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Seasonal and Rotational Influences on Corn Nitrogen Requirements

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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, 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.

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Agronomy

Disciplines
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Introduction

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Materials and Methods

The first year of this research at the Southeast Research Farm was 1999. The study area was soybeans in 1998. Therefore, in the initial year all yields follow soybean. The two rotations were initiated in 1999. The soil at this location is Kalona silty clay loam.

Tillage is fall disk-chisel plowing after corn stalks are chopped and spring field cultivation before planting. Rates of N applied to corn were 0 to 240 lb N/acre in 40 lb increments. Urea-ammonium nitrate solution (28% UAN) fertilizer is the N source and was broadcast and incorporated with secondary tillage 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. 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 (Table 1), up to 224 bushels/acre with SC and 191 bushels/acre for CC. Calculated economic optimum N rates for the SC and CC rotations were 205 and 240 lb N/acre, respectively. This is the second year in a row where the applied N requirement has been quite high. Figure 1 shows the variation in corn yield and N response for the rotations across the years. The economic optimum N rate (EONR) has been higher each year for CC compared with the SC rotation (2000–2007 average of 193 lb N/acre in CC and 134 lb N/acre in SC). The corresponding average yield for that time period for each rotation was 147 bushels/acre for CC and 181 bushels/acre for SC, with the corn yield in CC averaging 18.8% less than the SC. Yields have been lower each year with continuous corn, but more similar to corn rotated with soybean in the highest productivity years. The average soybean yield in 2007 was 58 bushels/acre and was not influenced by previous year 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 responses for the specific years and rotations at this site.

Acknowledgements

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

N Rate	SC[1]	CC[1]
lb N/acre	- - - - - - - bushels/acre - - - - - - -	
0	90	31
40	118	41
80	159	82
120	194	106
160	218	147
200	224	168
240	213	191

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

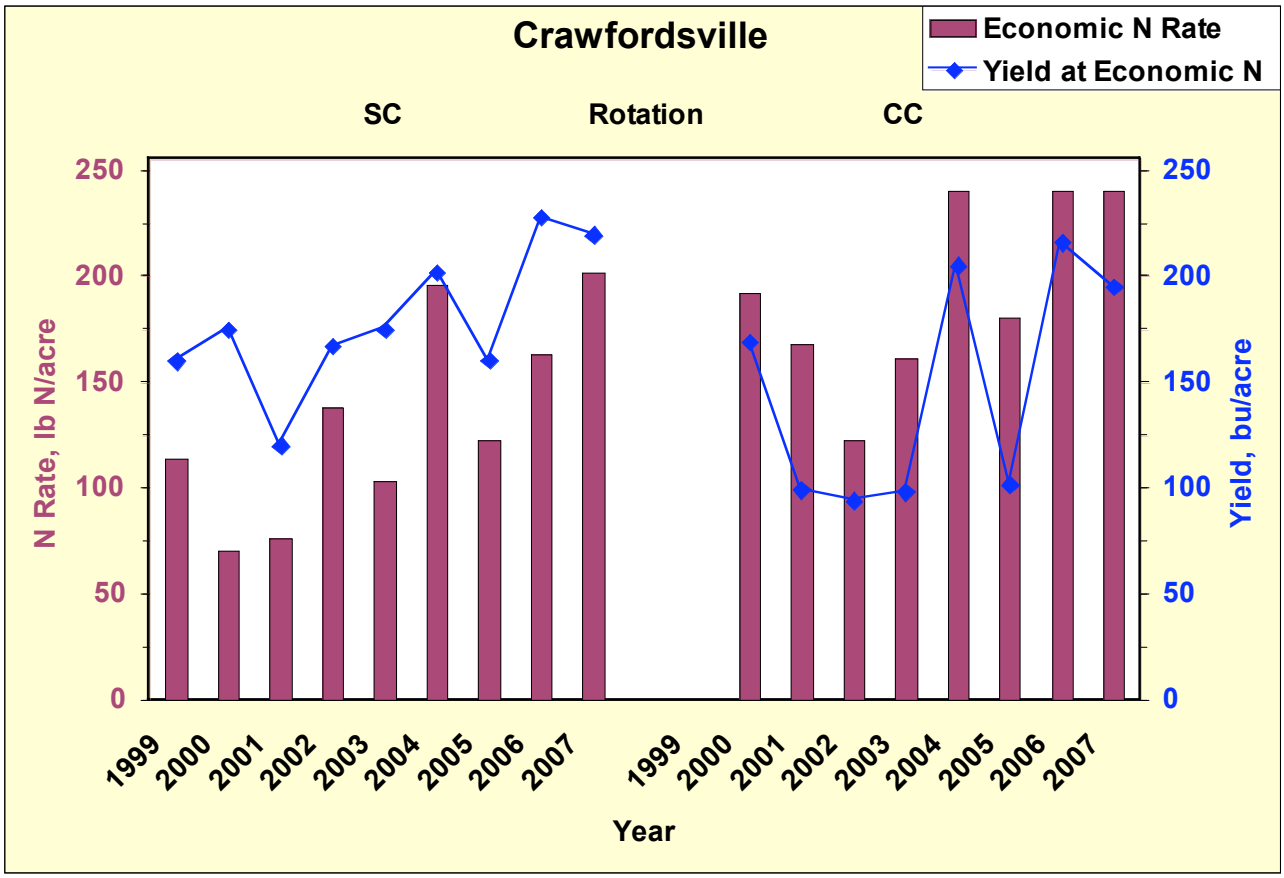

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Southeast Research Farm, 1999–2007. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).