Applying knowledge to improve water quality
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Nitrous oxide and ammonia emissions from manure and manure- treated soils

Agriculture has been implicated as an important source of atmospheric nitrous oxide and ammonia emissions. In dairy areas the main source of N is due to the spreading of animal waste on the agricultural land. Laboratory-scale studies and field studies were carried out in order to understand the basic processes controlling ammonia and nitrous oxide emissions from fresh manure and manure-treated soils. The laboratory studies estimated the maximum potential and tendencies of ammonia and nitrous oxide emissions from manure impacted by different oxygen availability conditions and tillage conditions. We found that greater air exchange significantly enhanced nitrification and inhibited denitrification in fresh manure. Soil texture was also a factor that controlled ammonia volatilization and nitrous oxide formation processes in soils. For larger-scale field research, state-of-the-art integrated micrometeorological instrumentation was used for measuring nitrous oxide atmospheric fluxes (eddy covariance method), precipitation, temperature, CO2 land-atmosphere exchange, and surface energy balance. The instrumentation (Campbell Scientific, Logan Utah.) provided continuous monitoring of the real-time high frequency data. Field and laboratory experiments both show increases in nitrous oxide flux after intensive precipitation events and after manure applications and are much greater on the poorly drained hardpan soils than on the well drained valley soils.

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