NATIONAL CONSORTIUM FOR REMOTE SENSING EDUCATION, RESEARCH, AND APPLICATIONS

IndianaView

PROJECT FACT SHEET

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Integration Between Remotely Sensed Data and Crop Simulation Models to Optimize Nitrogen Fertilization at the Field Scale

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Background: Nitrogen (N) fertilizer is one of the largest expenses for farmers, and its application is critical for improving final corn yield. Precision Nitrogen Management (PNM) is a research area that aims to match N fertilizer supply with crop N demand in both space and time.

A recent major advance in PNM is the development of the strategy: remote sensing and calibration strip-based PNM for corn (Miao, 2021). This new PNM technology (Figure 1) calculates site-specific N fertilizer rates based on high spatial (3 m per pixel) and temporal (daily) resolution satellite images. Preliminary data shows that this technology has the potential to significantly improve corn growers' nitrogen (N) use efficiency and reduce N losses (Miao, 2021).

Ongoing project: Purdue and the University of Minnesota are conducting on-farm trials in Indiana and Minnesota to systematically evaluate the new PNM technology in comparison with farmers' current practices. Six field experiments are being conducted in Indiana in 2021 (Figure 2).

Objectives: Overall, the main objective is to determine the agronomic, economic, and environmental benefits of the new PNM technology under diverse on-farm conditions. The specific objectives are:

- Identify and quantify spatial variation in crop growth during the growing season using remote/proximal sensing.
- Assess and quantify temporal variation in crop growth within a field using crop growth models.
- Integrate remote/proximal sensed data with crop simulation models to assess the new PNM technology.

Work completed in Indiana:

- PNM technology adapted to six locations in Indiana.
- Soil and plant samples collected at key growth stages.
- Weekly remote (satellite and drone imagery) and proximal (chlorophyll) sensed data.

The funds from the Indiana View scholarship were invested on Ana's participation in the DSSAT 2021 International Training Program (Georgia, USA). Funds were invested on equipment (partial payment of laptop) for the training. Ana got familiar with computer models for the simulation of crop growth and yield, soil, and plant water, nutrient, and carbon dynamics and their application to real-world problems.

On-farm experiments will be conducted for three crop growing seasons (2021-2023).

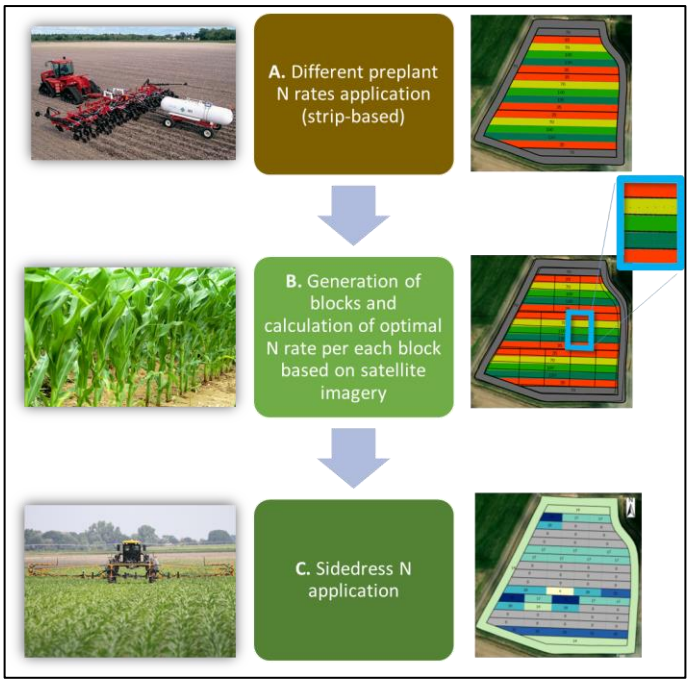

Figure 1. Workflow of the remote sensing and calibration strip-based Precision Nitrogen Management (PNM) for corn.

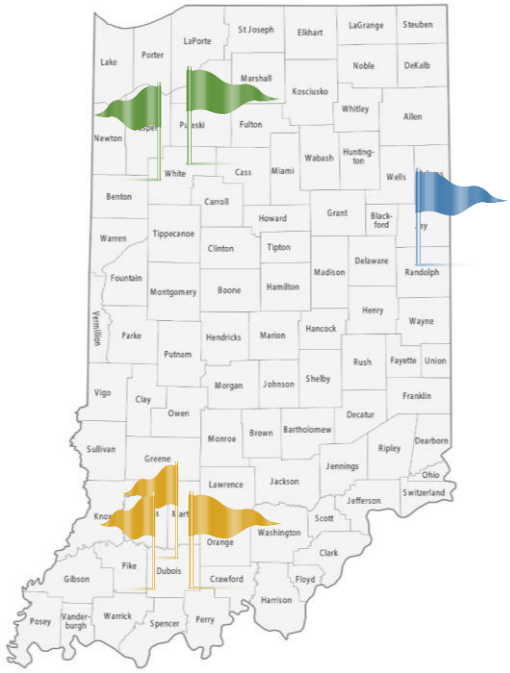

Figure 2. Distribution of six field experiments conducted in Indiana during the crop growing season 2021. Counties: White (green flags), Randolph (blue), and Dubois (yellow).

FOR FURTHER READING:

Miao, Yuxin. "On-Farm Precision Ag Research Update: In-Season Site-Specific Side-Dress Nitrogen Rate Recommendations for Corn," 2021. https://blog-crop-news.extension.umn.edu/2021/06/on-farm-precision-ag-research-update-in.html.