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Helping Corn Producers to Reduce N Loss Using Color-Guided Fertilizer Application

Agriculture appears to be a major source of nitrogen (N) contamination in water resources. Color-guided sidedressing of N fertilizer is a promising technology for reducing N loss from corn production systems to water resources. Factors controlling movement of N from agricultural systems to water resources are complex, but N fertilizer rate appears to be a primary determinant. Our research has shown that optimal rate of nitrogen fertilizer for corn varies widely, both between fields and within fields. Corn producers usually apply the same N rate over whole fields and often whole farms, meaning that many areas are either over-fertilized or under-fertilized. Over-fertilization is more common because it is less economically damaging. Over-fertilized areas are potential high source areas for nitrate movement to surface waters via base flow or tile drainage. Accurate variable-rate application of N fertilizer can result in less overapplication of N and less unused N fertilizer after harvest. We have found that corn color is a much more accurate measure of optimal N fertilizer rate than any of a wide range of soil measurements. Our group has developed calibrations relating reflectance from corn at various stages with the amount of N fertilizer needed. We are using these calibrations in demonstration projects with corn producers to variably apply N fertilizer at the field scale. Color (reflectance) sensors mounted on variable-rate fertilizer applicators can control the fertilizer rate as the applicator drives through the field. In seven on-farm demonstrations in 2004, average N rate was reduced by 33 lb N/acre compared to rates currently used by cooperating producers, with only a 3 bu/acre yield loss and average yields over 190 bu/acre. We have initiated plots to measure the effect of this technology on nitrate lost in tile drainage water.

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