LONG-TERM MEASUREMENT OF NITRATE LEACHING BELOW CORN

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ABSTRACT

Agriculture has contributed to groundwater contamination because of difficulty with controlling nutrient loss from farming. Many studies have evaluated nitrogen leaching from tile-drained agricultural soils, but less research has been performed on well-drained soils, also common throughout the Midwest. This study focused on leaching measurements from a well-drained soil with two tillage and three fertilization practices. Equilibrium tension lysimeters were used to measure nitrate leaching on chisel-plow (CP) and no-tillage (NT) plots, which were fertilized at a low rate (10 lb N/acre), economically optimum rate (160 lb N/acre), and excessive rate (160 lb N/acre mineral fertilizer with an additional 110 lb N/acre manure). The 270 lb N/acre treatment simulates not crediting manure when deter-mining the crop N requirement. During 2-years of study with the manure treatment, the flow-weighted mean nitrate concentration was shown to be a better indicator of the effects of fertilizer practices than the total amount of N loss. Applying fertilizer above recom-mended rates resulted in the poorest water quality. Nitrate leaching loss and the flow-weighted mean nitrate-N concentration for 7 years of data are reported for the CP and NT treatments. Almost three-quarters of the total nitrate lost from both ecosystems was leached during the spring months. The nitrate-N concentration was highly variable depending on the year; however, when averaged over 7 years, it was only 9.6 ppm for CP and 13.3 ppm for NT. While the agroecosystems are close to the 10 ppm nitrate drinking water standard, the concentrations are less than other studies, which were done on tile-drained fields. The results reported here suggest that when managed properly, modern agricultural practices on upland soils are capable of meeting environmental standards for nitrate-N with good management on continuous corn.

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