

## MANURE MANAGEMENT FOR NUTRIENT CONSERVATION

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Manure is rich in plant nutrients. Dairy manure contains about 75% of the nitrogen (N), 60% of the phosphate ( $P_2O_5$ ) and 80% of the potash ( $K_2O$ ) fed to the cow. Fresh, this manure contains about 10 lb of nitrogen, 5 lb of phosphate and 8 lb of potash per ton, which is comparable to the nutrients removed from the soil by a ton of corn silage (about 8 lb of nitrogen, 4 lb of phosphate and 8 lb of potash). As commercial fertilizer cost increases, manure management to conserve and recycle these nutrients through crops will be of increasing economic value.

Of the plant nutrients in manure, nitrogen is the most costly and easily lost. The 10 lb of nitrogen in fresh cow manure consists of about 6 lb as organic compounds and about 4 lb as ammonia or compounds (urea, uric acid) that are rapidly converted to ammonia. The organic nitrogen is also converted to ammonia but much more slowly.

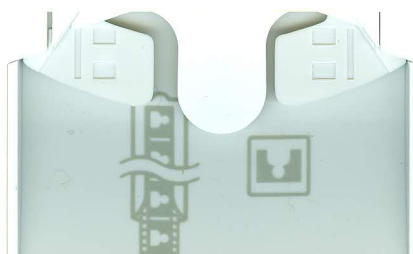
Ammonia is a gas and easily lost to the atmosphere. The greater the exposure of manure to air in the barn, in storage or in the field after spreading, the greater will be the loss of nitrogen as ammonia. Field research at Cornell University indicates that after spreading in the field about half the ammonia is lost in 3 days and nearly all in a week if the manure remains on the surface. Ammonia losses from most soils stop when the manure is incorporated, so the sooner after spreading the manure is incorporated the smaller will be ammonia loss.

After incorporation in the soil ammonia is converted by microorganisms to nitrate, a form of nitrogen that is not retained by the soil. Any nitrate nitrogen not accumulated by a crop may be moved downward out of the crop root zone with drainage water. These losses may be minimized by basing manure application rates on crop nitrogen needs, applying just before planting and use of a cover crop if manure is applied to tilled land in late summer or early fall.

Manure together with the nitrogen, phosphate and potash it contains may be washed off a field with runoff water and erosion. These losses are especially great during spring runoff where manure was applied to hillsides during winter. Such losses will be greater on sloping land and on land with little or no crop, or crop residues.

Recommendations to minimize nutrient loss:

- (1) Manure should be applied just before planting and immediately incorporated.
- (2) Application rates should be based on the amount of nitrogen the manure can supply and the nitrogen requirement of the crop. Amounts of commercial fertilizer applied should be reduced by taking into account the nutrients in the manure.



- (3) If manure must be applied in late fall or winter:
  - (a) apply to land with the least slope
  - (b) avoid land commonly flooded in the spring
  - (c) apply to land with the greatest amount of crop or crop residue.
- (4) Avoid manure application to hayland with more than 50% legume. The nitrogen will stimulate grass growth at the expense of the legume.

In our 1982 experiment in Westport, Massachusetts, we are comparing dairy and poultry manure application rates against commercial fertilizer and a check plot of no fertilizer or manure addition. One rate of dairy manure (30 ton/acre) was both surface applied and incorporated while all other manure treatments had the manure incorporated. Manure rates were: dairy, 15, 30 and 100 ton per acre; and poultry, 10 and 20 ton per acre. Commercial fertilizers were ammonium nitrate at the rate of 200 lb N per acre and 15-8-12 also at the rate of 200 lb N per acre. The field was planted to Agway 584S corn on May 7, 1982.

