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Seasonal and Rotational Influences on Corn Nitrogen Requirements

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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 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.

Keywords

Agronomy

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences

Seasonal and Rotational Influences on Corn Nitrogen Requirements

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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 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 rotations were established in 1999. The study area was cropped to no-till soybeans in 1998, therefore, in the initial year all yields are following 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 were 0 to 240 lb N/acre in 40 lb increments. Ammonium nitrate is the N fertilizer source and was surface sidedress applied. The farm superintendent chose the corn hybrid and soybean variety. Pest control practices were 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

Yield levels were quite good in 2007 (Table1), up to 206 bu/acre with SC. The yields with no N applied were 55 bushels/acre in CC and 127 bushels/acre in SC. Yield at the economic optimum N rate (EONR) was 172 bushels/acre in CC and 205 bushels/acre in SC. Figure 1 shows the variation in corn yield and EONR for the rotations across years. Yields are typically higher in SC than CC, however, yields in the two rotations have been similar in some years (Figure 1). For 2000–2007, corn yield in CC averaged 7% less compared with SC (165 versus 178 bushels/acre, respectively). The soybean yield for 2007 was 59 bushels/acre (51 bu/acre average across 2000–2007) and has not been influenced by previous year N application to corn.

Calculated EONR in 2007 for the CC and SC rotations were 240 and 209 lb N/acre, respectively. The average N fertilization requirement has been higher for CC compared with SC (average of 196 lb N/acre in CC and 141 lb N/acre in SC from 2000–2007, a 55 lb N/acre difference).

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.

Acknowledgements

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

N Rate	SC ¹	CC ¹
lb N/acre	----- bushels/acre -----	
0	127	55
40	133	80
80	170	117
120	195	128
160	190	155
200	206	172
240	206	167

¹SC = corn following soybean; CC = corn following corn.

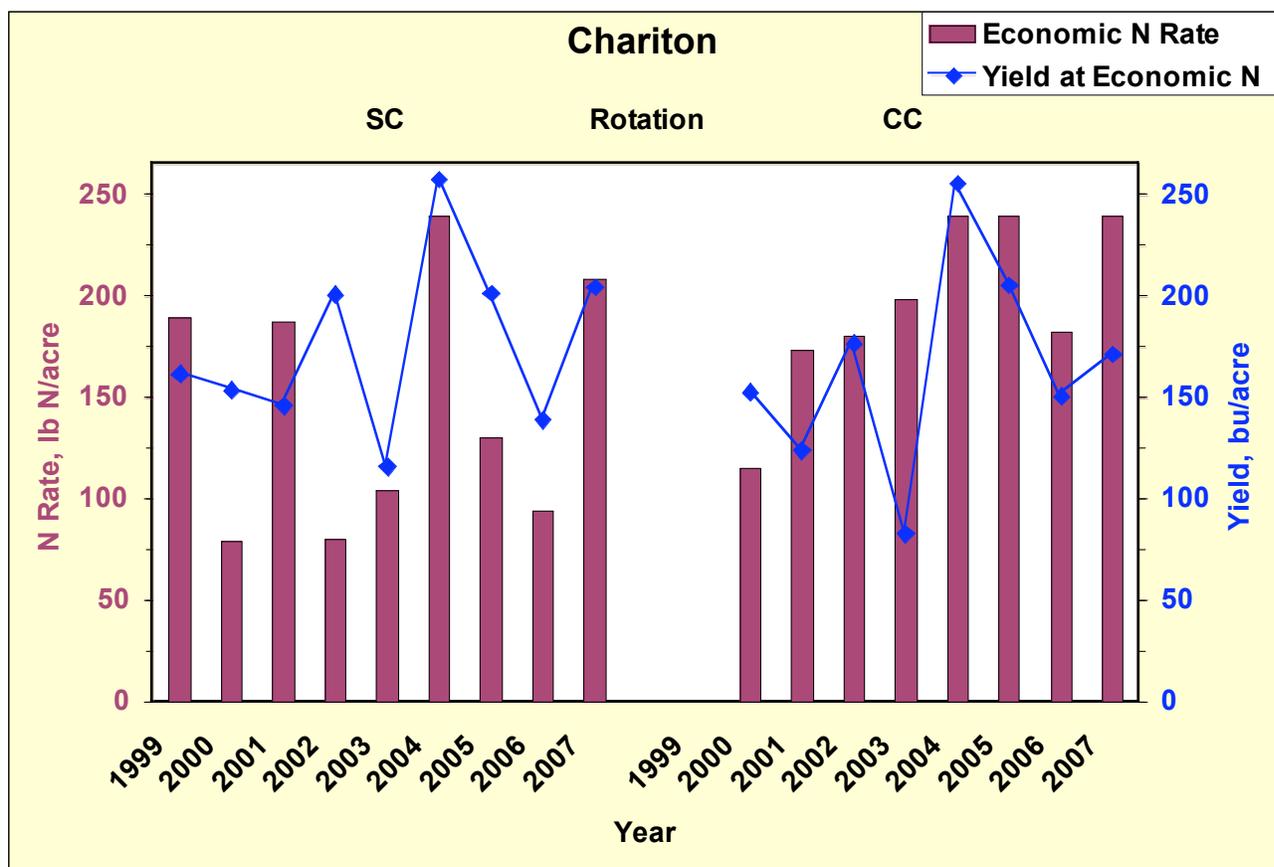


Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, McNay Memorial Research Farm, 1999–2007. The EONR was calculated at a 0.10 price ratio (\$/lb N:\$/bu corn grain).