2008

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 N fertilization needs in continuous corn (CC) and corn rotated with soybean (SC) as influenced by location and climate. Multiple rates of fertilizer N are 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, differences that exist between the two rotations, responses to applied N 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 N fertilization needs in continuous corn (CC) and corn rotated with soybean (SC) as influenced by location and climate. Multiple rates of fertilizer N are 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, differences that exist between the two rotations, responses to applied N 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 Northern Research Farm was 2005. The study area was cropped to soybeans in 2004. Therefore, in the initial year all yields follow soybean. The two rotations were initiated in 2005. The soil at this location is Canisteo clay loam.

Tillage is fall chisel plowing 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 is the N source and was broadcast and incorporated with secondary tillage before planting. No N is applied with the planter. The farm superintendent chose the corn hybrid and soybean variety. Pest control practices are those typical for the region and rotations. Corn and soybeans were harvested with a plot combine. Yields were corrected to standard moisture.

Results and Discussion

In 2007, grain yield responded positively to applied N in each rotation (Table 1 and Figure 1). This is the second year for comparative yields and N response between the two rotations. In 2007, the calculated economic optimum N rates for the SC and CC rotations were 100 and 103 lb N/acre, respectively. Corn in the CC rotation yielded 64 bushels/acre less compared with corn following soybean, and for some unknown reason yields did not increase as normal with increasing N rate in the CC rotation. Figure 1 shows the variation in corn yield and N response for the rotations across years. Grain yield in the SC rotation has been considerably higher than in CC. The average soybean yield in 2007 was 45 bushels/acre and was not influenced by the previous year N rates applied 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 for the first years of the study and therefore are not meant to represent N recommendations. They do, however, represent responses for the specific years and rotations at this site.

Acknowledgements

Appreciation is extended to Dave Rueber, Northern Research Farm superintendent, and his staff for their assistance with this study.

Table 1. Corn grain yield as influenced by N fertilization rate in 2007, Northern Research Farm.

N Rate	SC[1]	CC[1]
lb N/acre	- - - - - - - bu/acre - - - - - - -	
0	88	40
40	136	66
80	163	108
120	171	107
160	179	104
200	144	103
240	175	96

[1]SC, corn following soybean; CC, corn following corn.

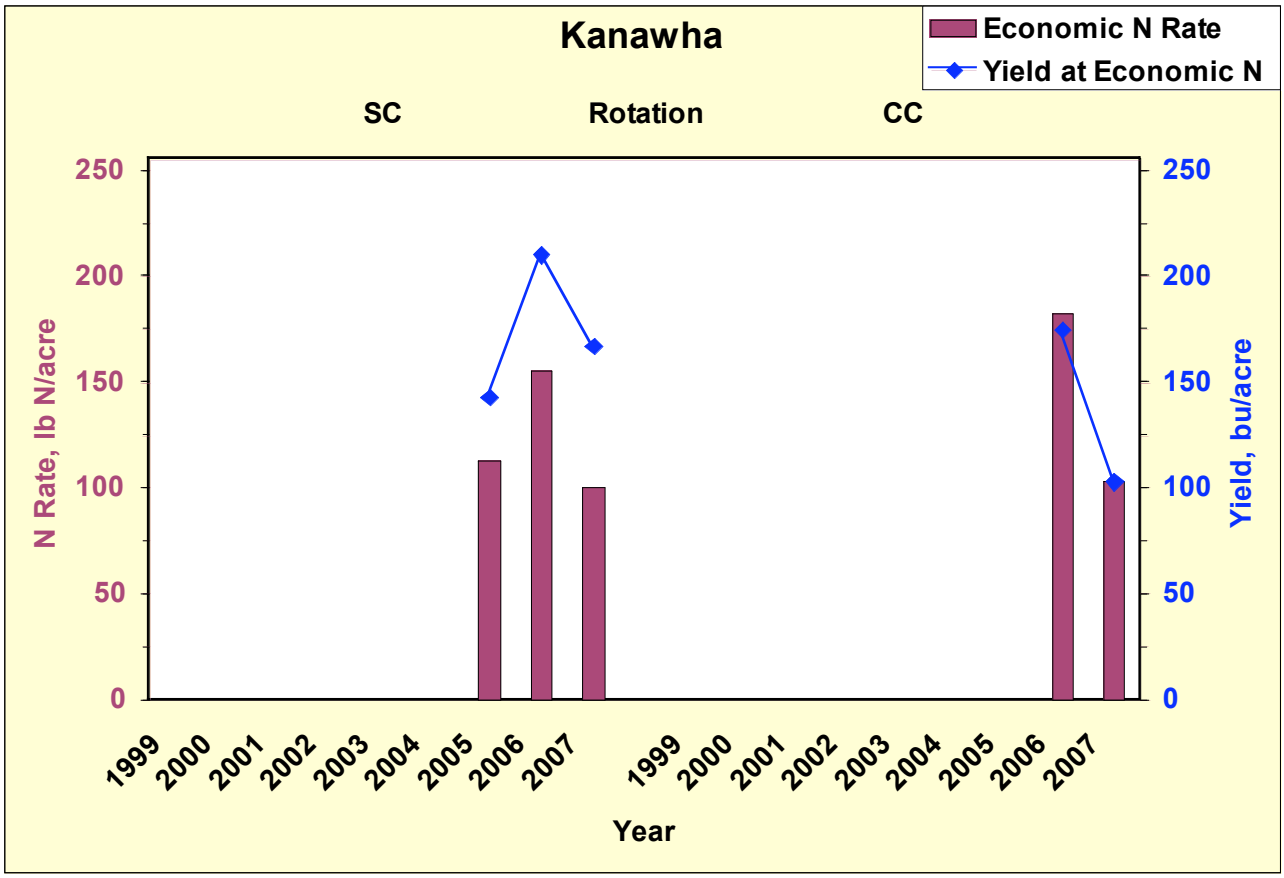

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Northern Research Farm, 2007. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).