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 (CC) and corn rotated with soybean (SC) 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 applied N across different soils and climatic conditions, and evaluation of tools used to adjust N application.

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 (CC) and corn rotated with soybean (SC) 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 applied N across different soils and climatic conditions, and evaluation of tools used to adjust N application.

Materials and Methods

The two crop rotations (CC and SC) were established in 1999. The study area was no-till soybeans in 1998. Therefore, in the initial year all yields followed soybean. The soil at this location is Haig silty clay loam, and the field has tile drainage.

Tillage is fall chisel plowing (spring chiseling in 1999) and disk/field cultivation before planting. Rates of N applied to corn are 0 to 240 lb N/acre in 40 lb increments. Ammonium nitrate is the N fertilizer source and is surface sidedress applied. The farm superintendent chose the corn hybrid and soybean variety. Weeds were controlled using practices typical of the region. Soil was sampled for routine soil testing and P, K, and lime were applied as called for by test results. Corn and soybeans were harvested with a plot combine. Yields were corrected to standard moisture.

Results and Discussion

Corn grain yield was responsive to N application in 2006. The yields with no N applied were 57 bushels/acre in CC and 101 bushels/acre in SC. The yields were relatively low in 2006; yield at optimum N was 151 bushels/acre in CC and 139 bushels/acre in SC. Yields that were higher in CC than SC is unusual, however, yields in the two rotations have been similar in several years (Figure 1). Variation in corn yield and N response for the rotations across years is shown in Figure 1. For 2000–2006, corn in CC averaged 10 bushels/acre less compared with SC (164 versus 174 bu/acre, respectively).

Calculated economic optimum N rates for the CC and SC rotations were 183 and 94 lb N/acre, respectively, in 2006. The average N fertilization requirement has been higher for CC compared with SC (average of 190 lb N/acre in CC and 131 lb N/acre in SC from 2000–2006, a 59 lb N/acre difference). The soybean yield for 2006 was 63 bushels/acre (49 bu/acre average over the seven years from 2000–2006) and has not been influenced by previous year's N application to corn.

This study will continue, and the best value will occur after additional years of data are collected. The results presented in this report represent N responses for the specific years and not recommendations.

Acknowledgments

Appreciation is extended to Nick Piekema, ag research specialist, Jim Secor, farm superintendent, and the McNay Farm crew for their assistance with this study.

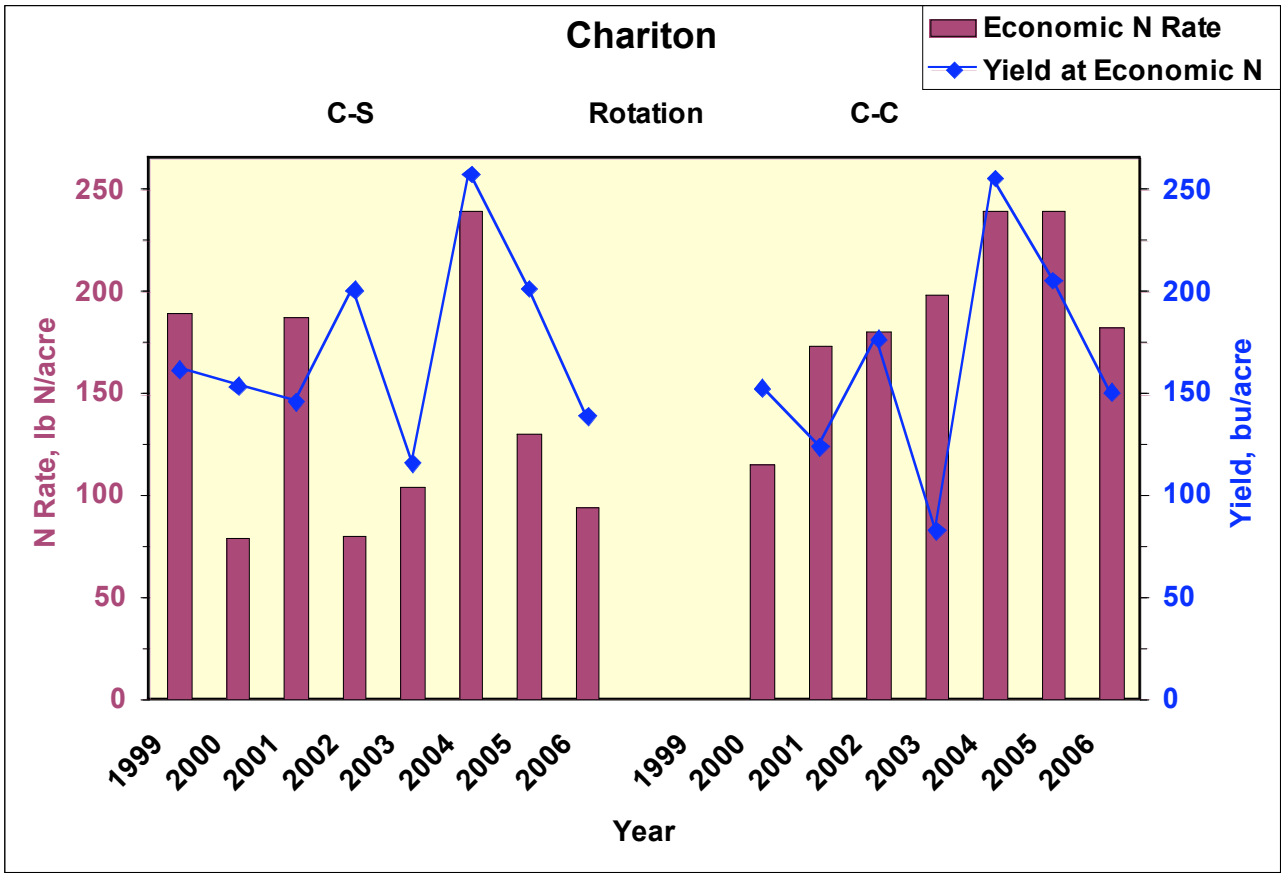

Figure 1. Corn yield and economic optimum N rate for each rotation and year, McNay Memorial Research Farm, 2006.