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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

**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 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.

## Materials and Methods

The first year of this research at the Ag Engineering/Agronomy Research Farm was 1999. The study area was cropped to corn in 1998, therefore, in the initial year all yields are following corn. The two rotations were initiated in 1999. The soil at this location is Clarion loam.

Tillage is fall chisel plowing and disk/field cultivation before planting. Rates of N applied to corn are 0 to 240 lb N/acre in 60 lb increments. Urea fertilizer is the N source and was broadcast and incorporated with secondary tillage before planting. 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 (Table 1), up to 203 bushels/acre with SC and 193 bushels/acre for CC. The yield with no N applied was 80 bushels/acre in CC and 116 bushels/acre in SC.

Calculated economic optimum N rate (EONR) in 2007 for the SC and CC rotations was 169 and 174 lb N/acre, respectively. The EONR in 2007 for corn following soybean was higher than usual, and has increased in recent years. Figure 1 shows the variation in corn yield and EONR for the rotations across years. The EONR has typically been higher each year for CC compared to the SC rotation (2000–2007 average of 157 lb N/acre with CC and 114 lb N/acre with SC, a 43 lb N/acre difference). The corresponding average yield for that time period for each rotation was 169 bushels/acre for CC and 197 bushels/acre for SC, with the corn yield in CC averaging 14% lower compared to SC.

The soybean yield for 2007 was 39 bushels/acre (53 bu/acre average from 2000–2007) and has not been influenced by previous year N application to corn.

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, Ag Engineering/Agronomy Research Farm.**

| N Rate | SC[1] | CC[1] |
|---|---|---|
| lb N/acre | - - - - - - - bu/acre - - - - - - - | |
| 0 | 116 | 80 |
| 60 | 167 | 142 |
| 120 | 183 | 173 |
| 180 | 203 | 188 |
| 240 | 199 | 193 |

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

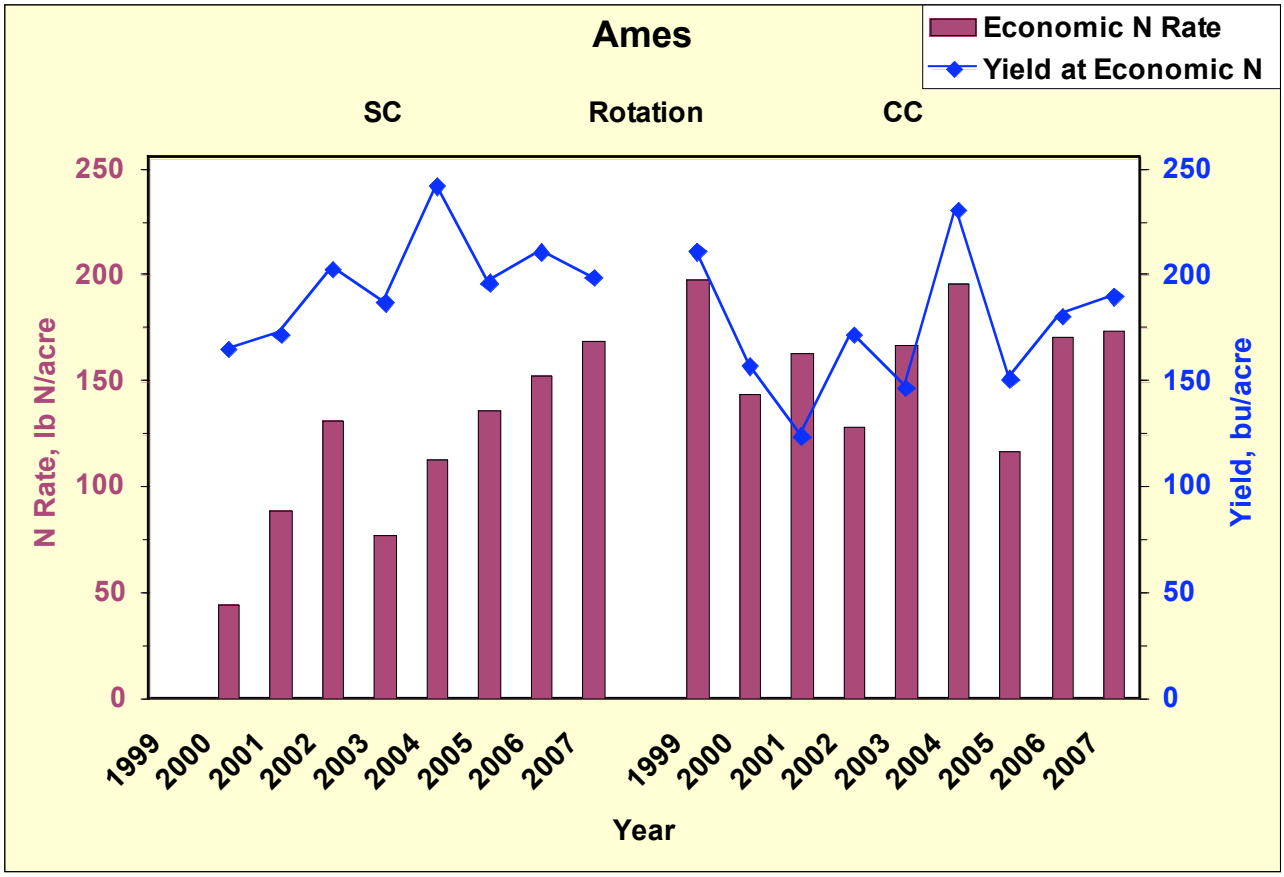


**Figure 1. Economic optimum N rate (EONR) and corn yield at the EONR for each rotation and year, Ag Engineering/Agronomy Research Farm, 1999–2007. The EONR was calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).**