

How to calibrate a Manure Spreader

Good management of your crop's nutritional needs involves more than just knowing what's in the manure before spreading it. Properly calibrating your manure spreader is essential in knowing how much manure and therefore nutrients you will be applying to the field. You can eliminate guesswork and reduce potential environmental risk.

You can use three methods to calibrate a manure spreader: the stationary load scale method, the tarp or pail method, and the spreader load method.

Method 1: Using stationary load (truck) scales

Truck scales can accurately weigh a load of solid or liquid manure. This can be done by weighing each truck axle on portable truck scales, or by using local large truck scales. You can access stationary load scales in some communities, at large gravel pits, at municipal refuse centres, at grain centres, or at other agricultural businesses. Both the tractor and the spreader need to be weighed.

1. Weigh the tractor and spreader when they are both empty and full. Subtract the empty weight from the full weight to give you the manure weight as shown in Step 1.
2. Apply manure from one spreader load of manure. Measure the area that the manure has been applied. A simple way to measure the area is with a measuring wheel.
3. Convert any imperial measurement to metric, as shown in Step 3.
4. Calculate the application rate as shown in Step 4.



Calculations for Method 1

Step 1: calculate weight of manure load

$$\begin{aligned}(\text{full spreader}) - (\text{empty spreader}) &= (\text{weight of manure load}) \\ 10,000 \text{ kg (full)} - 4,000 \text{ kg (empty)} &= 6000 \text{ kg of manure} \\ 1000 \text{ kg} &= 1 \text{ metric tonne (t)} \\ 6000 \text{ kg} &= 6 \text{ t}\end{aligned}$$

Step 2: calculate area of application

$$\begin{aligned}(\text{width of spread area}) \times (\text{length of spread area}) &= (\text{area of application area}) \\ 2 \text{ m (width)} \times 160 \text{ m (length)} &= 1920 \text{ m}^2\end{aligned}$$

Step 3: convert square metres (m²) to hectares (ha)

$$\begin{aligned}\text{m}^2 \div 10,000 &= \text{ha} \\ 1920 \text{ m}^2 \div 10,000 &= 0.192 \text{ ha}\end{aligned}$$

Step 4: calculate rate of application in tonnes/hectare (t/ha)

$$\begin{aligned}(\text{total weight of manure}) \div (\text{area of application}) &= (\text{application rate per hectare}) \\ 6 \text{ t} \div 0.192 \text{ ha} &= 31 \text{ t/ha}\end{aligned}$$

Method 2: Using a tarp or pail to determine application rate

Solid or semi-solid manure can be calibrated using a tarp for solid manure or a pail for semi-solid manure. By passing the loaded manure spreader over a small tarp spread flat on the ground, you can get an estimate of your machine's application rate. The tarp is weighed before and after loading it with manure. By using either three tarps at once or by using a single tarp and repeating the process three times to get an average, you should get a reasonable estimate.

You can use the same procedure with semi-solid or liquid manure by using a pail instead of a tarp.

Tarp Method (solid manure)

1. Use a tarp that measures 2 metres by 2 metres. You can also use three tarps that measure the same.
2. Weigh each empty tarp in kilograms.
3. Lay the tarp flat on the ground along the spread path. If you use three tarps, make sure you lay them separately with no overlap.
4. Drive the spreader over the tarps. Apply the manure at the speed and in the gear that you typically use to apply a load.
5. Fold up the tarps with the manure and reweigh.
6. Subtract each filled tarp weight from each original tarp weight. This gives you the manure weight in kilograms. You can also dump the manure into a bucket and weigh it. Remember to subtract the weight of the empty bucket.
7. Take an average of the three weights by adding them together and dividing by three.
8. Check Table 1 for the manure application rate.

You can also use the following formulas if the manure weight isn't listed above:

$$\text{manure weight (kg)} \times 3.6 = \text{tonnes per ha}$$

$$\text{tonnes per hectare} \div 2.47 = \text{metric tonnes/acre}$$

Pail Method (semi-liquid or liquid manure)

The pail method is similar to the tarp method. By using either three pails at once or by using a single pail and repeating the process three times to get an average, you should get a reasonable estimate of application rate.

1. Use either a single pail or three pails that are all straight walled.
2. Place the single pail along the spread path and drive over it three times. If you have three pails, place them in a line and make a single pass with the manure spreader. Make sure the pails are short enough not to get knocked over by the spreader.



TABLE 1.
APPLICATION RATE FROM TARP WEIGHTS OF MANURE

Manure weight on a 2m x 2 m tarp (kg)	tonnes/ha	tonnes/acre
5.0	18	7.3
5.5	19.8	8.0
10.0	36	15.3
10.5	37.8	21.9
15.0	54	22.76
15.5	58.9	23.8
20.0	72	29.1



3. Measure the depth of the manure in the pail in millimetres. Use either the marked measurements in the pail or a ruler.
4. Take an average of the three pails by adding the depth of the manure and then dividing by three.
5. Check Table 2 for the manure application rate.

**TABLE 2.
APPLICATION RATE FROM MANURE IN PAILS**

Depth of manure in pail (mm)	litres/ha	gallons/acre
2.0	20,000	2138
2.5	25,000	2673
3.0	30,000	3207
3.5	35,000	3742
4.0	40,000	4276
4.5	45,000	4810
5.0	50,000	5345
5.5	55,000	5880
10.0	100,000	10,690

You can also use the following formulas if the manure depth isn't listed above:

$$\begin{aligned} \text{manure depth (mm)} \times 10,000 &= \text{litres/hectare} \\ \text{litres/hectare} \times 0.1069 &= \text{gallons/acre} \end{aligned}$$

Method 3: Using spreader loads to determine application rate

This method is the least accurate, but it can be used for all types of manure, from solid to liquid. Using this method, you can estimate the application rate after you've applied manure to the first field. If needed, you can adjust the spreader's speed or gears for the remainder of the fields to recalibrate the application rate.

Manure spreader manufacturers give a capacity based on "struck level" or "heaped" manure load condition. This refers to the volume that is contained in the spreader.

1. Determine the manure weight by using either Method 1 or the manufacturer's rated spreader capacity. Pick the capacity based on how high you fill the manure spreader.
2. Apply manure to a field of which you already know the exact area. Count the number of loads it takes to finish the entire field.
3. Multiply the number of loads by the capacity of the manure spreader.
4. Divide the total manure weight in tonnes by the size of the field to determine the application in tonnes per hectare. The example below shows you how to calculate using this method.



Calculations for Method 3

Example:

You have 6000 kilograms (6 tonnes) of manure to spread on a known field size of 5.6 hectares. You have 24 loads of manure to spread on the entire field. What is the application rate per hectare?

(number of loads) times (manure weight in tonnes) = number of total manure in tonnes

24 loads x 6 tonnes = 144 tonnes

Total manure (tonnes) divided by field size (ha) = application rate

144 tonnes ÷ 5.6 ha = 25.7 tonnes per hectare application rate

Any questions?

By calibrating your manure spreader accurately and getting your manure samples analyzed, you are well on your way to ensuring your crops' nutrient requirements are managed properly. A certified Nutrient Management Planner or your local Agrologist can also help develop a program for managing your crops' nutritional needs.