Pilot Project – Digital Twin for Smart Farming

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Pilot Project – Digital Twin for Smart Farming

Digital Twins for In-season Precision Crop Management

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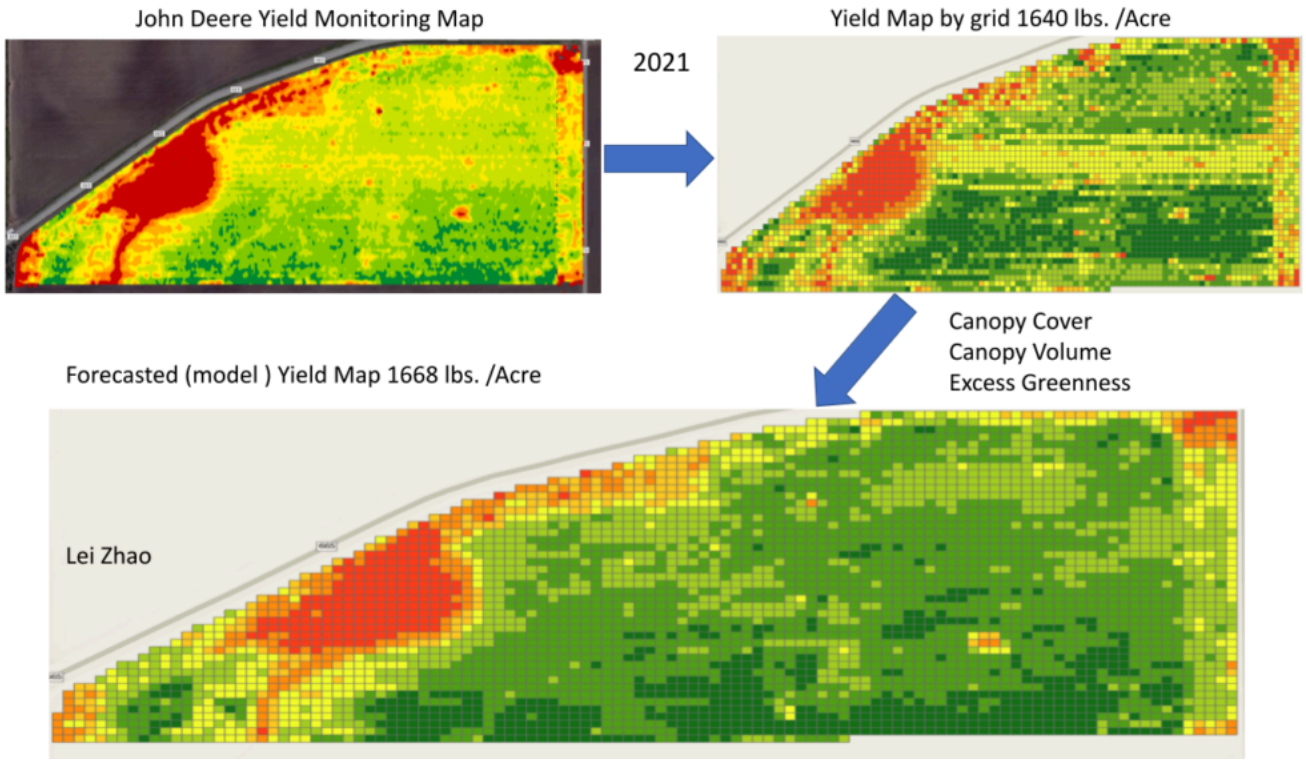

Big data analytics in crop management are increasingly becoming a central topic of research. A recent NSF report stated, “The growing availability of data presents an opportunity to improve the resilience and efficiency of food and agriculture production on a scale unimaginable even one decade ago”. The National Institute of Food and Agriculture (NIFA) recognized these tendencies and initiated research on big data analytics, machine learning, artificial intelligence, and predictive technologies to develop digital agriculture tools and keep US agriculture competitive.

Digital Twins are expected to enhance production systems by increasing input use efficiency and profitability while reducing agriculture’s environmental footprint. By providing growers and scientists tools to monitor and predict fields’ conditions we can inform important in-season decisions on crop management. Examples include, but are not limited to, planting (or replanting), growth regulators, irrigation, weeds, disease and insect protection, fertility, and harvest aids. We envision integrating engineering and data analytics by leveraging multidisciplinary collaboration

between scientists with expertise in 3D scene modeling, geospatial data science, big data analytics, crop physiology, agronomy, socioeconomics, marketing, and extension to enhance the predictive power of farmers for real to near time informed decisions.

During the first year, our team will use Cotton as a target crop to demonstrate the feasibility of the proposed DT for smart farming. Cotton is particularly suitable because its undetermined, perennial growth habits present a challenge to producers in managing the balance between vegetative and reproductive growth, leading to crop maturity, yield, and fiber quality. However, the concepts outlined here can be readily transferred to other cotton-producing states and adapted to other crops such as soybean, corn, wheat, sorghum, tomatoes, potatoes, spinach, forages, and others. We will apply the data-driven models to new regions and crops in year 2 and beyond.