Manure Testing: Benefits and Rationale

Many livestock producers depend on surface application of livestock or poultry manure to satisfy nutritional requirements of pastures and hay meadows. There are numerous benefits associated with applying manure to grasslands. Surface applied manure has made possible forage yields which would otherwise be economically impossible for many forage producers in Arkansas.

To achieve the greatest dry matter return for each unit of manure applied, a working knowledge of the chemical constituents of manure is needed. Nutrient concentrations vary among manures based on their origin and management prior to being loaded into the spreader. For example, poultry litter coming from houses which are completely cleaned out between flocks contains less nutrients than litter coming from houses where multiple flocks are grown on the same bedding that is either windrowed or decaked between flocks.

A manure analysis report determines the nutrient concentration of a manure stock. Manure nutrient concentration coupled with soil test recommendations, enables producers to calculate application rates on a per acre basis. Having a good estimate of nutrients that a particular manure contains allows farmers the ability to apply only the amount of manure necessary to satisfy nutrient needs required for optimum yield. Knowing the fertilizing value of a particular manure also helps prevent over-application of manure and soil and environmental contamination.

The chemical composition of manure is complex, but from an agronomic standpoint, the three most valuable nutrients found in manure are nitrogen, phosphorus, and carbon. Nitrogen exists in manure in organic and inorganic forms, and depending on storage facilities and methods, significant amounts of gaseous N may be lost to the atmosphere by volatilization. Organic forms of N must be converted to mineral forms (either nitrate or ammonium) before it can be utilized by a plant.

Phosphorus is an essential nutrient for plants and is used by plants in its phosphate form. It is present in manure in its dissolved form, orthophosphate. As such, it can easily be picked up by runoff waters and enter surface water, potentially leading to algae blooms and reduced water quality. Because phosphorus does not convert to gaseous forms like nitrogen, it stays in the manure.
during storage and then forms complexes with mineral soil particles after land application.

Carbon is the most abundant element in manure, and although it does not directly play a major role in plant nutrition, it is very important for increasing soil organic matter and soil quality. Like nitrogen, carbon is subject to conversion between solid and gaseous forms, and considerable amounts of carbon may be lost to the atmosphere during manure storage as carbon dioxide or as methane if oxygen is not present. The ratio of carbon to nitrogen (C:N) is also an important property of manures since high C:N ratios (>30) will cause soil microbes to temporarily take up virtually all inorganic nitrogen in the soils resulting in short term nitrogen deficits.

The quality of the manure analysis is only as good as the sample taken. Form of manure (dry or wet), method of storage, sampling location, and number of representative samples taken all contribute to sample quality. Poor or haphazard sampling techniques may return erroneous results, a costly prospect particularly since accurate application rates depend on representative samples.

For tips on quality sampling techniques, see “Manure Testing,” a SERA-17 publication, at https://sera17dotorg.files.wordpress.com/2015/02/bmp_manure_testing.pdf.