

ALTERNATIVE TILLAGE AND NITROGEN MANAGEMENT OPTIONS TO INCREASE CROP PRODUCTION AND REDUCE NITROUS OXIDE EMISSIONS FROM CLAYPAN SOILS

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ABSTRACT

The Central Claypan Region covers an area of 10 million acres of claypan or claypan-like soil in Missouri, Oklahoma, Kansas, Iowa, and Illinois. Agricultural production on claypan soil can have lower yield and a greater impact on the environment than most agricultural soils partly due to poor drainage which may increase the potential for gaseous nitrogen loss of applied fertilizers, including nitrous oxide. Nitrous oxide emissions from agricultural practices in the United States account for 78% of total human-related emissions and are of growing concern since nitrous oxide is a greenhouse gas that has a global warming potential 297 times greater than that of carbon dioxide, and which also depletes the ozone layer. Reducing nitrogen loss from applied fertilizer in agricultural practices through improved tillage and nitrogen management may increase crop production while reducing environmental N loss, including nitrous oxide. Findings from this research indicate that slow release, polymer-coated urea can maintain winter wheat yields with fall N applications, presumably due to reduced N loss and greater plant uptake compared to traditional dry urea fertilizer. Tilling of the soil in the seed row (strip-tillage) combined with deep banded placement of nitrogen fertilizer increased corn yield over no till with surface broadcasting of nitrogen fertilizer. Strip-tillage combined with deep banding placement was found to reduce the amount of nitrous oxide emitted per unit of corn grain produced, thereby, reducing the environmental impacts of N fertilizer use per amount of agricultural production.