

The Perishability and Profitability of Manure

By Winston Way

INTRODUCTION

Manure is Vermont's third most valuable agricultural product. Unfortunately, manure's value to crops is not realized because of improper care. Manure treated to "best managements could provide over four times the nitrogen benefit of poorly managed manure. But "best management" can only be applied with a good understanding of manure's problems as well as its benefits.

Manure's nutrient content is highly variable. Amount and type of feed make a difference. Heavy grain feeding causes richer manure. High protein concentrates, urea feeds, and legume forages increase manure's nitrogen content. The higher potash levels in alfalfa are conveyed to urine because cows have little use for so much potassium.

Another benefit of grain by-product concentrates is that they represent nutrients imported from outside. Each ton of feed adds about 400 pounds of high analysis fertilizer to a cow's manure. Thus, the average dairy farm acquires more fertilizer from the feedbag than from purchased commercial fertilizer.

MANURE PROBLEMS

Even under best possible management crops will not obtain all the nutrients originally present in the manure. There are inevitable gas and liquid losses during pre-storage and post storage periods. There are portions of manure so undecomposable that crops will not get them until the years following application.

Liquid losses - Manure easily loses its liquids unless it is retained by bedding or stored in a container that does not leak. While nitrogen does volatilize, all soluble nutrients as well as suspendable solids (such as organic phosphorus) can be lost to runoff in January and spring thaws. They may also leach through soils into ground water. Nitrogen in the form of nitrate ions are the greatest threat to ground water and wells.

Volatilization - Storing manure in winter does not by itself insure nutrient preservation. Before being put into storage and once removed from storage, manure is still subject to volatilization. This creates not only a nutrient loss, but an air pollution problem and odor nuisance. Proper storage must be combined with improved methods for getting at least the liquid fraction into the soil quickly.

Timing - Timeliness of manure's use determines much of its worth to a crop. Nitrogen especially must be available to the crop at the period of greatest use. Like chemical nitrogen, manure's urea will disappear by leaching, volatilization, denitrification or bacterial absorption long before the plant can use it if manure is applied in the spring prior to planting.

Solid decomposition - Manure solids are most easily decomposed when incorporated into a soil. Thus, regardless of prior management, manure must be incorporated into soil as soon as possible. If not, fewer nutrients will be liberated in a given growing season and soils are kept wetter and cooler, delaying germination and promoting seed and seedling diseases. In addition, herbicides and lime can be rendered less effective.

BENEFITS OF MANURE

Nutrients - Manure is a major source of nitrogen, phosphorus and potash on dairy farms and furnishes every nutrient needed by plants. Experiments by Dr. Fred Madgoff at the University of Vermont have shown that its alkaline minerals, mainly calcium, magnesium, potash and sodium not only help supply plant needs but can modify soil pH to correct acidity and reduce toxic aluminum. Rates of 20-30 tons of manure per acre allow this to occur and indeed make it happen over a decade, while chemical nitrogen leaves residual acidity with each use.

Manure is rich in sulfur. It contains all the micronutrients from boron and molybdenum to copper and zinc. Whatever was in the living plant and seed eaten by animals becomes apart of manure. Dairy cows pass about 75% of the nutrients they consume.

Availability - Not only are all nutrients present in every forkfull of manure, but most are in complex organic forms which slowly release and reduce leaching loss and chemical fixation by the soil. Nitrogen in the solid portion of manure is the best example of the fact that "manure is biologically paced to the needs of the crop". This means that when corn is growing fastest, with greatest nitrogen demand, manure is decomposing at its fastest rate. During cool, drier, or wetter times, when growth is slowed, decomposition and crop growth are regulated by the same environmental factors.

Physical effects - Manure is an excellent source of organic matter. All of the intermediary breakdown products ultimately result in soil humus. It provides a sponge effect to increase soil water-holding capacity. Organic matter insures better soil structure, improving both air and water drainage in clays. Roots function better and therefore, nutrient uptake is enhanced. Physical effects of manure on soil can last for a decade or more.

Manure plus - Manure benefits crops in a multitude of indirect ways. It feeds the tons of soil organisms beneath each acre, such as earthworms, bacteria, insects, nematodes, protozoa and fungi. Plants benefit from vitamins, hormones, and, perhaps, other growth promoting substances yet to be discovered, dubbed by one researchers as "fecal factors".

MANAGING MANURE

To profit most from manure and to protect the environment, it is important to adopt good management practices. "Best managements may not always be appropriate because of economic and other farm considerations. However, it should be the goal.

Wise manure handling involves many decisions large and small; no two farms are alike; housing differs, as does space for storage. Cropping patterns also require or limit choices.

Best management checklist

These rules are for best management of manure on a farm. Through simple and straightforward, they require money, effort, and will power to implement.

However, without them, a farmer may lose nutrients worth hundreds, if not thousands of dollars each year.

1. Store manure to permit flexibility of use. Slurry has advantages.
2. Keep manure as cool as possible. Below-ground storages are cooler in summer.
3. Keep manure away from air. Bottom-loaded storages are ideal.
4. Keep manure moist. Slurry holds onto ammonia better than solid.
5. Retain all of manure's liquid. Use enough absorptive bedding to prevent runoff when piled or handled.
6. Get manure into storage quickly - the sooner, the better, to minimize air exposure.
7. Store manure in a non-leaking container. Lagoons are not perfect - they may not seal; seals are disturbed during agitation.
8. Plow under, disc-in, or inject manure as quickly as possible after spreading. One hour should be your goal; injection is ideal.
9. Spread on sod ground just ahead of, or during, an inch or two of rain (not always easy to do).
10. Be timely with application according to your crop's needs. Empty storages in fall and/or spring on sod crops; empty storages in May or July for com. Avoid midsummer application unless injecting slurry so as to avoid odor problems.
11. Spreading manure in winter on frozen ground or snow is the worst possible way to use manure.

12. Never leave manure on the ground exposed to sun and wind.
13. Never exceed safe rates; protect water tables as well as the crop.
14. Love thy neighbor" enough to be considerate about odor problems when spreading. Watch the weather. Manure Rained in" or injected has less time to give off odors. Temperature and wind direction make a difference. Cold, winter-stored manure is less likely to smell than that removed from above-ground storages after hot weather.
15. No-till corn does not allow for the best management of manure. An injector becomes necessary, since manure cannot be incorporated otherwise. If left on the surface, manure interferes with the effectiveness of herbicides and may result in loss of surface-applied nitrogen fertilizers. It also interferes with the penetration of lime.

Summary

Livestock farmers must find better ways to conserve the value of manure. Doing so will automatically correct or prevent environmental problems and, in the process, create easier handling than ever before. But above all, the management ,methods chosen must be adaptable to the operation size and layout. Manure is the nearest thing to a crop growing panaceea that can be found. Taking advantage of its countless virtues will increase farm profits!

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