

Commonly required conversions for manure spreader volumes.

To convert from	To	Multiply by
bushels	cubic feet	1.24
gallons	cubic feet	0.134
gallons	pounds	8.3 (liquid)
gallons	tons	0.0041 (liquid)
cubic feet	gallons	7.48
cubic feet	tons	0.031 (liquid) or 0.0275 (solid)
cubic feet	pounds	62 (liquid) or 55 (solid)



Manure Sampling and Spreader Calibration

In Pennsylvania



Manure Sampling

Manure test results, soil test recommendations and manure spreader calibration form the basis for determining appropriate manure application rates to meet crop nutrient needs.

Knowing the nutrient content of the manure:

- maximizes economic benefit from manure
- may reduce commercial fertilizer costs
- reduces environmental impacts from unnecessary application

Manure analysis can vary widely from farm to farm. Proper sampling allows farm-specific manure nutrient content analysis.

Collecting a representative sample:

- is the most important factor affecting the accuracy of the manure test
- is the most challenging aspect of the process
- relies on timing of collection being extremely close to when it is spread
- depends on pulling enough sub-samples from different parts of bedded pack or litter
- relies on liquid manure being thoroughly agitated
- should ideally be done for 3-5 years annually, to establish the average nutrient content
- needs to be re-done when changes in feeding or manure storage/handling occur



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Manure sampling kits are available from the labs that do the sampling. Samples should be taken from loads representing the beginning, middle, and end of the manure storage unloading process. Samples should be taken with clean steel or plastic shovels, scoops, or cups and placed in a clean five-gallon plastic bucket to make a composite sample. Do not use galvanized containers, which can alter the analysis results. Composite samples should be sent to the lab in plastic bottles (liquid and solids), or one-gallon heavy-duty "zip-lock" plastic bags for dry material like broiler litter, according to the directions provided by the testing lab.

Sampling During Loading

1. Take sample and place in bucket.
2. Take minimum of 5 samples while emptying storage.
3. After all samples are collected, that manure needs thoroughly mixed.
4. Take sample of mixed composite sample and fill lab's container.

Sampling During Spreading

1. Spread a tarp or heavy plastic in the field, spread manure over it with spreader.
2. Collect the manure from the tarp or plastic sheet and place it in the bucket.
3. Repeat with a minimum of five spreader loads throughout emptying of storage.
4. After all the samples have been collected in the bucket, mix thoroughly.
5. Take a sample from the mixed composite sample and fill the lab's container.
6. This procedure is usually only practical for more solid manures.

Sampling Poultry Litter

The consistency and nutrient content of dry litter varies within a poultry house. Material under and near waterers and feeders differs from the rest of the house. Manure from brood and grow-out areas should be sampled separately.

- Use solid manure sampling probe to collect 15-20 samples throughout house to depth of the litter to be removed.
- Collect samples from around waterers and feeders proportional to space they occupy in house.
- Collect samples in bucket, mix thoroughly, take sample and place in lab sample container.
- A sample gathered while spreading might be even more representative.



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Information compiled from Penn State Agronomy Facts #68. More thorough details and calibration procedures can be found in Agronomy Facts #68 from your local Extension office or <http://extension.psu.edu/plants/nutrient-management/educational/manure-storage-and-handling/manure-spreader-calibration>



Produced and distributed by
PA Agricultural Ombudsman Program

www.paagombudsman.com

September 2015

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Sampling directly from stockpiled manure, compost, or litter is not recommended due to difficulty obtaining a representative sample. Weathered exteriors, volatilization, and leaching provides inaccurate results.



Ample agitation is critical for sampling and spreading a uniform liquid manure. When not properly agitated, nitrogen and potassium can concentrate in the top liquid portion, while phosphorus will be more concentrated in the solids accumulated at the bottom.

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For all manure, be sure to test for the following:

- Percent moisture or percent solids
- Total nitrogen
- Ammonium-nitrogen (NH₄-N)
- Total phosphorus (P)
- Total potassium (K)

Other analyses that may be useful include pH, C:N ratio, water-extractable P, calcium carbonate equivalent, secondary nutrients (Ca, Mg, and S), and micronutrients (Cl, Na, Cu, Mn, Zn, and Fe). Usually it is not necessary to analyze manure for nutrients such as Ca, Mg, Zn, and boron. Most manure contains significant amounts of these nutrients and fields with a history of manure application are rarely deficient.

Information compiled from Penn State Agronomy Facts #69. More thorough details and sampling procedures can be found in Agronomy Facts #69 from your local Extension office or <http://extension.psu.edu/plants/nutrient-management/educational/manure-storage-and-handling/manure-sampling-for-nutrient-management-planning>



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Carefully collect all manure on the tarp and place on scales.

Spreader Calibration

Planned manure application rates listed in nutrient or manure management plans must correlate with actual application rates. Calibrating the manure spreader:

- is the only way to know actual manure application rates.
- ensures manure application rates are realistic, practical and attainable.

Contact your local Conservation District, USDA Natural Resources Conservation Service (NRCS), or private consultant for more information or assistance.

Use measuring wheel to mark a rectangular area, in feet, after applying manure.



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There are two common methods for calibrating: Swath or load-area method—best for liquid.

Measure the amount of manure in a typical spreader load and the land area covered by applying one load of manure following these steps:

1. Apply a full load of manure and measure the land area covered.
 - a. A level area, long enough for the load to be applied in a single pass, makes measurements and calculations simpler.
 - b. A rectangular field pattern should be used to make measuring easier.
2. Maintain a uniform ground speed throughout the swath length for PTO-driven spreaders, (ground-driven spreaders aren't affected by ground speed).
3. To change application rates, adjust tractor/PTO speeds, spreader output settings, or application management.
4. The calibration process should be followed for each change(s).
5. Repeat until the desired application rate is achieved.

Tarps can be large or a series of smaller ones, depending on what is available and easiest to weigh.



Weigh an empty spreader and a full spreader. Subtract the difference to find out how much manure is in a load. Then measure how much of an area is covered by one or more loads.



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Tarp or weight-area method—best for solid.

Weigh the manure spread over a small surface and compute the amount applied per acre following these steps:

1. Measure the weight of manure applied over a small measured area (tarp).
2. Divide the weight of manure collected on the tarp by the size of the tarp.
3. To change application rates, adjust tractor/PTO speeds, spreader output settings, or application management.
4. The calibration process should be followed for each change(s).
5. Repeat until the desired application rate is achieved.

Manufacturer's capacity ratings for liquid spreaders work if it is filled to capacity, but adjustments need to be made if it is less than full. Likewise, box-type or semisolid spreaders must be adjusted for "heaped or piled" loads. Details for determining capacity using the dimensions of a spreader can be found in *Agronomy Facts #68*.

Use tent pegs or long spikes to keep tarp or large plastic stationary while driving over it. Fold tarp carefully prior to weighing, so as not to spill any collected manure.

