

AgMIP Sentinel Site Data and Criteria:

Data for Crop Model Calibration, Evaluation, Improvement and and Climate Impact Assessment

AgMIP will use data at specific sites for calibration, evaluation, and improvement of crop models, which will then be used for regional and global climate impact assessments. The full complement of data that can be used for these purposes requires an intensive and time-consuming series of measurements, which are not readily available for many sites. To address the wide variation in data availability and quality, AgMIP is defining a tiered sentinel site approach, with tiers corresponding to the amount and quality of data available for these purposes (Figure 1).

AgMIP collaborators are encouraged to share their Sentinel Site Data with other AgMIP colleagues, to facilitate a larger group contribution to model improvement and to climate impact assessment. AgMIP has a Database system nearly ready for storing such data and making it publically available. Contact AgMIP Crop Modeling Coordinator Ken Boote (kjboote@ufl.edu) or IT Coordinator Cheryl Porter (chporter@ufl.edu) for more information on how to contribute sentinel site data.

Platinum Sentinel Site Data

Selected ‘platinum sentinel sites’ have adequate data for complete and rigorous point model intercomparisons and this designation represents the top tier of data availability and quality. The use of the platinum sentinel site data for rigorous intercomparison of models provide the strongest scientific basis for understanding differences among models and for improving relationships for more accurate simulations.

Platinum sentinel sites, which are located in different agroecological zones, feature an in-depth set of data for crop model calibration, evaluation, and improvement. These platinum sites have observed data on soil, weather, and management conditions for use as model inputs in addition to observations that include within-growing season measurements such as biomass accumulation and variation in soil water as well as soil and plant nutrient concentrations. At minimum, in-season measurements must include total biomass and grain mass taken at least four times. Ideally, in-season measurements would also include leaf area index and biomass components (leaf, stem, and reproductive organ).

In addition, the platinum sentinel sites contain the minimum dataset (model inputs and observed crop and soil variables) that are determined to be of the highest possible quality (e.g., weather data based exclusively or primarily on observations, soil parameters based on direct measurements rather than pedo-transfer functions). Efforts are also made to acquire complementary data that are not strictly necessary for assessment of crop growth and productivity, but that can be used for evaluation of other simulated biophysical processes (e.g., in-season soil N mineralization rates or rates of crop evapotranspiration).

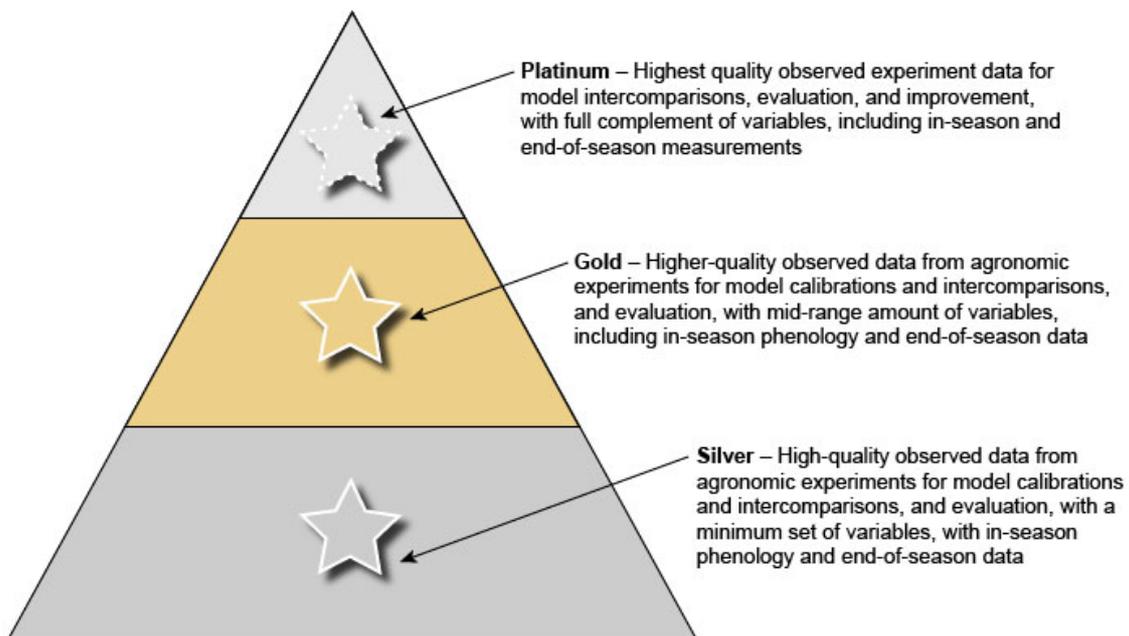


Figure 1. AgMIP Sentinel Site Pyramid.

Gold Sentinel Sites Data

The second-tier ‘gold sentinel sites’ are sites that have the minimum data required for model calibration, operation, and evaluation, but that may lack the breadth of variables or depth of data available in sentinel sites, and may have some data that do not meet the quality standards of platinum sentinel sites. Generally, gold sentinel sites will have observed weather data, observed soils but possibly via pedo-transfer functions, along with crop data including anthesis date, maturity date, and end-of-season biomass and yield. Though gold sentinel sites rely more heavily on end-of-season data for calibration, regions should include some gold sentinel sites that do have some in-season measurements for calibration of cultivars. The lower data requirements for gold sentinel sites will allow for more sites, thus providing greater regional representation for crop model intercomparisons and a more representative foundation for regional projections.

Silver Sentinel Sites Data

At the third-tier ‘silver sentinel sites,’ data are characteristic of many of the yield trials that plant breeders manage. In many of those sites, data are collected on end-of-season yield, maturity date and basic management, such as planting date, irrigation regime, and nutrient applications. At such sites, some input data for model calibration and validation may not be available but can be estimated using nearby weather stations and soil survey data, for example. There are many of these sites operated by national and international institutions as well as the private sector. The potential value of these site data is their greater availability for use across multiple sites and multiple years that could help modelers to calibrate models and/or evaluate their performance across wide areas and wider ranges of temperature and soil water availability.

Silver sentinel site data may be obtained from a variety of sources, and frequently may not be based on direct observation. For example, daily weather data may be obtained from remote sensing, downscaling, or reanalysis products, and soil profiles may be built using the FAO Soil Map of the world, representative profiles from ISRIC-WISE database complemented with generic profile data, or a mixture of these data with some observed data.

Regional Data

In addition to the categorized data from the sentinel sites, AgMIP utilizes various other sources of data for regional climate impact assessments, including soil, weather and management input information that is available for defined spatial units as well as regionally aggregated yields. These data need to include regional estimates of average sowing dates, flowering dates, maturity dates, and regional yield data (FAO, NASS, etc.) as well as typical crop management practices typical of the region.

These data will be used for simulations across space within a region in which different soils, weather, and management practices are used to represent the heterogeneity for scaling up to particular spatial units. Simulations using these data from multiple spatial units will be aggregated to develop regional yield projections. The regionally aggregated crop yield data are used to evaluate and correct for biases between regionally-aggregated crop model simulations and what has been reported at regional scales.

The spatial scales at which these data are available may vary considerably according to the type of data (soil, management, climate, and cropping systems) and sources of data. Simulations using spatially-matched soil and weather data from multiple locations in the region will be aggregated to develop regional projections.
