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- Conservation District,
- Cooperative Extension Service or
- Natural Resources Conservation Service.

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South Dakota Department of Agriculture
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South Dakota Department of Environment and Natural Resources
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www.state.sd.us/denr/DES/surfacewater/feedlot.htm

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Calibrating Manure Spreader Application Rates



Photo courtesy USDA NRCS SD

Calibrating Manure Spreader 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 takes one or two hours 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.



One of the keys to successful nutrient management is a sound manure application plan. This includes:

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

Calibrating Manure Spreader Application Rates

The two best approaches for calibrating a manure spreader are the **LOAD-AREA** and **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 three step process.



Photo courtesy Davison County Conservation District

1. **Determine the amount of manure in the spreader.** The most accurate way to determine the amount of manure in a spreader is weighing the spreader when it is empty and again when it is full. For a reliable estimate of spreader capacity, weigh several representative spreader loads (recommend five) to determine the average gross weight. Subtract the empty spreader weight. Then, calculate the average net loaded weight.
2. **Determine the area of spread.** The “area of spread” is determined by measuring the length and width of the ground covered by the manure. Width measurements near the beginning and end of the spread pattern should be avoided because the spreader may not be operating at full capacity. Allow for the overlap of adjacent passes.

3. **Calculate the application rate.** The application rate is calculated using the formula for either liquid or solid manure.

Formula for Solid Manure:

$$\text{Tons per acre} = \frac{\text{Average Loaded Weight (lbs.)} \times 21.8^{1/}}{\text{Distance Traveled (ft.)} \times \text{Width of Spread (ft.)}}$$

Formula for Liquid Manure:

$$\text{Gallons per acre} = \frac{\text{Tank Volume (gal.)} \times 43,560^{2/}}{\text{Distance Traveled (ft.)} \times \text{Width of Spread (ft.)}}$$

DETERMINING THE 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 spread pattern is uniform. 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 overlapping which is often required to make a more uniform application.

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

1. desired manure application rate (based on soil and manure tests),
2. width of the manure spread, and
3. manure spreader holding capacity (weight and/or volume).

With these values, calculate the distance or length of spread using one of the following formulas:

Formula for Solid Manure:

The Travel Distance (feet) per Load Equals:

$$\frac{\text{Average Load Weight (lbs.)} \times 21.8^{1/}}{\text{Width of Spread (ft.)} \times \text{Appl. Rate (tons per acre)}}$$

Formula for Liquid Manure:

The Travel Distance (feet) per Load Equals:

$$\frac{\text{Tank Volume (gallons)} \times 43,560^{2/}}{\text{Width of Spread (ft.)} \times \text{desired Appl. Rate (gallons/acre)}}$$

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

WEIGHT AREA METHOD

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



Photo courtesy USDA NRCS SD

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

1. Prepare/cut three 56 inch x 56 inch tarps or pieces of heavy material (*This size equals 1/2000 of an acre*). The pounds of manure collected on a 56 inch 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. In a field, anchor the three tarps 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 representative manure samples.
5. Fold and place the first tarp in the empty bucket without spilling the manure.
6. Weigh 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 the *tons of manure applied per acre*.

1/ Factor for converting pounds to tons and square feet to acres. (21.8 = 43,560 sq. ft. per acre divided by 2000 lbs./ton)

2/ The factor for converting square feet to acres = 43,560.