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MACSUR Workshop
9-12 October 2016
The Mitigation Challenge

• Need for cooperative research frameworks focused on GHG mitigation (Baker and Follett, 2012)
  • Subject complexity
  • Regional variability
  • Standardized methods
  • Data/sample archives
  • A long-term issue... ...continuity is essential!

Why should scientific organizations with similar interests labor along in ignorance of each other’s efforts?
Presentation Overview

• What is MAGGnet?

• Current status

• Report recent project activity
Global Research Alliance on Agricultural Greenhouse Gases

• **Established**: December 2009, United Nations Climate Change Conference, Copenhagen, Denmark

• **Purpose**: Facilitate research, development and extension of technologies and practices that will help deliver ways to grow more food (and more climate-resilient food systems) without growing greenhouse gas emissions.

• **Current Membership**: 46 countries (Europe, Americas, Asia Pacific, Africa)

http://globalresearchalliance.org/
The Global Research Alliance is composed of four research groups:

- Livestock
- Croplands
- Paddy Rice
- Integrative

http://globalresearchalliance.org/
Croplands Research Group – Key Work Areas:

1. Understanding the current research landscape (facilitating communication among members)
2. Building capacity (e.g., Borlaug fellowships, USA; LABEX scientist exchanges, Brazil)
3. Research networks and databases
4. Collaborative research
5. Providing policy support and links to international initiatives
6. Good practice guidance and technical methodologies

http://globalresearchalliance.org/
What is MAGGnet?

- **Managing Agricultural Greenhouse Gases Network**
- MAGGnet represents a coordinated, multi-national approach for inventory and analysis of greenhouse gas mitigation research.
- Initiated February 2012. Major activities include two metadata calls, update, and grant proposal (FACCE-JPI).

http://globalresearchalliance.org/maggnet/
MAGGnet

• Hypotheses
  • GHG networks provide a forum for generating creative solutions to critical mitigation challenges using diverse perspectives
  • data archives and management activities often serve as a key focus for GHG networks using modelling approaches
  • high-quality field data are essential to feed modelling and meta-analyses to inform mitigation policies

• Objectives
  • to compile metadata from experimental sites* throughout the world where greenhouse gas fluxes and soil carbon dynamics are monitored.

* [Sites with published data]

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MAGGnet
Metadata Entry Template

Worksheet Tabs
- Experiment description
- Experiment location
- Experiment duration
- Climate attributes
- Soil and drainage attributes
- Data type
- Treatments
- Key Findings
- Journal citations
- Primary contact

GOAL:
15 min per site

- General Instructions
- Color coded worksheets
- Frequent use of drop-down menus
- 23 countries
- 318 experiments

- 14 unique climate subdivisions
- 11 surface soil textures
Table 2. Number, current status and duration of studies included in the Managing Agricultural Greenhouse Gases Network (MAGG-net), December 2015.

<table>
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<tr>
<th>Country</th>
<th>No. of studies</th>
<th>Status</th>
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<th>Duration</th>
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Experimental Sites Summary

**Status**
- 236 completed
- 82 ongoing

**Duration**
- 217 short-term (<1-3 yr)
- 54 mid-term (>3-10 yr)
- 47 long-term (>10 yr)

**Common Treatments**
- Fertilizer rate (69)
- Manure/Amendments (53)
- Tillage type (44)

<table>
<thead>
<tr>
<th>Soil/GHG/Plant parameter</th>
<th>Projects measuring parameter (%)</th>
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<tr>
<td>Soil carbon</td>
<td>78</td>
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<tr>
<td>N₂O flux</td>
<td>78</td>
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<tr>
<td>CO₂ flux</td>
<td>43</td>
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<tr>
<td>CH₄ flux</td>
<td>28</td>
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<tr>
<td>Grain</td>
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<td>Stover</td>
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<td>Roots</td>
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</table>
MAGGnet Contributions

Model Inter-comparison Exercise (INRA, France)
- MAGGnet used to help identify sites for modeling exercise

Template used by GRA Paddy Rice Research Group (NIAES, Japan)
- MAGGnet template adapted for rice production

GRA Modeling Platform (GRAMP) Collaboration (James Hutton Inst., UK)
- MAGGnet metadata shared through interactive map

http://globalresearchalliance.org/maggnet/
Quantifying Greenhouse Gas Mitigation Effectiveness through MAGGnet

Objectives:

• Quantify the effectiveness of specific mitigation practices,
• Quantify potential tradeoffs in GHG mitigation and crop yield, and
• Identify and communicate critical data gaps.
Approach

• Identify experimental sites with measurements of soil organic C, N$_2$O flux, and grain yield.
  • 97 sites, 9 countries
• Gather journal publications reporting metrics outlined above for each experimental site.
  • 126 publications
• Partition reported data by management variable into ‘Business as Usual’ and ‘Alternative’ treatments
  • N fertilization, N source, Crop Rotation, Tillage
### 19 Italian LTE’s

<table>
<thead>
<tr>
<th>Crops</th>
<th>Sites</th>
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<tr>
<td>Wheat (start yr 1962-09)</td>
<td>17 (incl. 6 durum wheat)</td>
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<tr>
<td>Maize (Start yr 1962-06)</td>
<td>12 (incl. 4 with silage)</td>
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<tr>
<td>Sugarbeet (1962-08)</td>
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<td>Pulses (1962-98)</td>
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<td>Sunflower</td>
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<td>Vegetables</td>
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<td>Grasslands and forages</td>
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<tr>
<td>Other (6 crops)</td>
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<td>Treatments</td>
<td>Sites</td>
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<tr>
<td>Fertilization (organic)</td>
<td>10 (6)</td>
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<tr>
<td>Crop residue mgt</td>
<td>7</td>
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<tr>
<td>Crop rotation</td>
<td>6</td>
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<tr>
<td>Tillage</td>
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<td>Organic farming</td>
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<td>Soil type</td>
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<td>Cover crops</td>
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Italian partnership in MAGGnet

European Journal of Agronomy

Editorial

IC-FAR - Linking long term observatories with crop system modelling for a better understanding of climate change impact and adaptation strategies for Italian cropping systems

www.ICFAR.it
Preliminary Results (N$_2$O flux)

- Small number of treatment contrasts (46)

- N fertilization yielded only significant difference among management variables

- No difference in yield-scaled emissions
Plans Going Forward

• Continue expansion of meta-database

• Online search function by site attributes, crops, management, etc.

• Progress on FACCE-JPI work plans

• Refine/Update input for GRA Modeling Platform (http://gramp.org.uk/)

• Explore collaborations/partnerships
  • Livestock Research Group, Integrative Workgroup
Opportunities and Challenges

Opportunities...

• Online search function by site attributes, crops, management, etc.

Challenges...

• It is easier to fund initial network development than ongoing activities.

• Scientist engagement (*The ‘It’s my (meta)data!’ and ‘What’s in it for me?’ Syndromes*).
For additional detail, please see...


http://globalresearchalliance.org/maggnet/
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