# AgMIP

The Agricultural
Model Intercomparison
and Improvement Project

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# NEXT GENERATION KNOWLEDGE, DATA AND TOOLS

Agricultural system models provide predictive and assessment capability to a wide range of decision-makers in the private and public sectors. There has been extensive and beneficial research to improve agricultural models – but the fact remains that many of the models used today are the result of investments made 30-40 years ago.

> *The complexity of agricultural challenges facing the nation and the world are such that agricultural data stewardship and advanced tools are needed to enable sustainable production...*

AgMIP has convened internationally renowned and early career experts from around the world for a Next Generation Models Groundwork scoping study, initially funded by the Bill and Melinda Gates Foundation, to review the current state of agricultural system models and to explore possibilities for significantly advancing the way they use data and information technology. *(Papers accessible at agmip.org)*

The complexity of agricultural challenges facing the nation and the world are such that agricultural data stewardship and advanced tools are needed to enable sustainable production that can meet future national and international food, fiber, and bioenergy needs. There is a major gap between the potential value of data collected in agricultural experiments and the value currently obtained through use of those data. Typically, data collected in experiments are used for the original research purpose only. Vastly greater value might be obtained if the data were combined across locations, time, and management conditions so that one could develop or evaluate models against emerging patterns and key distinctions. In this way data could inform decision support systems, assess the benefits of new technologies or management, changes in climate, and trade-offs between productivity gains and environmental risks. AgMIP and USDA have joined to explore concepts for harmonizing agricultural databases and models through the development of a National Agricultural Data Network with harmonized data.

Future agricultural decisions are likely to include increasing linkages among a diverse suite of knowledge products. These will range from mobile technology "apps" to personal computer-based dashboards to online analytical and communication tools to things that have not yet been considered. Discovery processes using 'translational' tools to improve processes of discussion and decision amongst diversely trained and experienced persons are needed to bridge gaps in understanding between researchers and modelers of physical, biological, and social systems. AgMIP is actively contributing support of a range of discussion and decision processes to advance translational tools and increase engagement with decision makers.

With its partners, AgMIP has developed an approach to link harmonized site data with weather, soil, management and phenotype data and is now leading a collaborative effort to design connections also with the genotype data. Combining the genotype and phenotype data for breeding populations grown across multiple locations will allow analysts to quantify effects of specific genes on various phenotypic processes as well as genotype – environment – management (GxExM) interactions.

With hack-a-thons among the technological communities, targeted workshops involving dedicated systems thinkers and coders, 'key-message' discussion forums within stakeholder communities; AgMIP is committed to advance processes and products of discovery. A forthcoming AgMIP Impacts Explorer is in co-development among researchers, technicians, and decision makers. Once complete, it will enable access to information and results from integrated assessments of agricultural systems in Sub-Saharan Africa and South Asia, in modes favorable to decision making in those systems and regions.

## Data into Models



**Locatable**
- Catalog

**Accessible**
- Storage
- Servers
- Network
- Metadata
- Search & download tools

**Machine Readable**
- Standards
- Application Program Interfaces (APIs)

**Usable/ Reusable**
- Ontologies
- Discovery tools
- Computation/ analytic tools
- Models
- Article/data linkage
- Curation

**Reproducible**
- Lab notes
- Assumptions
- Others

*Figure from: Liu*

In an AgMIP Next Generation Models Groundwork scoping study, funded by the Bill and Melinda Gates Foundation, experts from around the world reviewed the current state of agricultural system models and explored possibilities for advancing developments in models, data, and information technology resulting in a set of papers titled "Towards a New Generation of Agricultural System Models, Data, and Knowledge Products", led by the AgMIP Principal Investigators, that will be published in a special issue of *Agricultural Systems.*