

## For More Information

For information or assistance with your **management options**, contact your local Natural Resources Conservation Service (NRCS) or conservation district office.

Natural Resources Conservation Service  
10 East Babcock Street  
Federal Building Room 443  
Bozeman, MT 59715  
(406) 587-6813  
<http://www.mt.nrcs.usda.gov>

Montana Assoc. of Conservation Districts  
501 N. Sanders  
Helena, MT 59601  
(406) 443-5711  
<http://www.macdnet.org>

For information or assistance with **regulatory requirements** of manure management, contact the Montana Department of Environmental Quality.

Department of Environmental Quality  
1520 East Sixth Avenue  
P.O. Box 200901  
Helena, MT 59620-0901  
(406) 444-2544  
<http://deq.mt.gov/index.asp>

## Manure as a Resource Series

Three additional brochures are in this series. To receive a copy of any of the following brochures, visit your local NRCS office or the NRCS website.

- Sampling Manure for Nutrient Management
- Using Manure Analysis Results
- Sampling Soils for Nutrient Management.



United States Department of Agriculture  
Natural Resources Conservation Service

## Calibrating Manure Spreader Application Rates

Manure as a Resource Series



*Helping People Help the Land*

## Manure Spread Application Rates

One of the most critical components of a comprehensive nutrient management plan that includes animal manure is the application rate. Calibration of a manure spreader helps livestock producers use the nutrients contained in manure more efficiently.

Calibrating a spreader only takes a short time but can save hundreds of dollars in fertilizer costs. This publication describes two calibration methods that effectively estimate the amount of nutrients applied to a field.

*Applying the nutrients in manure according to crop needs reduces production costs and protects water resources.*



## Manure Application Plan

The key to successful nutrient management is a sound manure application plan. This includes:

- Setting realistic yield goals,
- Quantifying available nutrients through regular soil and manure tests,
- Crediting nutrient contributions from other sources, such as legumes,
- Keeping diligent records of rate, method, and date of manure and commercial fertilizer applications, and
- Using best management practices to reduce runoff and the leaching of nutrients.

# Calibrating Manure Spreader Application Rates

There are two basic approaches for calibrating a manure spreader. They are the load area and the weight area methods. The load area method is the most accurate and can be used for both liquid and solid manure. The weight area method works only with solid or semi-solid manure.

## Load Area Method

The load area method is a 3-step process.



First, determine the amount of manure in the spreader. The most accurate way to determine the amount of manure in a spreader is weighting the spreader when it is empty and again when it is full. For a reliable estimate of spreader capacity, weigh several representative loads (at least five) to determine the average gross weight. Subtract the empty spreader weight. Then, calculate the average net loaded weight.

Next, determine the area of spread using the method at the right. Width measurements near the beginning and end of the spread pattern should be avoided because the spreader may not be operating at full capacity.

Finally, calculate the application rate. The application rate is calculated using the formula for either liquid or solid manure.

Formula for Solid Manure Equals Tons/Acre	Formula for Liquid Manure Equals Gal/Acre
$\frac{\text{Average Loaded Weight (lbs)} \times 21.8^1}{\text{Distance Traveled (ft)} \times \text{Width of Spread (ft)}}$	$\frac{\text{Tank Volume (gal)} \times 43,560^2}{\text{Distance Traveled (ft)} \times \text{Width of Spread (ft)}}$

## Weight Area Method

When a scale is not available, the application rate of a box spreader can be determined by collecting manure on a tarp or piece of heavy material.



The weight area method is less accurate than the load area method. This method consists of eight steps:

1. Prepare/cut three 56-inch square tarps or pieces of heavy material (this size equals 1/2,000 of an acre). The pounds of manure collected on 56 inches square equals tons applied per acre.
2. Weigh one of the clean tarps and a large bucket on a platform scale. Record the weight.
3. Anchor the three tarps in the field ahead of the spreader near the beginning, middle, and end of the area that will be spread with one load.
4. Drive over the three tarps at a normal speed to collect a representative manure sample.
5. Fold and place the first tarp into the empty bucket without spilling the manure.
6. Weight the bucket, tarp, and manure. Subtract the weight of the clean tarp and bucket recorded in step 2.
7. Repeat the process for each of the two remaining tarps.
8. Calculate the average weight (pounds) of the manure collected. This value equals tons of manure applied per acre.

1. Factor for converting pounds to tons and square feet to acres ( $21.8 = 43,560 \text{ sq ft per acre divided by } 2,000 \text{ lbs/ton}$ ).

2. The factor for converting square feet to acres =  $43,560 \text{ sq ft per acre}$ .

## Determining Area of Spread

The “area of spread” is the length and width of the ground covered with one load of manure. The area of spread is affected by speed and equipment settings. Spreaders discharge manure at varying rates depending on travel and PTO speed, gear box settings, and discharge openings. It is important to adjust the spreader so the pattern is as uniform as possible. Accurately measuring the length and width of this area is essential.

To determine width, measure two adjacent spreads and divide by two to find the “effective” spread width. This accounts for overlap, which is often needed for a more uniform application.

The length of spread is determined using the following three values:

- Desired manure application rate based on soil and manure tests,
- Width of the manure spread, and
- Manure spreader holding capacity (weight and/or volume).

From these values, calculate the distance or lengths of spread using these formulas.

$$\text{Formula: Solid Manure Equals Feet/Load} \\ \frac{\text{Average Load Weight (lbs)} \times 21.8^1}{\text{Spread Width (ft)} \times \text{App. Rate (tons/ac)}}$$

$$\text{Formula: Liquid Manure Equals Feet/Load} \\ \frac{\text{Tank Volume (gal)} \times 43,560^2}{\text{Spread Width (ft)} \times \text{Desired App. Rate (gal/ac)}}$$

Spread a load. If the distance traveled does not equal the calculated distance, adjust the speed or equipment settings.