Forecast and Assessment of Cropping Systems in South Central 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. Forecast simulations were validated with in-field data collected from corn and soybean. Corn (P1197AM) was planted April 25, 2018, at a seeding rate of 33,500 seeds/acre following soybean, with plots fertilized at three differing nitrogen rates: 0, 150, and 300 lb N/acre, with three replications. Soybean (P36A18X) was planted April 30, 2018, at a seeding rate of 149,000 seeds/acre following corn. Both crops had 30-in. row spacing.

Results and Discussion

Combine yield for corn was 180, 198, and 206 bushels/acre at 15 percent moisture for N rates of 0, 150, and 300 lb N/acre, respectively. Soybean combine yield was 57 bushels/acre at 13 percent moisture.

The 2018 growing season started with a wetter and warmer-than-average May and June. Midsummer saw closer-to-normal temperatures but had a drier July. Precipitation amounts picked up toward the end of the season, leading to almost double the amount of rainfall typically seen in September (Figure 1). The influence of precipitation for this season is reflected in the site's water table record (Figure 2). The drier July is especially prominent with the steady drop in the water table. Measured values of soil nitrate were as expected per plot application rates (Figure 3). APSIM modeling was able to capture and predict measured data well (data not shown).

Acknowledgements

This was a collaborative project involving many faculty, staff, and students. A special thanks to Pioneer for providing seed and Iowa Soybean Association and Foundation for Food and Agriculture Research for financial support.

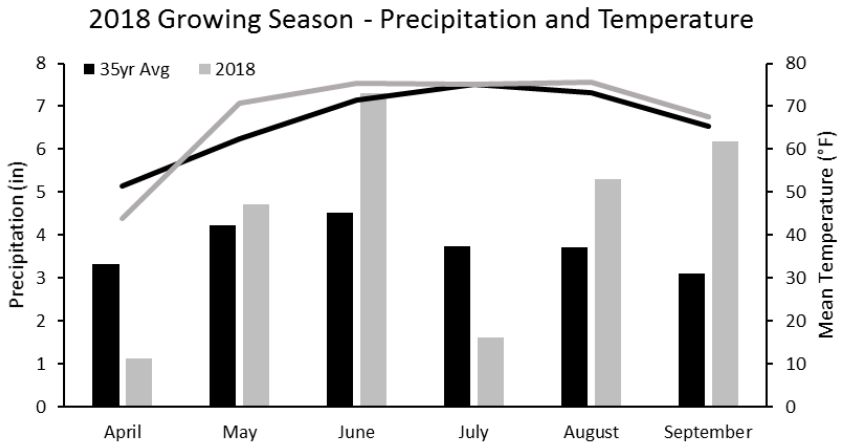

Figure 1. Monthly rain totals (grey bars) and mean monthly temperature (grey line) for the 2018 growing season compared with the 35-year average monthly rain (black bars) and mean temperature (black line).

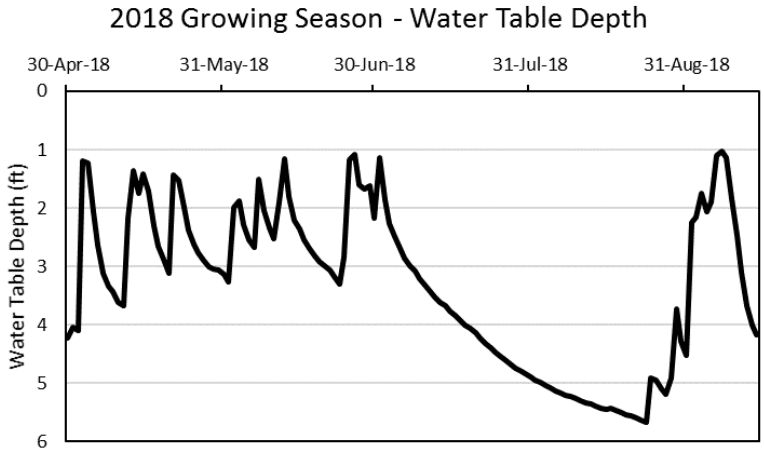

Figure 2. Water table depth from the surface (ft) for the 2018 growing season.

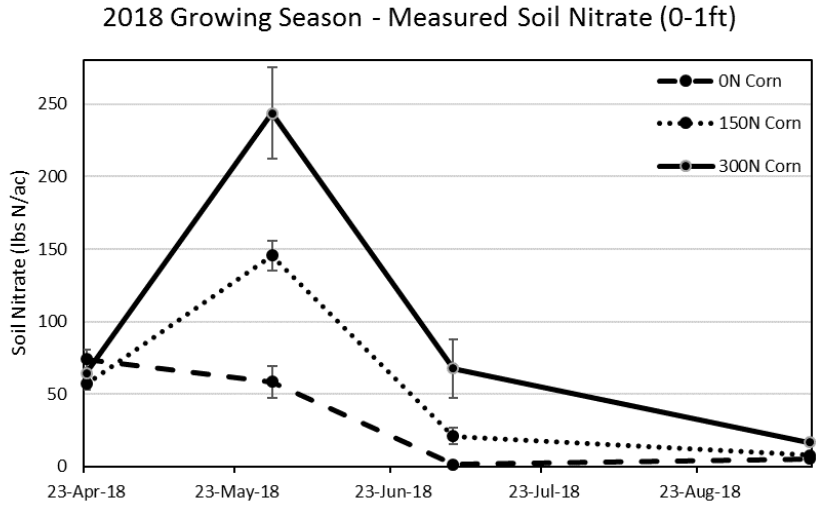

Figure 3. The 0-1 ft soil nitrate measurements for the 2018 growing season. Measurements were taken in the corn plots with varying N applications. Bars indicate error.