Manure and Wastewater Sampling Guide

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Why Sample Manure and Wastewater?

Manure and wastewater are valuable resources that can reduce fertilizer needs and help improve soil and your bottom line. Sampling and testing of manure and wastewater is needed so one can apply the manure and nutrients appropriately. There are also Animal Feeding Operation (AFO)/Concentrated Animal Feeding Operation (CAFO) regulations that require manure and wastewater testing.

Over-applying nutrients can contaminate the groundwater, which when consumed by children, can lead to blue baby syndrome and childhood cancers. It also increases the risk of nutrients being transported to surface waters, which can result in algae growth and fish kills. Manure and wastewater testing identifies the nutrient concentration and helps one determine appropriate application rates.

What to Sample?

A standard manure sample analysis includes moisture, pH, salinity (EC), and elemental composition for many of the essential nutrients (e.g., N, P, K, Ca, Mg, Na, and S). Moisture percentage and nitrogen (N) and phosphorus (P) composition are needed to determine the proper manure application rate and meet the requirements of a nutrient management plan (Martin & Beegle, 2014; Modderman, 2021). Testing for ammonium-N (NH_4-N) is recommended as it provides N availability information and insight on how to best handle your manure.

Nitrogen

- Manure contains both inorganic N (plant-available) and organic N (not readily plant-available). Together these are called Total N. Both elemental composition and Kjeldahl analyses determine Total N.
- Available N in manure is primarily NH_4-N. The percentage of N that is available varies considerably based on the type of manure (e.g., dairy, poultry, etc.).
- Manure N can vary greatly (50% or more) from book values or general guidelines (Wilson, 2021; Ni & Lim, 2022). Testing for NH_4-N is recommended to prevent over- or under-applying N.

Phosphorus

- AFO/CAFO regulations require testing of the manure and soil for N and P. Manure application rates are limited when soil test P levels are above 50 ppm.

Carbon to Nitrogen Ratio

- This is useful for manures that have a lot of bedding. Manures/composts with a C:N ratio >35 (Brust, 1991) temporarily tie up the N so it is not immediately available after application.

pH and EC

- Manure pH and EC can affect the pH and salinity of the soil, respectively. Limited manure application rates may be warranted for some soils to avoid salinity problems.

When to Sample?

Sampling and analysis should occur as close to land application time as possible. The nutrient concentration in manure and wastewater can change over time due to runoff, leaching, and changes in moisture percentage. Nitrogen can also be lost due to volatilization.

There are two primary approaches for when to sample.

(1) **Just prior to land application.** Take samples two to three weeks prior to land application, if possible. The goal is to have the sample results back just in time to determine the appropriate land application rate. When using this method, check with the laboratory to see what their turn-around time is. Your sampling date should allow enough time to get your results prior to land application.

(2) **At the time of land application.** This method works when the manure being applied is providing only a portion of the nutrients needed or when one has a history of manure application and the manure values tend to remain fairly constant from one year to the next. If using this method, sample manure as it is being applied, then immediately send the sample for analysis. Use results to determine additional fertilizer needs.

How to Sample?

Nutrients can vary greatly within a manure pile or holding area. The amount and type of bedding in manure or wastewater can greatly influence the nutrient content. When sampling manure and wastewater, it is important to obtain a representative sample to not over- or under-apply manure. Sampling procedures vary depending on the type, or form, of manure or wastewater.

Manure comes in many forms: (1) solid; (2) semi-solid; (3) slurry; and (4) liquid. The amount of solids present affects the manure handling systems and how you sample (Table 1; McEnany et al., 2021).

Table 1

Manure Forms

Form	Solid	Semi-Solid	Slurry	Liquid
% Solids	>20%	10%–20%	4%–10%	<4%
Handling considerations	-	• Amount of bedding greatly impacts handling characteristics. • May require separation or drainage of free water to handle as a solid. • Alternately, add water or wastewater to handle as a liquid.	• Handles as a liquid. • Needs special pumping equipment.	-

Manure Sampling Methods

The manure and wastewater sampling methods presented in this guide are listed below. Full sampling procedure information follows.

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Solid Manures

A. Manure Stockpiles

1. Sampling Prior to Application

Sampling directly from a manure stockpile is generally not recommended as it is very difficult to get a good representative sample (Wortman et al., 2014). Manure stockpiles have a lot of variability with the outside typically being dry and forming a "skin" whereas the bottom of the pile is often wet and has a lot of leachate (Figure 1).

When sampling directly from a manure stockpile, it is very important that many subsamples are taken.

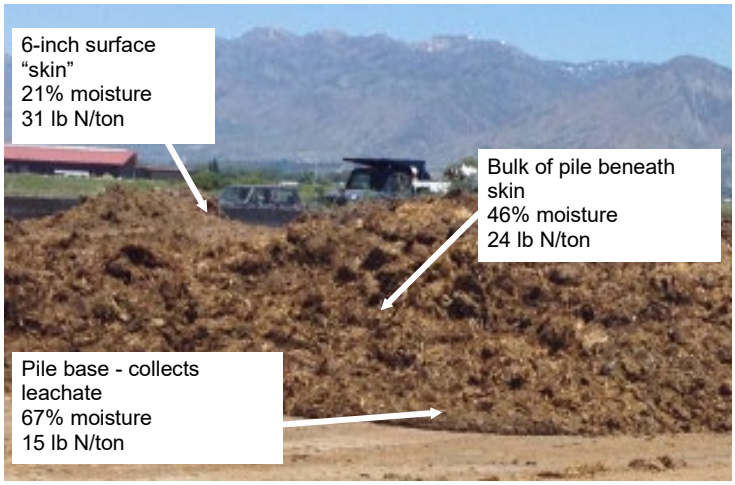

Figure 1. *Manure Stockpile With Relative Moisture and Nitrogen Contents*
Photo: Rhonda Miller

Preparation	
Equipment needed	• Spade or manure collection probe. • Clean plastic bucket, wheelbarrow, or tarp for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).

Collection setup and guidelines	• Subsamples should be taken from 10–20 (or more) widely dispersed sites.
	  ○ Take samples from all sides, and across the entire pile (Figure 2).
	  ○ Sample from areas that are representative of the material present. Avoid sampling pockets of just bedding or just manure.
	  ○ Subsamples should be representative of the moisture present.

Sample collection	
Sampling procedure	Step 1. Remove the crust. Step 2. Take samples that are at least 18 inches deep from each of the 10–20 sites. Step 3. Place subsamples in a clean plastic bucket/wheelbarrow/or tarp. Step 4. Mix thoroughly. Step 5. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

Figure 2. *Sampling Across Manure Pile*
Photo: Rhonda Miller

Figure 3. *Sampling During Solid Manure Loading*
Photo: Rhonda Miller

2. Sampling When Loading

Sampling during loadout (Figure 3) is relatively easy and benefits from some additional mixing of the manure pile as the pile is loaded. It is important that the samples are collected throughout the loading process.

Preparation	
Equipment needed	• Shovel or scoop for collecting subsamples. • Clean plastic bucket, wheelbarrow, or tarp for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).
Collection setup and guidelines	• Take at least 10–12 subsamples. • Take samples at the start, middle, and end of loadout.
Sample collection	
Sampling procedure	Step 1. Pull 10–12 samples from loader bucket throughout loadout. Step 2. Place subsamples in a clean plastic bucket/wheelbarrow/or tarp. Step 3. Mix thoroughly. Step 4. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

3. Sampling When Spreading

Sampling during spreading is done by placing tarps out in the field (Figure 4). One can also verify the amount of manure being applied when using this method.

Preparation	
Equipment needed	• Tarps for collecting samples (8–12 tarps are needed). • Shovel or scoop for collecting subsamples. • Clean plastic bucket, wheelbarrow, or tarp for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).
Collection setup and guidelines	• Obtain samples from 8–12 tarps that are placed across the field. • Tarps will need to be fastened down.
Sample collection	
Collecting Sampling procedure	Step 1. Spread and fasten tarps (8–12). Step 2. After manure is applied, gather tarps. Step 3. For each tarp: • Break apart any clumps. • Mix well on the tarp. • Take 1–3 subsamples per tarp. Step 4. Place subsamples in a clean plastic bucket. Step 5. Mix well. Step 6. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

Figure 4. *Sample Collection Using Tarps*
Photo: Livestock and Poultry Environmental Learning Community (LPELC.org)

B. Compost Piles

1. Sampling Prior to Application

Compost piles are sampled like a solid manure stockpile. Since the compost should have been mixed several times during the composting process, fewer subsamples are required. If you are using a cold compost process with very little turning, then more subsamples should be taken.

Preparation	
Equipment needed	• Spade or manure collection probe. • Clean plastic bucket, wheelbarrow, or tarp for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).

Collection setup and guidelines	• Take subsamples from 5–8 widely dispersed sites. If using a cold compost process, take subsamples from 10–20 widely dispersed sites.
	  ○ Take samples from all sides, and across the entire pile.
	  ○ Sample from areas that are representative of the material present.
	  ○ Subsamples should be representative of the moisture present.

Sample collection	
Sampling procedure	Step 1. Remove the crust. Step 2. Take samples that are at least 18 inches deep from each of the 5–20 sites. Step 3. Place subsamples in a clean plastic bucket/wheelbarrow/or tarp. Step 4. Mix thoroughly. Step 5. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

C. Poultry Litter

There are two methods for sampling in-house prior to application or cleanout: (1) the point method; and (2) the trench method (Zhang & Hamilton, 2017; Lory & Fulhage, 1999; Coffey et al., 2000). Sampling in-house prior to application or cleanout is generally not recommended as it is difficult to get a good representative sample. Sampling during cleanout is the preferred method.

1. Sampling In-House Prior to Application – Point Method

Preparation	
Equipment needed	• Narrow spade. • Clean plastic bucket or wheelbarrow for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).
Collection setup and guidelines	• Visually divide the house into three zones (Figure 5). • Within each zone, walk the length of the house in a zig-zag pattern. • Randomly identify 8–10 points along the path in each zone. • At each point, use a narrow spade to clear a small trench to a depth just above the dirt floor (Figure 6). • Samples taken around feeders and waterers should be in proportion to the space they occupy in the house.
Sample collection	
Sampling procedure	Step 1. Take a uniform 1-inch slice as a subsample. Step 2. Place all 24–30 subsamples in a clean plastic bucket or wheelbarrow. Step 3. Mix thoroughly. Step 4. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

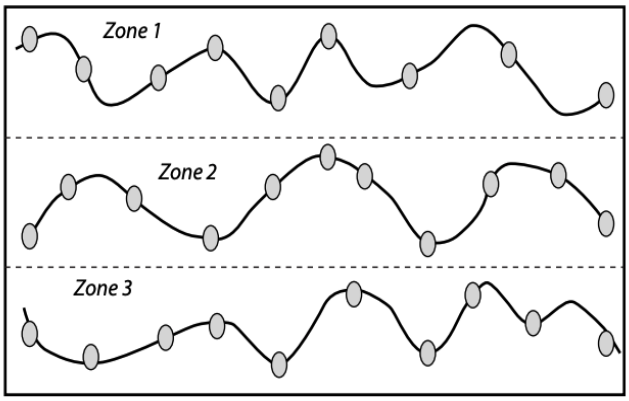

Figure 5. *Sampling Zones and Paths in Poultry House*
Photo: University of Kentucky Extension, Pub. ID-148

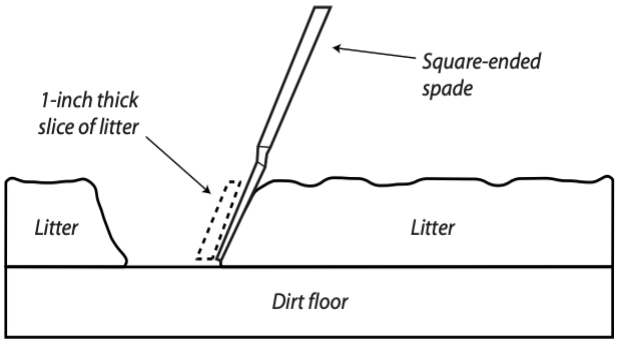

Figure 6. *Sample Collection Using Spade in Trench*
Photo: University of Kentucky Extension, Pub. ID-148

2. Sampling In-House Prior to Application – Trench Method

Preparation	
Equipment needed	• Narrow spade. • Clean plastic bucket and wheelbarrow for collecting and mixing subsamples. • Four freezer bags (two bags are needed for each sample for double bagging).
Collection setup and guidelines	• Visually divide the house into two zones (Figure 7)—a brooder portion and a non-brooder portion. • In the middle of the brooder area, dig a trench the width of a spade from the centerline to the house sidewall. • Place all litter from the trench into a wheelbarrow. • Repeat this process for the non-brooder area.
Sample collection	
Sampling procedure	Step 1. Dig the trench and fill the wheelbarrow 2/3 full. Step 2. Mix well, breaking apart any clumps. Step 3. Remove one shovelful and place in 5-gallon bucket. Step 4. Empty wheelbarrow. Step 5. Repeat this process until the trench is completed. Step 6. Place manure from the bucket into emptied wheelbarrow. Step 7. Mix well. Step 8. Obtain 0.5-pound composite lab sample. Step 9. Repeat steps 1–8 for the second trench.
Handling	• Fill one freezer bag 2/3 full for each area composite sample, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

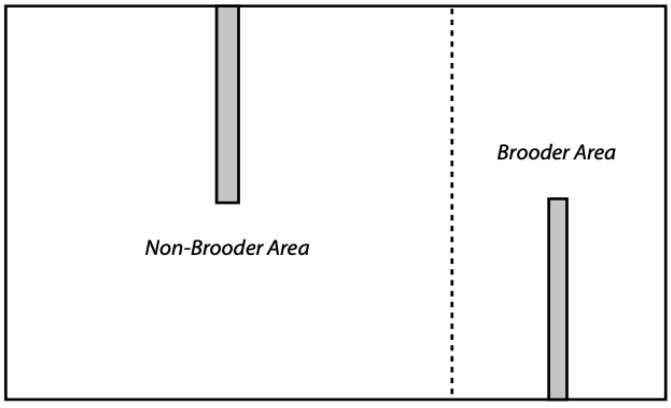

Figure 7. *Sampling In-House Using Trench Method*
Photo: University of Kentucky Extension, Pub. ID-148

Figure 8. *Cleanout of Poultry House*
Photo: LPELC.org

3. Sampling During Cleanout

Preparation	
Equipment needed	• Spade or manure collection probe. • Clean plastic bucket, wheelbarrow, or tarp for mixing subsamples. • Freezer bags (two bags are needed for each sample for double bagging).
Collection setup and guidelines	• After scraping out and piling the litter (Figure 8), sample like a solid manure stockpile. • Take 10–20 subsamples from all areas of the pile.
Sample collection	
Sampling procedure	Step 1. Remove the crust. Step 2. Take samples that are at least 18 inches deep from each of the 10–20 sites. Step 3. Place subsamples in a clean plastic bucket/wheelbarrow/or tarp. Step 4. Mix thoroughly. Step 5. Obtain 0.5-pound composite lab sample.
Handling	• Fill one freezer bag 2/3 full, remove air, and seal. • Double bag and seal. • Keep the sample cold or frozen.

Liquid Manure (Wastewater)

Liquid manure (<4% solids) is often stored in lagoons but may also be stored in aboveground tanks or concrete structures. Liquid manure will exhibit stratification of solids and nutrients with ~90% of the N being in the top liquid portion, and ~90% of the P being in the settled solids.

When emptying a storage tank or lagoon (to its minimum volume), the liquid wastewater should be agitated before emptying. At times, when additional storage space is needed in the lagoon or storage tank, only a small portion of the wastewater is removed to gain extra storage capacity. In these cases, the wastewater is typically not agitated before wastewater removal.

A. Lagoons and Storage Tanks – Agitated (When Emptying to Minimum Volume)

A storage tank or lagoon that is being emptied to its minimum volume should be well agitated (2–4 hours) prior to sampling. After the liquid manure is fully agitated, one can sample directly from the lagoon or pit (prior to application), or sample during loading or application.

1. Sampling Prior to Application – Directly From Pit or Lagoon

Preparation	

Equipment needed	• Cup or bucket sampler:
	  ○ Cup sampler—plastic sampling cup with a 10- to 15-foot handle.
	  ○ Bucket sampler—plastic bucket with a rope attached to it (do not use a galvanized bucket).
	• Clean plastic bucket for mixing subsamples.
	• Clean plastic sample container 16 ounces or larger with screw-type lid.
	Plastic bag.

Collection setup and guidelines	• Make sure the lagoon, storage tank, or pit has been well agitated, typically 2–4 hours.
	• Collect subsamples from different locations across the lagoon, tank, or pit.
	• Subsample collection:
	  ○ Cup samplers.
	  ▪ Subsamples should be taken 6 feet away from the bank or sides and 3–4 feet below the surface.
	  ▪ Avoid solids, debris, and scum.
	  ○ Bucket samplers.
	  ▪ Throw a bucket with rope to the center of the lagoon.
	  ▪ After the bucket falls below the water surface, pull it back.
	  ▪ Make sure the bucket is raised before it strikes the bank.

Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples from around the lagoon or storage tank. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving 1-inch headspace. • Place in a plastic bag and seal. • Keep the sample cold or frozen.

2. Sampling During Loading

Preparation	
Equipment needed	• Plastic container for collecting subsample. • Clean plastic bucket for mixing subsamples. • Clean plastic sample container 16 ounces or larger with screw-type lid. • Plastic bag.
Collection setup and guidelines	• Make sure the lagoon, storage tank, or pit has been well agitated, typically 2–4 hours (Figure 9). • Collect subsamples throughout loading process (top, middle, bottom).
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples during the course of pump-out (Figure 10). Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in a plastic bag and seal. • Keep the sample cold or frozen.

Figure 9. *Agitating Liquid Manure*
Photo: Rhonda Miller

Figure 10. *Sampling Liquid Manure From Tank During Pump-Out*
Photo: John Sawyer, Iowa State University Fertility Extension

3. Sampling During Spreading

Preparation	
Equipment needed	• Plastic buckets or aluminum pans for collecting subsamples. • Clean plastic bucket for mixing subsamples. • Clean plastic sample container 16 ounces or larger with screw-type lid. • Plastic bag.
Collection setup and guidelines	• Make sure the lagoon, storage tank, or pit has been well agitated, typically 2–4 hours. • Place 8–12 plastic buckets or aluminum pans around the field to catch manure/effluent from the spreader or irrigation equipment.
Sample collection	
Sampling procedure	Step 1. Collect and place 8–12 subsamples in a clean plastic bucket. Step 2. Mix well. Step 3. Obtain 1-pint composite lab sample. Note: If the pit has not been well agitated, separate composite samples should be collected for upper, middle, and lower layers of the pit, noting the application location in the field.
Handling	• Fill the plastic container with a 1-pint composite sample, leaving a 1-inch headspace. • Place in a plastic bag and seal. • Keep the sample cold or frozen.

B. Lagoons and Storage Tanks – Not Agitated (Pumping to Reduce Lagoon Level)

The lagoon is typically not agitated when removing only a small portion of the lagoon effluent to reduce the lagoon level. Due to stratification of the nutrients in the lagoon, only the top portion of the lagoon is sampled.

1. Sampling Prior to Application – Directly From Pit or Lagoon

Preparation	

Equipment needed	• Cup or bucket sampler
	  ○ Cup sampler—plastic sampling cup with a 10- to 15-foot handle (Figure 11).
	  ○ Bucket sampler—plastic bucket with a rope attached to it (do not use a galvanized bucket).
	• Clean plastic bucket for mixing subsamples.
	• Clean plastic sample container 16 ounces or larger with screw-type lid.

Collection setup and guidelines	• Collect subsamples from different locations around the lagoon or storage tank.
	• Subsample collection:
	  ○ Cup samplers.
	  ▪ Subsamples should be taken 6 feet away from the bank or sides and 1 foot below the surface.
	  ▪ Avoid solids, debris, and scrum.
	  ○ Bucket samplers.
	  ▪ Throw a bucket with rope to the center of the lagoon or tank.
	  ▪ As the bucket hits water, pull it back.
	  ▪ Make sure the bucket is raised before it strikes the bank.

Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples around the lagoon or storage tank. Step 2. Place the subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.

Figure 11. *Cup Sampler in Lagoon*
Photo: Rhonda Miller

Figure 12. *Slurry Sample Collection Using Column Sampler and Access Port*
Photo: Melissa Wilson, University of Minnesota Extension

Slurries

Slurries (4%–10% solids) are primarily generated in systems where little or no bedding is added to the manure. Slurries are often stored in pits beneath the livestock housing but can also be stored in aboveground storage tanks or ponds. Slurries behave as liquids with the solids settling and the nutrients stratifying into layers. Slurries are often agitated prior to sampling.

Manure storage in confined settings can be very dangerous—especially during agitation. The hydrogen sulfide present can easily overtake people. Extreme care should be taken when working with manure in confined settings. Adequate ventilation is imperative. Two people should always be

present. If there are problems, the second person should call for help, not try to help the first person unless they have appropriate safety gear, such as a self-contained breathing apparatus.

A. Confined Pit

1. Sampling Prior to Application

Sampling in confined pits is done using column samplers (Figure 12) (Coffey et al., 2000; Wilson & Cortus, 2020). The pit can be either agitated or non-agitated.

Preparation	

Equipment needed	• Column sampler—may be purchased or homemade.
	  ○ PVC pipe—narrow enough to fit through slats and wide enough to collect undisturbed sludge at bottom.
	  ○ Pipe should be long enough to reach the bottom of the pit.
	  ○ Mechanism to close off PVC pipe and collect sample.
	• Clean plastic bucket for mixing subsamples.
	• Clean plastic sample container 16 ounces or larger with screw-type lid.
	• Plastic bag.

Collection setup and guidelines	• If agitating pit, agitate for at least 2–4 hours prior to sampling. **Note: Use extreme caution when agitating.** • Access to the pit can be through the slats in the flooring or through manure access ports on the outside of the building. • Subsamples should be taken through the full depth of the pit or tank.
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples from different locations throughout the pit. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.
Video	Sampling a Liquid Manure Storage Pit for Nutrient Analysis (https://www.youtube.com/watch?v=QXCOb80qECA). This video from the University of Minnesota Extension shows how to construct and use a column sampler in a confined pit.

2. Sampling During Loading

Preparation	
Equipment needed	• Plastic container with long handle for collecting subsample. • Clean plastic bucket for mixing subsamples. • Clean plastic sample container 16 ounces or larger with screw-type lid. • Plastic bag.
Collection setup and guidelines	• Make sure the storage tank or pit has been well agitated, typically 2–4 hours. • Samples can be taken directly from tanker using a telescoping swing sampler or a wide-mouthed container on a long pole. • Collect subsamples throughout the loading process (top, middle, bottom).
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples over the course of pump-out. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample (Figure 13).
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.

Figure 13. *Obtaining Composite Sample*
Photo: Melissa Wilson, University of Minnesota Extension

B. Aboveground Tanks or Storage Structures

1. Sampling Prior to Application

Aboveground tanks or storage structures should be agitated prior to sampling.

Preparation	

Equipment needed	• Cup or column sampler:
	  ○ Cup sampler—plastic sampling cup with a 10- to 15-foot handle.
	  ○ Column sampler—may be purchased or homemade (Coffey et al., 2000; Wilson & Cortus, 2020).
	  ▪ PVC pipe that is long enough to reach the bottom of the tank or storage structure.
	  ▪ Mechanism to close off PVC pipe and collect sample.
	• Clean plastic bucket for mixing subsamples.
	• Clean plastic sample container 16 ounces or larger with screw-type lid.
	• Plastic bag.

Collection setup and guidelines	• Agitate the tank for at least 2–4 hours. • Collect subsamples from different locations and depths across the tank or storage structure.
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples from different locations and depths. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.

2. Sampling During Loading

Preparation	
Equipment needed	• Plastic container with long handle for collecting subsample. • Clean plastic bucket for mixing subsamples. • Clean plastic sample container 16 ounces or larger with screw-type lid. • Plastic bag.
Collection setup and guidelines	• Make sure the storage tank or pit has been well agitated, typically 2–4 hours. • Subsamples can be taken directly from the tanker using a telescoping swing sampler or wide-mouthed container on long pole (Figure 14). • Collect subsamples throughout the loading process (top, middle, bottom).
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples over the course of pump-out. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.

Figure 14. *Loading From Storage Structure*
Photo: Rhonda Miller

C. Slurry Lagoons and Holding Ponds

1. Sampling Prior to Application

Slurry lagoons and holding ponds should be agitated prior to sampling.

Preparation	

Equipment needed	• Cup or bucket sampler:
	  ○ Cup sampler—plastic sampling cup with a 10- to 15-foot handle.
	  ○ Bucket sampler—plastic bucket with a rope attached to it (do not use a galvanized bucket).
	• Clean plastic bucket for mixing subsamples.
	• Clean plastic sample container 16 ounces or larger with screw-type lid.
	• Plastic bag.

Collection setup and guidelines	• Agitate the lagoon or holding pond for at least 2–4 hours.
	• Collect subsamples from different locations across the lagoon or holding pond.
	• Subsample collection:
	  ○ Cup sampler
	  ▪ Subsamples should be taken 6 feet away from the bank or sides and 3 to 4 feet below the surface.
	  ▪ Avoid solids, debris, and scum.
	  ○ Bucket sampler
	  ▪ Throw a bucket with rope to the center of the lagoon.
	  ▪ As the bucket hits water, pull it back.
	  ▪ Make sure the bucket is raised before it strikes the bank.

Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples from around the lagoon or holding pond. Step 2. Place subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cold or frozen.

2. Sampling During Loading

Preparation	
Equipment needed	• Plastic container for collecting subsample. • Clean plastic bucket for mixing subsamples. • Clean the plastic sample container 16 ounces or larger with screw-type lid. • Plastic bag.
Collection setup and guidelines	• Make sure the storage tank or pit has been well agitated, typically 2–4 hours. • Samples can be taken directly from the tanker using a telescoping swing sampler or wide-mouthed container on a long pole. • Collect samples throughout the loading process (top, middle, bottom).
Sample collection	
Sampling procedure	Step 1. Collect 10–12 subsamples over the course of pump-out. Step 2. Place the subsamples in a clean plastic bucket. Step 3. Mix well. Step 4. Obtain a 1-pint composite lab sample.
Handling	• Fill the plastic container with composite sample, leaving a 1-inch headspace. • Place in plastic bag and seal. • Keep the sample cool or frozen.

Testing at Analytical Laboratories

Selecting a Lab

To ensure accurate results and unbiased recommendations, it is a good practice to send your sample to a certified lab. The North American Proficiency Testing Program for Agricultural Labs (NAPT) and the Manure Analysis Program (MAP) are two of the more common certifications.

Shipping Your Sample

Manure and wastewater samples being tested for N should be kept cold from the time of collection until they arrive at the testing laboratory. Nitrogen rapidly changes form and can be lost due to volatilization. Keeping the samples cold slows down the microbes that convert the N from one form to another.

It is important that samples be shipped immediately with no more than a two-day delivery time. For best results, samples should be kept cold while shipping. Plan to have the sample arrive when the laboratory is open so that it can be kept cold and processed appropriately. Samples should typically be shipped early in the week, not before a holiday or weekend.

Each lab will have its own specifications for containers and sample size. Some labs will provide containers. Be sure to check the specific requirements before collecting and sending a sample. The following sample sizes and container requirements are for the USU Analytical Laboratories (USUAL).

A. Solids

Item	**Specifications**
Sample	Obtain a good, representative composite sample as outlined in Section 1, Solid Manure.
Sample size	By weight 0.5 pounds, 1–2 pints by volume
Container	Use two heavy-duty sealable plastic bags.
Handling	• Fill plastic bag 2/3 full. Remove air. Seal tightly. • Label plastic bag with sample identification. • Double bag, remove air, and seal tightly. • Keep sample cold or frozen. Do **not** dry the sample.
Shipping	• Ship immediately with no more than a two-day shipping time. • For best results, keep the sample cold or frozen while shipping. • Ship at the beginning of the week. • Do not ship immediately before a holiday.

B. Liquids and Slurries

Item	**Specifications**
Sample	Obtain a good, representative composite sample as outlined in Section 2, Liquid Manure, and Section 3, Slurries.
Sample size	1 pint
Container	Use a clean plastic container 16 ounces or larger with screw-type lid. Plastic bag. **No** glass containers.
Handling	• Fill the container with 1 pint of composite sample, leaving a 1-inch headspace. Seal tightly. • Wipe the outside of the container. • Label the container with sample identification. • Place composite sample in plastic bag and seal. • Keep the sample cold or frozen.
Shipping	• Ship immediately with no more than a two-day shipping time. • For best results, keep the sample cold or frozen while shipping. • Ship at the beginning of the week. • Do not ship immediately before a holiday.

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