other kind of research.

Brazil (coordinated by W. Scivittaro, EMBRAPA)

The Brazilian delegation was numerous with scientists and graduate students from four main research groups participating: EMBRAPA Temperate Agriculture, Universidade Federal de Pelotas - UFPEL, Universidade Federal do Rio Grande do Sul –UFRGS, and Universidade Federal de Santa María - UFSM. The list of papers presented follows:

"CH4 and N2O emissions related with urea or slow release N fertilizer"–*T.Veçozzi (UFPel/Embrapa)*
"Yield-scaled GHG emissions under long-term no-tillage and conventional tillage in Southern Brazil" – *C. Bayer (UFRGS)*
"A seven-year study of fall soil tillage on yield-scaled GHG emissions" –*C. Bayer (UFRGS)*
"Potential decrease of GHG emissions by conversion of rice mono-cropping to crop rotation with soybean and maize" –*E. Camargo (UFRGS)*
"Potential decrease of GHG by intermittent water regimes" –*T. Zschornack(UFRGS)*
"Impact of technological levels of rice production on GHG emissions" –T*. Zschornack (UFRGS)*
"Greenhouse gasses emissions from irrigated rice: Incidence of soil tillage and surface cover by crop residues; Incidence of irrigation system and water management; Comparison between cultivated and natural areas" - *G. Buss (UFPel/Embrapa/UFRGS)*
"CH4 and N2O emissions regarding soil preparation" –J. Silva *(UFPel/Embrapa/UFRGS)*

Some relevant findings:

- N sources (urea and slow release N fertilizer) did not change emissions.
- No-till and anticipated tillage in the previous fall significantly reduced CH4 emissions in rice fields compared with conventional tillage without yield penalty.
- Soil tillage may have other beneficial effect as improved soil management and more studies are needed for the different soil management practices used by rice farmers
- Rotation with other crops like soybean and maize reduced yield-scaled GHG emissions in rice
- systems
- Intermittent irrigation during vegetative stages confirmed as highly effective to reduce GHG emissions without yield penalty.
- Non-disturbed natural humid areas which are naturally flooded several periods along the year, and prone for rice cultivation emit much more GHG than the rice crop.

Chile - Sara Hube, INIA

In Chile most rice is pre-germinated and broadcast onto the field. Greenhouse gas emissions from rice account for only a small percentage of total country emissions from the agriculture sector.

The fist experiment in Chile to measure greenhouse gas emissions from rice took place in the Maule Region, under continuous flooding conditions with different amounts of nitrogen. The experiment showed higher methane emissions from the treatments where higher amounts of nitrogen had been applied.

A second experiment is underway during this season evaluating straw incorporation into the soil. Several improvements in gas measurements were incorporated after the PRRG meeting in Cali last year.

Paraguay - Aldo Noguera, MAG

In Paraguay rice production has increased impressively in both area and yields and it is expected to continue increasing as both land and water are readily available. A National Plan for Rice is under construction with five points: rational use of water resources, research and extension, strengthening of production, strategic alliances and climate change risk management. Within this last point there is the need for local research on GHG emissions.

Capacity building, training and adequate funding are needed for initiating proper studies on gas emissions from rice fields.

Uruguay – S. Tarlera and P. Irisarri, UDELAR/INIA

Field research has been completed comparing two different irrigation managements in high yielding rice systems. The experiment took place over three seasons and compared the conventional method (continuous flooding since 30 days after emergence) with an alternate wetting and drying (AWD) method where continuous flooding came only after panicle initiation. Under the AWD method there was a noticeable reduction in methane emissions but there was also a reduction in crop yield.

Questions raised by these initial studies were how achieve lower GWP without affecting grain yield and also how to obtain higher frequency of measurements, hopefully with an automated "in situ" measurement device. This would also allow for study GHG in rice systems as a whole and not only during the crop.

A new project jointly executed by UDELAR and INIA is underway: "GHG emissions and microbial dynamics in soils in search for sustainable intensification of rice cropping systems" with the aim of characterizing several alternatives of rice intensification. Specific objectives are:

- To compare three contrasting rice systems regarding their intensity on annual CH4 and N2O emissions and productivity.
- To evaluate the population dynamics of soil microbial groups involved in C and N recycling relevant to CH4 and N2O emissions.
- To determine potential maximum microbial activity of methane oxidation, methane production, ammonium oxidation and denitrification.
- To identify correlations between biological and physicochemical parameters with GHG emissions in the three different rice systems.

Emission measurements will start this fall (April-May).

PARTNER´S PRESENTATIONS

CCAFS Latin America update – Deissy Martínez Barón, CCAFS Regional Program for Latin America (based at CIAT)

An update of CCAFS rice research and work in the Latin America region was presented. Among the four flagships, two are related with GRA issues: Climate Smart Agriculture (CSA) and Low Emissions Agricultural Development.

Regarding *CSA*, A Climate Site-specific Management Systems (CSMS) project is being developed in Nicaragua, Colombia and Peru, which will develop a two-way CSMS that allows farmers in LAM to contribute with self-generated data on soil, crop management and production in return for tailored, site-specific information on Climate-Smart Practices (CSP). The system will "learn" from past and current environmental variables to generate appropriate adaptive responses that optimize current resource availability or respond to predicted conditions. Within the *Low Emissions Agricultural Development* Flagship, projects such CCAC rice project led by CIAT and a building capacity platform in the region on measuring GHG in rice and livestock providing useful information for the formulation of policies such as NAMAs (Nationally Appropriate Mitigation Action), are part of the CCAFS Latin America portfolio.

CCAC Rice Component – N. Chirinda, CIAT

The Climate and Clean Air Coalition to reduce short-lived climate pollutants (CCAC) is a Partnership of 40 governments and 53 non-state entities hosted by United Nations Environmental Program. The Agriculture Initiative has four components: Open Agricultural Burning, Livestock & Manure Mgmt, Paddy Rice Production, and Enteric fermentation.

The goal of the Paddy Rice Component is to disseminate alternate wetting and drying (AWD) on large scale to facilitate both, more stable food supply and reduction in methane emissions. It is being implemented by IRRI in Asia and CIAT in Latin America with Vietnam, Bangladesh and Colombia and partner countries.

PROCISUR Regional Platform – J. Terra, INIA Uruguay

PROCISUR is the Cooperative Program for Technological and Agricultural Development of Southern Cone of South America, created in 1980 by NARS of this region with support from IDB Bank and IICA with the mission of promoting cooperation in science, technology and innovation.

It has seven platforms and one of them is "Natural Resources and Climate Change" with focus in sustainable use of natural resources, reducing environmental impact, adaptation to climate change and mitigation of GHG emissions.

Through this platform PROCISUR is supporting Americas Sub-Group of PRRG-GRA.

WORK PLAN ACTIVITIES

Action Plan 1 - Standardize measurements

The Sub-Group will wait for version one of the Guidelines for Measurement to bring inputs for version two.

Action Plan 2 – Database of experimental sites

The draft version of the spreadsheet for collecting this information was presented and the delegates are ready to bring the information once the final one is circulated.

Action Plan 3 – Increase participation

Effort will continue on incorporating USA and European delegates to this Sub-Group. In Latin America there are two countries that are members of the Alliance and not members of PRRG, despite having important rice sectors: Costa Rica and Panamá. Contacts will be made to explore their incorporation to this Sub-Group.

Action Plan 4 - Develop a concept note for multi-site/country experiments on rice systems

A new emphasis was placed on having a multi-country experiment in the region during the final round table of the Workshop. There was agreement on three main focuses:

1. Gas emission comparison among regions, climates and production systems taking in account the whole rice system.
2. Modelling of gas emission in different systems.
3. Better understanding of the soil microbiology related with GHG emissions from rice paddies.

A search for possible funding is the next step.

Action Plan 5 – Mitigation and Adaptation Synergies

The Sub-Group will bring inputs to the network that is coordinated by Vietnam. Several studies presented during the workshop highlighted clear cases of synergies, mainly crop management and production systems options which not only reduce emissions but also improve yields or profitability.

Figure 4. Final discussions

FUTURE ACTIVITIES

Next meeting

The Group did not decide place and location for the next meeting. It was left to decide in next months and possible locations are: a) going back to Colombia, b) Uruguay, or c) again in Brazil but visiting University of Santa María where a research group is working with eddy-covariance. The Co-Chair will follow this and make consultations with delegates before deciding. The date in 2016 will depend on the country, because the idea is to come at a time that field experiments could be visited.

Meeting Close

The Co-Chair then brought the meeting to a close, thanking all participants for their attendance at the workshop and participation in the discussions of the Group. Special thanks were made to EMBRAPA for the excellent support for the meeting and to PROCISUR for support of delegates to participate in the workshop.

APPENDIX 1: Participants List

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EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária

UFRGS – Univesidade Federal do Rio Grande do Sul

UFPel – Universidade Federal de Pelotas

INTA – Instituto Nacional de Tecnología Agropecuaria – Argentina

MAG – Ministerio Agricultura y Ganadería del Paraguay

UdelaR – Universidad de la República Oriental del Uruguay

INIA Chile – Instituto Nacional de Investigación Agropecuaria, Chile

INIA Uruguay – Instituto Nacional de Investigación Agropecuaria, Uruguay

CIAT – Centro Internacional de Agricultura Tropical, Colombia

FLAR – Fondo Latinoamericano para Arroz de Riego, Colombia

CCAFS – Climate Change Agriculture and Food Security research theme of the CGIAR.