Forecast and Assessment of Cropping Systems in Northeast Iowa

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Introduction

In 2018, the Forecast 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 review the past 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, historical, current, and Climate Forecast System (CFS) forecasted weather data, and in-field data collection. Forecasts were initiated at planting and updated every 10 days. To validate the forecast simulations, in-field data were collected from 1-acre corn and soybean plots from the water quality drainage experiment. In these plots, corn hybrid Pioneer P0157AMXT (101 day CRM) was planted May 17, 2018, at 33,674 seeds/acre in 30-in. rows, and fertilized with 150 lb N/acre applied June 1, 2018, as urea-ammonium nitrate. Soybean variety Pioneer 21A28X (2.2 MG) was planted May 17, 2018, at 200,000 seeds/acre with a 10-in. grain drill.

Results and Discussion

Corn yielded 243 (± 2.4) bushels/acre and soybean yielded 69.3 (± 1.6) bushels/acre, both of which were close to long-term averages. Both the corn and soybean yields were higher than the statewide average yield for FACTS.

In 2018, both water and nitrogen uptake were greater than normal early in the growing season (Figure 1), despite an overall cooler season (Figure 2). High early-season temperatures and ample water availability supported high evapotranspiration and nitrogen uptake. The water table was at approximately the 3-ft soil depth at planting and remained there until July. After several rains starting in late August, it rose dramatically, which contributed to wet soils making a timely harvest challenging.

Acknowledgements

This was a collaborative project involving many faculty, staff, and students, but especially Ken Pecinovsky, farm superintendent, who was instrumental in the success of this project.

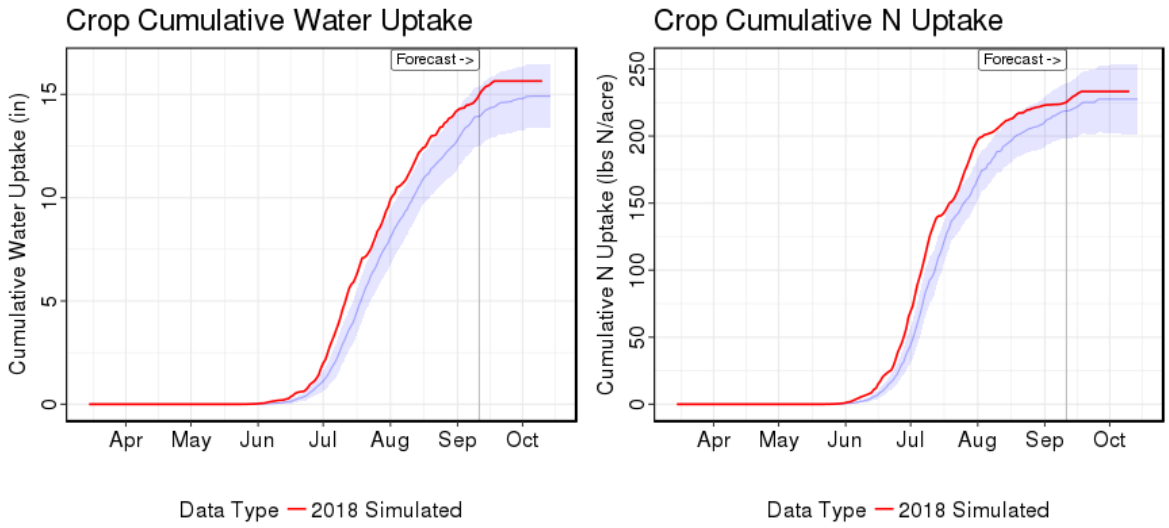

Figure 1. 2018 crop (corn) water and N uptake summary. NOTE: Corn water and nitrogen uptake were above average, driven largely by weather conditions in June. Figure taken from Iowa State University's FACTS website (https://crops.extension.iastate.edu/facts/).

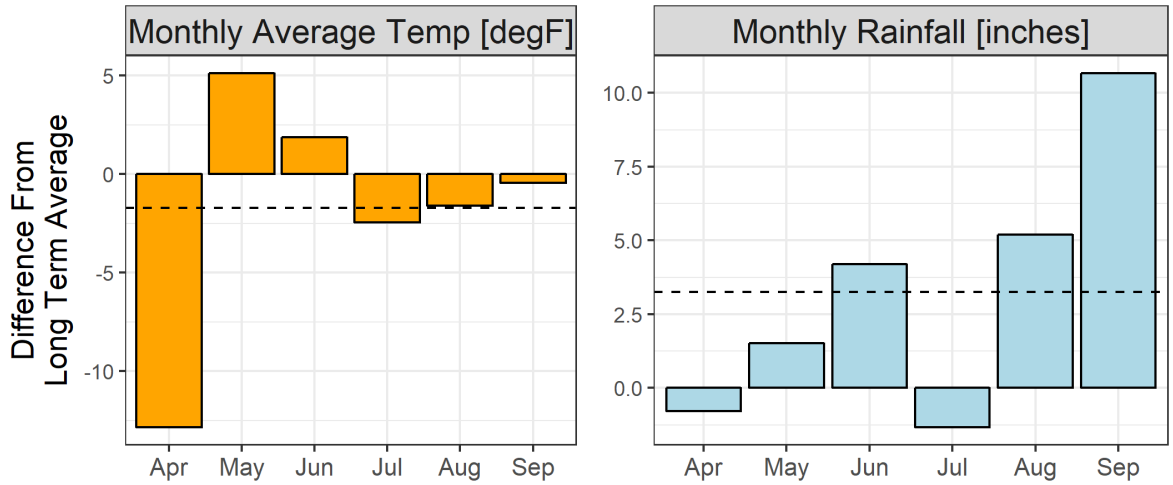

Figure 2. 2018 monthly (Apr-Sep) temperature and rainfall summary. NOTE: The 2018 growing season was cooler than the long-term average (dotted line = growing season average) with the exception of May and June and had higher than average precipitation (dotted line = growing season average).