

Ammonia Emissions from Land Applications of Fertilizers and Manure

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Ammonia volatilization can be a major nitrogen (N) loss process for surface-applied manures and urea containing fertilizers. There is growing concern that current manure management practices are contributing to ammonia loss and subsequent enrichment of streams and estuaries in the Mid-Atlantic region. Agriculture has been estimated to be a major source of ammonia to the atmosphere, and land application of manures and fertilizers can be a major contributor to agriculture's ammonia emissions. Ammonia losses from land application commonly vary from 20-75% of the manure ammonium-N (5-35% of manure total N), depending on management practices and environmental conditions. The major factors affecting ammonia loss from land applications are i) manure and fertilizer characteristics, such as manure type, fertilizer source, and manure percent dry matter; ii) application method, such as incorporation versus broadcast application; iii) environmental conditions, such as rainfall, temperature, and wind; and, iv) soil conditions, such as infiltration rate, soil moisture, and residue cover. Surface applications of liquid manures can lead to the largest and most rapid losses, e.g. 40-80% loss of ammonium-N (20-40% of total N) within a few days in warm weather to soils with high residue cover. Losses from poultry litters occur more slowly over approximately a week and are often 20-40% of the ammonium-N (5-10% of total N). Losses following surface applications of urea containing fertilizers are characterized by a few days of low loss, followed by several days of moderate loss which often amount to 5-20% of the fertilizer ammonium-N. The most effective method to minimize loss is immediate incorporation by direct injection or by tillage. Current ammonia loss estimates used within the region for nutrient management planning need to be reviewed and updated. An important need is reliable field data on ammonia losses under the soil, weather, and application methods typical of the Mid-Atlantic region. Managing ammonia emissions is especially important in livestock systems, which will require a systems approach involving the combined management of diet, manure handling, and land application techniques that are specifically designed for each individual farm.