TREE OF TABLES (TOTS): MODEL FOR AGRICULTURAL DATA INTEROPERABILITY

Overview:

The Open Ag Technology and Systems (OATS) Center at Purdue University, with partners across the NAPDC, is advancing a Maximally Interoperable Model (MIM) for agricultural data. Our premise, introduced in recent work on MIMs, is that interoperability is a human-centered property: data are truly interoperable when the time, effort, and specialized knowledge required to use them are minimized for the widest range of current and future users and systems. In agriculture, where decisions span seasons to decades, models also need "staying power." To meet this need, we developed Tree of Tables (ToTs): a simple but rigorous way to publish data as spreadsheets/CSVs (the leaves) organized in a clear folder hierarchy (the tree). The structure carries "traveling context" with files and "ambient context" in the folder structures, making data both human-legible and machine-ready, and aligning with NAPDC's mission to accelerate FAIR, producer-centric, cross-platform innovation.

Outcome and Deliverables:

Over the past year, the team has created an open-source Modus→ToTs conversion pipeline with Shapefile and GeoJSON support and a merge utility that links lab results to sampling locations.



OATSMobile system enables field-scale soil sensing, linking underground data streams with interoperable models

We are building a browser-based soil-health prototype (map + time-slider) that lets producers explore trends in soil properties over time while keeping their data in their own platforms. We presented and published the MIM framework at ASABE 2024 (DOI: 10.13031/aim.202401184), and our ToTs model was selected for presentation at CANVAS 2025, underscoring ToTs as a solid approach to interoperability across crops, soils, and environmental data.

Resources and Tools:

All ongoing work is available via the MODUS/ToTs GitHub repository. Public release, accompanied by tutorials and a virtual roundtable for feedback and collaboration, is planned for the upcoming period.