**NCSRP "Using data-driven knowledge for profitable soybean management systems" Project Progress Report**

We held a project meeting in San Antonio TX, on November 11-13, 2024. We discussed project progress, objectives, outputs, and logistics. During the duration of the project (2022 - 2024) we scouted the following number of fields per state: IA (48), MI (16), MN (3), NE (30), ND (12), OH (11), WI (37), PA (83), IL (3), IN (24), KA (1), NY (1) for a total of 269 fields. This data will serve as ground truth for subsequent analysis based on remote sensing data. Additionally, we aim to collect data from at least 332 fields with between-season data. This is currently an ongoing task for the team.

One objective of the project is the development of a script to allow real-time monitoring of fields with satellite images to detect areas potentially linked with low yield. By utilizing the well-established relationship of normalized vegetative index (NDVI) and yield, (low NDVI values are associated with reduced chlorophyl content and therefore, reduced productivity), we will be able to detect the potentially problematic areas within each field and notify growers every 7-10 days or whenever the next cloud-free image will be available. The attached (Figure 1) is an example of the result of the script for four different NDVI thresholds.
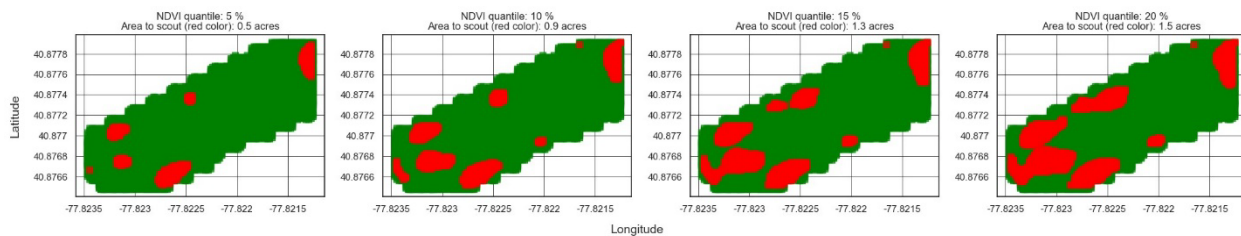
We are finalizing the three major functions in the Open Crop Manager (OCM) platform; scouting reports (Image 2), field registration, and the production survey, to maximize data quality and ease of use for farmers. Data security features will continue to be developed to combat emerging threats, and privacy policy notices have been implemented to help farmers manage their data appropriately. The OCM platform includes 32 pests, 38 diseases, 48 weeds, and 28 abiotic issues. Development of value-added features such as a disease diagnostic tool, stressor occurrence alerts, and comprehensive field summaries is ongoing, with the diagnostic aid tool and comprehensive field summaries (Image 3.) scheduled to be launched in spring of 2025. The OCM mobile application, which allows off-line reports in more remote regions, is currently in beta testing and is scheduled to launch in spring of 2025. In the meantime, the OCM browser version (found at open-crop.vmhost.psu.edu) will remain optimized for mobile use, with the option of using Epicollect5 for offline mobile reporting. Since 2022, we have collected 10,034 scouting observations and reports. The scouting tool also resulted in the collection of 10,069 images, which we will use to develop new algorithms for image assessment.

Project PIs Dr. Shawn Conley (WI) and Dr. Paul Esker (PA), Dr. Santosh Sanjel (PA), John Gaska (WI), and Dr. Spyridon Mourtzinis (WI), will supervise data collection and will be responsible for quality control of the data. The WI-PA core team retrieves soil, satellite, and weather information for each field each year from existing databases. The WI-PA core team holds bi-monthly virtual meetings to discuss and monitor project progress.

We have also developed a novel tool that allows real-time monitoring of fields with satellite images to detect areas, potentially linked with low yield. Information derived from this tool can result in increased farm profit. A "beta version" of the online tool will be ready for in-depth, extensive validation in the 2025 growing season following project completion. We will also strengthen state-to-state research collaboration through the managed coordination of the on-farm network. The potential impact of the outcomes derived from this study is significant, including helping farmers adopt new approaches and understand the effect of management decisions on soybean yield and profitability.

The development of the tools proposed in this project should prove of significant value to producers as it can result in increased efficiency. Additionally, as a bonus, they will recognize the value of participating in such efforts and further promote the value of this research by showcasing its benefits.