

# Calibrating Traveling Big Gun Sprinklers for Manure Applications

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## Importance of Calibration

You can avoid the potential adverse effect on ground and surface water caused by over fertilization by applying only the amount of waste and wastewater necessary to maintain soil fertility for crop production.

The calibration of liquid manure spreading equipment is important because it lets you know the amount of waste and wastewater you are applying to an area.

The calibration rate and the nutrient concentration level of the

liquid manure lets you know the amount of plant nutrients you are applying. Then, you can adjust your fertilization rate to avoid overfertilization.

## Calibration

The volume of wastewater applied by a traveling gun depends on the flow rate, lane spacing, travel distance and travel time. The necessary steps to calibrate a traveling big gun sprinkler are given in the example below.

1) Determine the volume of wastewater applied in inches (in) from the manufacturer's literature or **Table 1**. Note that **Table 1** includes a formula to be used as needed.

**Example:** From **Table 1**, a 200 GPM flow rate, 150 ft lane spacing, and a 2.0 ft/min travel speed should apply 1.1 in of wastewater.

**Your Numbers:** a \_\_\_\_\_ GPM flow rate, \_\_\_\_\_ ft lane spacing, and a \_\_\_\_\_ ft/min travel speed should apply \_\_\_\_\_ in of wastewater.

2) Determine the wastewater application rate in gallons per acre (gal/ac) by multiplying the inches of wastewater applied from **Step 1** by 27,154 gal/ac-in.

**Example:** 1.1 in x 27,154 gal/ac-in = 30,000 gal/ac

**Your Numbers:** \_\_\_\_\_ in x 27,154 gal/ac-in = \_\_\_\_\_ gal/ac

3) The pounds of N applied per acre (lb N/ac) is calculated by multiplying the wastewater application rate from **Step 2** by the pounds of N per thousand gallons of wastewater<sup>1</sup> and then dividing by 1000.

**Example:** 30,000 gal/ac x 5 lb N/1000 gal ÷ 1000 = 150 lb N/ac

**Your Numbers:** \_\_\_\_\_ gal/ac x \_\_\_\_\_ lb N/1000 gal ÷ 1000 = \_\_\_\_\_ lb N/ac

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1) To determine the volume of wastewater (gal/ac) to apply divide the desired number of pounds of N per acre (lb N/ac) by the number of pounds of N in a thousand gallons of wastewater<sup>1</sup> (lb N/1000 gal) and then multiply by 1000.

**Example:**  $\frac{150 \text{ lb N/ac}}{5 \text{ lb N/1000 gal}} \times 1000 = 30,000 \text{ gal/ac}$

**Your Numbers:** \_\_\_\_\_ lb N/ac ÷ \_\_\_\_\_ lb N/1000 gal x 1000 = \_\_\_\_\_ gal/ac

2) Convert the volume of wastewater required (gal/ac) from **Step 1** to inches by dividing by the conversion factor 27,154 gal/ac-in.

**Example:**  $\frac{30,000 \text{ gal/ac}}{27,154 \text{ gal/ac-in}} = 1.1 \text{ in}$

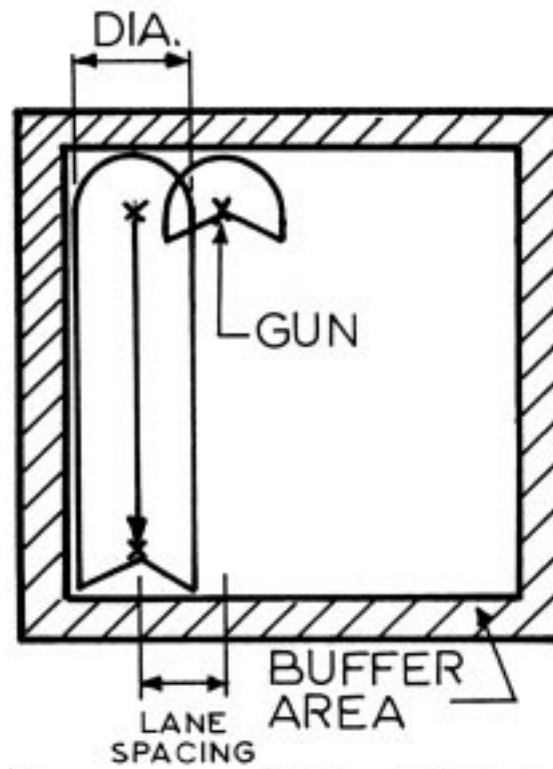
**Your Numbers:** \_\_\_\_\_ gal/ac ÷ 27,154 gal/ac-in = \_\_\_\_\_ in

3) Use the inches of wastewater from **Step 2** and **Table 1** or your manufacturer's literature to determine the desired flow rate (GPM), lane spacing (ft), and travel speed (ft/min).

**Example:** From **Table 1**, a 200 GPM flow rate, 150 ft lane spacing, and a 2 ft/min travel speed should apply 1.1 in of wastewater.

**Your Numbers:** a \_\_\_\_\_ GPM flow rate, \_\_\_\_\_ ft lane spacing, and a \_\_\_\_\_ ft/min travel speed should apply \_\_\_\_\_ in of wastewater.

<sup>1</sup>Refer to the University of Arkansas Extension publications *Liquid Animal Waste Sampling* (FSA 3006) and *Understanding Your Animal Waste Nutrient Analysis* (FSA3008) for information on having your liquid manure analyzed and interpreting the analysis.



(Approx. 70% of DIA.)

Figure 1. Traveling gun layout.

**Table 1. Wastewater Applied by Traveling Big Gun Sprayers**

Sprinkler Flow Rate (GPM)	Travel Lane Spacing (ft)*	Travel Speed (ft/min)							
		0.4	0.5	1	2	4	6	8	10
		Wastewater Applied (in)							
100	150	2.7	2.1	1.1	0.5	0.3	0.2	0.1	0.1
	200	2.0	1.6	0.8	0.4	0.2	0.1	0.1	0.1
	250	1.6	1.3	0.6	0.3	0.2	0.1	0.1	0.1
	300	1.3	1.1	0.5	0.3	0.1	0.1	0.1	0.1
200	150	5.4	4.3	2.1	1.1	0.5	0.4	0.3	0.2
	200	4.0	3.2	1.6	0.8	0.4	0.3	0.2	0.2
	250	3.2	2.6	1.3	0.6	0.3	0.2	0.2	0.1
	300	2.7	2.1	1.1	0.5	0.3	0.2	0.1	0.1
300	200	6.0	4.8	2.4	1.2	0.6	0.4	0.3	0.2
	250	4.8	3.9	1.9	1.0	0.5	0.3	0.2	0.2
	300	4.0	3.2	1.6	0.8	0.4	0.3	0.2	0.2
	350	3.4	2.8	1.4	0.7	0.3	0.2	0.2	0.1
400	200	8.0	6.4	3.2	1.6	0.8	0.5	0.4	0.3
	250	6.4	5.1	2.6	1.3	0.6	0.4	0.3	0.3
	300	5.4	4.3	2.1	1.1	0.5	0.4	0.3	0.2
	350	4.6	3.7	1.8	0.9	0.5	0.3	0.2	0.2
500	250	8.0	6.4	3.2	1.6	0.8	0.5	0.4	0.3
	300	6.7	5.4	2.7	1.3	0.7	0.4	0.3	0.3
	350	5.7	4.6	2.3	1.1	0.6	0.4	0.3	0.2
	400	5.0	4.0	2.0	1.0	0.5	0.3	0.3	0.2
600	250	9.6	7.7	3.9	1.9	1.0	0.6	0.5	0.4
	300	8.0	6.4	3.2	1.6	0.8	0.5	0.4	0.3
	350	6.9	5.5	2.8	1.4	0.7	0.5	0.3	0.3
	400	6.0	4.8	2.4	1.2	0.6	0.4	0.3	0.2
700	300	9.4	7.5	3.7	1.9	0.9	0.6	0.5	0.4
	350	8.0	6.4	3.2	1.6	0.8	0.5	0.4	0.3
	400	7.0	5.6	2.8	1.4	0.7	0.5	0.4	0.3
	450	6.2	5.0	2.5	1.2	0.6	0.4	0.3	0.2

\*The Travel Lane Spacing should be approximately 70% of the sprinkler's coverage diameter. The coverage diameter can be determined from the manufacturer's literature or by measurement. Refer to **Figure 1** for a diagram of a traveling gun layout.

**NOTE:** If your exact numbers are not in the table, use the formula below to calculate the application rate. The mathematical operations should be done in order from left to right.

$$\text{Wastewater Applied (in)} = 1.6 \times \text{Sprinkler Flow Rate (GPM)} \div \text{Lane Spacing (ft)} \div \text{Speed (ft/min)}$$

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