

## FIELD SCALE VARIABILITY OF CORN YIELD RESPONSE FUNCTIONS TO FERTILIZER NITROGEN APPLICATION

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Variable rate nitrogen (N) application assumes that corn response to N fertilizer varies within a field. However, this hypothesis has not been formally tested yet. Field variation of corn response to N fertilizer and economically optimum N fertilizer rates (EON) were assessed in on-farm experiments throughout central Illinois. Fields (16 to 32 ha.) were subdivided into 13 to 20 areas. Five nitrogen rates were randomized within these areas in 28 kg N increments (2 rates) and decrements (2 rates) from the N fertilizer rate based on the Univ. of Illinois recommendation. Application time and N source varied according to the farmer's N management practices. Combines equipped with yield monitors and GPS were used to obtain yield data. Raw yield data was analyzed for errors and cleaned. The mean yield of each plot was calculated and used to estimate the response functions. Yield response polynomial functions were estimated for each area with errors adjusted for spatial covariance. The EON at each area was calculated using the estimated parameters. The spatial autocorrelation of the EON was assessed using Moran's I statistic. In every field analyzed, corn response to N fertilizer significantly varied among areas. Within a field, some areas showed no response whereas others presented linear or quadratic responses. The EON showed a significant spatial structure. The knowledge of site-specific corn response functions is a critical step for the success of variable rate N application.

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