

Forecasting and Assessment of Cropping Systems in Northwest 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 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. In-field data were collected from both corn and soybean planted under high- and low-management regimes. High- and low-management plots received a spring application of 150 lb N/acre. The high-management plot received weekly irrigation during July and August, along with an additional application of 100 lb P/acre, 100 lb K/acre, 30 lb S/acre, and a mid-season N application of 75 lb N/acre.

Results and Discussion

The results show a significant difference between management systems for grain yield (Table 1). Combine yields for corn at 15 percent moisture were 264 and 228 bushels/acre. Soybeans at 13 percent moisture were 70 and 64 bushels/acre for high- and low-management, respectively. The higher yields for corn were due to a higher grain weight and greater leaf area index (Table 1).

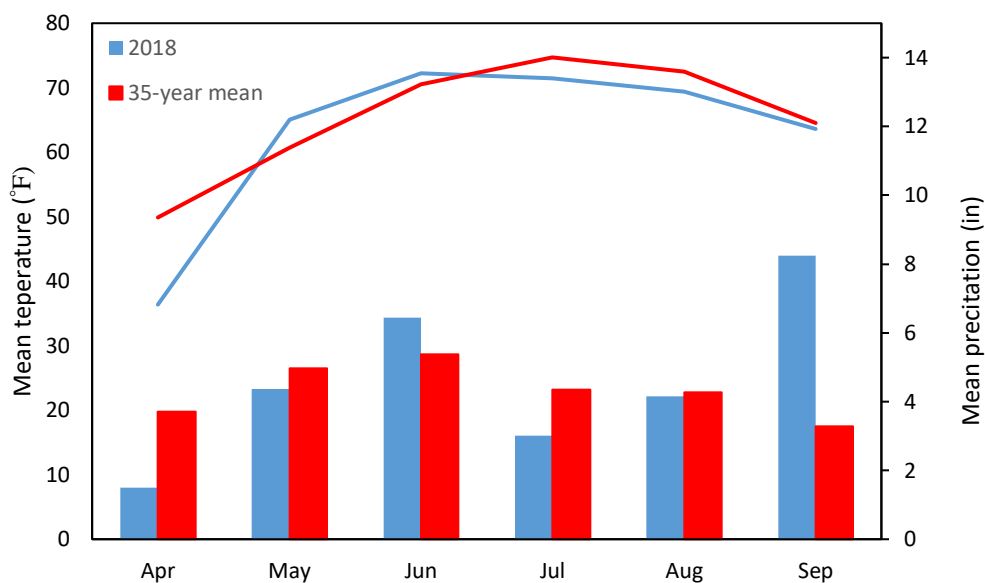
In terms of weather, the 2018 season was 12°F below normal in April followed by a sharp increase in temperature. This warmup increased crop growth, water uptake, and N uptake. The months of July and August had less rainfall than the 35-year mean (Figure 1). Irrigation during this time supplied adequate soil moisture during silking and lowered canopy temperature during grain fill. This along with the additional nutrients explained the yield difference between the high- and low-management treatments.

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

		High management	Low management
Corn	Yield (bushels/acre)	264	228
	Kernel number/ear	500	540
	1,000 kernel weight (g)	302	279
	Harvest index	0.58	0.56
	Maximum leaf area index	6.12	4.58
Soybean	Yield (bushels/acre)	70	64
	1,000 seed weight (g)	177	174
	Harvest index	0.3	0.32
	Maximum leaf area index	5.76	6.22

**Figure 1. Mean monthly precipitation (bars) and temperature (lines) for the Northwest Research Farm, Sutherland, IA, for 2018 and the 35-year mean.**