UNIVERSITY OF DELAWARE
COOPERATIVE EXTENSION

Know the Value of Manure: Manure Sampling and Analysis

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April 2025

Introduction and the Value of Manure Analysis

Manure has always been a valuable input to agricultural soils in our region. The value of manure has increased significantly in the last few years as the cost of commercial fertilizers has climbed to record highs. As such, manure is in high demand because it is a locally produced source of nutrients (macro- and micro-) and organic matter that are greatly beneficial additions to Delaware's sandy soils. Yet, the nutrient content of manure is highly variable from farm to farm. Getting a manure analysis close to the time the manure will be spread ensures you get the most bang for your buck. This article is focused on sampling solid/dry poultry manure because this represents the majority of manure samples collected in Delaware.

Manure analysis is a foundational component of crop production because the ability to make accurate manure management decisions is based on the physical and chemical properties of the manure, specifically the nutrient content. However, it can be challenging for the operation receiving the manure to obtain a manure analysis near the time of spreading, despite being a requirement for operations managed under a nutrient management plan. Poultry operations may obtain a manure analysis and share that information with the receiving farm. Yet, it is always in the best interest of the farm receiving the manure to also have the manure analyzed. Annual manure sampling and analysis can eliminate timing issues for operations with a consistent source of manure. After a few years of annual sampling, growers will have average manure analysis values that can be used for planning purposes. Using average manure analysis data reduces the stress of waiting for a current laboratory analysis and gives the farmer a better view if the nutrient values of the manure are changing.

Preparing to Collect a Manure Sample

The most important step in the analytical testing process is sampling. The goal of manure sampling is to collect a sample that will accurately represent the nutrient content of the manure that will be land applied. Before taking a sample, it is a good idea to check with the lab analyzing the sample to get information about 1) the quantity of manure to collect, 2) how to store the sample, 3) when and how to ship the sample, and 4) the paperwork that needs to accompany the sample. The Agricultural Compliance Lab at the Delaware Department of Agriculture offers free manure laboratory testing for Delaware residents; testing is available for non-residents for a fee.

We recommend securing the following basic manure sampling supplies prior to collecting a manure sample:

- Clean plastic bucket
- Clean shovel or spade
- Sealable plastic bags for dry samples like poultry litter or bedded horse manure
- Permanent marker for labeling the sample container
- Freezer space for the sample

It is best to avoid using the following items when sampling manure:

- Metals buckets
- Glass bottles for liquid samples

Sampling Dry Manure

Solid poultry manure can be sampled from a stockpile, manure shed, manure storage area, or the poultry house. Good sampling techniques will minimize analytical variability but will not eliminate it. As such, it is a good idea to take several manure composite samples and have those samples analyzed, even if the manure originated from the same farm. Testing multiple samples will provide a snapshot of the variability of physical and chemical properties.

Sampling Dry Manure from a Stockpile

Follow these steps when collecting manure from a stockpile (Figure 1):

- Take 10 - 20 subsamples and place them into a clean plastic bucket
- Begin each subsample 18" below the stockpile surface (avoiding the crusted surface)
- Mix subsamples thoroughly in a large bucket or on a clean hard surface

Figure 1. Poultry litter samples can be collected from a temporary in-field stockpile (Photo credit: Greg Binford, University of Delaware).

While sampling a stockpile it is best to avoid:

- Sampling manure on the outside of the stockpile that has been exposed to rain
- Taking soil with the manure subsamples
- Sampling areas of the stockpile that look different from the majority of the stockpile

Sampling Inside a Poultry House

Nutrient concentrations are highly variable within the poultry house. For example, the areas around feed lines, waterers, and brooding chambers can have different physical and chemical properties than manure in other areas of the house. Follow these steps when collecting a litter sample inside a poultry house:

- Visually divide the house into three areas, lengthwise
- Walk the length of the first area, in a zig-zag pattern, taking between 8 and 10 subsamples
- With the spade, remove a small "trench "of litter above the soil floor (this is not the subsample)
- Once the area is clear, now take a 1" thick slice of litter for a subsample and add the slice to a clean bucket
- Avoid taking soil with the subsample
- Repeat this in the other two areas
- Consider sampling each poultry house separately
- Thoroughly mix subsamples together
- Fill a plastic bag 2/3 full of the composite sample
- Label bag and place in a cooler with ice

Figure 2. Litter properties can vary spatially within the poultry house. When sampling manure inside the house, it is best to subsample at least three areas of the house by walking in a zig-zag pattern and collecting manure subsamples that can be composited into a representative sample. (Photo credit: Amy Shober, University of Delaware)

Sampling from a Manure Shed or Manure Storage Area

Sampling from a manure shed (Figure 3) or manure storage area can be tricky, especially if the structure is full. Most of the manure in a full shed or storage area will be inaccessible; plus, the manure that can be sampled easily may be exposed to rain. As such, it can be nearly impossible to collect a representative sample from a full manure storage structure. If sampling from a manure storage structure or area is the only option, it is best to wait to take the sample at the time that the shed or storage area is being cleaned out, as all the manure can be accessed for sampling during cleanout. If different "types" of manure (e.g., crust or cake with total clean out litter) are stored in the same area, it is best to sample each type of manure separately. If the majority of the manure in storage is accessible, then sampling manure from the storage area is a similar process as sampling from a stockpile. As such, follow the steps outlined above for "Sampling Dry Manure from a Stockpile" to obtain a representative sample. Remember, it is important to take several subsamples from the storage area and mix them together to generate a representative sample for submission to the laboratory. It may be prudent to collect multiple samples from the storage area depending on the capacity of the manure shed and the volume of manure being stored, with more samples collected from larger volumes of stored manure.

Storing and Shipping Manure Samples

Avoid shipping samples to the lab late in the week to ensure that the sample will be processed quickly and not held at the lab for many days before it is analyzed. As such, it may be desirable to store manure samples prior to submitting the samples to the lab for analysis. Most laboratories recommend freezing the sample, but check with the lab for sample holding procedures if the sample is not taken to the laboratory for analysis within an hour of sampling.

Figure 3. Poultry litter samples can be collected from within a manure storage structure if the litter is accessible. The best time to sample from a storage area is during cleanout. (Figure credit: University of Delaware)

When preparing a sample for shipment to the lab, we recommend the following steps:

- Place a portion of the mixed subsamples into a quart size plastic bag
- Label sample with contact information
- Place sample bag inside another quart size plastic bag
- Store in a freezer or cool area until shipment

Summary

Manure is a valuable resource that contains organic matter and nutrients that benefit soil health and crop production. Manure analysis provides important details about the nutrient content and other important physical and chemical properties of the manure that will be land applied. Taking a representative manure sample is the most important step to ensure high quality results from manure analysis. Delaware residents can have their manure samples analyzed for free by the Delaware Department of Agriculture. An accurate manure analysis will ensure that manure will be applied in compliance with state laws and regulations to enhance crop production and minimize environmental losses.

Additional Manure Sampling Resources (including liquid manure sampling)

- Delaware Department of Agriculture Manure Sample Submission Form https://agriculture.delaware.gov/wp-content/uploads/sites/108/2022/06/General-Sample-Submission-Form-DDA-Ag-Compliance..pdf

- University of Maryland Extension Sampling Manure For Nutrient Content https://extension.umd.edu/sites/extension.umd.edu/files/2021-02/Manure%20Sampling%20Procedures%20NM-6.pdf

- Penn State University Manure Sampling for Nutrient Management Planning https://extension.psu.edu/manure-sampling-for-nutrient-management-planning

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Publication Date: April 2025

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