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Animal Waste Management To Protect Water Quality Calibrating Manure Spreaders

Animal and poultry manure can be applied to meet crop needs only if you know how much you are spreading over a given area. Calibrating your spreader is a simple and effective way for you to improve the use of nutrients in the manure.

To calibrate your solid or liquid spreader, you must determine (1) the capacity of your hopper in tons or tank in gallons and (2) the amount of manure put on a certain area or the area your spreader covers to be emptied. Below are specific suggestions for simplifying calibration.

Calibration Of Solid And Semisolid Manure Spreaders

Solid manure has from 15 to 25 percent solids. Semisolid manure has from 5 to 14 percent solids. Solid manure includes broiler and horse manure; semisolid manure includes dairy cow wastes.

To calibrate a spreader for solid manure, collect the following materials: a bucket; a plastic sheet, tarp, or old bed sheet (An even size like 8 x 8 ft., 10 x 10 ft., or 10 x 12 ft. will make calculation easier.); and scales.

To calibrate your spreader:

- Locate a large, reasonably smooth, flat area where manure can be applied.
- Spread the plastic sheet, tarp, or bed sheet smoothly and evenly on the surface of the test field.
- Start driving the spreader at the normal application speed toward the sheet spread on the ground, allowing the manure to begin leaving the spreader at an even, normal rate.
- Drive over the sheet at the normal application speed while continuing to apply manure.
- Weigh the empty bucket, then pick up the sheet carefully and pour the manure into the bucket.
- Weigh the bucket remembering to subtract empty-bucket weight. This will give you the pounds of manure applied to the sheet.

- Repeat the procedure three times.
- Determine average weight of the three manure applications.
- Check Table 1 for pounds applied and size of the sheet; then read tons of manure applied per acre.

Table 1. Tons Of Manure Applied Per Acre As Correlated To Pounds Of Manure Spread On Test Area.

Pounds of Manure Applied to Sheet	Size of Plastic Sheet		
	8' x 8'	10' x 10'	10' x 12'
	Tons of Manure Applied/Acre		
1	0.34	0.22	0.18
2	0.68	0.44	0.36
3	1.02	0.65	0.54
4	1.36	0.87	0.73
5	1.70	1.09	0.91
6	2.04	1.31	1.09
7	2.38	1.52	1.27
8	2.72	1.74	1.45
9	3.06	1.96	1.63
10	3.40	2.18	1.82
11	3.74	2.40	2.00
12	4.08	2.61	2.18
13	4.42	2.83	2.36
14	4.76	3.05	2.54
15	5.10	3.27	2.72
16	5.45	3.48	2.90
17	5.79	3.70	3.09
18	6.13	3.92	3.27
19	6.47	4.14	3.45
20	6.81	4.36	3.63
21	7.15	4.57	3.81
22	7.49	4.79	3.99

Source: Harris, 1978a.

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If the size of your sheet is not listed, use the following equation to determine litter application per acre:

$$\frac{\text{Pounds of manure applied to sheet} \times 21.78}{\text{Area of sheet (in square ft.)}} = \text{Tons/acre}$$

This basic procedure can also be used for wet litter or dairy cow wastes with the following modifications: use a plastic sheet; weigh the sheet and bucket; place the sheet and the litter in the bucket together; and subtract the dry weight of both bucket and sheet.

The capacity of solid manure spreaders can be estimated from Table 2. If you know the number of spreader loads you used to cover a field or pastured area of known acreage, you can double-check your calibration. If you have a box-shaped spreader, its length, width, and depth can be multiplied to get capacity in cubic feet.

Table 2. Estimating Solid Manure Spreader Capacity.

Spreader Size		Amount Of Manure (Tons)
(Bushels)	(Cubic Feet*)	
70 to 75	87 to 93	1.5
90 to 100	112 to 124	2.0
125 to 135	155 to 168	2.5
180	224	3.5

*A bushel is equivalent to 1.24 cubic feet.

Source: Harris, 1978a.

Calibration Of Liquid Manure Spreaders

Liquid manure has from 0 to 4 percent solids. The following procedure is best used to calibrate a liquid waste spreader, but it can be used for all types of manure.

- Determine capacity of liquid spreaders in gallons. For liquid manure tanks, the capacity will most likely be expressed as gallons. (If the capacity of your tank is in tons, it takes about 240 gallons to make 1 ton.)

Gallons in square tanks: To find the number of gallons in a square or oblong tank, multiply the number of cubic feet that it contains by 7.5. For example, a tank of 100 cubic feet holds 750 gallons (100 x 7.5 = 750).

Gallons in circular tanks: To find the number of gallons in a circular tank, square the diameter in feet, multiply by length (depth for upright tank), and then multiply by 5.875. For example, a 6-foot diameter tank that is 10 feet long, or deep, holds 2,115 gallons (6 x 6 x 10 x 5.875 = 2115). This is equivalent to about 8.8 tons.

If you prefer to calculate the number of cubic feet and then the storage capacity in gallons, see figure 1 below.

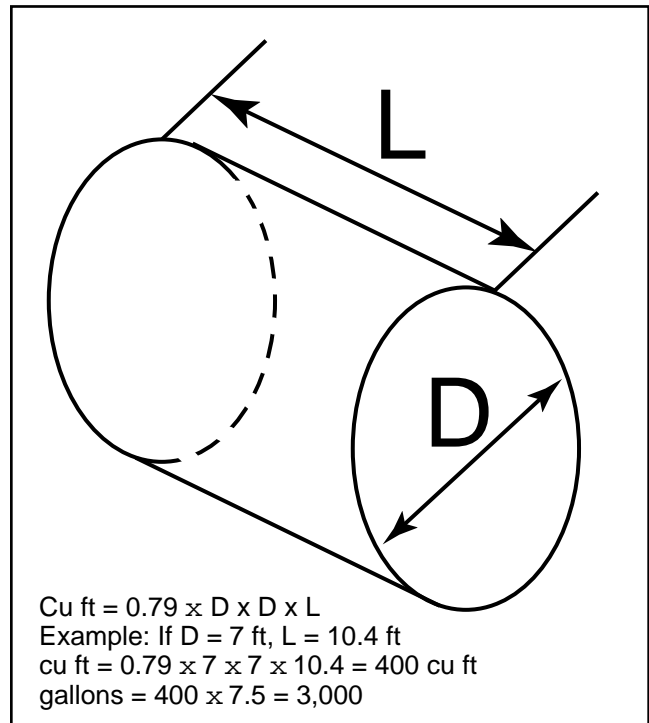


Figure 1. Calculating the volume of a full cylindrical tank.

- Measure the distance the spreader travels to empty the tank. One method to determine the travel distance is to measure and count the number of wheel rotations.

Tie twine or rope around tractor tire at top of tire. Mark ground directly below twine. Run tractor until rope again comes to the top. Measure distance tractor traveled. This gives the length of one revolution of the tractor tire in feet.

Run spreader load out in field and count number of times rope comes to the top. Multiply number by length of one revolution of the tractor tire. This gives total length the manure spreader traveled in feet.

- Measure width of path the spreader covered with manure. The path width can be paced off or measured with a tape.

- Multiply length times width and divide by 43,560. This gives total area in acres.

- Divide total gallons or tons of manure applied by the area to which it was applied:

$$\frac{\text{Total manure applied in gallons or tons}}{\text{Total area covered in acres}} = \text{Gallons or tons/acre}$$

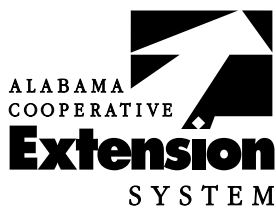
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