Toward Interoperability of Observations & Measurements Data in Production Agriculture: AgGateway's Implementation of ISO 19156

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Observations and measurements are the cornerstone of principled decision-making in agricultural field operations. They are the information captured in crop scouting for crop protection, nutrition and harvest; in postharvest grain weight and quality certificates; in soil and manure lab tests; in asset management and telematics (e.g., observing grain bin / dryer conditions); and are also the multiple environmental inputs used to drive irrigation decisions.

The ISO 19156 standard defines a data model for representing various aspects of observations, such as ultimate and sampling features of interest, observed properties, and the procedures used to derive the observation result. However, the standard does not include vocabularies for capturing the myriad specific combinations of these aspects used in agriculture.

AgGateway's global effort toward interoperability identified value in implementing an ISO 19156 – based model of observations and measurements for agricultural field operations. This work, centered on the PAIL, SPADE and ADAPT projects, emphasizes the explicit capture of the semantics of the various aspects of an observation. The work, performed by a group of industry and academic AgGateway participants spanning four continents, includes three major parts:

First, defining a componentized model of the properties of an observation, based on an extensible set of orthogonal vocabularies, which includes representing valid combinations of components. Second, deploying infrastructure, in the form of a RESTful API, to make the componentized variable definitions freely available to industry and the research community; this includes putting into place an ISO 19135-based process for stakeholders to request the addition of vocabularies or entries therein. Third, incorporating observations and measurements into AgGateway's ADAPT common object model and format conversion plug-in architecture, thus enabling widespread interoperability.

The diversity of agricultural sources of observations and measurements makes it challenging to implement a system that is both comprehensive and consistent. The work described here enables growers and their advisers to not only gather the data but to integrate them into their decision-making.

Keywords: measurement; information systems; data collection; ISO standard; software

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