Keep Nitrogen beneath the Surface

Due to skyrocketing fertilizer prices, manure is receiving serious attention from both livestock and crop producers. Utilizing manure as a primary source of nitrogen (N) has its drawbacks, but they can be overcome with proper management and equipment. The main point is preventing N loss from surface-applied manure. Too often manure is surface applied in the late summer and fall and not incorporated until spring. While tractor fuel is expensive, the N saved can more than offset the cost of incorporation into the soil.

Paul Wylie
County Extension Director
Allegan County

Three reasons to either inject liquid manure or promptly work surface-applied manure into the soil are that it stops ammonium-nitrogen losses, cuts odor generation, and greatly reduces the likelihood of runoff loss of nutrients. These things will reduce your fertilizer bill, improve neighbor relations and protect our environment.

The potential for nitrogen (N) loss when manure is surface applied and left for days or weeks is substantial. Research shows that the loss is significant and with urea N price per pound at 95 cents, this deserves attention. For example, liquid dairy manure has, per 1000 gallons: 28 pounds total N and half that is ammonium N or 14 pounds, 12 pounds of P₂O₅ (phosphate) and 20 pounds of K₂O (potash). Research from Vermont showed ammonium N loss was greatest during the first 10 hours after liquid dairy manure was surface-applied. Waiting 24 hours to incorporate the application resulted in a 50% loss of the ammonium N. You might think ammonium N loss is worse from liquid manure, but solid and semi-solid manures lose even more N because there is no liquid to be absorbed into the soil.

For example, if your plan is to apply dairy manure to meet the N recommendation for 150 bu. yield goal of shelled corn you would apply 140 pounds of available N valued at $133, or 10,000 gallons of manure. If you wait 24 to 48 hours to work it in, you still meet Right-to-Farm guidelines. However, you stand to lose 70 pounds of N from the ammonium component. With the current cost of urea N at $0.95/lb., you would have to buy additional fertilizer valued at $66/acre to make up for the loss and still pay the cost to spread the urea.

In the example, there are 200 pounds of K₂O valued at $114 at today’s prices. The 120 pounds of P₂O₅ is worth approximately $120, but if you don’t need it, it is worth nothing. Grand total for the 10,000 gallons of manure, is $367. This is the value of readily available nutrients plus 140 pounds of slow release N available in the next 3 years, worth $133 at today’s prices.
This manure application could be worth as much as $500 per acre. The bottom line is, the more valuable something is the better care we tend to take of it. Is it time to re-think your manure application practices? Shouldn’t these valuable nutrients be placed in the root zone where the crop can utilize them?

What kind of equipment should be used to incorporate surface-applied manure? Research in Maryland showed that a chisel plow reduces losses by 80%; a disk reduces losses by 90%, and a moldboard plow by 95% when used to incorporate manure immediately after it was surface-applied.


A Disk Plow being used to incorporate manure for demonstration at the 2006 Great Lakes Manure Handling Expo. Incorporating manure immediately after application can be used to reduce N losses by 80-95%.

Photo courtesy Beth Stuever