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Agronomy Journal Abstract - NITROGEN MANAGEMENT

Derivation of a Variable Rate Nitrogen Application Model for In-Season Fertilization of Corn

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Abstract

Nitrogen fertilizers used in crop production contribute to pollution of groundwater by nitrate and occurrence of hypoxia in the Gulf of Mexico. Economic and environmental pressures are forcing producers to improve N use efficiency. The objective of this study was to develop a production-based in-season N recommendation model for use with crop canopy sensors and remote sensing data. The approach is based on the general shape of an N fertilizer response function (sensor index vs. N rate) and the relationship between N rate and in-season crop vegetation index data. Transformation and substitution techniques were used to generate a simple function that offers an N fertilizer recommendation based on spatially variable in-season remote sensing data and established local crop production information such as the economic optimum N rate or producer defined optimum N rate. The model accommodates management zones, preplant N applications, manure mineralization, legume credits, nitrate in irrigation water, and crop growth stage. Estimates of potential yield are not needed. Instead the method relies on production information provided by the user and the generalized shape of the fertilizer N response function. Testing the model with SPAD chlorophyll meter data from irrigated corn showed that the recommended fertilizer N rate plus preplant N rate totaled 184, 164, 186, 188, and 200 kg ha⁻¹ for preplant N rates of 0, 50, 100, 150, and 200 kg N ha⁻¹ when averaged across growth stages for 3 yr.

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