AgMIP The Agricultural Model Intercomparison and Improvement Project

The Agricultural Modeling Intercomparison and Improvement Project (AgMIP)

Daniel Wallach
INRA
Marco Symposium 2015
Tsukuba Japan August 26-28, 2015

UKaid from the Department for International Development
USDA
USAID United States Agency International Development
CGIAR
RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security
CCAFS
NASA

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Outline

- **Overview of AgMIP**
- **AgMIP activities**
- **Ways Forward**




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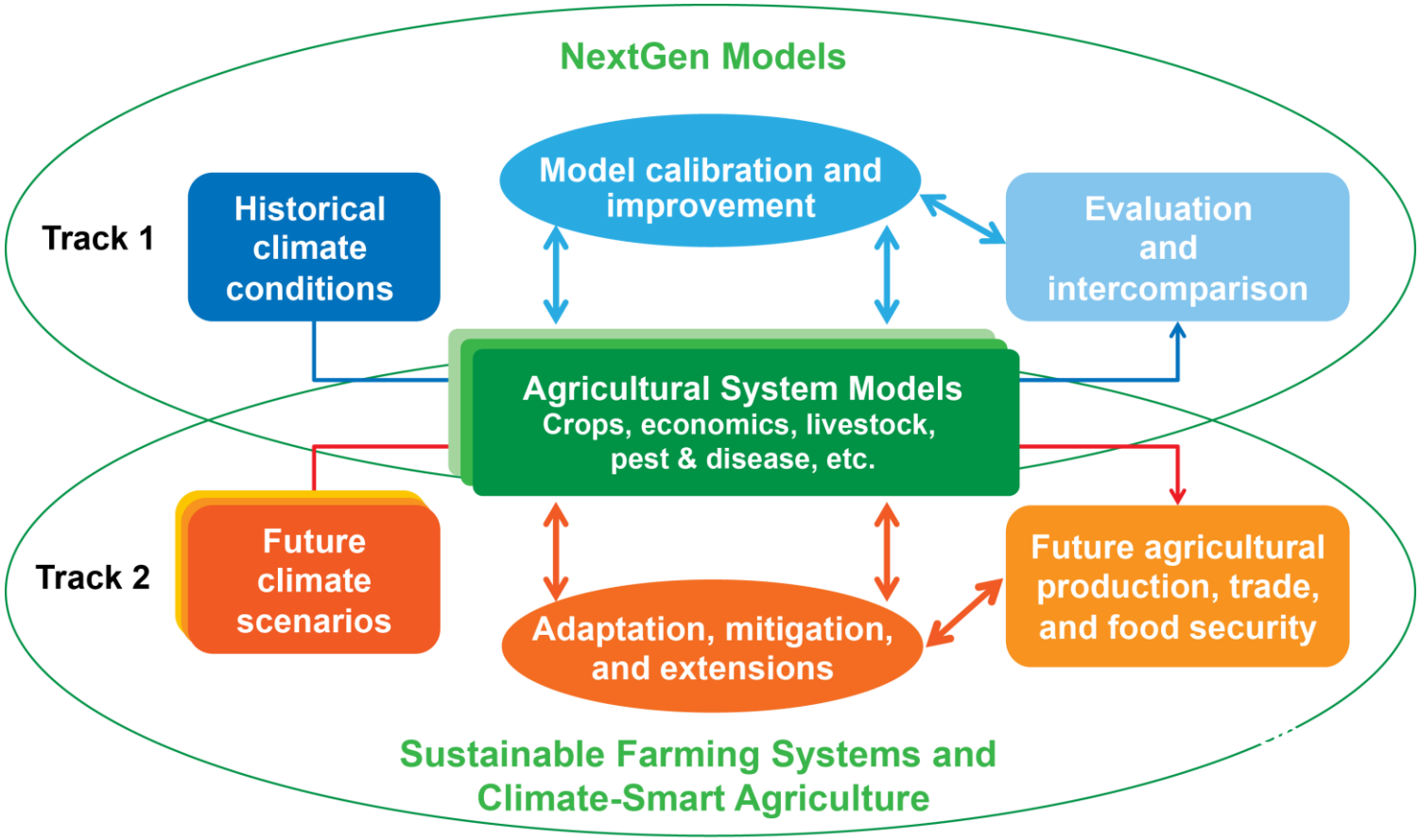
AgMIP Mission

Provide effective science-based agricultural decision-making models and assessments of climate variability and change and sustainable farming systems to achieve local-to-global food security

Near Arusha, Tanzania

Phase 2 (2015-2020) Science Approach



Track 1: Develop/Test NextGen Agricultural Systems Models

Track 2: Conduct Multi-Model Assessments for Sustainable Farming Systems and Climate-Smart Agriculture

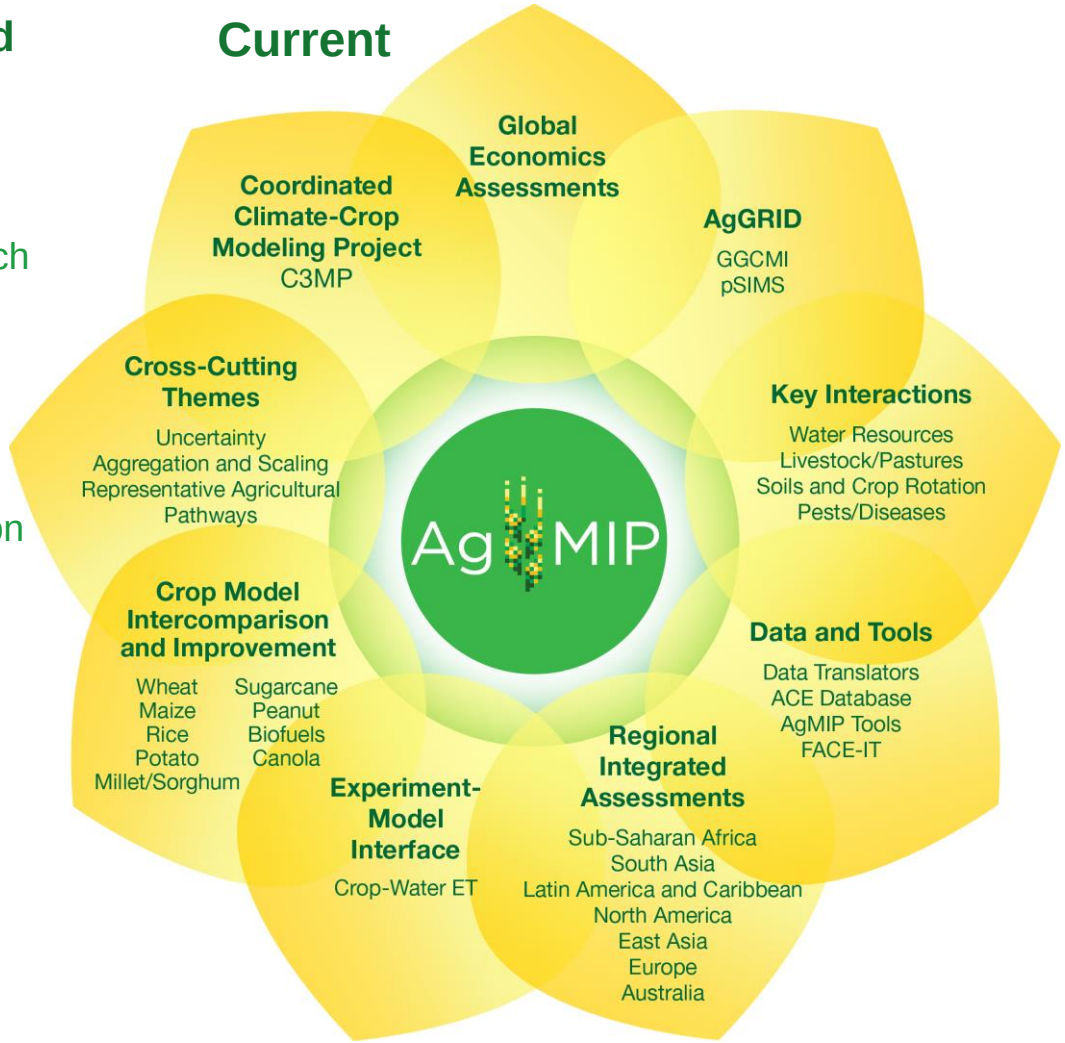
Rosenzweig et al., 2013 AgForMet

Current and Prospective Activities

AgMIP Teams and Activities

- Co-Leaders
- Written Plan with Goals and Research Questions
- Protocols
- External Science Advisors
- Review & Attribution
- Publications

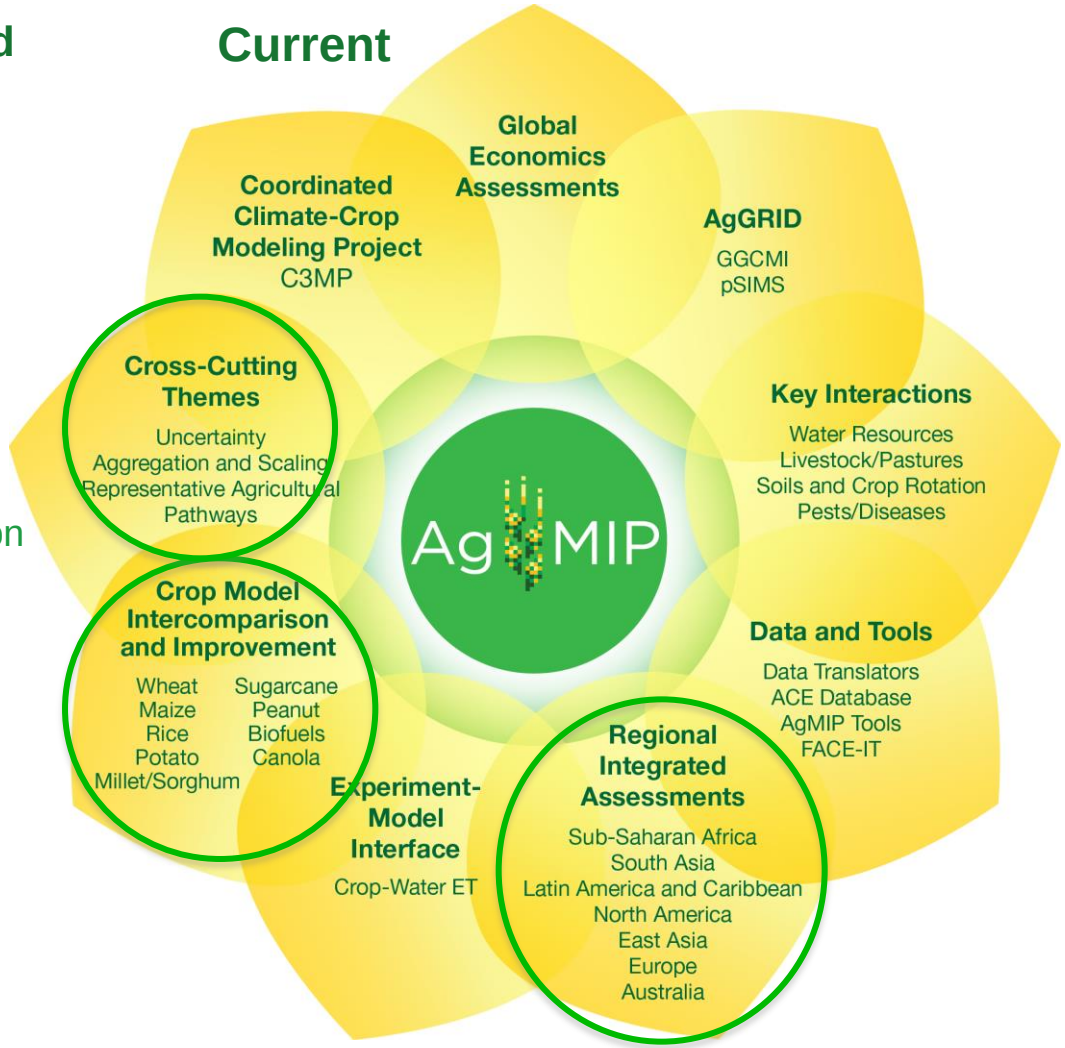
Current



Coordinated Global & Regional Assessments Key Components

AgMIP Teams and Activities

- Co-Leaders
- Written Plan with Short and Long-Term Goals
- Protocols
- External Science Advisors
- Review & Attribution
- Publications



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Crop Model Intercomparison and Improvement

K. J. Boote and P. J. Thorburn

Wheat, Maize, Rice, Sugarcane, Potato, Sorghum, Peanut, Soil, Bioenergy, Water-ET Teams




Crop Model Intercomparison and Improvement Studies

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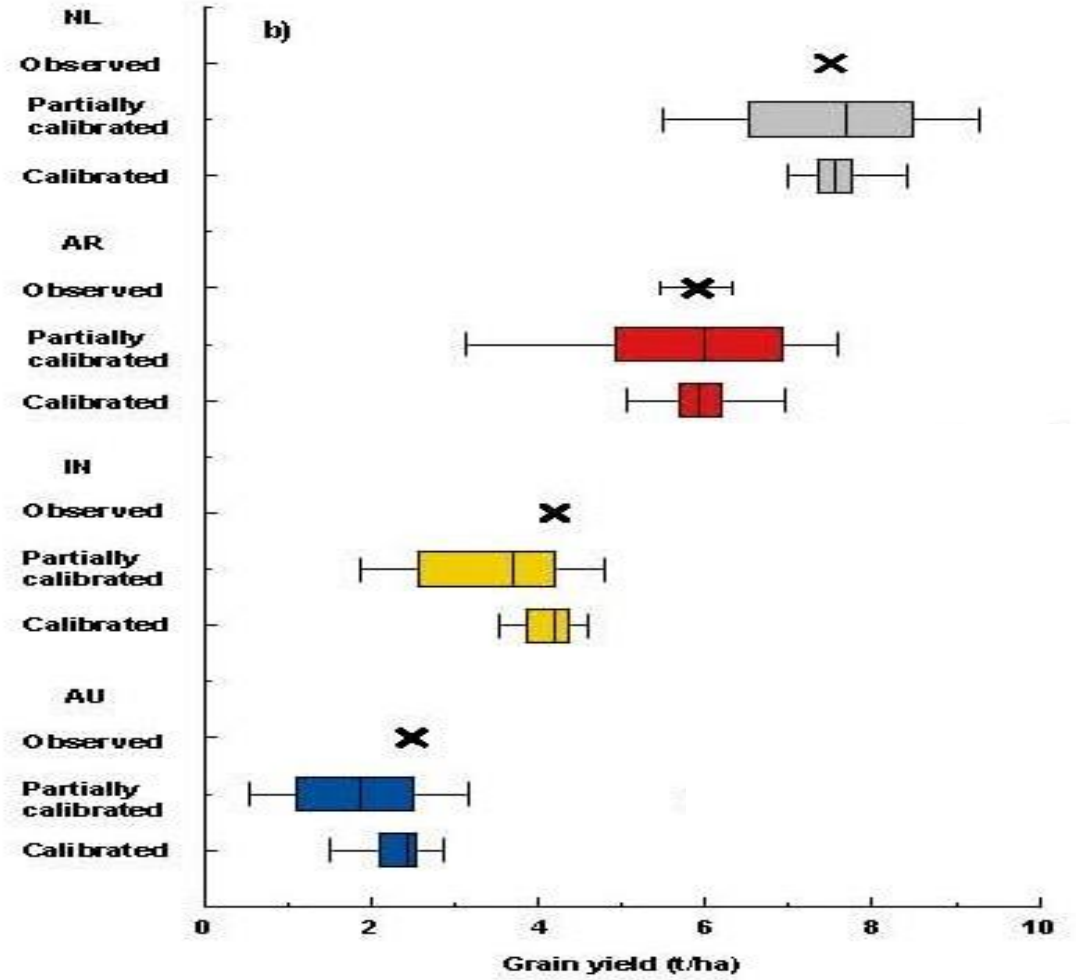
- Wheat, maize, rice, sugarcane, millet/sorghum, groundnut, potato, canola, grassland/pastures, soils and crop rotations; bioenergy; crop water/ET Teams
- Sentinel site experiment data, sensitivity tests
- Focus on uncertainty, processes, and model improvement

K. J. Boote and P. J. Thorburn
Crop Modeling Leaders

Rosenzweig et al., 2013

Extensive ensembles of crop models

27 wheat models



Ensemble of models predicted yields accurately

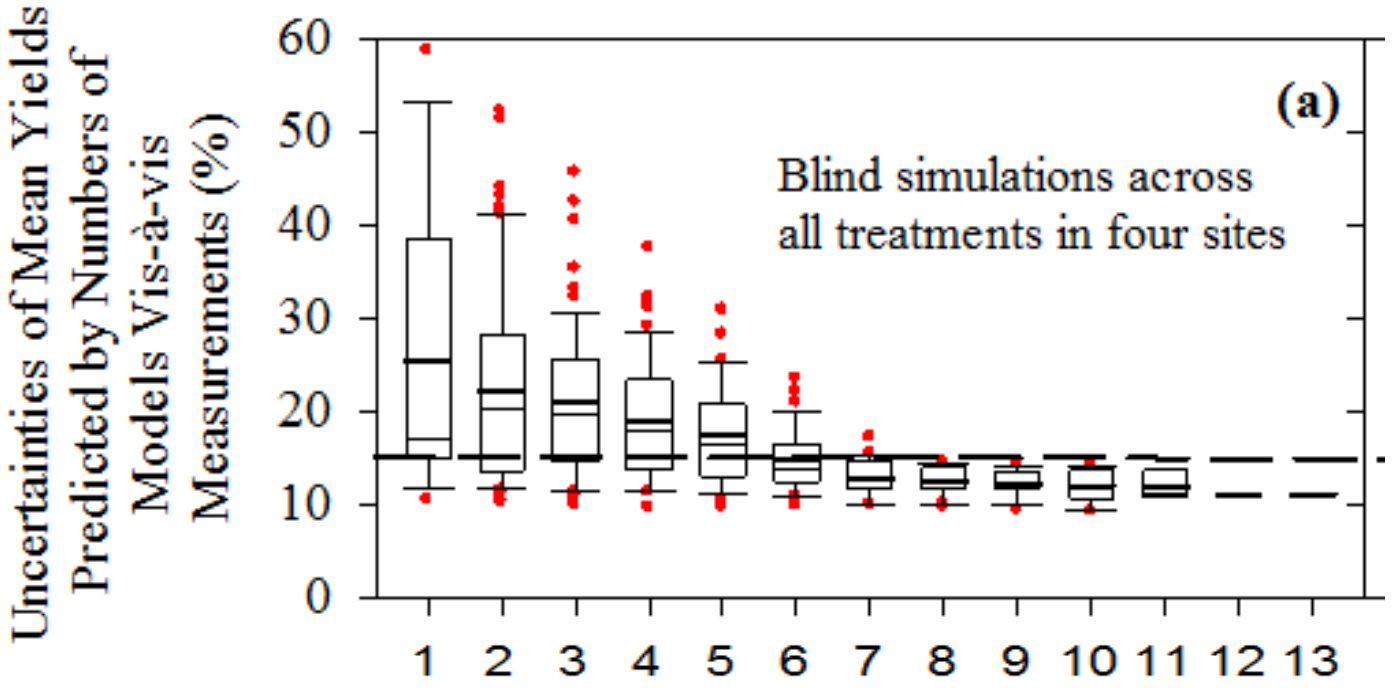
True under poorly and well calibrated conditions

Most individual models did not predict all sites well across varying environments

Asseng et al. 2013
Nature Climate Change

Number of models needed may be relatively small

13 rice models



~5-10 models needed to replicate observations across sites

Li et al., 2015 Global Change Biology

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Regional Integrated Assessments

John Antle, Jim Jones, Alex Ruane, Roberto Valdivia

Regional Research Teams




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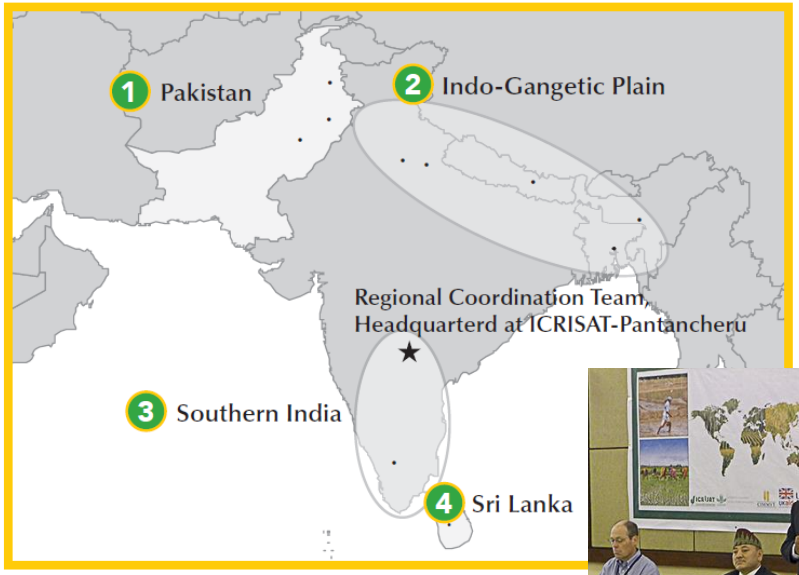
Regional Research Teams

5-year project, UK DFID funded
8 regional teams, 18 countries, ~200 scientists
Protocols for data, models, scenarios designed and implemented by multi-disciplinary teams and stakeholders

Pretoria, South Africa 2013



Katmandu, Nepal, 2013

Rosenzweig and Hillel (Eds)
Handbook of Climate Change and Agroecosystems
Imperial College Press, 2015

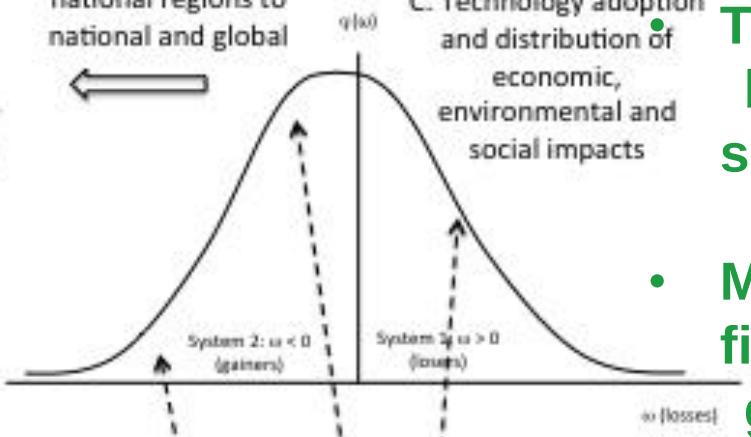
AgMIP Regional Integrated Assessment – 5 Attributes

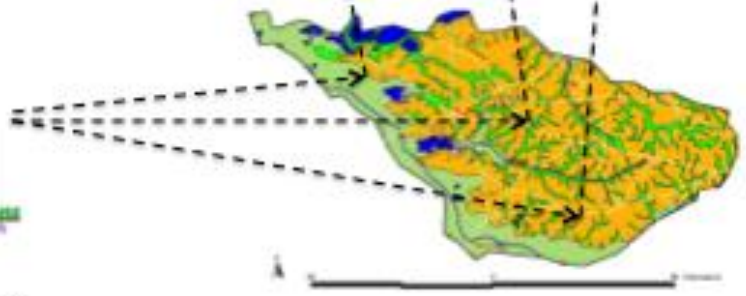
E. Global & national prices, productivity and representative ag pathways and scenarios (RAPS)

A. Complex farm household systems

D. Linkages from sub-national regions to national and global

C. Technology adoption and distribution of economic, environmental and social impacts



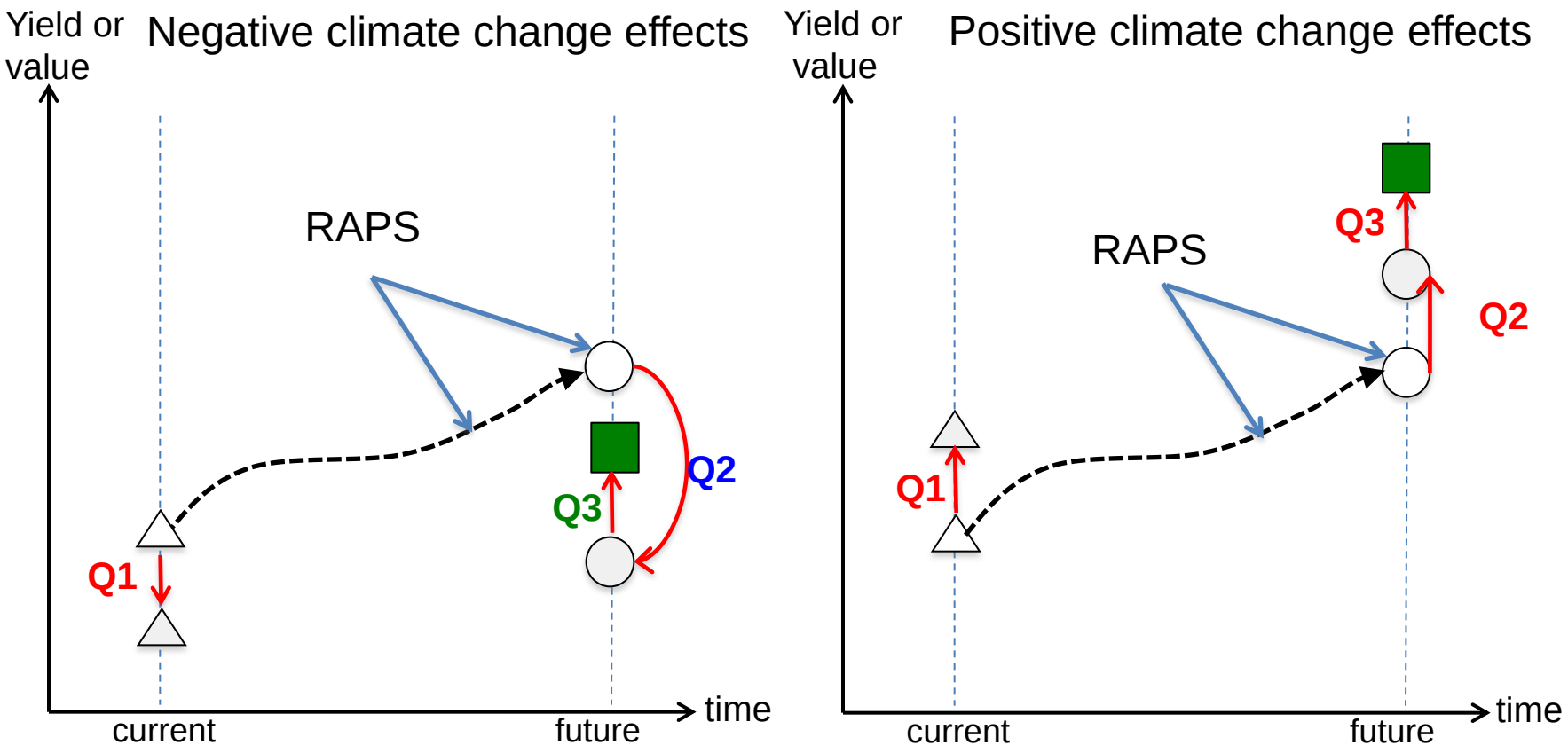


B. Heterogeneous region

- **Farming systems**
- **Transdisciplinary: biophysical/ socio-economic**
- **Multi-scale: field, farm, region, global data and models**
- **Multiple climate and crop models**
- **Distributional results: impacts on poverty**

Antle et al., 2015

3 Core Questions



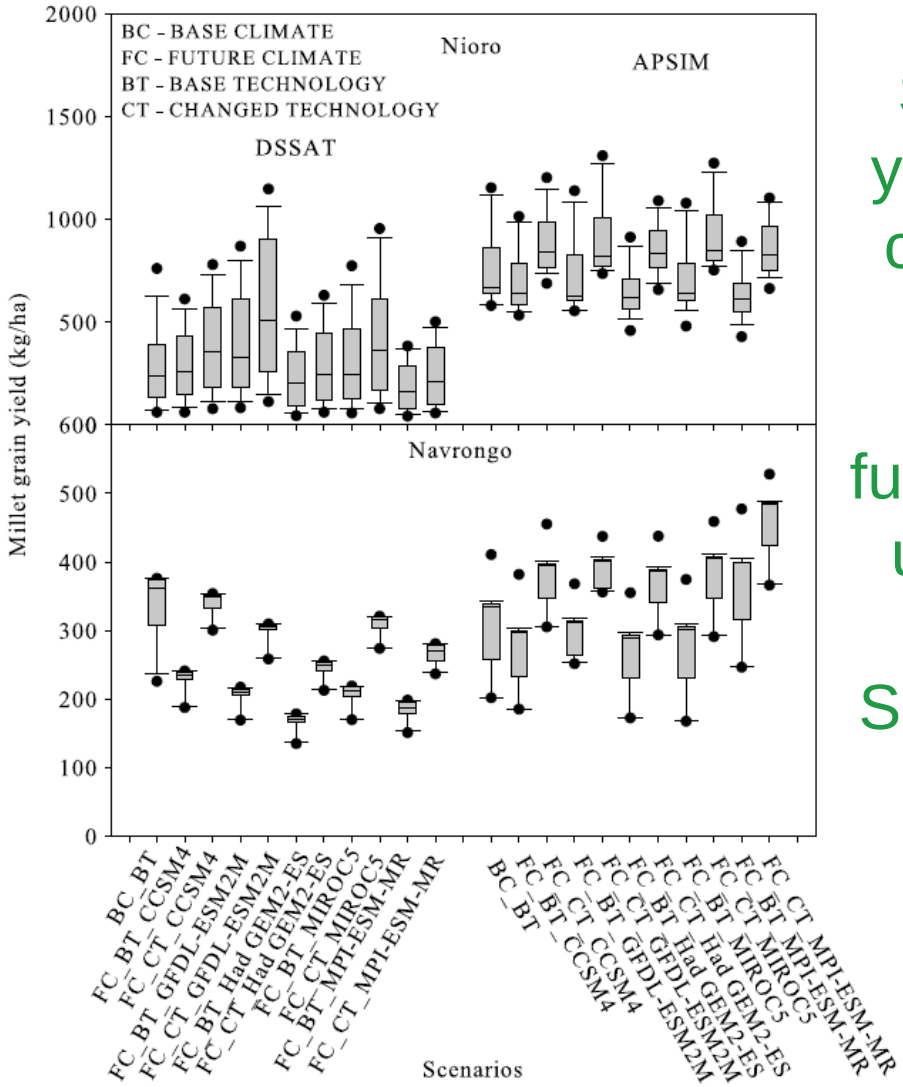
Q1) What is the sensitivity of current agricultural production systems to climate change?

Q2) What is the impact of climate change on future agricultural production systems?

Q3) What are the benefits of climate change adaptations?

Antle et al., 2015

West Africa Crop Model Results



Simulated variability in millet yields with DSSAT and APSIM crop models, for current base technology (BT) compared to adapted future changed technology (CT) under 5 CMIP5 GCM climate change scenarios for Nioro, Senegal and Navrongo, Ghana

APSIM tended to be more positive than DSSAT in both baseline and future climate

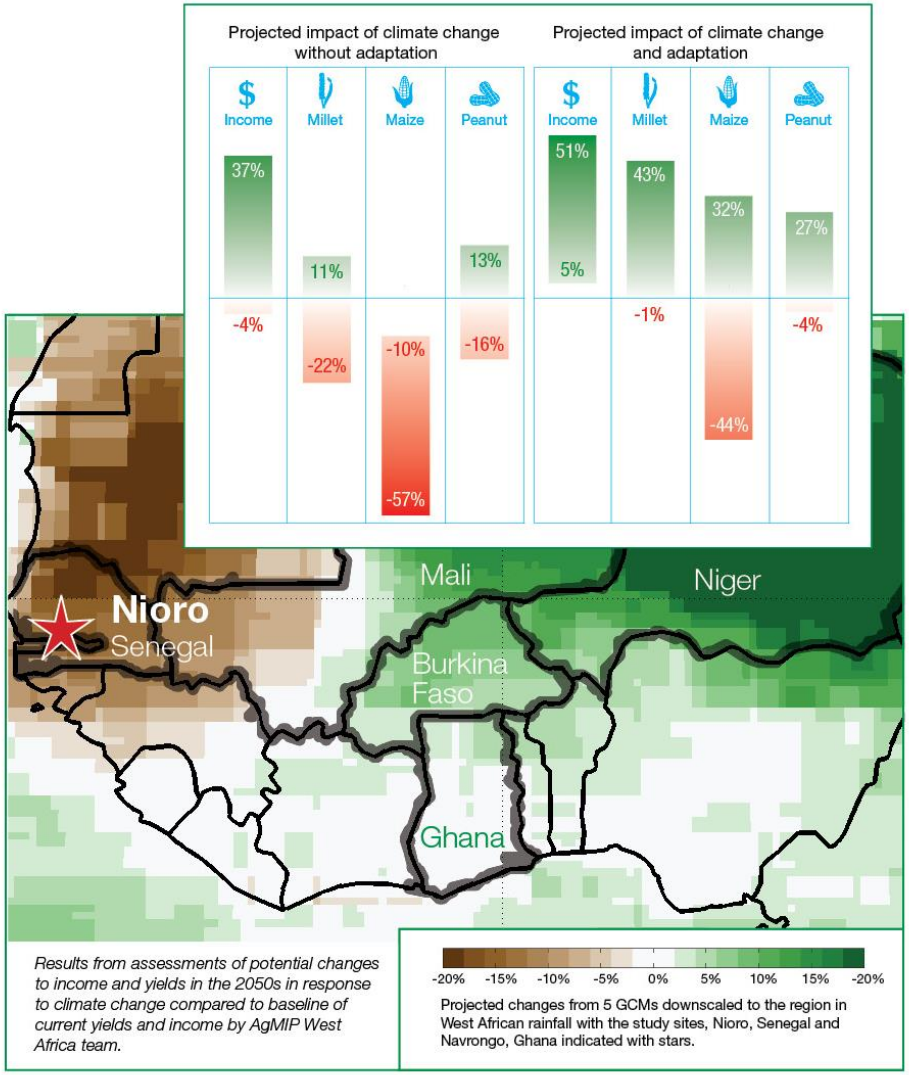
Phase 2: Determine why and institute model improvements

Adiku et al., 2015

West Africa Climate Change Impacts

Adaptation packages can raise incomes and lower poverty rates,

but do not always compensate crop yield losses completely



Adiku et al., 2015

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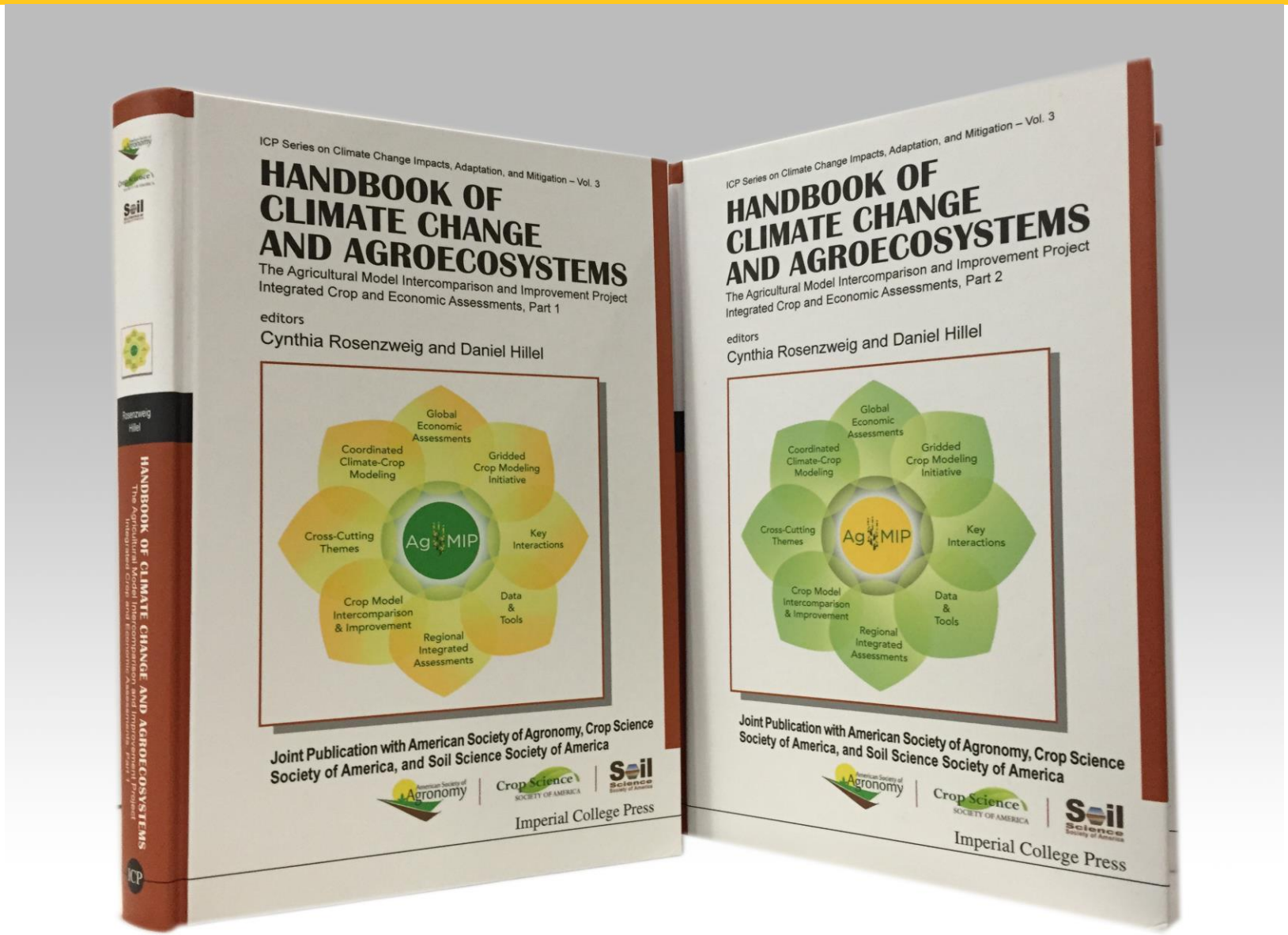
Handbook of Climate Change and Agroecosystems
Just published



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Uncertainty in agricultural impact assessment

Daniel Wallach, Linda Mearns, Mike Rivington, John Antle and Alex Ruane




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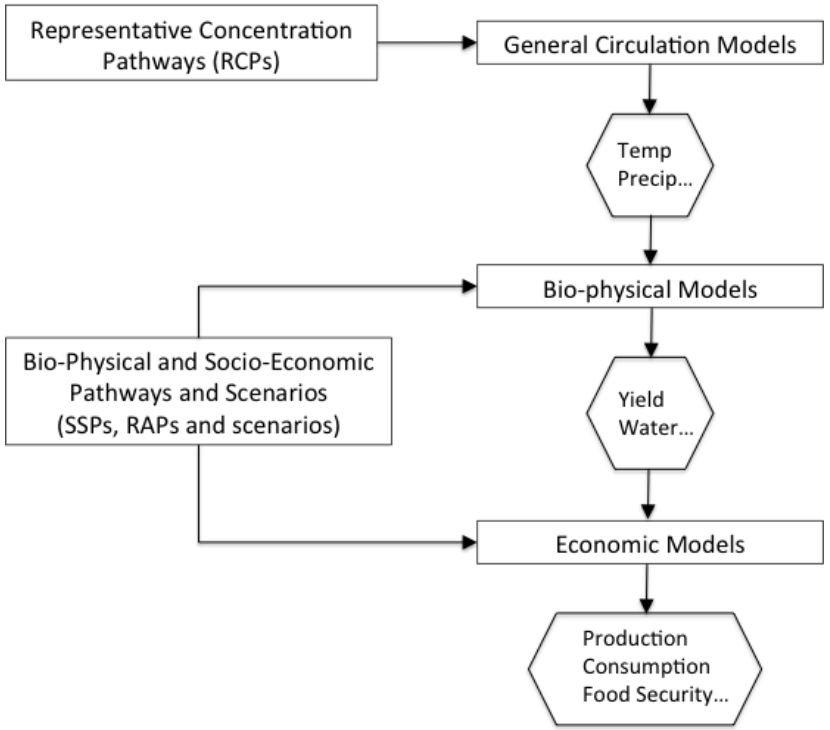
Impact assessment involves a cascade of models

Uncertainty at each stage

Need methodology for evaluating uncertainties



Wallach et al; 2015

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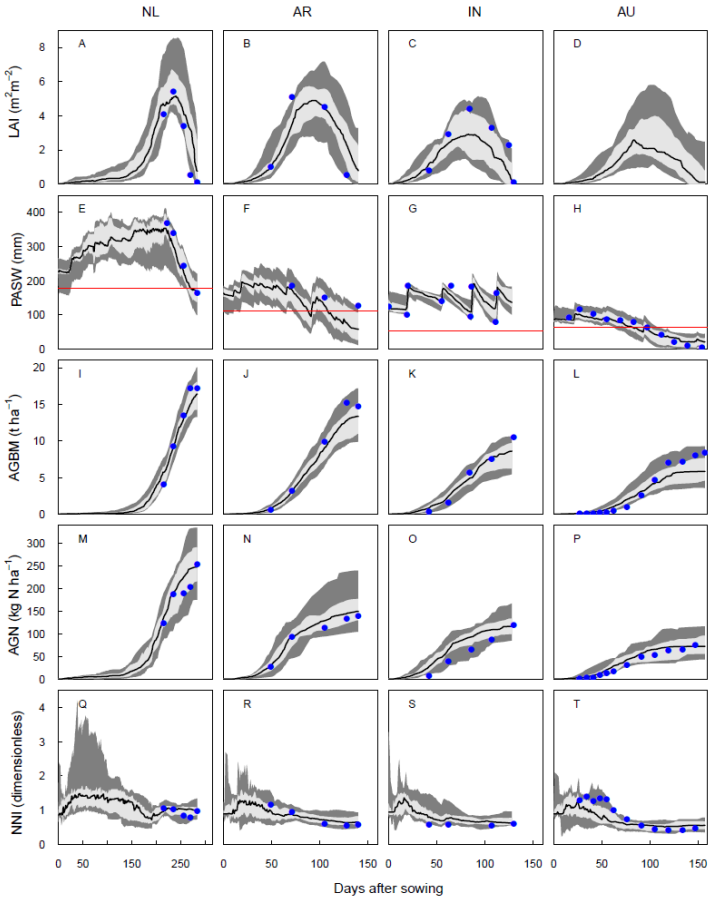
How to analyze information from ensembles

Lessons from climate modeling

How to combine multiple sources of error



Martre et al. 2015 Global Change Biology

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Key results and Ways Forward




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Key Points

- **Regional integrated assessments of farming systems are needed to identify vulnerable groups and regions.**
- **Uncertainty cascade shows that focus on improving rigor of impact assessments is highly warranted.**
- **At the global scale, 'pre-assessment' validation is essential to advance the capability of crop and economic models.**
- **Crops, livestock, sites, and processes are important to full understanding and credibility of global simulations.**
- **Building blocks and community are now in place for coordinated global and regional assessments for food security.**

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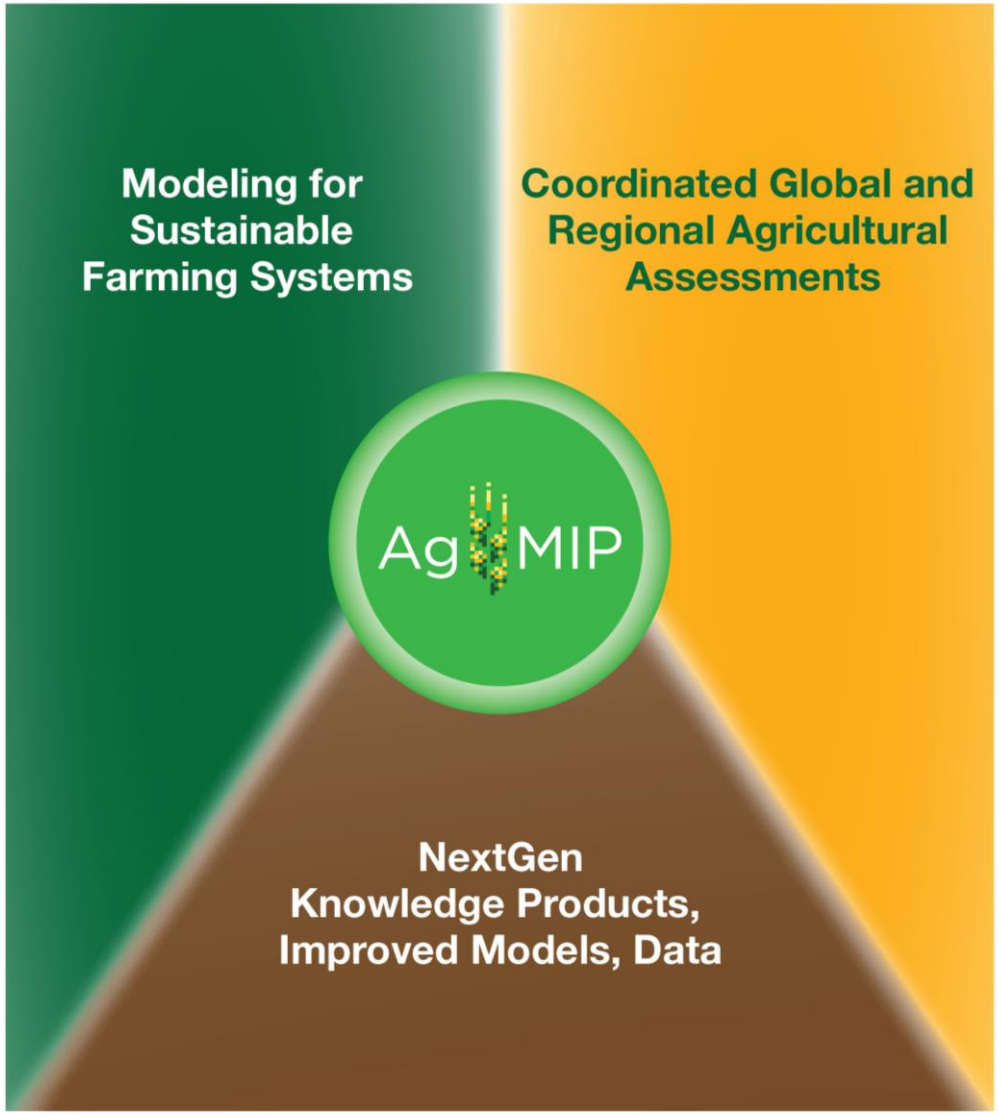
3 Focus Areas



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For protocols, up-to-date events and news, and to join AgMIP listserve – www.agmip.org