Forecasting and Assessment of Cropping Systems in North Central Iowa

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Introduction

In 2018, 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 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 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. In-field data were collected from both corn and soybean. Soybean plots followed a single treatment meant to replicate typical management practices of that area. Corn plots were planted following soybean and broken into three replications of three differing nitrogen rates 0, 150, and 300 lb N/acre. Corn planting occurred May 18, 2018 at a seeding rate of 35,000 seeds/acre. In all plots, pesticides were applied as necessary to ensure pests as a non-limiting factor.

Results and Discussion

Combine yield per nitrogen rate of 0, 150, and 300 were 113, 178, and 184 bushels/acre (Table 1). The amount of precipitation during the growing season was a persistent issue with excess precipitation during the spring and a deficit during pollination. The wet spring delayed planting until mid-May. In July, when the crop was flowering, there was 37 percent less precipitation than normal.

Higher nitrogen rates did show a positive impact on yield and also had a substantial effect on soil nitrate distribution and nitrogen loss. It is important to note the 3.3 in. of rainfall that occurred June 20 resulted in 6.3 to 75 lb N/acre leaching from the 0-1 ft soil depth to subsequent layers (Figure 1). Rainfall June 24 (1.1 in.) caused additional leaching of 1.9 to 27 lb N/acre from the 0-1 ft soil depth. Subsequent rainfall August 20 (2.93 in.) had much less nitrogen leaching (2.9 to 10 lb N/acre) because the amount of topsoil nitrate was at low levels.

Acknowledgements

This was a collaborative project that involved many faculty, staff, and students, but especially Matt Schnabel.

Table 1. Corn and soybean grain yield, yield components, harvest index, and leaf area index for the 2018 growing season.

	0 lb N/acre	150 lb N/acre	300 lb N/acre
Yield (bu/acre)	113	178	184
Kernel number/ear	432	546	561
Kernel weight (g)	0.23	0.25	0.26
Harvest index	0.54	0.59	0.58
Maximum leaf area index	4.14	4.46	4.71

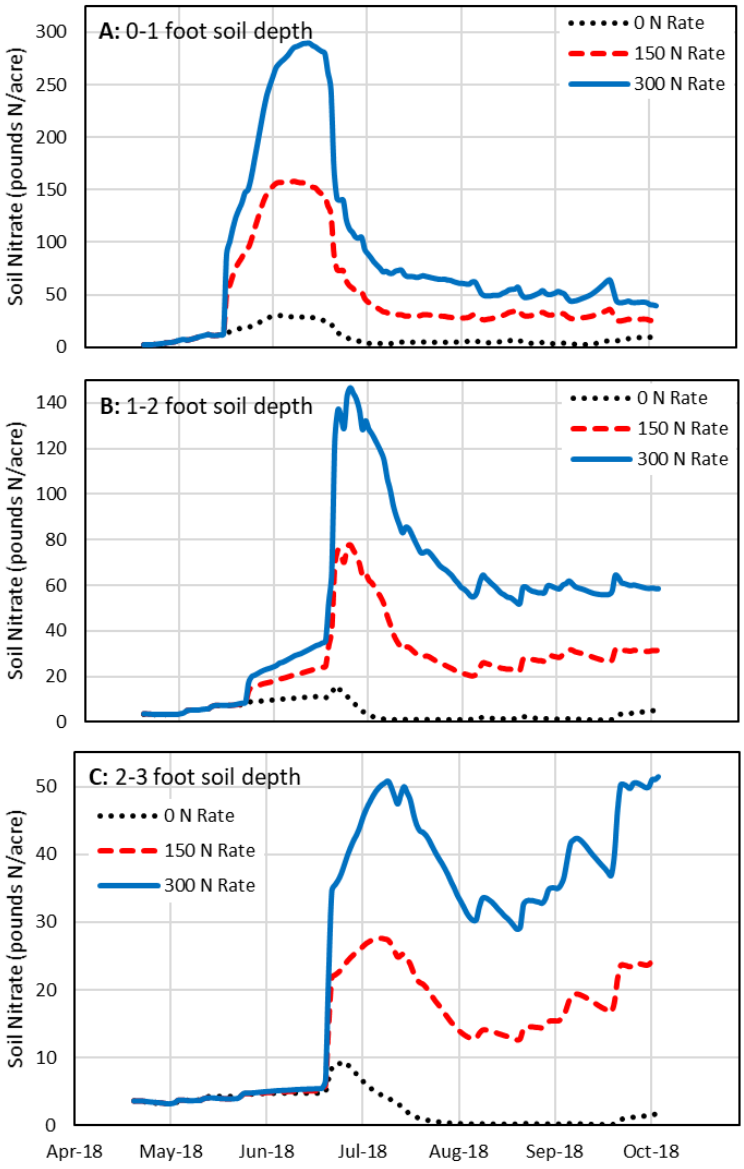

Figure 1. Soil nitrate for three soil depth layers (top, 0-1 ft; middle 1-2 ft; bottom 2-3 ft) for FACTS nitrogen rate trial at Kanawha, Iowa, 2018.