

# ASSESSING THE VARIABILITY OF CORN RESPONSE TO NITROGEN<sup>1</sup>

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## ABSTRACT

Because results of experiments designed to test the response of corn to N rate tend to vary considerably with the environment, repetitions of such studies over time are essential. It is not clear, however, what number of repetitions are needed in order to deduce sound recommendations for application of N fertilizer to succeeding crops. We used the results from 16 years of a crop rotation × N rate study conducted at Monmouth, Illinois to assess the effect of duration of such an experiment on the stability of the outcome. Data from the entire 16 years, and moving averages from 3-year, 5-year, and 8-year intervals of the study were used to generate economically optimal N rates (EONR) values using the quadratic-plateau model. For corn following corn, the EONR value calculated from all of the data was 147 lb N/acre. When 3-year averages were used, EONR values ranged from 101 to 217 lb N/acre, with a standard deviation of 35 lb N/acre. When 5-year intervals were used, the range was 104 to 182, with a standard deviation of 26 lb N/acre. And when data were averaged over 8-year intervals, EONR values ranged from 126 to 154 lb N/acre, with a standard deviation of 9 lb N/acre. For corn following soybean, the EONR calculated using data from all 16 years was 94 lb N/acre, or about 53 lb N/acre less than when corn followed corn. The yield at the optimal N rate was 144 bu/acre for corn following corn, and 170 bu/acre for corn following soybean. Using 3-year intervals, EONR values ranged from 33 to 135, with a standard deviation of 32 lb N/acre. With 5-year intervals, the range was 39 to 118 lb N/acre, with a standard deviation of 30 lb N/acre, and for 8-year intervals the EONR values ranged from 65 to 109, with a standard deviation of 15 lb N/acre. Given the flatter response of corn to N rate following soybean, it is not surprising that the variation in calculated EONR tended to be higher in this rotation than in continuous corn. While there is no definite rule concerning the number of years that N rate studies need to be conducted in order to produce good predictors for future N response, it is clear that studies conducted for 3 to 5 years can be expected to produce very different results from one another, and hence may have limited value in a predictive sense. Increasing this duration to 8 years considerably improved consistency over "experiments", but even studies of this duration carry the risk of generating inaccurate predictive values due to weather and crop conditions that occur during the course of the experiment.

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