

ENVIRONMENT

Title: Changes in Ammonia Emissions from North Carolina Swine Lagoons Associated with Improved Production Management – **NPB #18-205**

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Scientific Abstract: Swine manure management and storage has been implicated as a major source of increasing agricultural ammonia (NH_3) emissions in North Carolina. This study was conducted to establish how improvements in manure and animal management have affected nutrient loading in lagoons, reduced NH_3 emissions, and had effect on ammonium (NH_4^+) deposition in rural and urban areas. Periodic lagoon sampling for chemical analysis has been required for lagoon permitting and the data from swine facilities has been archived by the state of North Carolina. Archived lagoon chemistry analyses data from 182 farm lagoons were used to evaluate trends in lagoon chemical properties. Process and empirical NH_3 volatilization models were used with the data to calculate the relative changes of NH_3 emissions (since 2001) to improvements in swine production and management practices. Trends of lagoon nutrient content for both finisher and sow farms, primary and secondary lagoons, showed all measured nutrient elements in lagoons decreased from 17% to 95% except for a 41% increase in copper (Cu) in finisher primary lagoons (Copper is an essential dietary nutrient and supplementation above the minimum nutrient requirement can be used as an alternative to antibiotics for improving growth and feed efficiency at finisher farms). Because of reduced N and pH in the lagoons, a process model for NH_3 emissions suggested decreases from primary lagoons of 47% and 22% from both finisher and sow farm lagoons, respectively. Empirical and semi-empirical models predicted even larger decreases in NH_3 emissions ranging from 11% to 54% since 2001, depending on the animal type, primary or secondary lagoon, and emissions' model used. Long-term National Atmospheric Deposition Program (NADP) deposition measurements showed NH_4^+ deposition increased linearly with time at both the rural and urban sites. Our analysis of lagoon nutrient concentrations, NH_3 emissions, and NADP data indicates that the increase in rural and urban NH_4^+ deposition over the last 40 years, which have been largely attributed to increasing swine population, do not reflect changes in swine population, and that human population growth or other NH_3 emission sources must be investigated as significant factors.

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

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