

# **Manure management can be sticky**

by Meryl Rygg McKenna

Fifty years ago, in diversified farming areas where cattle and grain crops co-existed on a relatively small scale, it was common to see a tractor pulling a manure spreader, fertilizing fields. Now, it is more common to see dry granular commercial fertilizers being applied by large trucks or tractor-drawn spreaders.

Given the large number of livestock in certain regions in Montana and Wyoming, combined with tight margins in both crop and livestock operations, well-thought-out manure management is more important than ever.

How can a grower use manure as a resource most productively?

## **Planning is a priority**

Manure is a good source of organic matter, nitrogen (N), phosphorus (P), potassium (K) and micro-nutrients (micros). All of these elements are necessary for healthy plant growth. Adding manure to soil increases organic matter, which can improve the soil's structure, water-holding capacity, infiltration and soil microbe activity.

Nutrient values in manure can vary widely, depending on type of animal, age of manure, whether bedding or other material such as weed seed is in the manure, and other factors. A manure analysis is a low-cost (around \$60) method of obtaining the nutrient content of manure.

Once the nutrient value of manure is known, a plan is needed that will include where and when to apply manure, how to estimate the best application rate and which crops might benefit most. These things – plus a plan to protect water quality – make up a Nutrient Management Plan (NMP), according to Tommy Bass, Associate Extension Specialist who advises on manure management.

There are three types of manure NMPs: one for individuals; one submitted to the state Department of Environmental Quality for a permit; and one developed by the NRCS. A permit NMP is required only for animal feeding operations and their related farm enterprises. An NRCS NMP is a requirement of certain USDA cost-share programs. An individual NMP may be fairly simple, while a permit NMP may be quite involved.

Lenders and insurers are increasingly asking for some sort of management plan to reduce liability on animal feeding operations and some ranches. An NMP can answer that need. Help for creating NMPs may be available from consultants such as Certified Crop Advisers, USDA-Natural Resources Conservation Service or Extension.

One good thing about an NMP is that growers are required to keep records and sample their soil, said Neal Fehringer, a Certified Professional Agronomist and Certified Crop Adviser (CCA) from Billings. The process makes growers more aware of the impact that applying manure has on crops and the environment, ways to use it wisely and how to make the most of its benefits.

Giving manure away is a strategy for simplifying a nutrient management plan for permitted animal feeding operations. Certain aspects of the plan are still required to document other Best Management Practices (BMPs) and water quality protections

Tilling the soil in some way is very important after applying solid manure. If manure is applied to the surface but not incorporated into the soil, and an intense rain or flood-irrigation occurs, manure can leave the field and end up in streams, rivers and wells. In addition, nitrogen volatilizes into the atmosphere if it is not incorporated into the soil within 48 hours of application. Loss of nitrogen into the air means less is available for plants, and there is more manure smell in the neighborhood. More nitrogen in the atmosphere means it is deposited with rain in non-intended areas, thus increasing nitrogen in waterways, mountains, etc. From an economic standpoint, more nitrogen loss to the air means more money gone with the wind.

Soil injection of liquid manure, common on hog and dairy farms, is a style of application that is quickly gaining popularity. Its benefits include significant reductions in the negative effects of compaction from narrow-spaced truck passes, nitrogen loss, odor and tilling of the soil. It is efficient from a time-management perspective but is expensive due to high equipment costs. While several methods of injection are in use, growers have reported being extremely happy with agronomic production where the manure has been knifed into the soil.

Application of liquid manure through pivots and wheel lines has also been used, Fehringer said. It is a low-labor method with some smell downwind during application. Water moves much of the nutrients into the soil so odor after application does not occur. Care must be taken to prevent runoff from the field into surface waters.

### **Considerations**

In the right place and at the right time, manure can optimize crop yield and quality. Conversely, in the wrong place, or used at the wrong time, manure's nutrients can be considered pollution and have health and economic impacts to people, business sectors including agriculture, and the environment in general. Good management prevents P runoff or N leaching into ground and/or surface waters.

Land where manure has been repeatedly applied often has high test levels of P, K and micros. While nitrogen is highly water soluble and can be washed off fields or leached through the soil by rainfall or irrigation, phosphorus and other nutrients attach to soil particles and tend to remain in the soil unless washed off fields by water erosion. Build-up of P may pose a threat to water quality, and could have negative interactions with other nutrients, according to Bass.

Too much manure is often applied near feedlots, due to the cost of transporting it farther away from its source. This means fields near the source often already show high levels of P and K. Land that has not had much manure applied to it would benefit more overall, where manure N, P and K can be beneficial, providing a yield response from all nutrients.

Nitrogen leaching into groundwater is also a concern, especially in sandy or gravelly soils. Nitrate levels that can adversely affect humans or livestock have been detected in

wells in Montana. According to Patrick Hensleigh, Agronomist with the USDA-NRCS Ecological Services in Bozeman, the NRCS uses a nitrogen risk assessment based on soils, precipitation or irrigation, management and other factors to assess the risk of nitrogen leaching from a field or farm.

Some growers believe that applying manure to “alkali” areas will improve the soil. However, Fehringer said repeated heavy applications of manure raise the soil test salinity level because manure contains salts. Adding it to areas that are already salty will make the situation worse. This happens more under pivot irrigation and on dryland fields, where leaching of salts is limited.

Another concern Fehringer noted is that spreading manure can compact the soil, which is not good for plant growth. The type and speed of equipment used for spreading manure and the moisture content in the soil influence the extent to which the soil will be packed down. One option to minimize compaction is to load the manure into end-dump semi-trailers, dump it at the edge of a field, and load it from there onto a tractor-pulled manure spreader.

Whether by tractor or truck, spreading manure will likely leave tracks or ruts, which may require tillage to even out the soil. Spreading manure when the soil is dry will greatly lessen compaction.

Lastly, uniform application of manure is critical, just as a grower wants the fertilizer company to spread the whole field and not leave skips. Soil sampling after non-uniform application gives inaccurate test results of the situation in the field; thus crop yields will suffer. Sampling is best done shortly before application of manure.

### **Value of manure**

Using a recent manure analysis of 15 lbs N, 9 lbs P<sub>2</sub>O<sub>5</sub>, 18 lbs K and 3 lbs of S in a ton of a manure, and a recent fertilizer dealer cost of \$0.40/lb N, \$0.50/lb P<sub>2</sub>O<sub>5</sub>, \$0.33/lb K<sub>2</sub>O and \$0.28/lb S, Hensleigh estimated the manure’s value at \$17/ton. This estimate does not include the value of micronutrients or the increase of soil organic matter.

Fehringer noted, “When I have applied a value per unit of N, P, and K contained in manure, they cost about 50 cents on the dollar versus buying them in commercial fertilizer. The major cost of manure is transporting and spreading it.”

The lower costs of N, P, and K in manure hold true only if the soil needs those nutrients. When Olsen soil test P levels are over 60 ppm, Fehringer quits having growers apply any commercial P. When K levels are over 400 ppm, he stops having growers apply K. So, if soil test P and K are above these levels and the grower applies manure, then the value of P and K from the manure is zero because those nutrients provide no additional benefit. The nitrogen, organic matter and micro-nutrients are still beneficial, however. Since P tends to stay in the soils, it can build up to extremely high levels if not monitored. Fehringer said he has seen P test results as high as 435 ppm on a field that has received manure at high rates for over 30 years.

High soil P levels place an exclamation point on the need for a manure/nutrient management plan where nutrients can be allocated to fields where the needs are greatest and the grower can gain the greatest financial benefit, according to Karen Hoffman,

NRCS State Water Quality Engineer. Fields that have high P, K, and micro levels require only commercial nitrogen. With commercial fertilizer, producers only apply the nutrients that are needed. Bass added that applying manure at P rates and then rounding out N with a commercial product is also a sound strategy.

With so many economic, agronomic and management factors to consider, as well as the potentially daunting length and breadth of the permitting process, a conversation with a knowledgeable and trusted crop adviser may be the best place to begin.

*For more information on certified crop advisers, or to find one near you, go to <http://www.certifiedcropadviser.org>.*