2007

Seasonal and Rotational Influences on Corn Nitrogen Requirements

John E. Sawyer
Iowa State University, jsawyer@iastate.edu

Daniel W. Barker
Iowa State University, dbarker@iastate.edu

Seasonal and Rotational Influences on Corn Nitrogen Requirements

Abstract
This project was designed to study the nitrogen (N) fertilization needs in continuous corn (C-C) and corn rotated with soybean (C-S) as influenced by location and climate. Multiple rates of fertilizer N were spring applied, with the intent to measure yield response to N within each rotation on a yearly basis for multiple years at multiple sites across Iowa. This will allow the determination of N requirements for each rotation practice, differences that exist between the two rotations, responses to N applied across different soils and climatic conditions, and evaluation of tools used to adjust N application.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

Seasonal and Rotational Influences on Corn Nitrogen Requirements

John E. Sawyer, associate professor
Daniel Barker, assistant scientist
Department of Agronomy

Introduction

This project was designed to study the nitrogen (N) fertilization needs in continuous corn (C-C) and corn rotated with soybean (C-S) as influenced by location and climate. Multiple rates of fertilizer N were spring applied, with the intent to measure yield response to N within each rotation on a yearly basis for multiple years at multiple sites across Iowa. This will allow the determination of N requirements for each rotation practice, differences that exist between the two rotations, responses to N applied across different soils and climatic conditions, and evaluation of tools used to adjust N application.

Materials and Methods

The first year of this research at the Armstrong Research Farm was 2001. The study area was soybeans in 2000. Therefore, in the initial year all yields followed soybean. The two rotations, C-C and C-S, were initiated in 2001. The soil at this location is Marshall silty clay loam.

Tillage is fall chisel and spring disk/field cultivation before planting. Rates of N applied to corn were 0 to 240 lb N/acre in 40 lb increments. Urea fertilizer was the N source and was broadcast and incorporated before planting. No N was applied with the planter. The farm superintendent chose the corn hybrid and soybean variety. Pest control practices were those typical for the region and rotation. Soil was sampled for routine soil tests; and phosphorus, potassium, and lime were applied as called for by the soil tests.

Corn and soybeans were harvested with a plot combine. Yields were corrected to standard moisture.

Results and Discussion

In 2006, corn productivity was exceptionally high, with yields near those in 2004. Grain yield responded positively to N applied in each rotation (Figure 1). Calculated economic optimum N rates (EONR) from fitted response equations were 119 lb N/acre in the C-S rotation and 140 lb N/acre in the C-C rotation. The corn yield at the EONR was 5 bushels/acre higher in the C-S rotation (237 vs. 232 bu/acre). For the past five years, corn yield averaged 8% higher in the C-S rotation. Figure 1 shows the variation in yield and N response for the rotations across years. The EONR has averaged 37 lb N/acre higher in C-C than C-S and has been fairly consistent within each rotation despite large differences in corn yield. The EONR has been higher the last two years than the previous three years. Soybean yield in the C-S rotation averaged 63 bushels/acre in 2006 and was not influenced by previous year's N application to corn.

This study will continue, and the best value will occur after the accumulation of multiple years of data. The results presented in this report are not meant to represent N recommendations. They do, however, represent response to N fertilization for the specific years and rotations at this site.

Acknowledgments

Appreciation is extended to Bernie Havlovic, Jeff Butler, and the Armstrong Research Farm staff for their assistance.

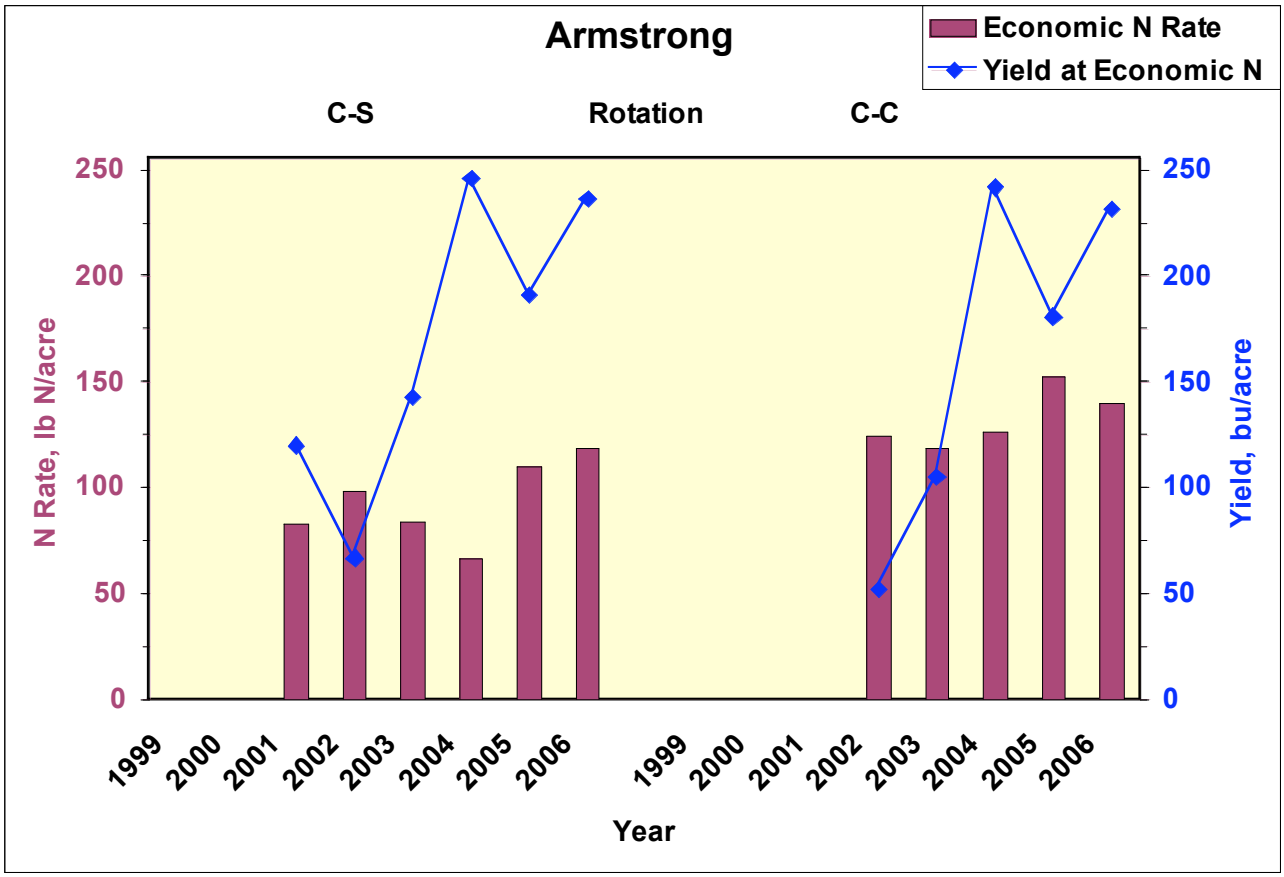

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Armstrong Research Farm, 2006. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).