



Developing multi-model assessment communities within the Agricultural Model Intercomparison and Improvement Project



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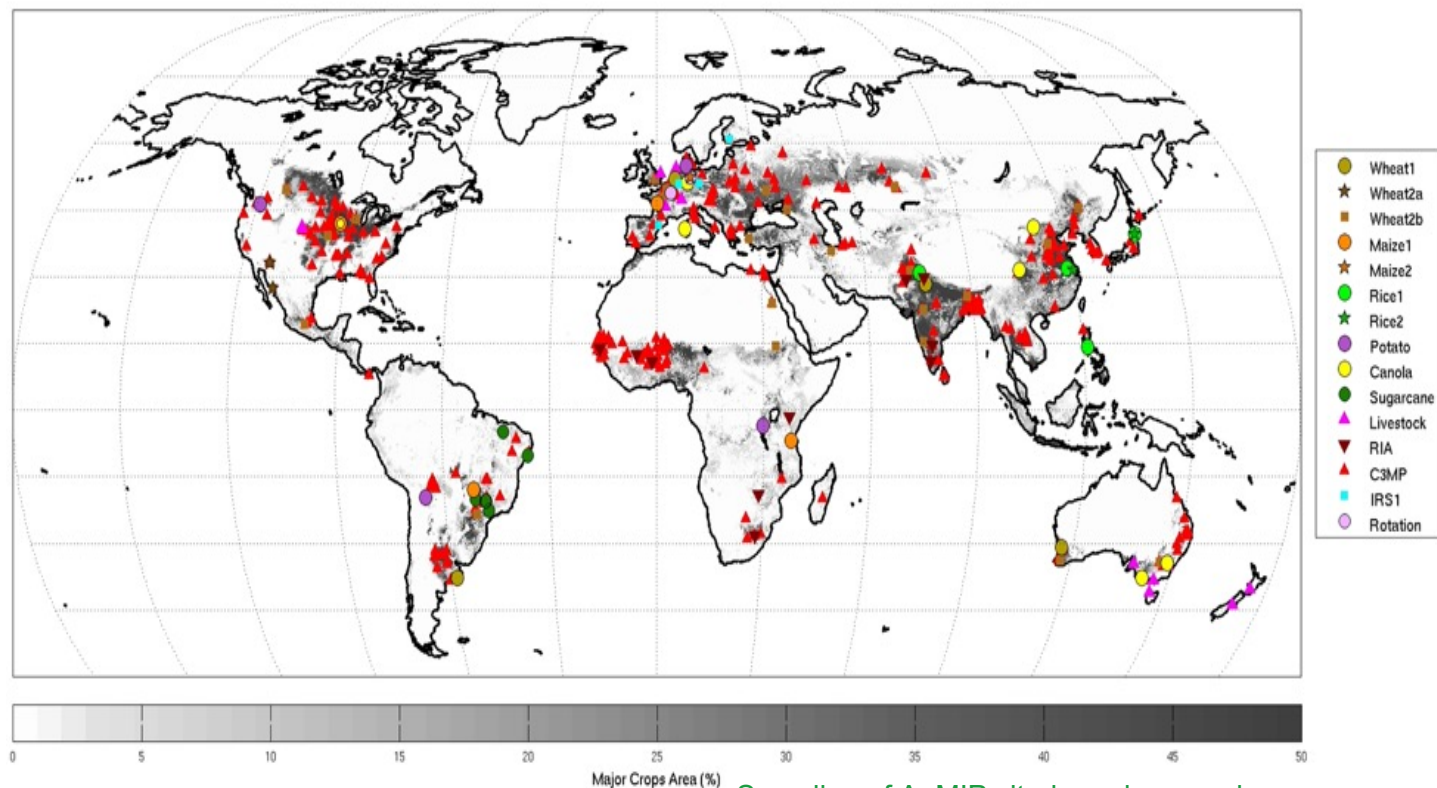
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²AgMIP / AEGIS / Texas A&M Blackland Research and Extension Center

USDA Forestry and Agriculture Greenhouse Gas Modeling Forum

March 5th, 2024

AgMIP is an international community of 1200+ **climate scientists**, **agronomists**, **economists**, **food systems** and **IT experts** working to improve assessments of **current and future risks to food security** in order to **build a more productive, sustainable, and resilient future**





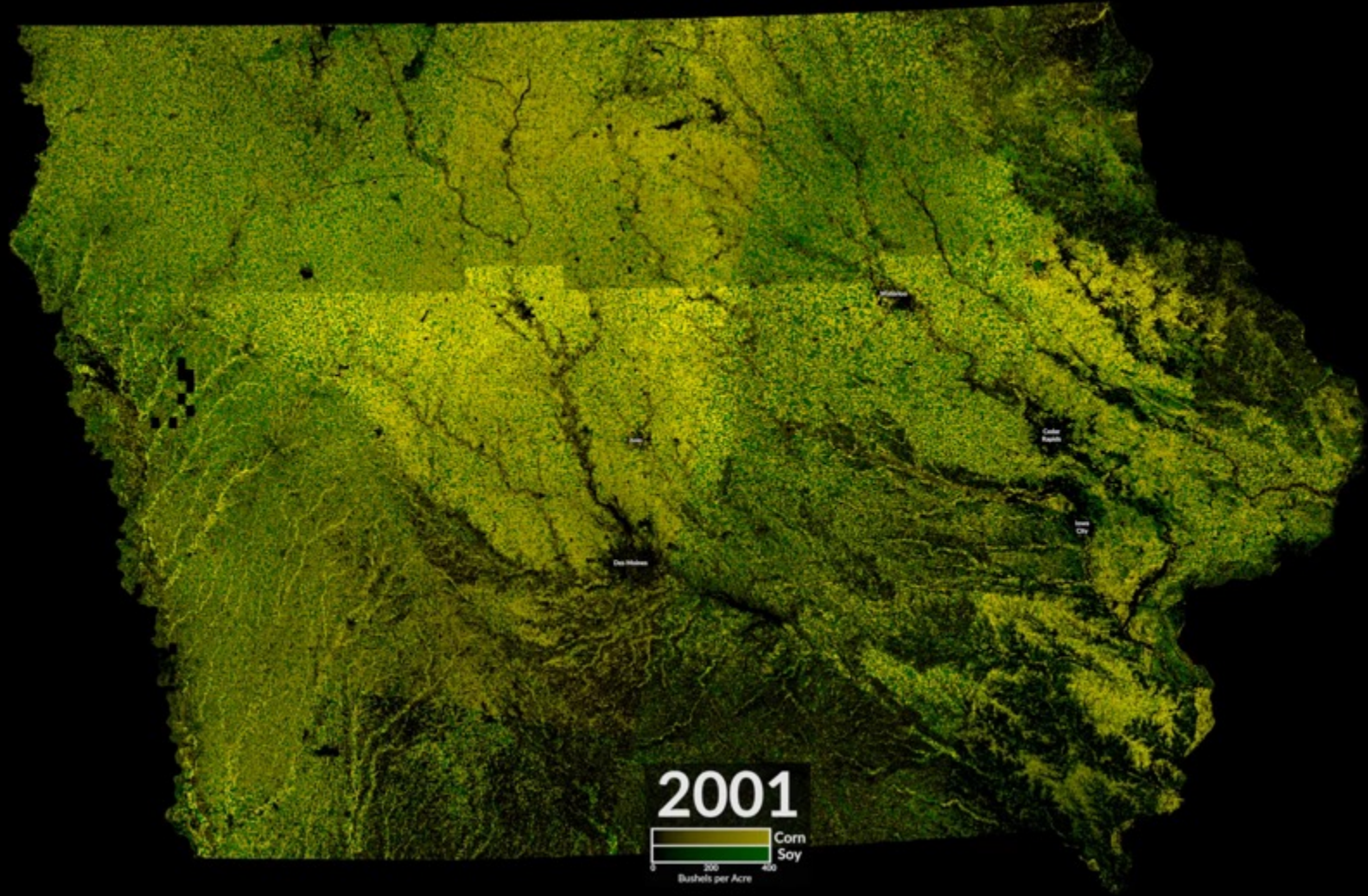
Some examples:

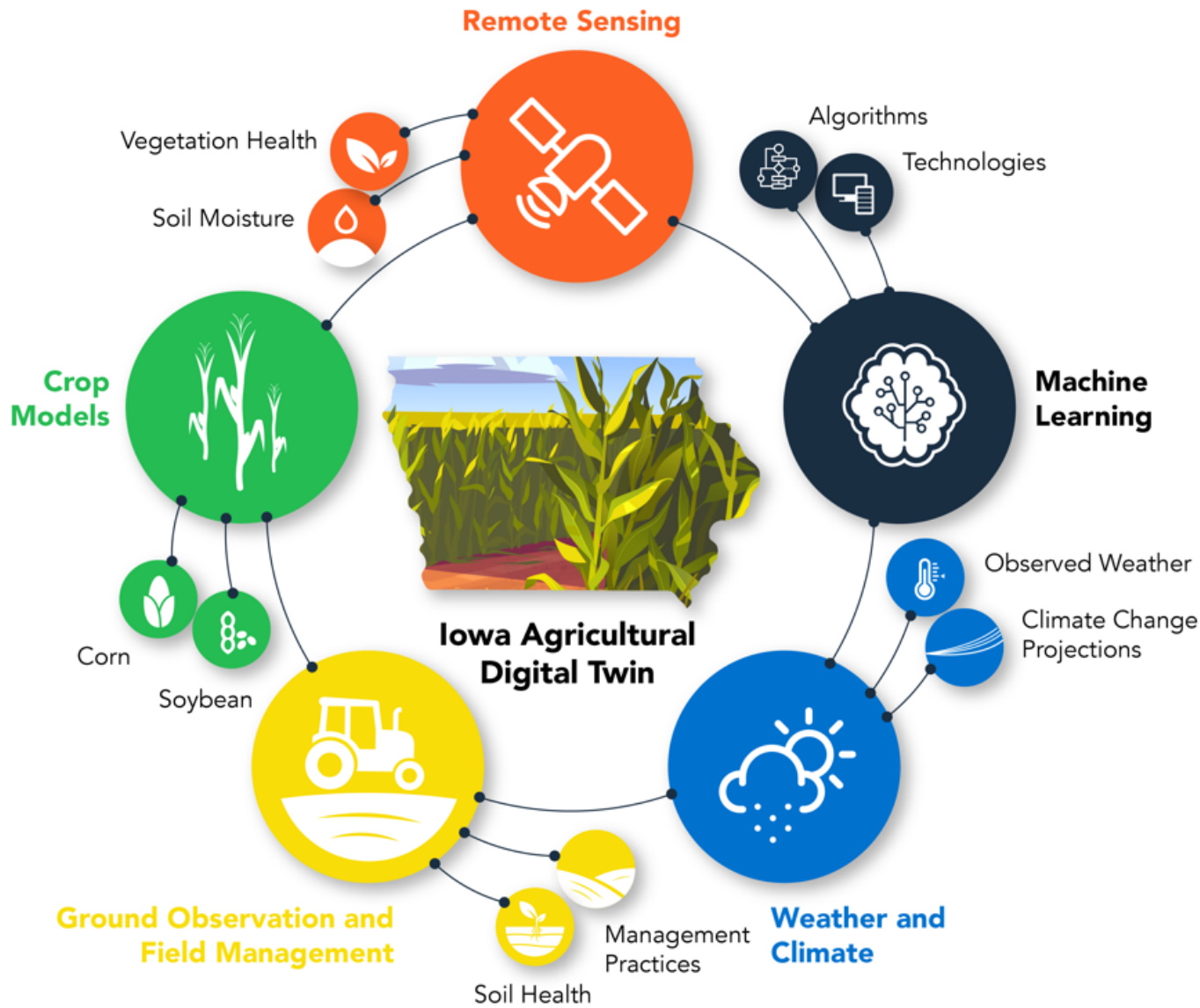
The AgMIP-Wheat team intercomparisons involve more than 40 crop models, empirical models and machine learning models, including some simulated by multiple, independent modelers

Economics models range from Global PE and CGE models to national and household scale analyses

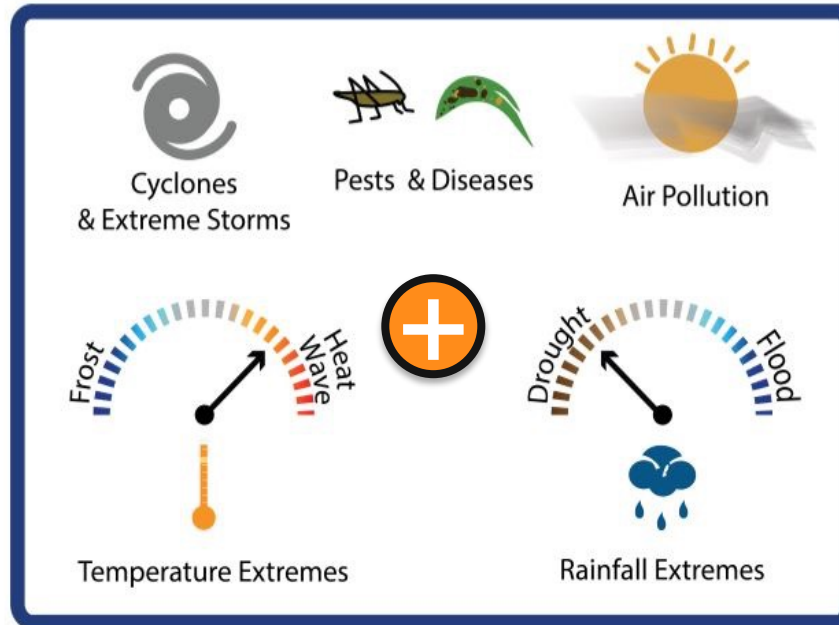
Visit www.agmip.org for more information and to sign up for AgMIP listserv

- 1. Apples-to-apples comparisons take work**
- 2. Experience in setting up a protocol-based model intercomparison and assessment**
- 3. Multiple models, multiple systems and settings**
- 4. Challenges in building a collaborative community**
- 5. Addressing concerns of participating modelers**
- 6. Language, notation and scenario challenges**
- 7. Ensemble benefits and potential pitfalls**





Hazards and Disasters

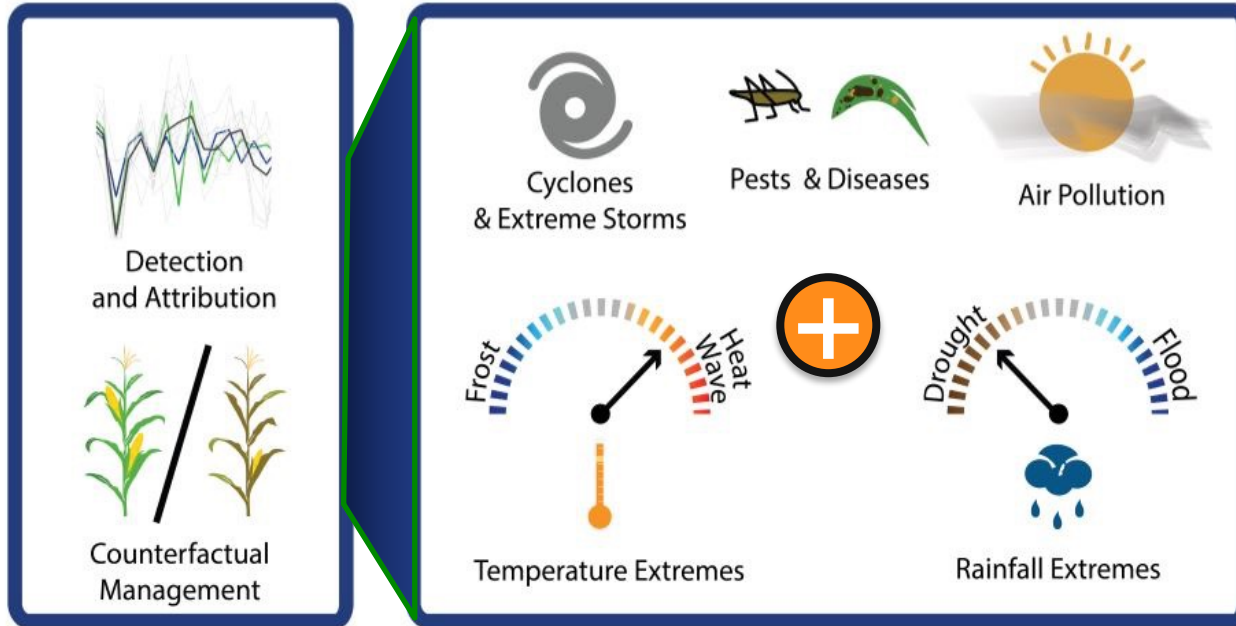


Real-time and Seasonal Outlook



Reactive Interventions

Hazards and Disasters



Historical

Real-time and Seasonal Outlook

Retrospective Analysis

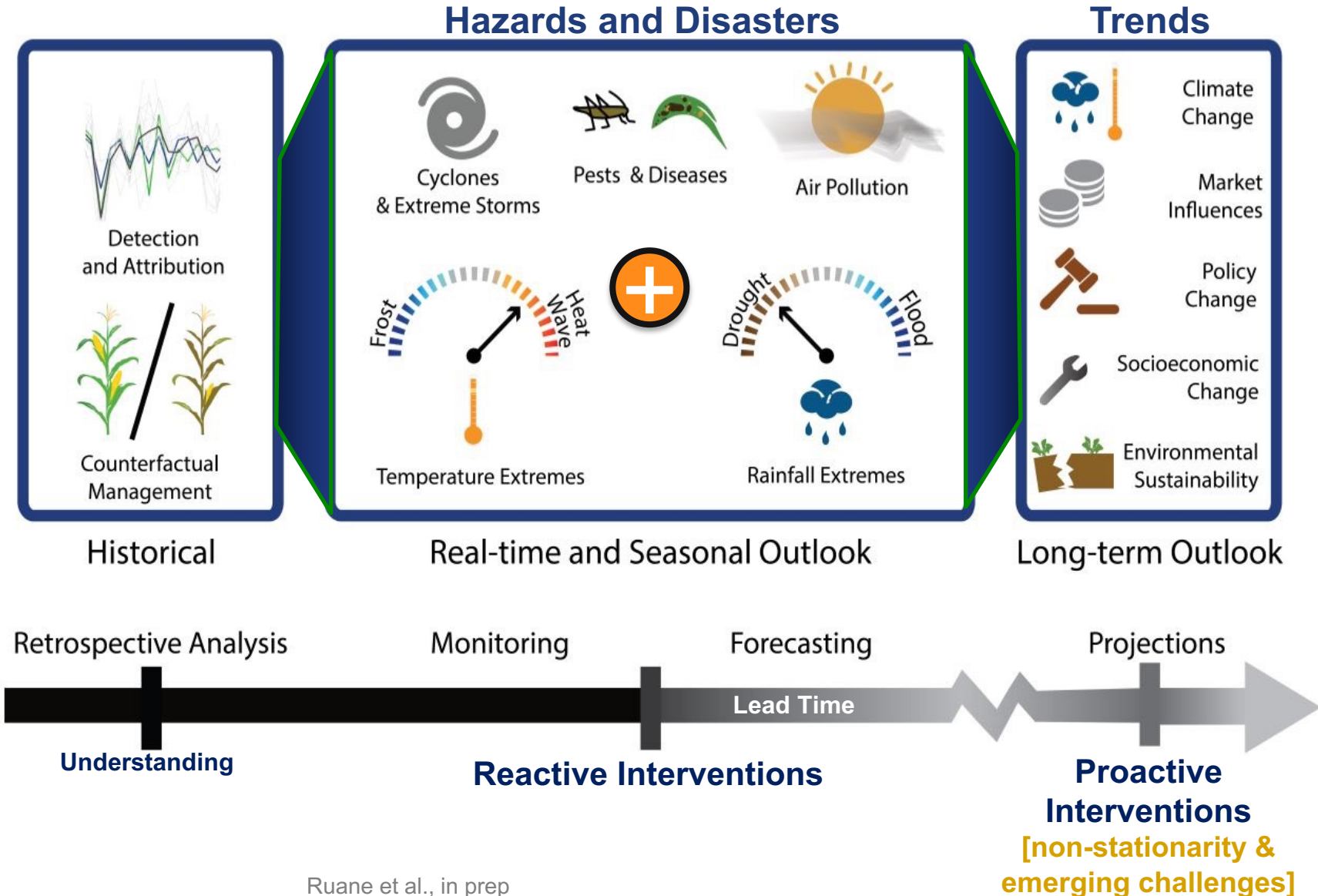
Monitoring

Forecasting



Understanding

Reactive Interventions





Organized by
AgMIP US
Consortium

MAKING CLIMATE-SMART AGRICULTURE WORK

*Integrating science, modeling and economics to help farmers, ranchers
and foresters mitigate and adapt to the challenges of climate change*

A virtual online conference

AGENDA

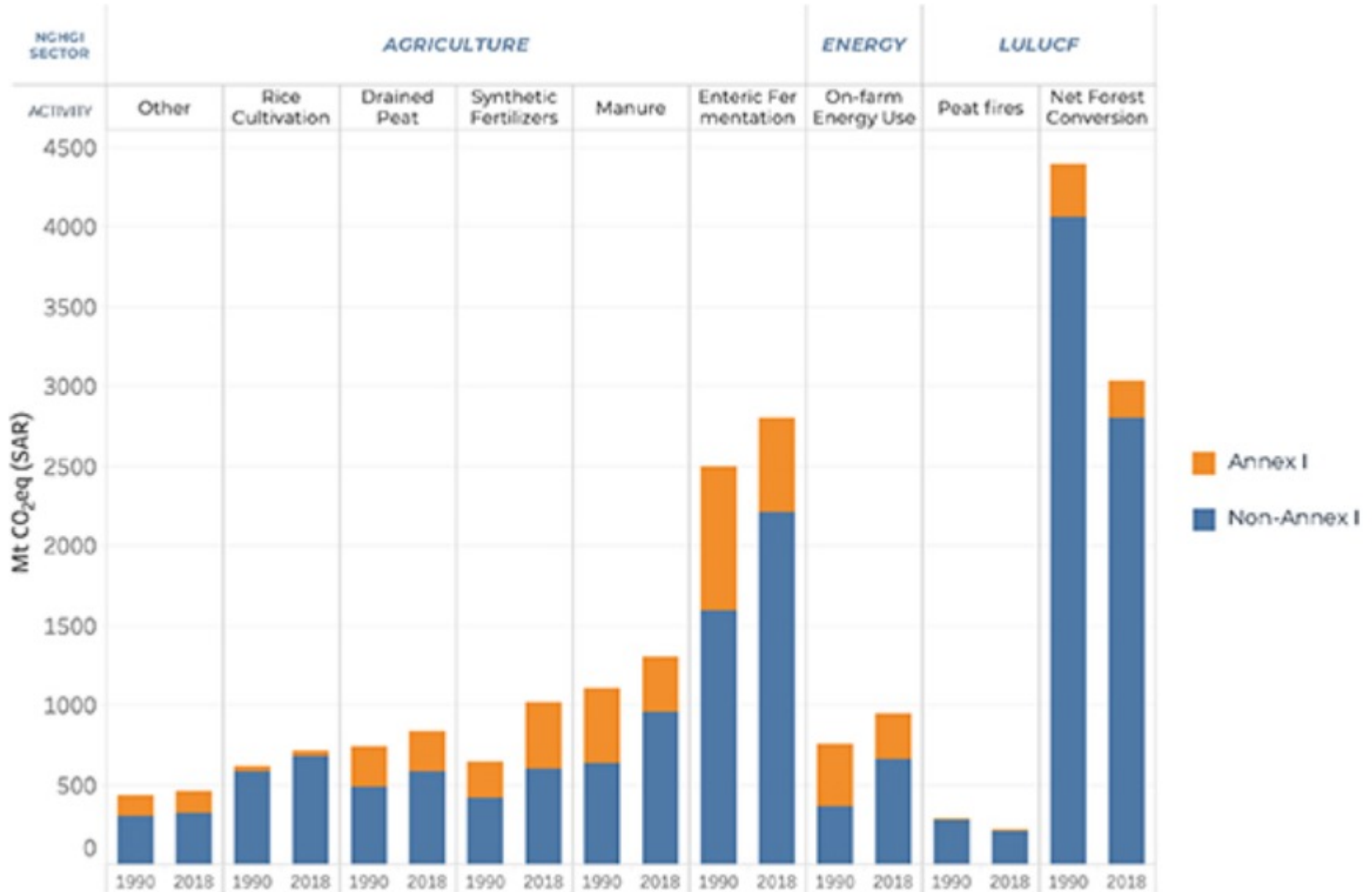
Registration required: <https://agmip.org/making-climate-smart-agriculture-work/>

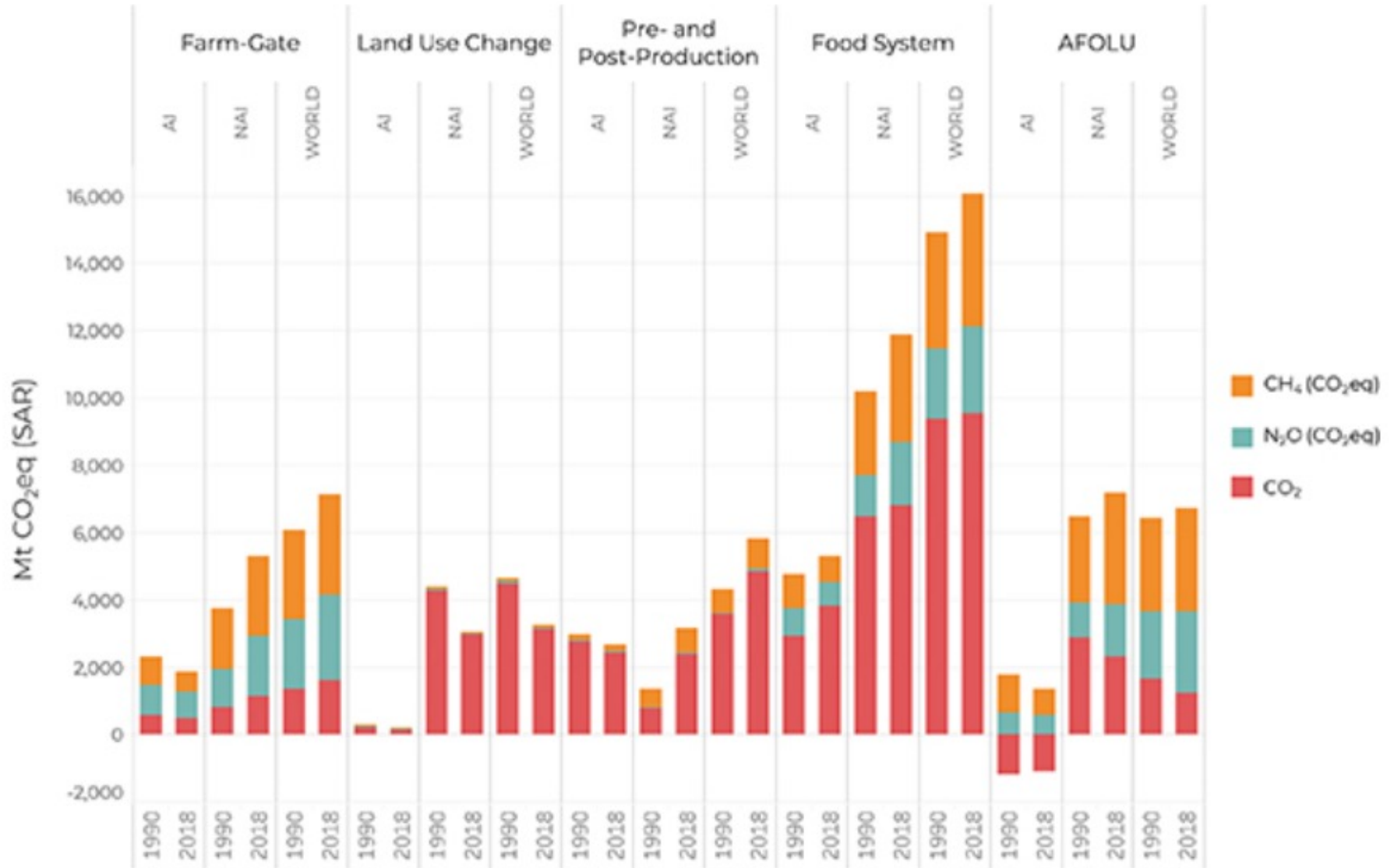
May 24-26, 2022

Key findings and observations:

- Many different modeling groups, but work rarely coordinated
- Many applications select models by familiarity, few direct intercomparisons
- Data sources remain a gap, but multiple opportunities for data-driven evaluation
- Great need for objective, impartial analysis of model capabilities and biases
 - *Could inform policy development*
 - *Points to a critical research agenda oriented toward climate-smart applications*
 - *Need new process and system understanding – tillage, residue, cover crops*

- **There is a bit of a feeding frenzy around new conservation programs and climate-smart best management practices**
 - Farmers have expressed concern that firms are pushing products or agencies are setting regulations out ahead of the science
- **Observations are limited by technical capabilities and by lack of long-term, devoted funding to maintain field stations and surveys critical to understanding long-term greenhouse gas exchanges**
- **Models can help us look beyond observations to understand soil processes, greenhouse gas fluxes, and long-term sustainability of different types of systems**
 - Help us understand benefit side of cost-benefit equation that holds up implementation and makes incentives more efficient
 - Great interest in counter-factual analysis to quantify the benefit of existing practices for early adopters.
 - Ensemble modeling approaches, driven by high-quality data, likely to outperform any individual model.
 - Opportunity to create a collaborative scientific community fostering open modeling systems, iterative improvement and product development
- **Some initial projects underway, e.g., by Bruno Basso, Dave Gustafson, and others**





AgMIP has helped identify a clear need for improved LCA work on agricultural systems

- **Too much reliance on a few models (e.g., GREET)**
- **Many processes represented by empirical coefficients developed on a subset of agricultural systems. Do these hold for:**
 - **Alternative system genetics and management?**
 - **Performance in different geographies?**
 - **Sensitivity of outcomes to climate extremes?**
- **Secondary effects of mitigation interventions is also an area where there is high potential for further analysis (e.g., albedo changes associated with changing land use)**

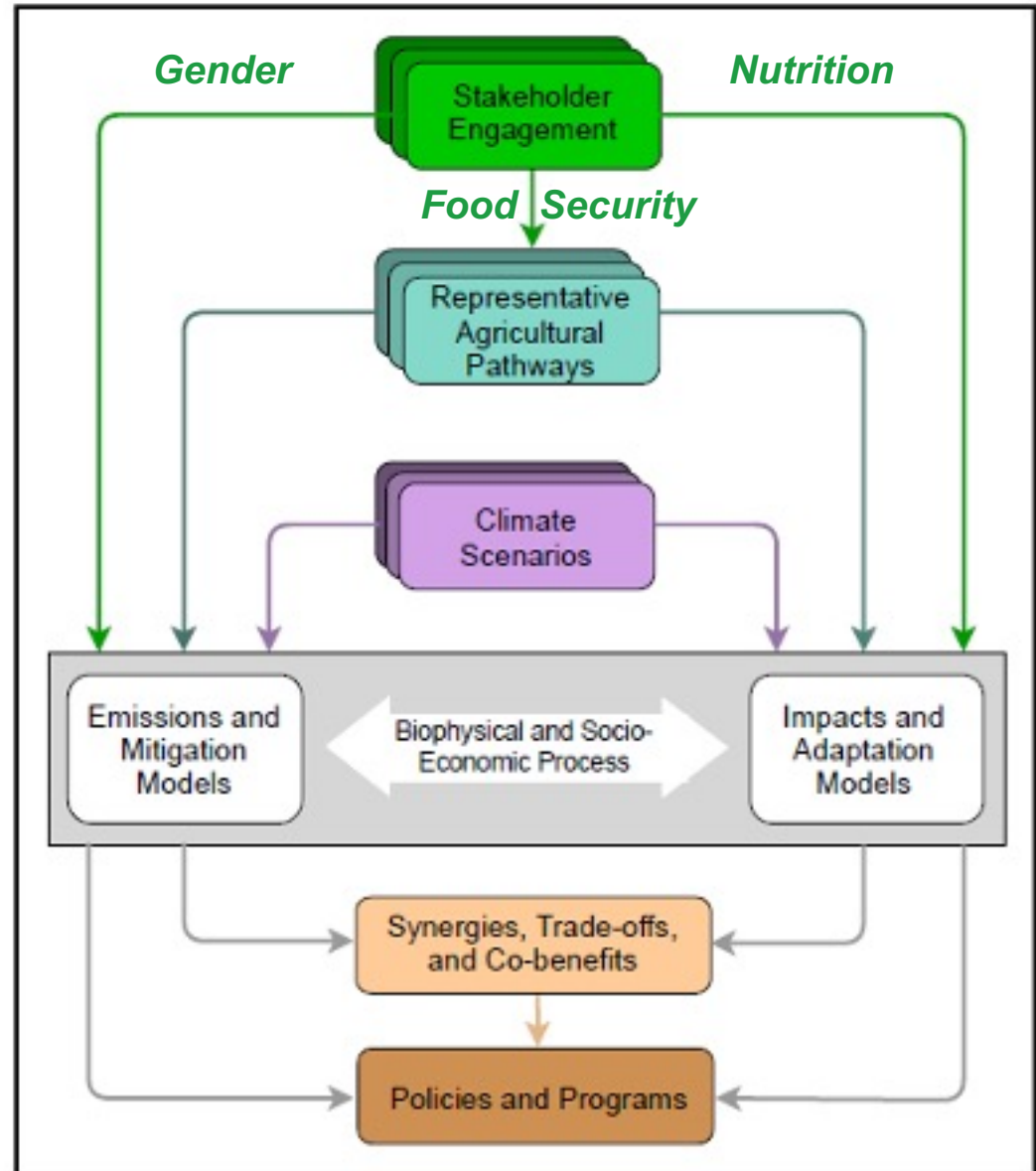
- **Scenarios process currently underway for the Coupled Model Intercomparison Project Phase 7 (CMIP7) and the IPCC 7th Assessment Report (AR7)**
- **Scenarios focus on large-scale pathways for socioeconomic development, population growth, GDP, technology advancement, and international cooperation**
- **Includes some information on Agriculture, Forestry and Land Use (AFOLU)**
 - Needs further elaboration in terms of practices, subsidies, dietary demands, conservation areas

Too often a disconnect between sustainability demands and the incentive structures of farmers, food system stakeholders and consumers.

- Demonstration project underway in Bangladesh
- AgMIP with CIMMYT, BARI, ACIAR, Global Research Alliance and other partners

Focus on rice systems with sustainable rice intensification, alternative wetting/drying, etc.

- Crop and soil/carbon models: ORYZA, DNDC and APSIM + TOA-MD



- **AgMIP has developed protocols for model intercomparison and improvement that could be extended to Ag/Forest GHG modeling**
- **Previous AgMIP activities and the AgMIP US Consortium have identified research gaps and opportunities for multi-model approaches for MMRV and related climate-smart agricultural support**
- **AgMIP is also working on quantifying food system emissions and life cycle analyses that extend beyond the farm gate**
- **AgMIP Tools can help us understand the past, monitor the present, and help prepare for the future**