2011

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 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
RFR A1076, Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

Seasonal and Rotational Influences on Corn Nitrogen Requirements

RFR-A1076

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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 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 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 are Readlyn-Floyd-Kenyon loams.

Tillage was fall chisel plowing corn stalks and spring disk/field cultivation before planting each crop. Rates of N applied to corn are 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

Corn yields were good in 2010 (Table 1). Calculated response to applied N for the SC and CC rotations were 175 and 240 lb N/acre, respectively. These applied N requirements were higher than normal for each rotation and similar to other years when rainfall had been greater than normal.

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 (2005–2010 average of 210 lb N/acre with CC and 159 lb N/acre with SC, a 51 lb N/acre difference). With CC, three of the last four years yield has increased to the highest N rate applied (240 lb N/acre). The corresponding average corn yield for the 2005–2010 time period for each rotation is 175 bushels/acre for CC and 200 bushels/acre for SC, with the CC yield averaging 13 percent lower compared with SC. Yields have been lower each year with CC.

The average soybean yield in 2010 was 70 bushels/acre, with no effect of prior N application rate.

This study will continue 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

Appreciation is extended to Ken Pecinovsky, Northeast Farm superintendent, and his staff for their work on this study.

Table 1. Corn grain yield as influenced by N fertilization rate in 2010, Northeast Research Farm.

N Rate	SC[1]	CC[1]
lb N/acre	- - - - - - - bushels/acre - - - - - - -	
0	97	67
40	141	86
80	156	111
120	188	147
160	201	164
200	199	179
240	197	186

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

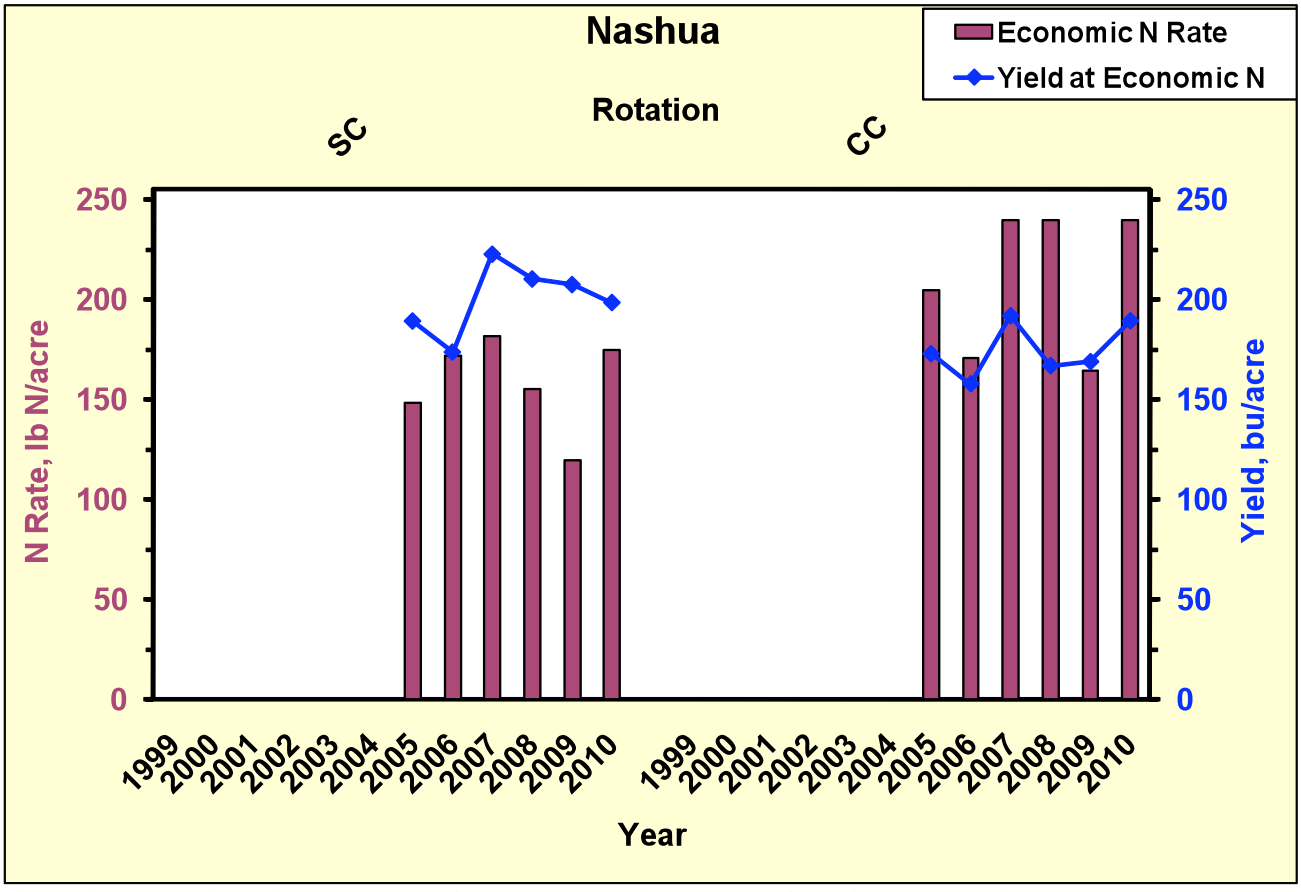

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Northeast Research Farm, 2005–2010. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).