Managing Agricultural Greenhouse Gas Network

Mark A. Liebig
USDA – Agricultural Research Service
Mandan, North Dakota, USA

Measuring Nitrous Oxide Emissions from Soil
6 November 2014, Long Beach, CA
MAGGnet Overview

- Background – GRA / CRG / MAGGnet
- Template Description / Current Status
- Recent Activities / Next Steps
Background

It begins with the Global Research Alliance...

• The Global Research Alliance on Agricultural Greenhouse Gases is a consortium of 42 countries working together to find ways to grow more food without growing greenhouse gas emissions.

www.globalresearchalliance.org
Background

- The Global Research Alliance is composed of five research groups:
  - Livestock
  - Croplands
  - Paddy Rice
  - Soil C&N
  - Inventory/Monitoring

www.globalresearchalliance.org
Croplands Research Group Focus

Component 1
Quantifying net greenhouse gas emissions in cropland management systems

Leaders: Brazil, USA

Component 2
Assessing greenhouse gas emissions in agricultural peatlands and wetlands

Leaders: Finland, Norway, Sweden

Component 3
Modeling nitrous oxide emissions and soil carbon stocks

Leaders: France, USA

www.globalresearchalliance.org
Component 1 Work Plan

Component 1 – Quantifying net greenhouse gas emissions in cropland management systems

- Standardized protocols and methods for determining GHG emissions and carbon sequestration
- International database on agricultural management influences on GHG fluxes, carbon sequestration (including long-term experimental sites)
- Practices for minimizing GHG emissions and sequestering carbon in different soils, environments, cropping systems
- Emission factors for specific countries
- Summary documents for decision makers

MAGGnet

Managing Agricultural Greenhouse Gas network

www.globalresearchalliance.org
Background

More specifically...

- MAGGnet represents a coordinated, multi-national approach for inventory and analysis of greenhouse gas mitigation research.

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

  *[Sites with published data]*

- Initiated February 2012. Major activities include two metadata calls, update, and grant proposal (FACCE-JPI).

www.globalresearchalliance.org
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 experimental site

- General Instructions
- Color coded worksheets
- Frequent use of drop-down menus
19 countries
302 experiments
28 GRACEnet sites

9 unique climate subdivisions
11 surface soil textures
Metadata Synopsis
Experiment Duration; Data Collection

Status of experiments
• 223 completed
• 79 ongoing

Duration of experiments
• 203 short-term (<1-3 yr)
• 53 mid-term (>3-10 yr)
• 46 long-term (>10 yr)

<table>
<thead>
<tr>
<th>Soil/GHG/Plant parameter</th>
<th>Projects measuring parameter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil carbon</td>
<td>79</td>
</tr>
<tr>
<td>N₂O flux</td>
<td>80</td>
</tr>
<tr>
<td>CO₂ flux</td>
<td>43</td>
</tr>
<tr>
<td>CH₄ flux</td>
<td>28</td>
</tr>
<tr>
<td>Grain</td>
<td>55</td>
</tr>
<tr>
<td>Stover</td>
<td>32</td>
</tr>
<tr>
<td>Roots</td>
<td>8</td>
</tr>
</tbody>
</table>
# Metadata Synopsis

## Experimental Treatments (Top 10)

<table>
<thead>
<tr>
<th>Treatment component</th>
<th>Number of Experiments Evaluating Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer rate</td>
<td>63</td>
</tr>
<tr>
<td>Manure/Compost</td>
<td>51</td>
</tr>
<tr>
<td>Tillage</td>
<td>42</td>
</tr>
<tr>
<td>Fertilizer type</td>
<td>40</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>38</td>
</tr>
<tr>
<td>Residue management/removal</td>
<td>34</td>
</tr>
<tr>
<td>Pasture/Grazing</td>
<td>26</td>
</tr>
<tr>
<td>Crop type</td>
<td>23</td>
</tr>
<tr>
<td>Cover crop</td>
<td>20</td>
</tr>
<tr>
<td>Irrigation</td>
<td>17</td>
</tr>
</tbody>
</table>

MAGGnet v. 1.2 (Nov 2014)
MAGGnet
Recent Activities

• Model Intercomparison Exercise
  – GRA Soil Carbon and Nitrogen Cycling Cross-cutting Group
  – MAGGnet used to help identify sites for modeling exercise

• Template used by GRA Paddy Rice Research Group
  – Effort led by Japan with site contributions from Indonesia, Philippines, Thailand, and Vietnam (13 sites)

• Development of MAGGnet Metadata Sharing Agreement
  – Adaptation of agreements by IC-FAR Crop-M (Italy) and N$_2$O Network (Australia)
  – To be posted on GRA website
MAGGnet
Next Steps

• **Initiate activities in FACCE-JPI Work Package 1**
  – Add response data for select sites (GHG emission, soil organic C stocks, crop yield)

• **Ongoing Effort...**
  – *Share* the purpose, current status, and future direction of MAGGnet
  – *Learn* how MAGGnet can better serve the modelling community
  – *Engage* others to increase involvement in MAGGnet
Thank you for listening!

www.globalresearchalliance.org