Liquid Manure Sampling Factsheet

WHY IS IT IMPORTANT TO SAMPLE LIQUID MANURE FOR ANALYSIS?

The characteristics of liquid manure can vary widely depending on many factors, such as animal species, feeding practices, manure handling and storage systems, and weather conditions. Like solid manure, liquid manure is also considered a valuable source of plant nutrients for crop production. Getting a representative sample that reflects the nutrient contents of the liquid manure to be applied to the field is essential to determining an appropriate application rate, improving nutrient efficiency, and minimizing adverse environmental impacts.

WHEN SHOULD A LIQUID MANURE SAMPLE BE TAKEN?

Liquid manure can be sampled either **before land application** or during land application.

If the sample is taken before land application (i.e., storage facility or tanker), agitation must be performed before sampling due to nutrient stratification (Figure 1). Nitrogen and potassium tend to concentrate in the top layer, whereas phosphorus tends to concentrate in the bottom layer (Harrison & Smith, 2004). It is challenging to get the liquid manure thoroughly agitated in a storage facility; typically, 2-4 hours of agitation are required (Coffey et al., 2000). Proper respiratory equipment should be worn when working and sampling in a manure storage facility, as dangerous gases (H_2S, NH_3, and CH_4) can be released and reach lethal levels during agitation.

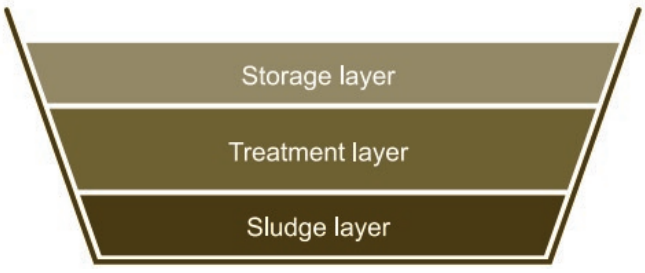


Figure 1. Stratification of nutrients in a liquid manure storage facility (Wallace, 2008).

If the sample is taken during land application, nutrient losses during handling and application should be considered. However, the drawback of this method is that the application rate for the current year cannot be adjusted due to the short laboratory turnaround time. The actual application rate can be back-calculated once the lab results are received, and it can be used to estimate the application rate for subsequent years, given that the source and storage of manure have not changed.

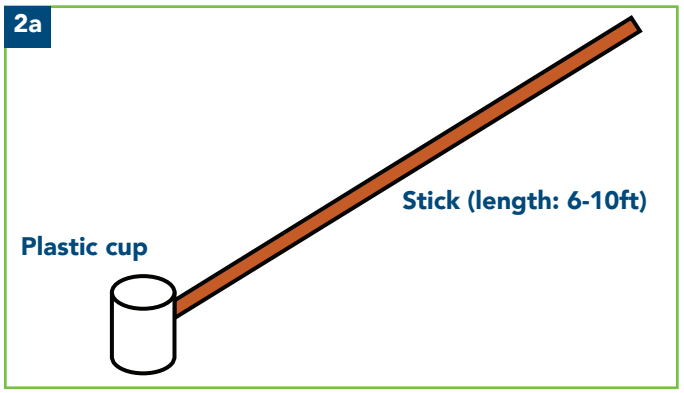
HOW OFTEN SHOULD A LIQUID MANURE SAMPLE BE TAKEN?

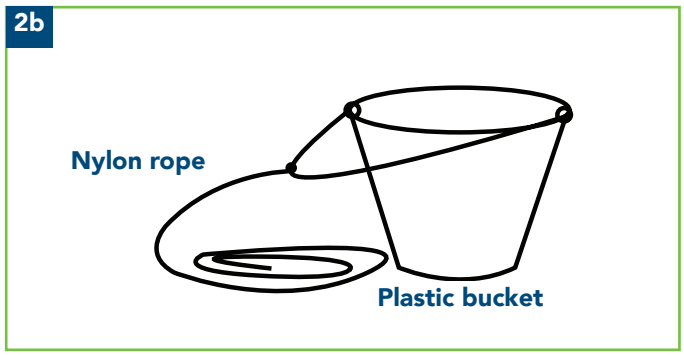
A liquid manure sample should be taken and tested at the same time every year. However, it is less frequently needed (every 4-5 years) after 3-5 consecutive years of sampling because farmers can estimate the application rate using the average historical nutrient values of the liquid manure unless there are substantial changes in the manure types and manure management practices (Wallace, 2008).

WHAT TOOLS ARE REQUIRED?

Samplers are commercially available but can also be constructed using materials in the local store. Some examples are as follows:

- One of the following:
  - Dipper: can be constructed by attaching a plastic cup to the end of a long stick (Figure 2a),
  - Bucket and rope: can be constructed by tying a long rope to a plastic bucket (Figure 2b),
  - PVC sampler: can be constructed with a PVC pipe, rubber ball or rubber stopper, hook eye bolt and wire (Figure 2c).
- Sample containers: wide-mouthed plastic containers such as ice cream or yogurt containers *Avoid using galvanized and glass containers during liquid manure sampling due to the risk of metal contamination and glass breakage, respectively.
- Personal protective equipment: gloves and masks.





FCAF ON-FARM CLIMATE ACTION FUND for Nova Scotia and Newfoundland and Labrador

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

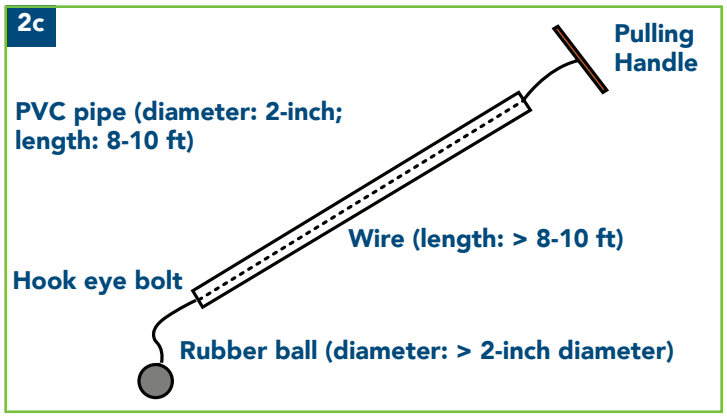


Figure 2. Liquid manure sampling tools (dipper (a); bucket and rope (b); PVC sampler (c)).

HOW TO USE THE TOOLS?

Sampling with a **dipper** - This method could be practical and convenient in an agitated storage facility. Slowly insert the dipper into the pit or lagoon and take samples from different locations and depths (top, middle and bottom) within the same storage facility (Iowa Learning Farms, 2011; U of M Manure Management, 2020).

Sampling with a **bucket** - This method is the least accurate, even in an agitated storage facility. Throw the bucket into the pit or lagoon and quickly pull back the bucket as soon as it breaks the surface of the liquid and pull it through from a depth of a foot. Repeat this process at other locations of the storage facility.

Sampling with a **PVC sampler** - This method can sample the entire profile/column of the liquid manure and permit sampling without agitation. Extend the PVC pipe vertically into the pit or lagoon with the rubber ball loose and open. Once the pipe reaches the bottom of the storage, pick up the pipe back slightly, and pull the wire until the end of the pipe is sealed off by the rubber ball. Slowly withdraw the pipe from the storage facility and release the rubber ball to deposit the sample into a bucket. Repeat this process at other locations of the storage facility (Iowa Learning Farms, 2011; U of M Manure Management, 2020).

HOW TO TAKE A REPRESENTATIVE LIQUID MANURE SAMPLE?

A representative liquid manure sample is the key to obtaining reliable and precise lab results. A good rule of thumb is to collect multiple subsamples (at least ten subsamples) and then combine them into a single composite sample for lab analysis. As laboratories may have slightly different requirements for manure analysis, such as sample size, it is suggested to consult with the selected lab before sampling to ensure the lab requirements for manure analysis are met.

Before land application:

- **Sampling from tankers:**

Liquid manure can be sampled from tankers before hauling for land application. Use a bucket to collect manure from the unloading port or use a dipper to collect manure from the loading port as soon as the tank is filled. Samples can be taken from each or every other tanker load.

- Sampling from pits and lagoons:

Liquid manure can be sampled from storage facilities such as pits or lagoons using a variety of samplers. Samples need to be collected at least 2 meters (6 ft) from the edge of the storage and at least 8 locations around the manure storage area (Figure 3) (Westerman et al., 2008). Before taking samples, use a stick to brush away the floating debris and scum.

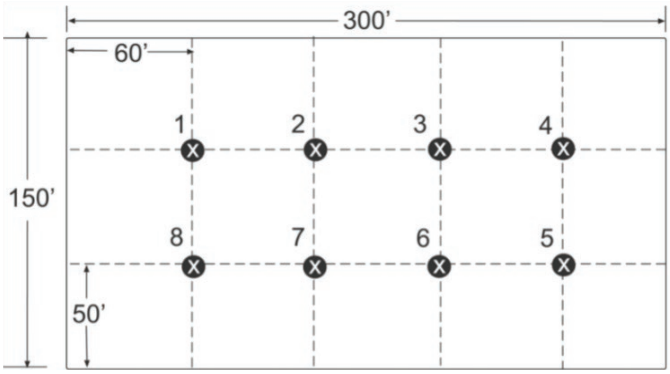


Figure 3. A layout of eight selected sampling locations in a lagoon (Wallace, 2008).

During land application:

- **Surface Broadcasting:**

If liquid manure is applied via surface broadcasting, you can randomly place multiple plastic containers or buckets on the field to catch liquid manure.

- **Injection systems:**

If liquid manure is applied via injection systems, you can collect samples directly from the injectors when the injectors are lifted from the ground. Samples should be taken at various intervals throughout the application process, such as the beginning, middle, and end. It is recommended to take a separate composite sample for each interval or take samples more frequently by adding more intervals.

After sample collection:

- Immediately after completing the application, combine all samples in a 5-gallon plastic bucket.
- Stir the sample thoroughly using a clean ladle, remove a homogenized subsample from the bucket, and pour it into a plastic sample container.
- Repeat Step 3 until the desired volume is obtained for lab analysis.

HOW TO HANDLE AND SHIP A LIQUID MANURE SAMPLE?

1. Fill the container with liquid manure (approximately ¾ full) and leave sufficient headspace to allow for gas accumulation or expansion during the freezing process.
2. Label the sample container with name, farm name, manure type (beef, dairy, or swine), date and time of sampling, contact information and address.
3. Ensure the container is clean and tightly sealed and place it in a second sealed plastic bag to prevent manure leaking and odour spreading.
4. Samples should be kept in a cool and dark place until they arrive at the lab. Place the container upright in a cooler with ice packs.
5. Fill out the submission form.
6. Ship samples immediately after collection and avoid arrivals on the weekends and holidays. If the samples cannot be shipped on the day of collection, freeze them to prevent biological activity.

WHERE CAN A LIQUID MANURE SAMPLE BE SUBMITTED FOR ANALYSIS?

*The following is a list of provincial analytical laboratories in Atlantic Canada that accept manure samples. *It is suggested to send samples to the same lab to increase the results' consistency and reliability.*

Nova Scotia Department of Agriculture Laboratory

(A1 package: DM, pH, N, C/N ratio, NH_4 -N, Ca, P, K, Mg, Fe, Mn, Cu, Zn, B, Na)
Sample size: 2 L

Harlow Institute (Dalhousie Agricultural Campus)
176 College Road, Bible Hill
P.O. Box 890, Truro, NS B2N 2P3
Tel: (902) 893-7444

Lab fees: **https://novascotia.ca/agri/documents/lab-services/analytical-lab-fees.pdf**

Submission form: **https://novascotia.ca/agri/documents/lab-services/analytical-lab-sample-sub.pdf**

Prince Edward Island Analytical Laboratories (PEIAL)

(M10 package: DM, C/N ratio, N, P, K, Ca, Mg, Cu, Zn; M10L package also includes NH_4-N)

23 Innovation Way, BioCommons Park
Charlottetown, PE C1E 0B7

Tel: (902) 620-3300

Submission form and lab fees: **https://www.princeedwardisland.ca/sites/default/files/forms/af_specialproductsanalysis.pdf**

New Brunswick Department of Agriculture, Aquaculture and Fisheries (DAAF) Agricultural Lab

Upon the closure of New Brunswick's analytical lab, samples will now be sent to PEI analytical laboratories (PEIAL). Samples can be delivered directly to PEIAL or dropped off at the head office or a regional DAAF office.

*Manure samples must be frozen.

Head office:
1350 Regent Street, Hugh John Flemming Forestry Centre
P.O. Box 6000, Fredericton, NB E3C 2G6

Tel: (506) 453-3826

Local offices: **https://www2.gnb.ca/content/gnb/en/departments/10/contacts/dept_renderer.137.html#offices**

Submission form and lab fees: **https://www.princeedwardisland.ca/sites/default/files/forms/af_specialproductsanalysis.pdf**

Government of Newfoundland and Labrador Soil, Plant and Feed Laboratory

(DM, pH, N, P, K, Ca, Mg, Fe, Mn, Cu, Zn, B, Na, Soluble Salts) (no individual test for NH_4-N)

*Sample size: 1 L

Department of Fisheries, Forestry and Agriculture
204 Brookfield Road, Provincial Agriculture Building
P.O. Box 8700, St. John's NL A1E 0B2

Tel: (709) 729-6738

Submission form and lab fees: **https://www.gov.nl.ca/ffa/files/Manure-Compost-Sample-Submission-Form-June-20-2022.pdf**

REFERENCES:

Coffey, R. D., Parker, G. R., Laurent, K. M., & Overhults, D. G. (2000). Sampling animal manure. Cooperative Extension Service. Univ. Kentucky, Lexington, KY.

Harrison, J., & Smith, D. (2004). Nutrient concentrations in manure storage facilities.

Iowa Learning Farms. (2011, July 18). Part 2: Sampling Liquid Manure [Video]. YouTube. **https://www.youtube.com/watch?v=k46Mew8bmLE**

U of M Manure Management. (2020, Oct 23). Sampling a liquid manure storage pit for nutrient analyses [Video]. YouTube. **https://www.youtube.com/watch?v=QXCOb80qECA**

Wallace, T. (2008). Sampling liquid manure for analysis.

Westerman, P. W., Shaffer, K. A., & Rice, J. M. (2008). Sludge survey methods for anaerobic lagoons. AG-639W, North Carolina Cooperative Extension Service, College of Agriculture & Life Sciences, North Carolina State University, USA.