by Drs. B.C. Darst and P.E. Fixen

What About Manure?

Plenty of controversy swirls about risks, availability, current use, and potential use of manure with commercial fertilizers.

Summary: *There is no question that the application of animal manure to cropland will continue to have an impact on N, P and K use in the future, but certainly at a much lower percentage than the potential calculated by the Council for Agricultural Science and Technology (CAST). As yields increase and demand for fertilizer nutrients goes up, part of the impact will be absorbed or minimized. However the fact remains that animals produce a lot of waste that must be disposed of in some manner. Such disposal will be a factor in the fertilizer market in the days to come.*

You may or may not have read a report issued out of the minority staff of the Senate Committee on Agriculture in late 1997 expressing a growing concern for environmental risks associated with livestock production in the U.S. Senator Tom Harkin (D) of Iowa was quoted at the time as saying, "The impact of pollution is no longer confined to only a few rural areas." Some of the unsettling statistics in the report included:

- In 60 percent of rivers and streams that the EPA has identified as impaired, agricultural runoff, including nutrients in animal waste, is the largest contributor to pollution.
- Broiler litter from a typical broiler house (22,000 birds) contains as much P as is in the sewage from a community of 6,000 people.
- On the Delmarva Peninsula, 600 million chickens produce over 3.2 billion pounds of raw waste per year, as much N as a city of nearly a half million people.

While the above statements have no direct relationship to the replacement value of animal manure for commercial fertilizers, they do reflect a growing concern over the negative effects of animal wastes on the environment and even human health. For example, the outbreak of Pfiesteria piscicida, which killed nearly a half million fish in North Carolina and the Chesapeake Bay in 1997, has been associated with but never linked to the use of animal wastes. The fear factor, however, helped to speed new legislation and regulations.

Manure as substitute

An important question then becomes: how much commercial fertilizer (NPK) will (can) animal manure replace? A CAST report estimated that up to 29 percent of N, and 68 percent of each P_2O_5 and K_2O in commercial fertilizers could potentially be replaced by manure, noting at the same time that amounts of commercial fertilizers replaceable by animal manure vary widely by U.S. region. Others have calculated figures similar to those in the CAST report.

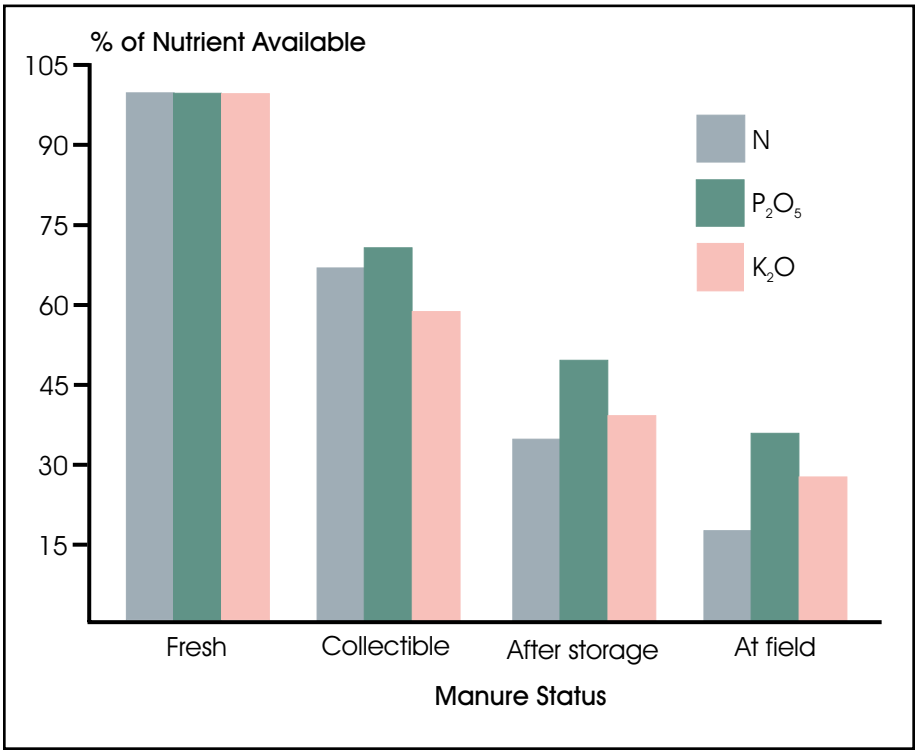

Figure 1. Nutrient status of manure from North Carolina livestock at different stages after collection, 1993.

The more important question may be: how much manure is already being used along with commercial fertilizers? Nobody has an exact answer to that, but we do know it is a significant amount in many areas. For example, chicken litter has been applied to crop and pasture lands in Arkansas, North Carolina and other poultry-producing states, impacting commercial fertilizer use for years. Although dairy manure produced in the Central Valley of California has been applied primarily on cotton and forages (corn silage and small grains), it also has been used on vegetables, citrus, and other crops.

Just how practical?

One downside of manure that makes it questionable as a practical source for agricultural nutrients is the amount of valuable nutrients lost because of decomposition during storage.

Nitrogen losses are greatest because of volatilization. During extended periods of storage, N losses are most common as NH_3 volatilization and denitrification. About 50 to 70 percent of N excreted is urea-N, found in urine, most all of which is quickly volatilized. Estimates of field losses by volatilization of NH_4-N from surface-applied manure range from 10 to 70 percent.

Phosphorus losses occur as runoff or as settling in lagoons. Loss is generally less than that for N.

Potassium. Significant K losses can occur when manure is stored outside and is rained on prior to field application. Manure does not need to be decomposed for the K to be leached out by rainfall. While these K losses pose no threat to the environment, they do reduce the value of the manure as a nutrient carrier for K.

Figure 1 shows the low percentage of NPK remaining in manure from North Carolina livestock for crop use after accounting for all nutrient losses from storage and transport of manure to the field. Only about two thirds of the nutrient value of the manure produced is collectible, and less than one-third is available for crop growth.

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