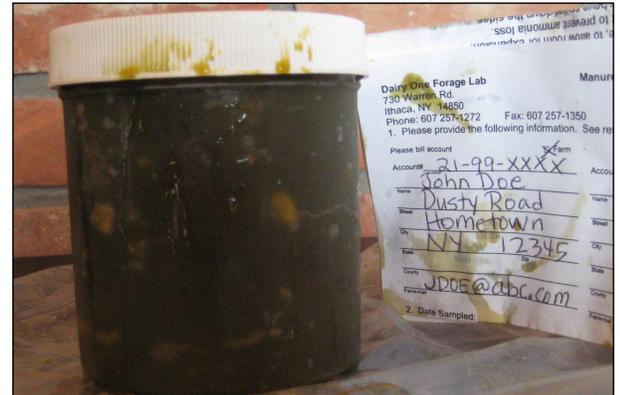


## Manure Sampling & Calibration

This season isn't over quite yet but it isn't too soon to start planning for the next cropping cycle. Once the corn comes off, many farmers will start emptying their manure storages. In fact, I am detecting a whiff of manure in the air right now which just tells me that my neighbor is getting a head start by applying manure to an old alfalfa field he plans to plow down next spring. In any event, now is a good time to check the calibration of manure spreaders and plan for the soil testing and manure analysis required by your Nutrient Management Plan.

Let's start with sampling; Manure is a valuable natural resource on dairy farms. It contains many of the essential plant nutrients needed for crop growth. Book values are helpful but they really don't give you an accurate analysis for your own farm. Storage conditions, rainfall, bedding used, feed programs, hoof bath products and waste water entering the storage, among other things, can have a big impact on the actual nutrient content of manure from your farm.



Establishing a manure database for your own farm is a valuable tool for determining the nutrients available in each source of manure you use. Manure analysis combined with soil test results and manure spreader calibrations form the foundation for field by field manure application rates to meet crop nutrient needs. It also helps you stay in compliance with your nutrient management plan and avoid costly over or under application.

It is a good idea to sample each type of manure each year for 3 - 5 years to establish a baseline for each type of manure available on your farm. After that, it is necessary to follow the regulatory guidelines included in your Nutrient Management Plan which will probably require testing every couple of years and/or anytime there is a major change in feeding programs, bedding, storage or handling.

Sampling, when manure is being loaded into the spreader or applied to the field is the best time. Sub-samples collected as manure is loaded or spread results in a more representative sample. Unfortunately, analysis results will only be available to calculate future application rates, not the current application. A running average or baseline value can be used once you have several years of values available to you. As long as no significant changes are made in the production system, the nutrient content of the manure should remain fairly constant.

One composite sample from multiple sub-samples that have been thoroughly mixed is sufficient for testing purposes in most cases. To avoid contamination, take samples with a clean steel or plastic shovel or cup and mix it completely in a clean 5 gallon plastic bucket. Avoid using galvanized tools or containers that can contaminate the sample and affect results.

Below are some general guidelines for sampling different types of manure:

1. **SAMPLING DAILY SPREAD MANURE** can be accomplished using a five-gallon bucket placed under the barn cleaner four or five times while loading the spreader or using a garden trowel and pail to collect samples from various spots on several loads over the course of several consecutive days. This should be mixed thoroughly in a bucket or on a tarp if it is dry enough. Take a sub-sample from the mixed composite sample and fill the manure sample container 1/2 - 3/4 full. Repeat this several times throughout the year to determine variability over time.
2. **SAMPLING DIRECTLY FROM STORAGE**; Sampling a storage directly is much more difficult and likely to result in more variable results than sampling as the manure is loaded into the spreader.
3. **SAMPLING DURING LOADING**; Collect at least five samples while emptying the storage and loading the spreader. Save these samples in a bucket, thoroughly mix the samples (a plunger works well in some cases) and take a subsample from this to fill the manure sample container. Keep the sample on ice to prevent ammonia loss if samples are collected over several hours.
4. **LIQUID MANURE**; It may be necessary to take multiple samples from large liquid storages that are difficult to agitate completely, especially if there are obvious changes in consistency or color. Nitrogen and potassium tend to be more concentrated in the liquid fraction at the top while phosphorus tends to be more concentrated in the solid fraction near the bottom. Other nutrients, including copper from copper sulfate hoof baths, may also be more concentrated in the solid fraction. If uniformity of agitation is a problem, consider collecting multiple composite samples from the top third, middle and bottom third of the storage so you have a better idea of variation in nutrient content from top to bottom. You can make a dipper by fastening a plastic cup to a broomstick and sampling directly from multiple tanker loads as the storage is unloaded.

Immediately after sampling each load, mix it up completely, remove a small amount with a spoon and place it in the plastic screw top container provided, then cap tightly and freeze it immediately. Collect several subsamples from different loads on different days and add each new subsample to the jar of frozen material and refreeze immediately. Continue until you have a representative bulk sample that fills the jar ¾ full, but no fuller, to allow room for expansion when it freezes.

5. **SOLID MANURE;** Sample while loading the spreader or during application in the field. Do not sample directly from a bedded pack or stockpile if it can be avoided. Samples should be taken from loads representing the beginning, middle, and end of the process. A minimum of five samples of approximately the same size should be taken while emptying the storage and placed in a bucket. Avoid large chunks of bedding or other areas that are "atypical". After all the samples have been collected, place it on a tarp or other clean surface and mix thoroughly. Take a sub-sample from the mixed composite sample and fill the manure sample container.
6. **SAMPLING DURING SPREADING** is another option but it can be a real mess...leave this one for solid manure. It involves spreading manure over a tarp and collecting, compositing and sub-sampling the contents for 5 or more loads. This can also be useful for irrigated manure but you will need to use buckets in place of the tarps.

#### **HANDLING AND SHIPPING GUIDELINES;**

Proper care and handling of the sample will ensure that the samples sent for analysis are representative of the original manure nutrient content.

Proper steps should be taken to avoid leakage, nutrient transformations such as volatilization, and moisture loss.

1. Dairy One provides screw top 16 oz plastic containers and submission forms upon request. These are the preferred sample container for liquid or semi-solid manure samples. We can also provide a cardboard mailer that will hold 2 sample jars.
2. Liquid and semi-solid manure sample containers should never be filled more than three-quarters full.
3. Please do not use zip lock bags for liquid or semi-solid manure. The folks at the post office and in our sample receiving area will be very grateful! Also, do not use glass containers for sampling or shipping since they tend to leak or break which poses a safety hazard.
4. Zip lock bags are ok for bedded pack, compost or other dry materials. Even then, fill bags approximately one-half full, squeeze out the air, close, and seal. Samples should be double-bagged to prevent leaking.
5. All manure samples should be kept cool until they are sent to the lab. Most labs recommend freezing samples or keeping them on ice. Include some blue ice in the shipping box to help keep samples cool. It is important to keep samples cool during the sampling process too so keep samples on ice in a "manure only" cooler during warm weather sampling.
6. Do not allow the samples to sit longer than one hour in a warm environment. Ideally, samples should be sent to the lab within a day. If they are not sent within a day, they should be frozen until shipped.
7. It is best to send samples early in the week to avoid arrival on a weekend or holiday. The quicker they can be processed, the better.
8. Be sure to clearly label the sample and completely fill out the lab information sheet that accompanies the sample. Enclose a check, credit card information or your account information for billing. The standard analysis will cost \$35. That includes total nitrogen, ammonia nitrogen, organic nitrogen, phosphorus, phosphate equivalent, potassium, potash equivalent, total solids and density. Other services are available at an additional cost. Results are reported on an as received basis (%) with the pounds of each nutrient per ton and per 1000 gallons.

Of course, manure analysis is just one part of the puzzle. Soil testing is needed to determine how much manure is needed, if any, to meet the nutrient requirements of the crops to be grown. You can find out more about the Dairy One and Agro-One soil testing options at [www.dairyone.com](http://www.dairyone.com). And finally, manure spreader calibration combined with the soil test recommendations and manure analysis results will help you determine spreader application settings and speeds needed to deliver the desired amount of manure.

Additional information can be found at:

Cornell Agronomy Fact Sheet Series Factsheet 38 Manure Sampling, Analysis and Interpretation

<http://nmsp.cals.cornell.edu/publications/factsheets/factsheet38.pdf>

PSU Agronomy Facts 69 Manure Sampling for Nutrient Management Planning

<http://cropsoil.psu.edu/extension/facts/agfact69.pdf>

Cornell Agronomy Fact Sheet Series Factsheet 18 Calibrating Manure Spreaders

<http://nmsp.cals.cornell.edu/publications/factsheets/factsheet18.pdf>

PSU Agronomy Facts 68 Manure Spreader Calibration

<http://cropsoil.psu.edu/extension/facts/agfact68.pdf>

