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Seasonal and Rotational Influences on Corn Nitrogen Requirements

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Abstract
This project was designed to study the nitrogen (N) fertilization needs in continuous corn (C-C) and corn rotated with soybean (C-S) 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 N applied across different soils and climatic conditions, and evaluation of tools used to adjust N application.

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Agronomy

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Introduction

This project was designed to study the nitrogen (N) fertilization needs in continuous corn (C-C) and corn rotated with soybean (C-S) 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 N applied 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 Northern Research Farm was 2005. The study area was soybeans in 2004. Therefore, in the initial year all yields follow soybeans. The two rotations, C-C and C-S were initiated in 2005. The soil at this location is Canisteo clay loam.

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 is the N source and is broadcast and incorporated with secondary tillage before planting. No N is 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 are corrected to standard moisture.

Results and Discussion

In 2006, grain yield responded positively to applied N in each rotation (Figure 1). The first year for comparative yields and N response between the two rotations was 2006. Calculated economic optimum N rates for the C-S and C-C rotations were 156 and 182 lb N/acre, respectively. Corn in the C-C rotation yielded 36 bushels/acre less than corn following soybeans. Figure 1 shows the variation in corn yield and N response for the rotations across years. Grain yields in the C-S rotation were considerably higher in 2006 compared with 2005. The average soybean yield in 2006 was 59 bushels/acre and was not influenced by the previous year N rates applied 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 for the first years of the study and therefore are not meant to represent N recommendations. They do, however, represent responses for the specific years and rotations at this site.

Acknowledgments

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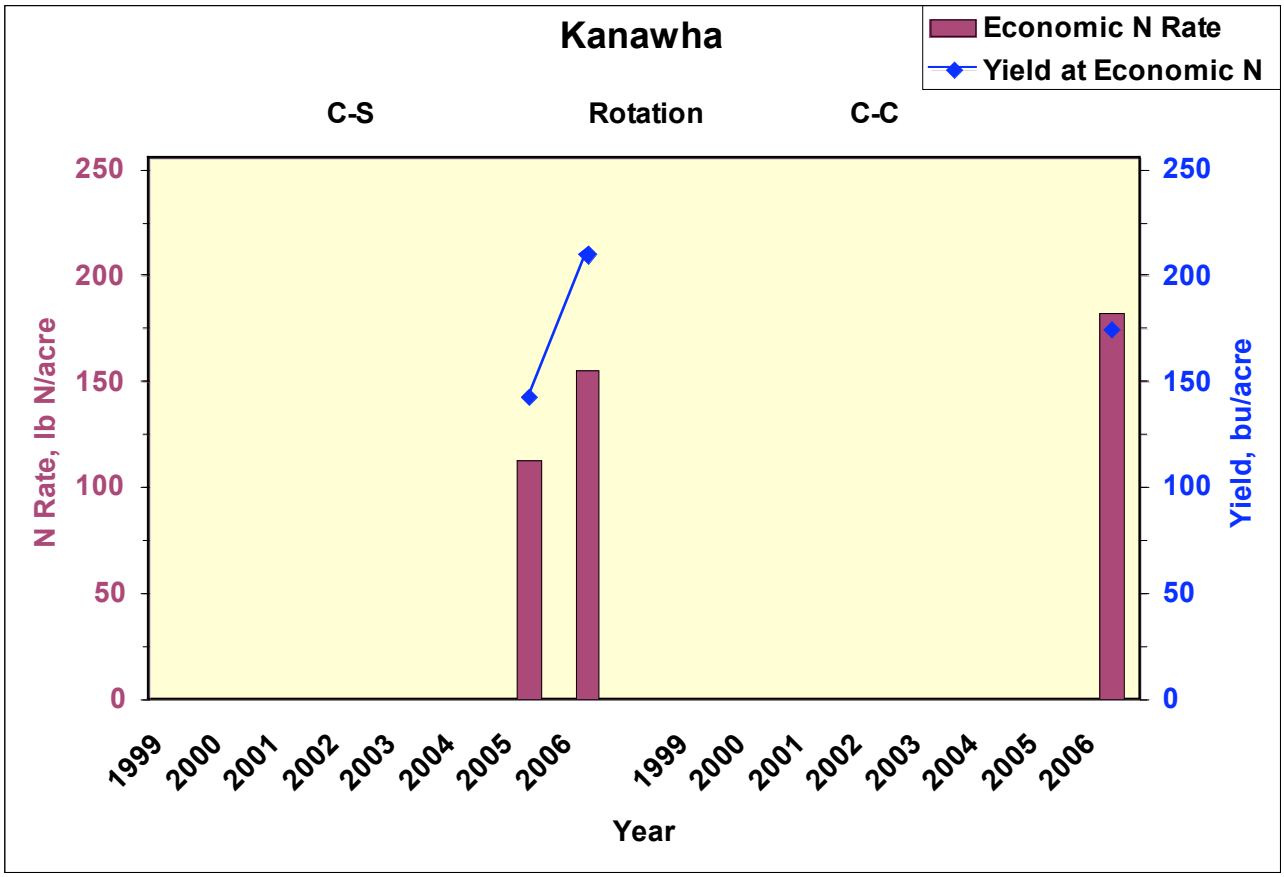

Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Northern Research Farm, 2006. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain). The first year of this study at the Northern Research Farm was 2005.