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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 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

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Introduction

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Materials and Methods

The first year of this research at the Northeast Research Farm was 2005. The study area was cropped to both soybean and corn in 2004. Therefore, in the initial year (2005) results were available for both rotations. The soils at this location are Readlyn-Floyd-Kenyon loams.

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 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 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 2008 despite the very wet season (Table 1). Calculated economic optimum N rates (EONR) in 2008 for the SC and CC rotations were 156 and 240 lb N/acre, respectively. These applied N requirements are higher than typically expected for corn in the rotations and reflect the wet spring and summer conditions, with this being the second year in a row with the continuous corn where the grain yield increased to the highest N rate applied, 240 lb N/acre. Figure 1 shows the variation in corn yield and N response for the rotations across years. The EONR has been higher each year for CC compared with the SC rotation (2005–2008 average of 214 lb N/acre with CC and 164 lb N/acre with SC). The corresponding average yield for that time period for each rotation was 172 bushels/acre for CC and 199 bushels/acre for SC, with the corn yield in CC averaging 14 percent less than the SC. Yields have been lower each year with continuous corn. The average soybean yield in 2008 was 66 bushels/acre and was not influenced by previous year N rate applied to corn.

This study will continue in the future and the best value will occur after the accumulation of many 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 2008, Northeast Research Farm.

N Rate	SC	CC
lb N/acre	- - - - - - - bushels/acre - - - - - - -	
0	77	48
40	111	65
80	141	88
120	182	113
160	210	129
200	207	149
240	215	162

SC, corn following soybean; CC, corn following corn.

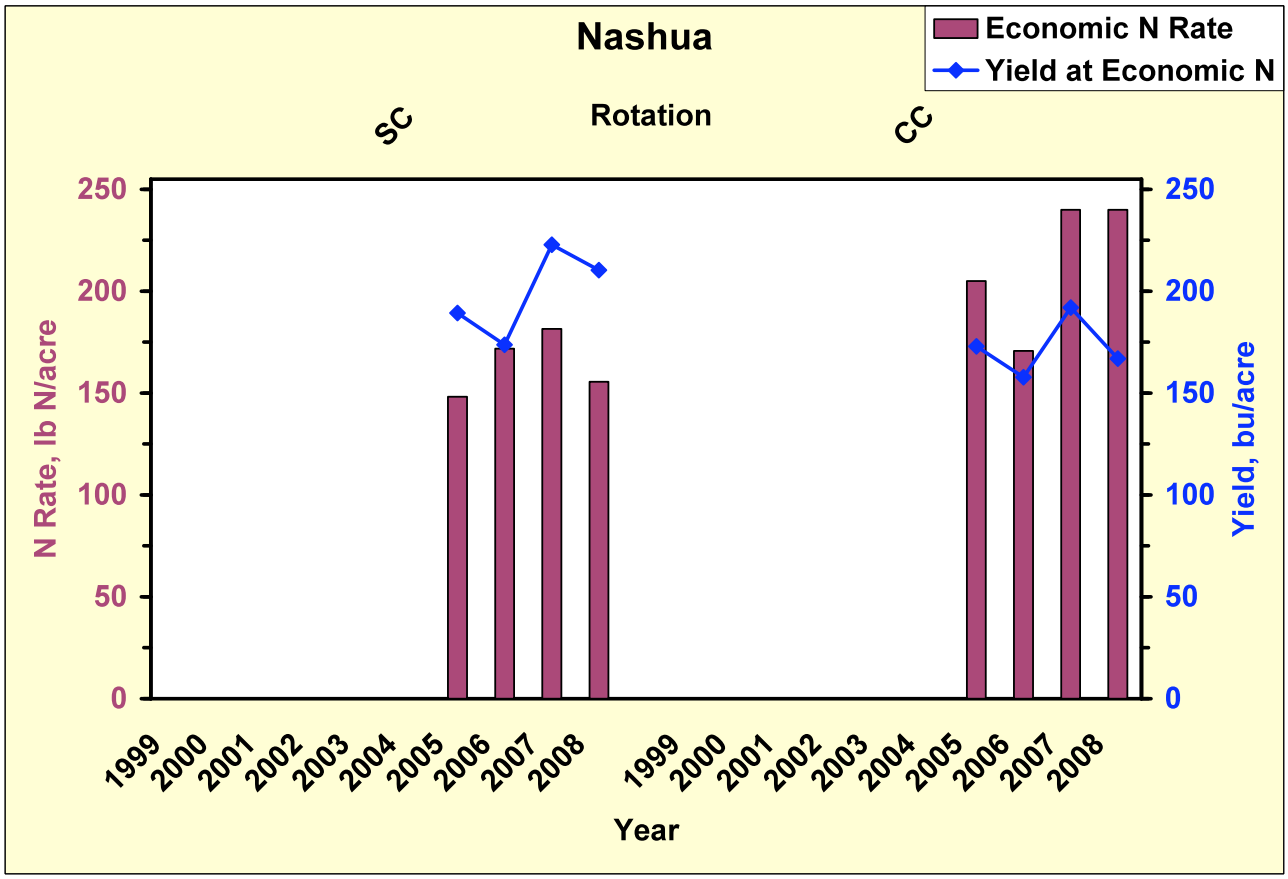

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Northeast Research Farm, 2005–2008. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).