Forecasting and Assessment of Cropping Systems in Northwest Iowa

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Introduction

In 2016, the Forecasting and Assessment of Cropping sysTemS (FACTS) project continued with the objective of forecasting in-season soil water-nitrogen dynamics, in-season plant growth, and end-of-season grain yields. This concept was initiated to help farmers and agronomists make in-season management decisions, plus look back on the growing season to see what management practices could have been changed to improve grain yields and net profits, but also reduce nitrogen loss.

Materials and Methods

This project combines the use of the Agricultural Production Systems sIMulator (APSIM) cropping systems model, the Weather Research and Forecast (WRF) model, and in-field data collection. Forecast simulations were based on current year weather up to the date of the simulation, followed by a 10-day weather forecast, and then a 35-year weather file to the end of the season. In-field data were collected from both corn and soybean planted at two dates. The corn was planted May 7 and June 1 with Pioneer hybrid P0506 at 35,000 seeds/acre. A nitrogen application rate of 150 lb N/acre was applied approximately 20 days after planting. The soybean was planted May 7 and June 1 with Pioneer line P22T61R at 140,000 and 136,000 seeds/acre, respectively, in 30-in. rows. In-field data collection included crop staging, soil temperature and moisture, soil nitrate-nitrogen, crop biomass, and grain yield. The in-field data collection was used to validate the forecast simulation.

Results and Discussion

The results illustrate the simulated median yield (50% probability) at crop emergence was a good proxy of the final simulated yield for the early planted corn. However, it underestimated yields for the late-planted corn and both soybean planting dates (Figure 1). In all four systems, there is a lot of uncertainty (10% and 90% probability). Near the time of pollination, the uncertainty of corn yield predictions for corn significantly decreases. For soybean, the uncertainty of yield predictions decreased during the grain filling period rather than at flowering.

Acknowledgements

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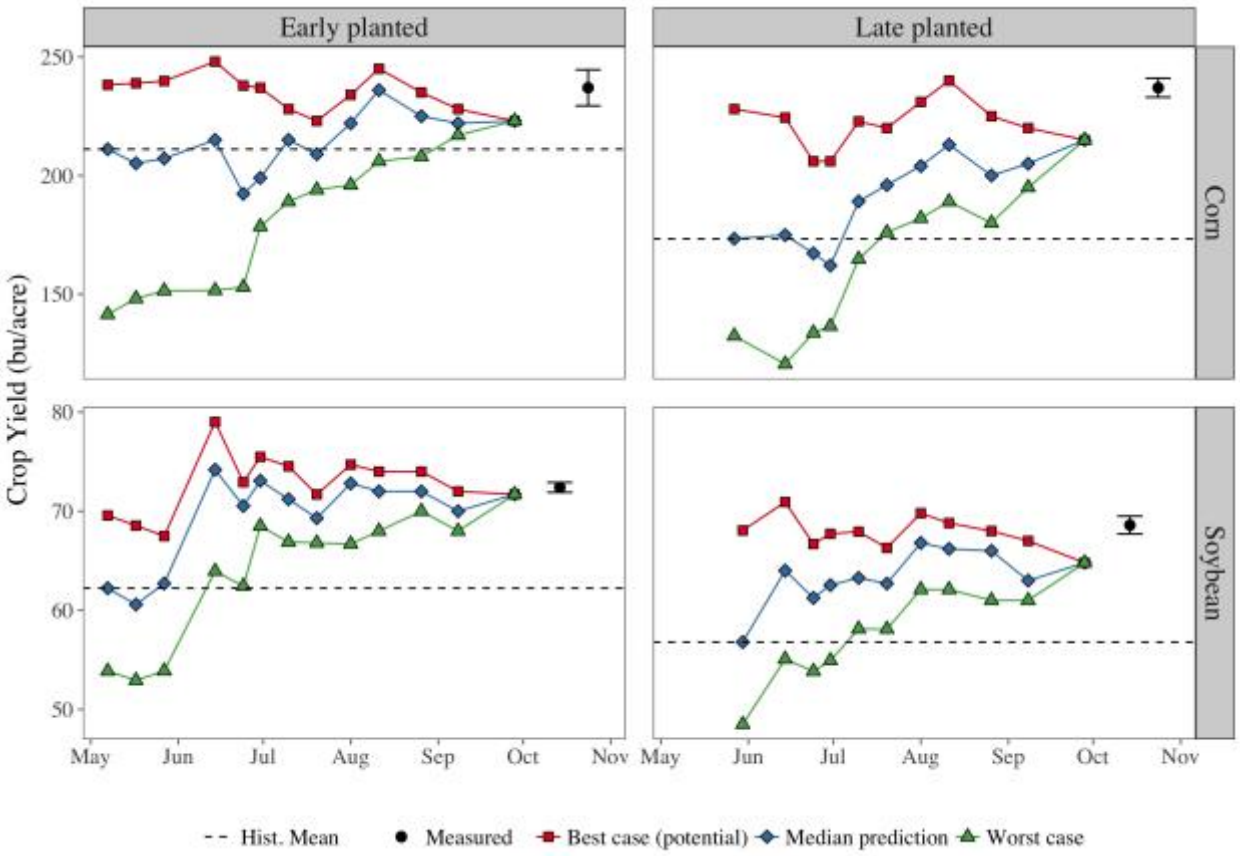

Figure 1. FACTS yield predictions of corn grain yield over the 2016 growing season. Green triangles, blue diamonds, and red squares show the probabilities of yield being above that level. Combine-measured (black circle) yields also are shown with error bars.