Manure Injection Impacts on Ammonia Volatilization and Environmental Losses

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Reducing Ammonia Emissions

- NH_3 emissions directly proportional to the quantity of manure left on soil surface
- Most NH_3 emissions are within the first 24 hours after manure application
- Prompt tillage greatly reduces NH_3 emissions, but:
  - Soil erosion may be an issue
  - Not possible in perennial crops
  - Delaying tillage reduces N conservation

Reducing Ammonia Emissions

- “Low Disturbance” injection methods compatible with soil conservation goals

- Injection provides immediate reductions in NH_3 emissions

Some Available Low Disturbance Injectors

Shallow disk injector

Sweep injector

Reported Reductions in Volatile Ammonia Losses Compared to Broadcast

Method	Cropland	Pasture
Chisel/knife	73% less	40% to ~100%
Disk Injection	58 to ~100% less	20 to 75% less
Tillage	50 to 92% less	------

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Estimated Value of N Savings from Reducing Ammonia Losses

- Assuming
  - 60% reduction in NH_3 emissions
  - 35% of manure NH_4-N lost with broadcasting
  - ~10 lb NH_4-N 1000 gal^{-1} dairy slurry
  - ~7,500 gal $acre^{-1}$
- N conserved
  - ~15 lbs N $acre^{-1}$
  - \$7.50 $acre^{-1}$ at \$0.50 lb^{-1} N
  - Value of the environmental benefit?

Other Benefits of Manure Injection

- Reduces nutrient and sediment losses with runoff
- Reduces odor emissions

Downside to Manure Injection

Greater potential for denitrification

- Loss of N as N_2 or nitrous oxide (N_2O) can offset NH_3-N conservation
- 0 to 300% increases reported in limited number of studies
- N_2O is a potent greenhouse gas
- Further research need to estimate impact on N losses
- Economic analysis needed to evaluate tradeoff

Downside to Manure Injection

Greater potential for N leaching

- Problem if concentrated manure bands intercept preferential flow pathways
- Generally does not appear to increase N leaching if crop N requirement is not exceeded
- Could be a problem with high water tables or tile drainage