The Effectiveness of Corn Nitrogen Recommendation Strategies in Creating Variable Rate Prescriptions

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Nitrogen is one of the primary macronutrients required for plant growth, and is often the most limiting factor in plant nutrition. In corn production, nitrogen fertilizer must be applied in order to supplement the nitrogen that is available in the soil. Due to nitrogen's mobile nature in the soil, and the effect of temperature and rainfall on its availability to plants, it is difficult to predict the optimum rate that should be applied to reach yield potential while avoiding over-application and environmental risk from off-site movement. Ohio State University Extension currently recommends using an economic rate calculation to predict this optimum rate. However, with the increasing use of precision agriculture technology that utilizes GPS to allow for site-specific management, there is an interest in using variable rate applications to further optimize nitrogen rates. The objectives of this study are to describe the variability of optimum nitrogen rates across soil types and productivity zones, evaluate the effectiveness of prediction methods in identifying the optimal rate in each zone, and describe the ability of these prediction methods in developing variable rate prescriptions. Five fields were selected as testing sites, with three replicated test blocks in each field. Test blocks were placed in high, medium, and low yielding zones in each field based on yield history. Utilizing test strips in each block ranging from 0 to 220 pounds of nitrogen applied, the economic optimum rate was calculated after yield data was collected at harvest. Ohio State nitrogen recommendations, Tri-State fertilizer recommendations, the pre-sidedress nitrogen soil test, and the potential nitrogen analysis soil tests were all utilized to predict optimum nitrogen rates. Based on preliminary data analysis, the Ohio State nitrogen recommendations produced the most accurate predictions, and utilizing variable-rate prescriptions to assign rates with an inverse relationship to yield history further improved accuracy.