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Setback distance effect on sediment and phosphorus in runoff following manure application

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Abstract Text:

Surface application of animal manure increases nutrients at the soil surface and the potential for nutrient loss in runoff, but may reduce runoff and erosion. Non-application setbacks are often required to reduce nutrient loss to surface water. The objective of this research was to determine the effect of setback distance on phosphorus and sediment in runoff. The research was conducted on a field in southeast Nebraska with silty clay loam soil, 3-4% slope, and with tile-inlet terraces. The drainage area served by a riser was an experimental unit. Seven treatments included no manure applied, and non-application setbacks of 0, 5, 10, 20, 30, and 40 m. Composted manure was applied in the spring of 2006 at the rate of 74 Mg ha-1 which resulted in the application of 686 kg ha-1 of P. In 2006 and early 2007, runoff samples were collected at each riser for three depths (7.5, 15 and 30 cm) and analyzed for phosphorus and sediment concentration. At some risers, ISCO samplers were installed to sample periodically during the runoff event and to determine the volume of runoff. Sediment and P concentration were significantly higher at 7.5 cm compared with 15 and 30 cm runoff sampling height during the first rainfall event, but sampling height did not affect concentrations during other events. Sediment and P concentrations were similar in riser bottles and ISCO runoff samples. Sediment and P concentrations varied with rainfall event and decreased by more than 50% between the first and fourth rainfall events. Runoff volume increased with decrease the size of drainage area and sediment concentration was higher with higher runoff rates. Implementing No-manure setback application, as BMP, to reduce phosphorus and sediment loss, is highly associated with time of manure application, rainfall events and characteristics of runoff contributing area.

Impact Statement:

The distance from the point of manure application to concentrated flow affects the risk of P reaching surface water. Properly managed setbacks improve water quality by acting as filters for water passing over or through the soil toward a water resource. Evaluating the impact of several setback distances from drainage outlet related to farm hydrological data will assist for implementing long term BMPs toward water quality protection.