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Seasonal and Rotational Influences on Corn Nitrogen Fertilization in Northeast Iowa

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Introduction

This project was designed to study the N fertilization needs in continuous corn (CC) and corn rotated with soybean (CS) 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 at this location are Readlyn-Floyd-Kenyon loams.

Tillage is fall chisel/disk corn residue and spring disk/field cultivation before planting. Rates of N applied to corn are 40 lb increments from 0 to 240 lb N/acre. Urea fertilizer is the N source and is broadcast and incorporated before planting. No N is applied with the planter. The farm superintendent chooses the corn hybrid and soybean variety. Pest control practices are those typical for the region and crop rotations. Corn and soybean are harvested with a plot combine.

Results and Discussion

Corn productivity in 2016 was good, and above the record statewide average. Grain yield responded positively to applied N in each rotation. The calculated economic optimum N rate (EONR) from fitted response equations were 174 and 206 lb N/acre in the CS and CC rotations, respectively. These fertilizer N application requirements are higher than the long-term average for both rotations, a reflection of the high rainfall in 2016. The corn yield at the EONR was only 5 bushels/acre higher in the CS rotation compared with CC (230 vs. 225 bu/acre).

Across the years, if the current Maximum Return To N Rate (MRTN) from the Corn Nitrogen Rate Calculator (CNRC, http://cnrc.agron.iastate.edu/) had been applied each year, the corn yields are usually the same as the yields at the yearly EONR (Figure 1). In 2016, the corn yield at the MRTN rate for both crop rotations was less than the yield at the calculated EONR. In a number of years (especially the last three), the corn yield with the MRTN rate was lower than at the EONR, due to a higher N application rate requirement associated with wet conditions.

Soybean yield in the CS rotation averaged 80 bushels/acre in 2016, second highest yield across years, and was not influenced by previous year N application to corn.

Acknowledgements

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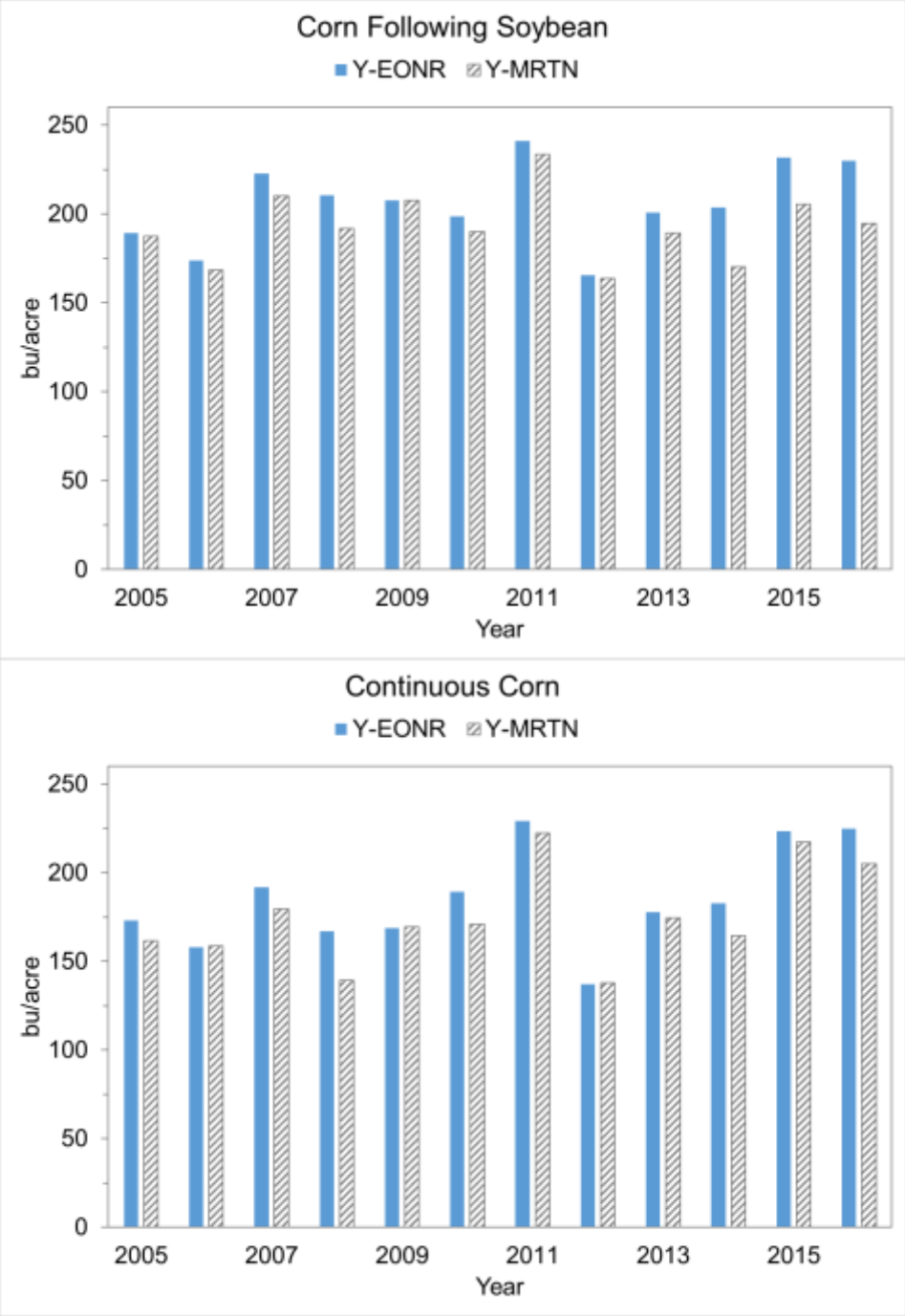

Figure 1. Corn yield at the yearly EONR (Y-EONR) and corn yield at the MRTN rate (Y-MRTN) if applied each year for each rotation (134 lb N/acre MRTN rate for corn following soybean and 184 lb N/acre for continuous corn), Northeast Research Farm, 2005–2016. The EONR and MRTN calculated at a 0.10 price ratio ($/lb N:$/bu corn grain).