GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

**Soil Carbon and Nitrogen Cycling Cross-cutting Group meeting report**

**Instituto Agronomica Meditteraneo, Valenzano, Italy**

7 July 2012

# Meeting Report

## OVERVIEW

Members of the Soil Carbon and Nitrogen Cycling Cross-cutting (C/N) Group met during the meeting of the Croplands Research Group of the Global Research Alliance on Agricultural Greenhouse Gases ("the Alliance") in Bari, Italy, between 3 and 7 July 2011.

The Group co-chairs from Australia (Leann Palmer, Department of Agriculture, Fisheries and Forestry, and Peter Grace, Queensland University of Technology) and France (Jean-François Soussana and Sylvie Recous, INRA) led these discussions.

This report is a summary of the discussions and presents a DRAFT work plan for consideration and approval by Members of the Soil Carbon and Nitrogen Cycling Cross-cutting Group.

## PARTICIPANTS

The meeting was attended by 34 Alliance country representatives and 4 other technical experts. 20 Alliance member countries were represented. No observer countries attended.

- **Alliance Members attending: Australia, Brazil, Canada, China, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Thailand, UK, USA.**
- **Alliance Members unable to attend: Argentina, Chile, Colombia, Ghana, Indonesia, Malaysia, Mexico, Peru, Philippines, Republic of Korea, Switzerland, Viet Nam Uruguay.**

## MEETING OUTCOMES

The meeting achieved the following outcomes:

- An update from the Secretariat covering the Alliance Council meeting in Saskatoon, Canada and on the Alliance website.
- Clarification of the governance and decision making process for Research and Cross-cutting Groups.

- Further clarification of the inter-relationship between the C/N Group and the Research Groups.
- Detailed discussions on a series of related activities to be undertaken by the C/N Group which have the overall objective to evaluate the ability of different Carbon/Nitrogen models to assess priority mitigation practices in the agricultural sector.
- It was recognised that to undertake these activities efficiently and effectively there needs to be clear identification of the roles and responsibilities of Members of the C/N Group and Members of all of the Research Groups, and in particular a good link should be established between the C/N Group and Component 3 work of the Croplands Group.
- The discussions produced a DRAFT Work Plan for the C/N Group for the Group Members' consideration and approval.

# SUMMARY OF DICUSSIONS

## UPDATE FROM THE SECRETARIAT

1. The Secretariat gave a presentation of the outcomes of the Alliance Council meeting held in Saskatoon, Canada from 5 – 8 June 2012 (Available from the soil C/N documents folder on the Alliance member website). As a part of this presentation, the key outcomes from the Council meeting were summarized, including notification that the Communication Policy has now been adopted by Council, that the Council requested more regular and detailed reporting from all of the Groups on their activities, and that the Council would like all Groups to report in a consistent manner by giving consideration to activities in their work plans in the following categories: stocktake, networks and databases, capability development, research collaboration, information and technology transfer, policy support and links to international processes.

2. The Secretariat also provided an update on the Alliance website pointing out the improvements that have been made and encouraged members to make full use of it. A user guide is located on the Secretariat Updates section of the Member's area of the Alliance website.

**Discussion**

3. The Secretariat was requested by the Group's co-chairs to provide some reflections on the way in which other Groups were organising their work, and on the key elements of the Charter that relate to Group decision making, including the consensus decision making process.

4. The Secretariat began by reminding Members that the Alliance is not in itself a funding body, but that its purpose is to bring about a step-change in global research activity. It was also highlighted that it is not always the case that the expertise needed to address every research activity exists within the Groups and there is a significant amount of expertise outside the Groups.

5. There were examples of ways that other Groups had dealt with this complexity by establishing a process to advance the work of the Group between meetings, and to enable consensus decisions to be taken on the issues of importance and priority for the Group without this

implying that all of the activities had to be conducted within the Group. With this in mind and reflecting on the outcomes of the Council meeting, the Secretariat suggested that the Group might want to consider the of activities that it could undertake, facilitate or influence in some or all of the following categories: stocktake, networks and databases, capability development, research collaboration, information and technology transfer, policy support and links to international processes.

*Discussion*

6. During the course of the discussion it was questioned how to proceed when an idea emerges between meetings and whether or not things could be started and then advanced and reported between meetings. Also, there was a need to identify what we don't know and for Members to be proactive in identifying areas that need to be addressed.

7. On the question as to what the distinction really was between undertake, facilitate and influence. Examples were given of the Livestock Group work plan, and also referring to some of the proposals being considered by the Croplands Group, the development of modelling network could be considered to be an activity facilitated by the Group, if brochures were to be prepared for farmers on good practices this would be an undertaking of the Group, and interactions between the Group and the AG-MIP could be characterised as the Group having influence on another process.

## Carbon and Nitrogen Cycling Cross-cutting Group

8. Jean-François Soussana presented an overview of the C/N Group Membership and activities to date. The Group is Co-chaired by France and Australia with 27 Alliance Member countries participating in it.

9. At the Alliance senior officials meeting in Versailles, 1-3 March 2011, it was confirmed that the C/N Group will be a Group with specific objectives and the Group's vision would be to:
   - develop improved methodologies and models for mitigation
   - define common objectives across Research Groups
   - build collective expertise on applicability of models, uncertainty and range of mitigation options, and
   - build a common modelling platform from multiple models.

10. The first C/N workshop was held on 4 March 2011 in Orleans, France and focused on building a common set of objectives and work topics. The emphasis was on inter-comparison of models dedicated to quantifying greenhouse gases and evaluating agricultural mitigation options, and on sharing datasets in order to test and improve the models.

11. The second C/N workshop was held on 13-14 July 2011 in Leuven, Belgium as a side event of the International Symposium on Soil Organic Matter. The initial areas of work for the Group identified was the selection of key models and core datasets for (i) inter-comparison, (ii) benchmarking and (iii) improvement of models for coverage, predictive capability and reliability, especially for mitigation options.

12. These activities that have been undertaken so far provide a very good basis for developing a formal work plan for the C/N Group, in accordance with the request of the Alliance Council identified above.

**Discussion**

13. The discussion then focussed on identification of the various activities that would need to be undertaken in order to conduct a modelling inter-comparison.

14. It was also pointed out that first there was a need to clearly understand what the value is of conducting an inter-comparison. Models are normally designed to perform in certain locations and the dominant characteristics of each site are different. There was also a need to keep in mind that some countries don't have huge amounts of data so we must make sure that models' data requirements are not out of reach at this point in time.

15. It was considered necessary to give thought to how to evolve these models into decision making tools. Currently, many of the models exist in the scientific community but the outputs need to be connected to the farming community. It was suggested that a useful approach could be simplified models or look-up tables that would be more useful for policy evaluation and decision support for mitigation planning.

16. The co-chairs clarified that the purpose of the exercise is to understand the state of play with respect to modelling mitigation options for agriculture, to establish where the largest technical potential exists in the sector, and to understand the uncertainties associated with different mitigation options.

17. A question was raised about how to manage a process which could involve hundreds of researchers, e.g. would scientific papers need to acknowledge the many hundreds of people that will be involved? The importance of data-sharing policies, use of peer reviewed data, and trust was highlighted. It was recognised that it will be impossible to conduct the work without key inputs from the Research Groups and extended scientific community. As a result of this discussion Members agreed that there may be a need to set some guidelines for intellectual property and considered that normal scientific community practice should apply when acknowledging intellectual contributions in publications arising from the activity.

18. It would be important to understand the needs of the end-user, farmers and policy makers.

19. With respect to other modelling exercises underway internationally, the Agricultural Model Intercomparison and Improvement Project (AG-MIP) was identified as a key example (this discussion took place in conjunction with the Croplands Group). The question was raised whether AG-MIP data would be able to be linked to the modelling inter-comparison (CN-MIP) being proposed by the C/N Group, noting that the AG-MIP community do wish to link to the Alliance. Steve Shafer, co-chair of the Croplands Group, provided information on this.

20. It was pointed out that there seemed to be significant cross-over between the CN-MIP, Component 3 of the Croplands Group, and AG-MIP. Jean-François Soussana outlined that the cross-over between CN-MIP and Component 3 of the Croplands Group (and other Research Groups) is in data provision and identification of mitigation options, not in modelling *per se*. It was suggested that the C/N Group should lead the modelling work and liaise with modeller contacts in each of the Research Groups.

21. The question was raised whether or not any economic modelling would be done also, (IMEC and ICOS databases) given how important economic considerations would be when communicating with policy makers and farmers. It was pointed out that economics are not currently part of the work plan and if the Research Groups or Council wished to do economic

modelling the C/N Group would work in tandem with them so as to avoid any misalignment of activites.

22. It was pointed out that farm-scale modelling is important because it captures the interactions between gases and management practices. Canada pointed out that it has a proposal for some activity on farm-scale models and the UK informed the meeting that is has recently developed a tool that does multi-pollutant analysis and also considers economics. It was also considered important to create a link between the C/N Group and the Inventories and Measurements (I&M) Group on any activity related to farm-scale modelling. The UK and Canada offered to explore how to advance work on farm-scale models in the longer-term.

*Modelling mitigation options*

23. Jean-François Soussana took the opportunity to present to the Croplands Group on the proposed C/N Group activity to evaluate how well C/N models capture mitigation in agricultural systems, including trade-offs between greenhouse gases.

24. In terms of mitigation options that would be considered and tested in the CN-MIP it was proposed to stay within the remit of agricultural systems, and in terms of land-use change to address changes between agricultural systems, e.g. cropland to grassland, but not deforestation. It was suggested to begin a process, starting with the Croplands Research Group, to identify the options it would like to consider, and then seek the same from the Paddy Rice Research Group and Livestock Research Group (LRG) in due course.

25. There was then a joint discussion between the Croplands Group and Members of the C/N Group to identify those cropping systems that Members would like to prioritise to be modelled under the C/N Group. Jean-François suggested that Members should identify their top 3 (or up to 5) priorities considering data availability as a criterion. A survey was handed out to Croplands Group Members to aide in the process that sought the following information:

- Regions: (classification may come later)
- Climate: e.g. temperate, Mediterranean, semi-arid, wet tropical, etc…
- Soil: e.g. mineral, organic, wet, etc...
- Crop systems: e.g. maize monoculture, typical crop rotation (specify), etc…
- Baseline management, e.g. tillage, mineral N, crop residues, etc…
- Mitigation options: e.g. catch crops, no-till, N fertilizer type, legumes, etc…
- Are Tier 1, 2 or 3 data available?
- Short term or long term datasets?

26. There was a question regarding the use of 'Tier 1, 2, 3'. It was clarified that it was best to think about it as Tier 3 including all greenhouse gas fluxes, all management & production variables, most soil, climate, environment data, mitigation options compared; Tier 2 including one or two greenhouse gas fluxes measured, soil, climate and management measured; Tier 1 including soil, climate, data and production data but no greenhouse gas measurements.

27. Discussions then identified a series of issues that needed to be considered and resolved during the course of the activity, including:

- how to deal with interactions between management options.
- how to understand the consequences of changed management practices on soil structure, and other biophysical aspects.

- how climate change and growing season interactions impact on emissions, e.g. fertilisation at different climatic conditions, droughts, moisture, temperature, etc.
- evaluation of how representative the modelled sites are for the whole region – noting that you can calibrating models in each site, but that may not have much applicability elsewhere.
- calibration of models in many different conditions in order to evaluate the effect of mitigation options.
- understanding of the relative contribution of each underlying process driving the model.
- ensuring drained peatlands are included in the exercise in the long term.
- how to deal with specificities of mitigation in different regions, e.g.:
    - similarities between countries in regions, e.g. Nordic countries drainage status in winter.
    - manure management and handling.
    - Length of growing season – daylight hours.
    - winter mortality.

28. The Group felt that there was a need to start somewhere, and while not all of these could necessarily be modelled as part of the bigger modelling exercise, and not everything can be included at the outset, they did warrant consideration and although they may not be done at the outset, they can be advanced later.

29. Information sharing between Member countries was raised as being of critical importance. Models are always country or region specific and are calibrated to the prevailing conditions.

30. The Group recognised the need to design experiments and projects so that the many teams that would like to be involved in the Alliance process can all contribute.

31. Also, it will be very important to place substantial effort on communicating better about models that are already working in places around the world, to be more useful for end-users. Ministries are more likely to provide resources if there are products being developed that are clearly able to be used by governments in the short term – therefore the Group should try to have a balance of activities to keep the interest of governments in supporting the activities.

32. As suggested earlier, it was agreed that the C/N Group would conduct the same exercise with the other Research Groups, and would seek policy input from all Alliance Council Members.

33. It was agreed that this activity would be conducted by the C/N Group, but would also be identified in Component 3 of the Croplands Group work plan.

34. The C/N model stocktake will be completed by Sylvie Recous to establish what mitigation options each model is able to deal with and whether models could deal with more options.

35. On the specific interaction with the Croplands Group for the provision of croplands data for the modelling exercise, Peter Grace (pr.grace@qut.edu.au) would lead this effort and would liaise with the Croplands Group Component 3 leads Sylvain Pellerin (pellerin@bordeaux.inra.fr) and Nancy Cavallaro (ncavallaro@nifa.usda.gov).

## CONCLUSIONS AND NEXT STEPS

36. The next steps for the Soil Carbon and Nitrogen Cycling Cross-cutting Group are as follows:

- End July: circulate draft C/N group work plan
- September: agree on C/N Group work plan, report to Council
- September: start contacting selected modellers (ask support from Council Members)
- September: three concept notes circulated to C/N, Crop, Livestock, Rice groups
    - Data needs (to data experts, ask Co-Chairs)
    - Modelling protocols (to model experts, e.g. Nancy & Sylvain)
    - Mitigation options needs (to Co-Chairs and Council Reps)
- end October: approval sought
- Model, data and mitigation experts networks established
- November 2012: send concept notes and place demands to model, data and mitigation experts
- February 2013: review submissions from model data and mitigation experts (C-N coordination team, plus group contacts)
- March 2013: send blind data sets to modellers
- End April 2013: CN-MIP workshop 1.
    - Fine tuning modelling protocols with modellers
    - Running first blind tests
- July 2013, CN-MIP workshop 2.
- Final stage 1 model runs
- Analyse model outputs
- Draft paper; present results, e.g. International Grasslands Conference in Australia, etc…

# APPENDIX 1: Participants List

| Country | Attendees |
|---|---|
| **Alliance Member Countries** | |
| Argentina | Unable to attend |
| Australia | Leann Palmer: DAFF (leann.palmer@daff.gov.au)<br>Peter Grace: Queensland University of Technology (pr.grace@qut.edu.au) |
| Brazil | Ladislau Martin: Embrapa, Brazil (martin.ladislau@yahoo.com) |
| Canada | Denis Angers: Agriculture and Agri-Food Canada (denis.angers@agr.gc.ca) |
| Chile | Unable to attend |
| China | Xunhua Zheng: Chinese Academy of Sciences (xunhua.zheng@post.iap.ac.cn) |
| Colombia | Unable to attend |
| Denmark | Soren O. Petersen: Aarhus University (soren.o.petersen@agrsci.dk) |
| Finland | Kristiina Regina: MTT Agrifood Research (kristiina.regina@mtt.fi) |
| France | Jean-Francois Soussana: INRA (Jean-Francois.Soussana@paris.inra.fr)<br>Sylvie Recous: INRA (sylvie.recous@reims.inra.fr)<br>Sylvain Pellerin: INRA (pellerin@bordeaux.inra.fr)<br>Pierre Cellier: INRA (cellier@grignon.inra.fr) |
| Germany | Heinz Flessa: vTI Institute of Agricultural Climate Research (heinz.flessa@vti.bund.de) |
| Ghana | Unable to attend |
| Indonesia | Unable to attend |
| Ireland | Gary Lanigan: Teagasc (gary.lanigan@teagasc.ie)<br>Mohammad Ibrahim Khalil: Environmental Protection Agency (i.khalil@epa.ie) |
| Italy | Claudio Mondini: Ministry of Agricultural, Food and Forestry Policies (claudio.mondini@entecra.it)<br>Dario Sacco: University of Turin (dario.sacco@unito.it)<br>Roberta Farina: Roberta.farina@entecra.it<br>Rosa Francaviglia: rosa.francaviglia@entecra.it |
| Japan | Ayaka W. Kishimoto-Mo: National Institute for Agro-Environmental Sciences (mow@affrc.go.jp)<br>Yasuhito Shirato: National Institute for Agro-Environmental Sciences (yshirato@affrc.go.jp)<br>Shinichiro Mishima: National Institute for Agro-Environmental Sciences (shin@affrc.go.jp) |
| Malaysia | *Unable to attend* |
| Mexico | *Unable to attend* |
| Netherlands | Caroline van der Salm: Wageningen UR (caroline.vandersalm@wur.nl) |
| New Zealand | Frank Kelliher: AgResearch (frank.kelliher@agresearch.co.nz)<br>Joanna Sharp: The New Zealand Institute for Plant and Food Research ltd (joanna.sharp@plantandfood.co.nz) |
| Norway | Lillian Øygarden: Bioforsk Norwegian Institute of Agricultural and Environmental Research (lillian.oygarden@bioforsk.no)<br>Daniel Rasse: Norwegian Institute for Agricultural and Environmental Sciences (daniel.rasse@bioforsk.no) |
| Peru | *Unable to attend* |
| Philippines | *Unable to attend* |
| Republic of Korea | *Unable to attend* |
| Spain | Jose Luis Rubio: CIDE-CSIC (jose.L.rubio@uv.es) |
| Sweden | Åsa Kasimir Klemedtsson: University of Gothenburg (asa.kasimir@gvc.gu.se)<br>Thomas Kätterer: Swedish University of Agricultural Sciences (Thomas.katterer@slu.se) |
| Switzerland | *Unable to attend* |
| Thailand | Somjate Pratummintra: Department of Agriculture (spratummin@yahoo.com) |
| UK | Mike Roper: Agriculture and Climate Change R&D Programme Defra |

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|---|---|
| | (mike.roper@defra.gsi.gov.uk)<br>Luke Spadavecchia: Defra (luke.spadavecchia@defra.gsi.gov.uk)<br>Jagadeesh Yeluripati: University of Aberdeen, Scotland (j.yeluripati@abdn.ac.uk) |
| USA | Steven Shafer: USDA-ARS(steven.shafer@ars.usda.gov)<br>Alan J. Franzluebbers: USDA-ARS (alan.franzluebbers@ars.usda.gov)<br>Mark Liebig: USDA-ARS (mark.liebig@ars.usda.gov)<br>Nancy Cavallaro: USDA (ncavallaro@nifa.usda.gov)<br>Charles Rice: Kansas State University (cwrice@ksu.edu)<br>Karamat Sistani: USDA-ARS (karamat.sistani@ars.usda.gov, khanizi@gmail.com)<br>Upendra Sainju: USDA-ARS (upendra.sainju@ars.usda.gov) |
| Uruguay | *Unable to attend* |
| Viet Nam | *Unable to attend* |
| **Secretariat: Hayden Montgomery, (**Hayden.Montgomery@mfat.govt.nz) | |