RESEARCH ABSTRACT

ENVIRONMENT

Title: Measurement and Prediction of Phosphorus Transport from Swine Manure at the Watershed Scale - **NPB #00-022**

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Abstract

Livestock production facilities are coming under increased scrutiny with regard to runoff of phosphorus (P) from fields receiving animal manures. Watersheds are not uniform in their surface properties or land use so it is difficult to know how P management on individual fields will affect the quality of surface waters. The objective of this study was to measure and simulate how swine manure management affects P export from a watershed with intensive swine production. Stream water sampling (1-3 week intervals) was conducted for one year at 14 locations within the Tipton Creek watershed in central Iowa. Data on soil and manure P concentrations and amounts were also collected. Geographic Information System (GIS) data layers (topography, soils, land use, and land cover) were prepared to create the input data necessary to run the Agricultural Non-Point Source model (AGNPS).

The average dissolved reactive (DRP) and total phosphorus (TP) concentrations in stream water from 41 sampling dates were 0.14 and 0.21 mg/L, respectively. Total P export from the Tipton Creek watershed from April 1, 2000 to April 1, 2001 was estimated at 10.6 metric tons (11.7 tons) for an average of 0.52 kg of P lost per ha (0.47 lbs P/acre). This loss represents approximately 2.8% of the applied P (fertilizer and manure). Four rainfall events during the 2000 growing season and snowmelt in March 2001 were responsible for the transport of 91% of the P from the watershed. Using animal inventory numbers and standard P excretion values, swine manure was estimated to supply approximately 35% of the land-applied P in the watershed. AGNPS simulations were completed using the 4 storm events from 2000 with an assumed 5% annual increase in swine production and subsequent increase in P application to the soils of Tipton Creek watershed. These simulations indicated that such a production trend, *without any changes in current management*, could result in a 40% increase in P transport from the watershed after 5 years. However, a combination of swine diets with lower P amounts and use of high available-P feedstuffs and/or phytase enzyme have been shown to reduce P excretion by as much as 50%. Adoption of these practices over the next 5 years would likely prevent any increase in P production from swine facilities and potentially reduce P production compared to current levels.