

Quantifying Greenhouse Gas Mitigation Potential of Cropland Management Practices: A Review of the GRA Croplands Research Group Greenhouse Gas Network

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ABSTRACT

Multi-national greenhouse gas (GHG) flux networks play a central role facilitating model development and verification while concurrently identifying critical research needs. In 2012, a network was established within Component 1 of the Global Research Alliance (GRA) Croplands Research Group. The network, referred to as MAGGnet (Managing Agricultural Greenhouse Gases Network), sought to establish a coordinated, multi-national approach for inventory and analysis of GHG mitigation research specific to croplands. Initial MAGGNET activities focused on collection and organization of metadata from experimental sites where soil C dynamics and/or GHG flux had been part of the data collection protocol. Ten GRA countries (Argentina, Denmark, France, Indonesia, Italy, Japan, Korea, Spain, Uruguay, and USA), encompassing 123 unique experimental sites, contributed information in response to the initial metadata call. Follow-on activities have expanded collected metadata using published experimental site information, thereby establishing a foundation for inclusion of key response metrics (e.g., GHG flux, soil C stock changes, crop yields). MAGGNET aims to leverage data collected at cropland experimental sites throughout the world in order to strengthen estimates of GHG mitigation effectiveness from targeted management practices while identifying opportunities for additional field research. Moreover, network activities will be coordinated with ongoing C and N modeling efforts within the GRA Croplands Research Group (Component 3) and C/N Crosscutting Research Group, potentially improving national inventories of GHG emissions. Collectively, MAGGNET should serve to strengthen collaborations among scientists and contribute to the overall goal of the GRA Croplands Research Group, which seeks to reduce GHG intensity and improve overall production efficiency of cropland systems throughout the world.

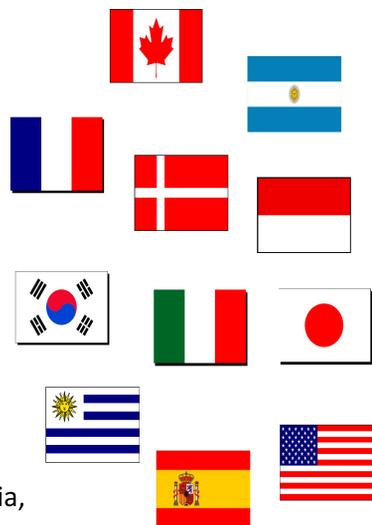
What is the Global Research Alliance?

- The Global Research Alliance (GRA) on Agricultural Greenhouse Gases brings countries together to find ways to grow more food without increasing greenhouse gas (GHG) emissions. The GRA was established in 2009 and includes more than 30 member countries from all regions of the world.
- GRA members seek to expand GHG mitigation research efforts across three agricultural sectors groups (Cropland; Livestock; Paddy Rice) and two cross-cutting groups (Soil Carbon and Nitrogen Cycling; Inventory and Measurement). These Groups have developed work plans that facilitate collaborations among countries and other partners, as well as to share knowledge and best practices, build capacity and capability amongst scientists and other practitioners, and move towards breakthrough solutions to reduce agricultural GHG emissions. All activities are founded on the voluntary, collaborative efforts of participating countries.
- For more information about the GRA, please see www.globalresearchalliance.org.

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What is MAGGnet?

- In 2012, an effort was initiated to develop a coordinated, multi-national approach for inventory and analysis of GHG mitigation research. The effort, referred to as MAGGnet (Managing Agricultural Greenhouse Gases Network), sought to compile metadata from experimental sites throughout the world where GHG fluxes and soil carbon dynamics were monitored.
- MAGGnet was initiated by the USA within Component 1 of the GRA Croplands group. The Component 1 charge is to quantify net GHG emissions from cropland management systems.
- There are currently 11 countries formally participating in MAGGnet (Argentina, Canada, Denmark, France, Indonesia, Italy, Japan, Korea, Spain, Uruguay, and USA).



What has MAGGnet accomplished?

2012

- A simple data entry spreadsheet was distributed to GRA contacts within the Croplands group in February 2012. The spreadsheet was designed to gather key metadata on experimental sites.
- Components of the spreadsheet included experiment description, location, duration, and treatments, as well as the type of data collected (soil, GHG flux, plant), a listing of related publications, and contact information for the principal investigator.
- Response to the metadata call was encouraging, including information from 123 unique experimental sites.
- A synopsis of the metadata was presented to the GRA Croplands group in Bari, Italy in July 2012. Plans to expand the data entry spreadsheet were discussed at the meeting.

Treatment component	Number of experiments evaluating component
Fertilizer type	32
Residue management/removal	29
Crop type	23
Crop rotation; Cover crop; Tillage type	21
Fertilizer rate	19
Pasture/Grazing systems	12
Tree crops	6
Soil type/Topography	4
Organic vs. Conventional	3
Fertilizer application method; Biofeedstock type; Soil compaction; GHG analysis method	2
Drainage; Tillage Frequency; Vineyard	1

14 projects categorized as 'Agroecosystem Monitoring'

2013

- Since the July 2012 meeting in Italy, MAGGnet has focused on expanding the data entry spreadsheet using guidance and input from participating countries.
- An expanded data entry spreadsheet was developed to include climate attributes, soil and drainage attributes, additional treatment categories, and key findings. The spreadsheet was pre-tested and revised using metadata from six experiments in Canada.
- The expanded data entry spreadsheet was distributed to GRA contacts within the Croplands group in June 2013.

Soil/GHG/Plant parameter	Percentage of total projects measuring parameter
Soil properties	93
Soil carbon	93
CO ₂ flux	56
CH ₄ flux	32
N ₂ O flux	63
Grain	64
Stover	45
Roots	7



Worksheet Tabs

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

What might the future hold for MAGGnet?

- The recent metadata call hopes to garner an additional 50 experimental sites by November 2013.
- A Letter of Intent (LOI) to the FACCE-JPI Multi-partner Call on Agricultural Greenhouse Gas Research was submitted to support MAGGnet (Project Title: *Quantifying Greenhouse Gas Mitigation Effectiveness through the GRA Croplands Greenhouse Gas Network*). The LOI was found to be eligible and the full proposal is due September 2013.
- As with many voluntary activities, the biggest challenge is to appropriately gauge the request for additional information so as to not discourage network participation. Efforts will continue to be made to ensure broad inclusion of as many countries as possible by expanding the effort at an appropriate pace.

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