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Deep Manure Impact on Soil N and P Concentrations, Corn and Soybean Yields, and Water Infiltration

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Abstract Text:

With increasing N fertilizer costs, reducing volatilization losses from manure is more important than ever. Adopting techniques designed to reduce ammonia volatilization losses may reduce the total amount of manure required to meet the plants N requirement. The purpose of this study was to determine the influence of deep manure placement on crop yields, water infiltration, and the amount of N and P retained in the soil. Field research was initiated at two South Dakota sites in 2004. Yields, water infiltration, P, and N transformations were measured for the 30 months following manure injection. Treatments were deep manure injection (45cm), shallow manure injection (15 cm), and conventional fertilizer-based management. At each site, treatments were replicated three times. Soil samples to a depth of 90 cm were collected and analyzed for Bray P, ammonium-N, and nitrate-N. Temporal changes in apparent saturated hydraulic conductivity, soil nutrient concentrations (N and P), and crop grain yields were measured. Deep manure injected either reduced or did not impact surface soil (0-15cm) soil P concentration, increased inorganic N for the two growing seasons following injection, and increased apparent saturated hydraulic conductivity for a period less than two years. These results were attributed to deep injection reducing manure organic N mineralization, nitrification rates, and N losses. Deep manure injection did not impact soybean (Glycine max) yields and increased corn (Zea mays) yields if they were N limited. Results suggest that deep placement of manure should be considered as a technique to reduce N losses from manure, which in turn can reduce N fertilizer requirements and amount of manure required to meet the crops N requirement.

Impact Statement:

The project shows that N can be conserved by deep placement. This savings will reduce the amount of manure required to meet the plants N demand. An economic analysis showed that over a two year period this application technique would reduce cost up to $100/acre.