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Nitrogen and phosphorus concentrations of runoff as affected by plowing

John E. Gilley*, Bahman Eghball, David B. Marx
USDA-ARS; *John.Gilley@ars.usda.gov

Abstract:

The excessive application of manure on cropland areas can cause nutrients to accumulate near the soil surface. This study was conducted to measure the effects of moldboard plowing on the redistribution of nutrients within the soil profile and nutrient transport by overland flow. Composted beef cattle manure was applied at dry weights of 0, 68, 105, 142, and 178 Mg ha⁻¹ to a silty clay loam soil and then incorporated by disking. Selected plots were moldboard plowed 244 days later to a depth of approximately 23 cm. Soil samples for analysis of water-soluble phosphorus, Bray and Kurtz No.1 phosphorus (Bray-1 P), NO₃-N and NH₄-N were collected at depths of 0 - 5, 5 - 15, and 15 -30 cm before and after moldboard plowing. Three 30-min simulated rainfall events, separated by 24-hour intervals, were then applied. Dissolved phosphorus (DP), NO₃-N, NH₄-N, and total nitrogen (TN) content of runoff were measured from 0.75 wide x 2.0 m long plots. Bray-1 P content at the 0 - 5 cm soil depth was reduced from 200 to 48.0 mg kg⁻¹ and NO₃-N content decreased from 9.49 to 2.52 mg kg⁻¹ as a result of the moldboard plowing operation. Consequently, mean concentrations of DP and NO₃-N in runoff from the moldboard plow plots decreased from 1.76 and 2.29 mg L⁻¹ under no-till conditions to 0.03 and 0.60 mg L⁻¹. Thus, the experimental results suggest that moldboard plowing can significantly reduce concentrations of DP and NO₃-N in runoff from land application areas.

Impact Statement:

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