Forecasting and Assessment of Cropping Systems in Northwest Iowa

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Introduction

In 2017, 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 April 24 and May 7, 2017, with P0157AMX at 35,000 seeds/acre. A nitrogen application rate of 150 lb N/acre was applied April 17, 2017. The soybean was planted May 8 and May 25, 2017, with P22T69R at 140,000 seeds/acre in 30-in. rows. In-field data collection included crop staging, soil temperature and moisture, soil nitrate-nitrogen, crop biomass, root length, and grain yield. The in-field data collection was used to validate the forecast simulation.

Results and Discussion

The results illustrate both early and late planting dates obtained similar biomass dry matter production and grain yield for both corn and soybean (Figure 1). Final yields for corn were 185.6 and 187.2 bushels/acre for the early- and late-planting dates and soybean yields were 64.8 and 57.8 bushels/acre for the early- and late-planting dates. The similar yield values for corn are due to only a few days difference in planting date.

Root growth was most likely not restricted by the water table in 2017. For corn, the water table was at 2 ft near the time of planting, and gradually declined below the depth of the well installation (Figure 2). The groundwater began to rise again with rainfall after crop growth had ceased.

Acknowledgements

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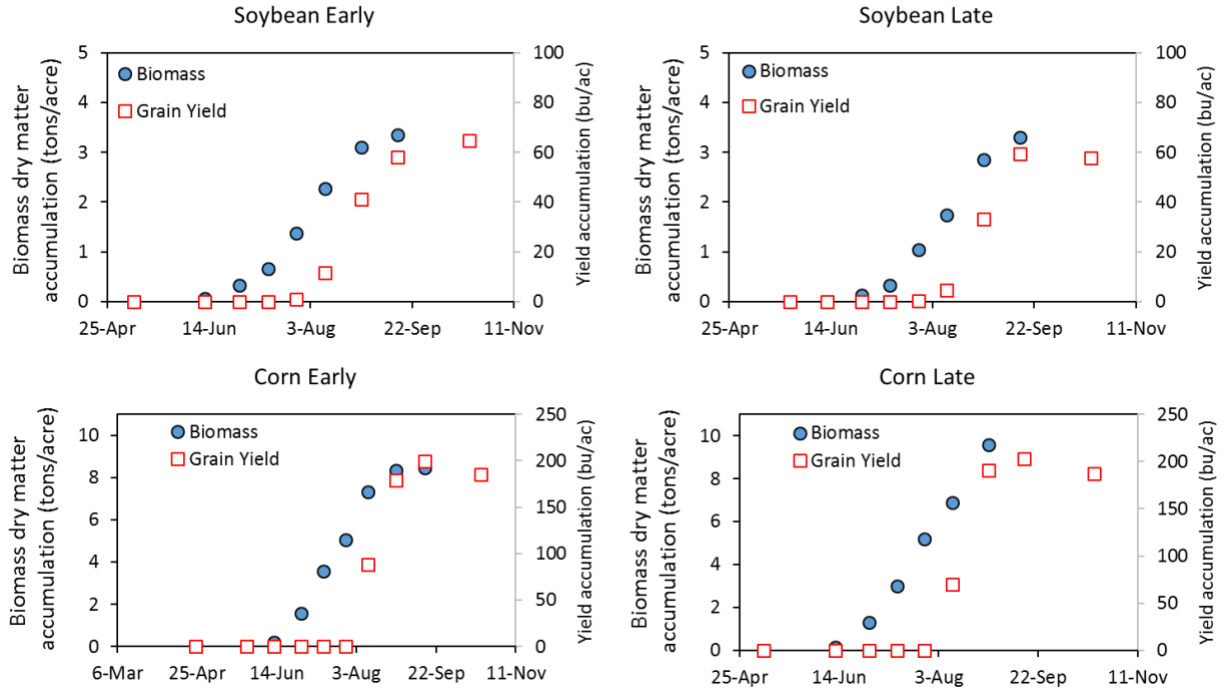

Figure 1. Soybean (top panels) and corn (bottom panels) biomass and grain yield for early (left panels) and late (right panels) planting dates in 2017.

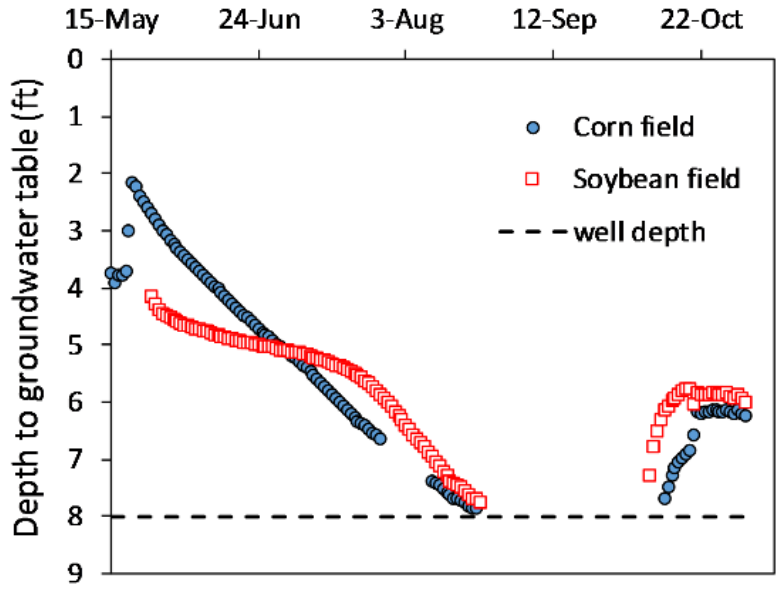

Figure 2. Water table depth with a well depth of 8 ft as indicated by the horizontal dashed line.