

Paddy Rice Research Group Meeting

Dale Bumpers National Rice Research Centre, Stuttgart, Arkansas, USA

13-15 July 2016

Meeting Report

OVERVIEW

The third meeting of the America sub-Group of the Paddy Rice Research Group (PRRG) of the Global Research Alliance on Agricultural Greenhouse Gases (“the Alliance”) was held at Dale Bumpers National Rice Research Centre 13-15 July 2016. The meeting was chaired by Uruguay (Mr Gonzalo Zorrilla, INIA) and Japan (Dr Kazuyuki Yagi, NIAES), as co-Chairs of the Paddy Rice Research Group.

This report is a summary of the key discussions and outcomes of the meeting. PDF’s of the presentations are provided separately on the member’s area of the Global Research Alliance website.

PARTICIPANTS

The meeting was attended by 41 participants, representing 9 Alliance member countries and partner organisations, as well as other invited organisations.

- **Alliance Members attending:** Argentina, Brazil, Canada, Chile, Colombia, Japan, Indonesia, Uruguay and USA.
- **Partner Organisations attending:** CIAT.
- **Invited Organisations attending:** FLAR.

MEETING OUTCOMES

The meeting achieved the following outcomes:

- Overview of the 2015 Council meeting outcomes and the request for Research Groups to develop priority actions ahead of the 2016 Council Meeting in Mexico.
- Review of the PRRG activities and report from the 2015 Asia sub-Group meeting in Nanjing, China.

- Presentations and discussion of potential new partners for the Group, the Latin American Fund for Irrigated Rice (FLAR) and the Sustainable Agricultural Initiative (SAI) Platform.
- Country reports from members of research progress, including from the USA as meeting host and new member to the Group.
- Identification of new workplan activities and priority actions for presentation to the Council.

SUMMARY OF DISCUSSIONS

1. The third meeting of the America sub-Group of the Paddy Rice Research Group was opened by Dr Anna McClung, Director of the Dale Bumpers National Rice Research Centre (DBNRRRC). Dr McClung welcomed all participants to Arkansas and provided an overview of the Centre's research activities and rice production systems typical to the region.

2. Mr Gonzalo Zorrilla, Co-Chair of the Paddy Rice Research Group, welcomed participants to the meeting, particularly researchers from the USA contributing to the Group for the first time. The 12 members participating in the Group from North and South America account for 6% of the world's total rice production. However, a number of significant rice producing countries in the region particularly Peru, Nicaragua, Dominican Republic and Cuba (not an Alliance Member) are not yet actively involved in the Group. Members in this region are at different stages of research to measure greenhouse gas emissions from rice production, with some countries well advanced and in other countries little to no research yet underway.

SECRETARIAT OVERVIEW

3. The Secretariat provided an update of the outcomes of the Alliance Council meeting, which took place 8-11 September 2015 in Des Moines, Iowa. The meeting was hosted by the USA who also took on the role of Council Chair from the Netherlands. The Secretariat announced that Mexico has become the Council Vice-Chair and will host the next Council Meeting 11-12 October 2016 in Mexico City, Mexico. The focus of the 2016 Council meeting will include the finalisation of the Strategic Plan, first discussed at the Council meeting last year, to advance Alliance objectives under four key strategies 1) further research collaboration; 2) foster outreach, knowledge sharing and information exchange; 3) build effective partnerships; and 4) leverage financial and other resourcing.

4. The Council also agreed to enhance the activities of the Alliance Secretariat, enabling the Secretariat to actively promote the achievements of the Alliance and raise the visibility of the Alliance with Members, Partners and other international organisations. To help achieve these objectives the Council has also approved the appointment of Hayden Montgomery as the Special Representative.

Potential Partner SAI Platform

5. Hayden Montgomery, the Special Representative for the Alliance, introduced the Sustainable Agriculture Initiative (SAI) Platform as a potential partner for the Group. The SAI Platform involves major global stakeholders from the food supply chain developing an inclusive approach toward the improvement of sustainable supply chains and support for growers.

6. A Sustainable Rice Project Group including major producers Ebro, Kellogg, MARS, Migros, Nestle, Tilde and Unilever has developed a farm sustainability assessment that includes a greenhouse gas component, and works with rice producers in different regions in order to provide information and tools (e.g. the Cool Farm Tool) to improve the sustainability of production. A role

for the Paddy Rice Research Group could be to provide advice on models and data for this type of sustainability assessment and the SAI Platform's Sustainable Rice Project may be able to assist the PRRG to reach producers more effectively. The next teleconference of SAI Rice Project is 6.9.16 and PRRG Co-Chairs are invited.

Development of Priorities for the Alliance

7. The Special Representative introduced a request from the Alliance Chair and Vice-Chair that the Research Groups work together to present to the Council, a short-list of proposed projects or activities that are collectively considered to be of highest priority for the Alliance. The short-list of proposals will be considered by Alliance Council at its meeting in Mexico City, in October 2016 with a view to adopting a number of them as Alliance projects.

8. The development of these priority activities or "Flagship projects" is in response to identified weaknesses in the Alliance, as discussed at the 2015 Council meeting, including a lack of connection between the Alliance Council and its Research Groups and therefore often a lack of funding for Research Group activities. A similar comment has come from the meeting of the International Research Collaboration Working Group in Brussels where this group also identified the importance of identifying and clearly articulating priorities as a way to better mobilize and target resources.

OVERVIEW OF THE PADDY RICE RESEARCH GROUP

9. Dr Kazuyuki Yagi, Co-Chair of the Group presented an overview of the Paddy Rice Research Group including past meetings and activities.

10. Partners and regional Networks were identified as important collaborators for the Group, as demonstrated by the recent collaborative project with the Climate and Clean Air Coalition (CCAC) focusing on mitigating methane emissions from paddy rice. The Group also invited the Environmental Defense Fund (EDF) to the 2015 Asia sub-group meeting to discuss opportunities for collaboration.

11. The Group has workplan activities underway in the following areas:

1. Technology transfer – The Group has published the MIRSA Project Guidelines for measurement techniques on the website of the NIAES, Japan, in August 2015. A further plan to develop a standardized methodology of MRV for rice greenhouse gas emissions is now underway.
2. Database – A database compiling metadata from experimental sites throughout the world where greenhouse gas fluxes are monitored has been developed, this activity is in collaboration with the MAGGnet activity of the Croplands Research Group.
3. MIRSA – The multi-country research project for Southeast Asia, MIRSA, was launched in 2013 and will continue until 2018. The project compares water management practices from sites in Indonesia, the Philippines, Thailand and Vietnam. A concept note for a similar multi-country project in America has been prepared.
4. A Network on mitigation and adaptation synergies has been created, led by Indonesia and Vietnam. The Group have discussed a number of possible activities and practices that could be developed in this network.

12. The Group will contribute to a special issue on rice greenhouse gas mitigation in *Soil Science and Plant Nutrition* the call for papers is expected later in 2016. A scientific session on rice greenhouse gas emissions has been organised for the Group to contribute to the World Congress on Soil Science in Brazil, August 2018.

OVERVIEW OF THE INTEGRATIVE RESEARCH GROUP

13. Dr Brian McConkey, Co-Chair of the Integrative Research Group (IRG), presented on the establishment of this Group as well as the development of the Group's five Networks and proposed workplan. The IRG was established following the decision at the 2015 Council meeting to merge the existing Cross-Cutting Groups (Soil Carbon and Nitrogen Cycling; Inventories and Monitoring) into one Research Group with a number of Networks. Activities in the IRG include existing activities from both Cross-Cutting Groups, the transfer of the Grasslands Network from the LRG and the development of new research areas. The IRG will coordinate cross-cutting activities across the three other research groups. The five Networks now established are:

1. Grassland – coordinated by Uruguay and Ireland
2. Field Scale - coordinated by France and the UK
3. Soil Carbon - coordinated by Canada and France
4. Farm and Regional Scale – Australia and Austria
5. Greenhouse Gas Inventories – coordinated by Canada and the Netherlands

14. The Group was asked to identify what opportunities exist to collaborate between the IRG and the PRRG and which topics and networks are of the most interest. The Group was also asked to consider what they could contribute to the IRG and what outputs could be developed over the next 12 months.

15. The Group discussed the need to look at the whole farm system, considering rotation of crops and improvement of production across systems. The IRG is the Group that needs to focus on this activity as it is at the interface of the other three system focused Groups. The PRRG has previously discussed developing actions on inventories, modelling and the integration of rice with other production systems, as areas where the Alliance needs to develop cross-cutting activities.

FLAR – Eduardo Graterol

16. The Latin American Fund for Irrigated Rice (FLAR) is a Public - Private alliance and involves a range of funders, industries, governments, farmer organisations, research organisations and International organisations such as CIAT. Members that invest in the fund are provided with the improved germplasm, agronomy advice, scientific and technical outputs developed by FLAR.

17. Current projects include improving crop yield in the tropics by growing soybean and rice in rotations, shifting production systems from rainfed to irrigated using water harvesting technologies, and projects to improve the outputs for small farmers. Rice farmers who export their crops are more aware of the need to reduce greenhouse gas emissions. There are regional organisations already involved in research to support this need (e.g. CIAT) with countries supporting this work although they may only have limited research capacity.

18. The Group discussed inviting FLAR to become a partner of the PRRG. The Co-Chairs will also provide further information to FLAR Board of directors about this partnership.

CIAT – Ngonidzashe Chirinda

19. A review of mitigation research in the region is underway, and will include observations on intermittent drainage practices, models such as the Cool Farm Tool, the key regional differences and areas that need more research.

20. Following previous meetings of the Group, CIAT has led the development of concept notes proposals for multi-site/country experiments, funding is now being sought for these activities, which include:

1. Comparisons among regions, climates and production systems;
2. Modelling of greenhouse gas emissions from different systems;
3. Better understanding of the soil microbiology dynamics rice paddies.

21. CIAT has a number of other activities underway which are relevant to the work of the PRRG including:

1. In collaboration with the CCAC, research on smart irrigation practices is underway in three countries (Colombia, Bangladesh and Vietnam). The results of this work can then be shared with other countries.
2. The GreenRice project funded by the Tinker foundation includes the development of NAMAs
3. Novel water management options (AWD and Severe AWD) for smallholders in Colombia and Brazil, in collaboration with EMBRAPA.
4. Partnering with Applied GeoSolutions to improve the model DNDC using data from rice systems and sharing this information on the Croplands Research Groups GRAMP website. A training component is also part of this activity.
5. Genetic differences between high and low emissions varieties, this work focuses on structural differences in the plant aerenchyma tissue.
6. CIAT has also hosted a summer school of the Latin America Greenhouse Gas Mitigation Network (LAMNET) with sessions on innovation in measurements, modelling and policies. This course had a focus on livestock practices and will focus on rice systems next year.

COUNTRY REPORTS

22. Each member presented to the Group regarding rice production systems within their country and research underway, particularly the measurement of greenhouse gas emissions.

Brazil - Walkyria Bueno

23. The Fluxus programme on Greenhouse Gas Dynamics and Carbon Balance in Crops Production Systems in the Southern Planes Region has activities under a number of different mitigation strategies for rice production in southern Brazil. Activities include:

1. Water saving, a reduction in emissions has been seen when the irrigation is reduced during periods where water is less available.
2. Soil and rice straw management, rather than the typical practice of leaving fields flooded over winter instead the rice straw is incorporated into the soil and the field drained. This can show a reduction of CH₄ emissions of up to 33%.
3. Crop diversification, rotation of rice crops with soybeans can lower emissions when compared to conventional and no-till continuous rice.
4. Rice cultivars, the use of shorter life-cycle cultivars reduces the time the fields are under flooded conditions and the total water usage.
5. Management of nitrogen fertilizers, by evaluating the best time for Nitrogen fertilizer applications, the type of fertilizers used and the use of nitrification inhibitors. Slow release

fertilizers were found to have higher emissions across a three year project when compared to Urea and nitrification inhibitors were found to work best when used with urea also.

Argentina –Ditmar Kurtz

24. Measurement and the reduction of greenhouse gas emissions form part of a number of research programmes in Argentina, activities include:
1. A soil mapping project, there is a need to improve soil maps for better modelling results.
 2. Modelling methane emissions locally and regionally, for the use of the DNDC model more soil data needs to be collected to improve the results.
 3. Field measurements of methane emissions from rice paddies. This work was suspended last year, but is expected to resume next year.
 4. Rice straw management project using closed chambers to compare emissions from conventional tillage, reduced tillage, straw burning, and natural waterlogged grasslands. This project should now be extended to take measurements across the whole year, not just the growing season.
 5. Argentina has developed a publication on best management practices guidelines for rice production, and it is hoped that the next version could include options to mitigate Greenhouse gas emissions.
 6. New funding for scholarships on rice greenhouse gas research has just been announced.

Chile – Sara Hube

25. The land area used for rice production has been decreasing in Chile, although due to improved management the yield has been increasing and the greenhouse gas emissions from rice have reduced.
26. In 2013 researchers took the first greenhouse gas measurements from rice systems in the Parral region. This first year the team focussed on the methodology to get the best results. During 2014-2015 the same site was used to determine the emissions from rice for typical management practices. Higher methane emissions are seen in the treatments where straw and nitrogen are also applied to the field.
27. The group are also working on communication materials to disseminate information on the best practices and research findings.

Colombia – Ivan Avila

28. FEDEARROZ represents the rice growers in Colombia and promotes the research, development and transfer of new technologies. The massive technology adoption project (AMTEC) is a five year programme to increase productivity and reduce production costs through the transfer of crop management technologies to farmers. The project is supported by a consortium of collaborators, the Colombian government, CIAT, CCAC, FLAR and FEDEARROZ and takes an integrative approach, considering all aspects of the system from soil preparation, water management, nutrition, and pest and disease management. This project is also committed to reducing greenhouse gas emissions with a fact sheet produced on mitigation practices.
29. CIAT with the support of CCAC has mapped Colombia to identifying suitable areas for rice cultivation, considering aspects such as weather and soil and suitability of these areas to apply available mitigation technologies, such as AWD.

30. Water management has been another focus area, comparisons between conventional practices and AWD found that emissions were very similar during early growth stages. However, during the reproductive phase emissions increased in the conventional system, the AWD systems had a showing 67% reduction of methane emissions.

31. Future work for Colombia includes developing accurate emission factors (CH₄, N₂O, CO₂) for Colombia, selecting optimal areas for rice growth and mitigation practices, and the Government's commitment to develop a rice NAMA.

Uruguay – Silvana Tarlera

32. A recent study has identified the yield scaled global warming potential of two irrigation management systems in a highly productive rice system (2015- Scientia Agricola). The experiment looked at an alternative water management system. The results of the experiment found crop yield was reduced in one year of the three year study but no difference was seen in the other two years, methane emissions were also reduced.

33. Uruguay is undertaking a long term paddy rice-other crops-pastures rotational experiment to understand the benefits and effects of different crop-pastures rotations, including improved nutrient balance, mitigation of methane emissions and increased production. GHG emissions measurements and soil microbial processes will be studied along the long term rotational experiment.

34. Three systems from the long term experiment were selected for greenhouse gas measurements: continuous rice, a technical control (rice and pasture) and rice in rotation with soybean. The measurements were taken across the whole year, with more measurements taken during the three main growing stages of growing, tillering and flowering. The experiment results found a link between the genes expressed by soil microbes when rice had been grown the previous year, suggesting that rotation of crops is important to reduce the abundance of methanogens in the soil, and therefore reduce methane production.

ADVANCES IN RESEARCH FROM USA RICE SYSTEMS

35. On the afternoons of the first and second day researchers from USDA, the University of Arkansas and University of California - Davis presented their current research on the management of rice systems in Southern USA to reduce greenhouse gas emissions. The work presented covered both research and on-farm implementation activities. The presentations are available on the Alliance website.

1. Climate Change and Food Security - Lewis Ziska, USDA-ARS.
2. Greenhouse gas emissions on rice fields subjected to alternate wetting and drying - Bruce Linquist, UC-Davis.
3. Alternative Irrigation Management Practices - Jared Hardke, University of Arkansas.
4. Past, present and future research for moving greenhouse gas reductions to the farm - Merle Anders, Private consultant.
5. Emerging opportunities for farmers to participate in carbon market – Joe Massey, USDA-ARS.
6. N fertiliser placements and greenhouse gas emissions from continuously flooded rice systems - Arlene Adviento-Borbe, USDA-ARS.
7. On-farm rice irrigation research in the mid-south – Michele Reba, USDA-ARS.
8. New tools for implementation of multiple inlet rice irrigation systems – Chris Henry, University of Arkansas.

9. Alternate wetting and drying as an effective management practice to reduce methane in Arkansas rice production – Benjamin Runkle, University of Arkansas.
36. Highlights of GHG research findings in USA:
 - AWD as a win-win-win technology with positive impacts at the farm (water consumption and costs without yield reduction), at human health (reducing As) and at environment (water use, GHG emissions, mercury)
 - More refined methods to apply it at farm level is needed: how dry? when to dry? How to measure soil moisture?
 - N applied into the soil did not reduce emissions
 - Multiple inlet pipes for irrigation may help on AWD
 - Flux – chamber methods
 - Carbon credits could be an incentive using DNDC model
 - Reduced water availability in some regions is another incentive for AWD

NEW ACTIVITIES

37. The final afternoon session of the meeting provided an opportunity for the Group to revise the PRRG work plan, which was developed in 2010. The request from the Council Chairs for the Research Groups to develop priority activities for consideration at the 2016 Council meeting was also considered with a number of suggestions provided. The following ideas were discussed, with the people whom will to coordinate these activities or develop proposals for the Alliance priority actions still to be decided.

Knowledge generation

1. Mitigation of emissions through selection of cultivar.
2. Mitigation of emissions through water management – AWD and other.
3. CO₂/temperature effect on yield/emissions.
4. Multi-country/partner project as possible Alliance Flagship/Priority.
5. Mapping water balance to assess applicability of AWD in different regions.
6. Burning of rice straw and impact on emissions.
7. The effect of AWD practices on second cropping/ratoon.

Membership and Partners

8. Seek approval from PRRG members to accept FLAR as partner of the Group. In parallel, FLAR to seek approval from its Board members.
9. Strategy for bringing in new Members from Europe, South Asia, Americas and the role of Partners' e.g. SAI with Italy, FLAR with Peru, Australia.
10. Temperate Rice Conference in Australia in March 2017 – opportunity for PRRG meeting – or sub-group meeting.
11. Funding/Resourcing activities – Private Sector investment.
12. Agreement to proceed to talk to SAI Platform Sustainable Rice Project.

Communications – adoption and extension

13. Known best practice that reduces emissions.
14. Database of papers on webpage.
15. Policy design recommendations.

Methodologies, measurement and reporting

16. Definitions work - What is AWD? Universal characterisation. Objective measure of water stress to define “drying”.
17. Country specific emissions factors for rice fields – how to develop them?
18. PRRG net – flux-chamber network
19. Evaluation of tools/models for rice, e.g. Cool Farm.
20. Validation of models in different regions.

38. The Action plan will be revised based on the conversation during this meeting and shared with this Group and the Asia sub-Group. The new action plan will be developed for the next Americas sub-group meeting.

Flagship projects

39. The template will be distributed to the PRRG so that all members may provide suggestions for proposals. The activities discussed so far include:

1. Multi country project on water management practices that reduces greenhouse gas emissions – based on MIRSA, but also including other regions.
2. Global assessment of methane mitigation through water management. AWD feasibility mapping, but also including definitions and models etc. – integration of several activities.
3. A review of the diverse production systems in Latin America and potential for learning from these systems in Asian systems in the future (upland rice).
4. Plant genetic variability/microbe diversity – plant issues, aerenchyma, microbes, exudates.
 - a. Summary of past results looking at plant cultivars and methane emissions?
5. A workshop focusing on AWD and methane – to summarise findings and actions.

Next meeting

40. Dates for the next meeting of the PRRG America-Sub-Group were discussed, with a number of possibilities identified, and the final date yet to be confirmed. Possible options include the Temperate Rice Conference in March 2017, which would be an opportunity for a joint meeting of the two sub-Groups next meeting. Other options could be in Brazil or Uruguay in 2017. The Co-Chairs will consider these options and inform the Group when more information is available.

APPENDIX 1: Participants List

Country	Attendees
Alliance Member Countries	
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