TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE RENO, NEVADA SOIL CONSERVATION SERVICE

JUNE 1993

AGRONOMY TECHNICAL NOTE NO. NV-63

SUBJECT: CPA - MANURE SPREADER CALIBRATION

The attached Idaho Technical Note Agronomy No. 27 can be useful in discussions with individuals planning to apply manure on fields. With the emphasis on water quality, this type of knowledge will be needed.

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for

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TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE BOISE, IDAHO SOIL CONSERVATION SERVICE

TN - AGRONOMY No. 27 September 1990

MANURE SPREADER CALIBRATION

HOW TO CALIBRATE MANURE SPREADERS

Spreading manure on cropland is an excellent way to use farm produced manure. Nutrients contained in manure can be used to supply growing crops with nitrogren, phosphate and other nutrients.

Proper spreading helps make better use of nutrients in manure. It can also help maintain surface and ground water quality by applying the amounts of manure that can best be used by plants.

Manure Application Rates

Manure application rates should be based on crop needs, existing soil nutrient levels, and the nutrients in the manure to be spread. Soil tests, manure analysis and crop fertilizer guides can provide this information.

Excess manure application wastes nutrients and increases potential for groundwater contamination. Knowing the amount of manure the spreader is applying is essential to proper use of manures. Manure spreaders can be calibrated using the following processes.

Calibrating solid or semisolid manure spreaders. The items needed are: a plastic sheet (6 ft. x 6 ft. or 10 ft. x 10 ft. is good, but any size will do); a scale (milk or bathroom scale); and a bucket.

1. Weight the sheet with the bucket on the scale.

Prepared by Floyd G. Bailey, State Conservation Agronomist and Janice L. Jinings, Area Agronomist, Boise, Idaho from information contained in EPA's document, "Manure Management for Environmental Protection."

2. Lay the sheet in the field where manure will be spread. Place the sheet far enough into the field to get enough distance to put the spreader in gear and bring the tractor up to speed. Most spreaders apply less at the beginning and at the end of the load.

3. Drive the tractor and spreader directly over the sheet.

4. Fold the sheet so that no manure is spilled. Put the sheet in the bucket and weigh both on the scale.

5. Subtract the weight of the empty bucket and sheet in step 1 from the weight of the sheet and bucket filled with manure. This number is the weight of the manure collected on the sheet.

6. Repeat the procedure and determine an average for the two weights.

7. From Table 1 (under size of sheet and pounds of manure on sheet) determine tons of manure applied per acre.

8. If the size of the sheet used or the pounds of manure collected is not on the chart, the following formula should be used to calculate tons per acre:

$$\frac{\text{Pounds of manure} \times 21.8}{\text{Size of sheet in square feet (length x width)}} = \text{tons of manure per acre.}$$

TABLE 1. Manure Spreader Rate Calibration

Manure on sheet (lb)	Sheet Size 6 ft. x 6 ft.	10 ft. x 10 ft.
	tons manure/acre	
5	3.0	1.1
6	3.6	1.3
7	4.2	1.5
8	4.8	1.7
9	5.4	2.0
10	6.1	2.2
11	6.7	2.4
12	7.3	2.6
13	7.9	2.8
14	8.5	3.1
15	9.1	3.3
16	9.7	3.5
17	10.3	3.7
18	10.9	3.9
19	11.5	4.1
20	12.1	4.4
21	12.7	4.6
22	13.3	4.8
23	13.9	5.0
24	14.5	5.2
25	15.1	5.4
26	15.7	5.7
27	16.3	5.9
28	16.9	6.1
29	17.5	6.3
30	18.2	6.5
31	18.8	6.8
32	19.4	7.0
33	20.0	7.2
34	20.6	7.4
35	21.2	7.6

TABLE 2. Manure Spreader Capacity

Spreader Size	Tons of Manure
in gallons 1/	
1000	4
2000	8
4000	16
in bushels 2/	
75	2.8
100	3.75
125	4.7
150	5.6
in cubic feet 3/	
100	3
200	6
300	9

1/ 1 gal. manure = 8 lbs.
2/ 1 bu. manure = 75 lbs.
3/ 1 cu. ft. manure = 60 lbs.

Calibration of Liquid Manure Spreader

The items needed are a yardstick or tape measure and a string or rope.

1. Determine the manure spreader's capacity in tons or gallons using Table 2.

2. Tie the string around the tractor tire at the top of the tire. Mark the ground directly below the string where the tire rests on the ground. Pull the tractor forward until the string is again at the top of the tire (one revolution). Mark the ground again, as before. Using the tape, measure the distance between the two marks made on the ground. This is the distance the tractor moved with one revolution of the tire.

3. Spread the load, counting the number of times the rope comes to the top of the tire. Multiply the number of revolutions the tire made to spread the load by the number of feet the tractor moved in one revolution (step 2). This is the distance travelled to spread the load.

4. Measure the width (in feet) that the spreader is covering with manure.

5. Multiply the distance travelled to spread the load (step 3) by the width that the spreader is covering with manure (step 4). Divide that number by 43,560 (the square feet in one acre). This is the number of acres covered.

6. Divide gallons or tons of manure applied (the spreader capacity found in step 1) by the number of acres covered (step 5). The result is the tons or gallons applied to that acreage.

   Spreader capacity (step 1) = tons or gal. manure applied per acre
   Acres covered (step 5)

Once the rate being spread has been determined, adjustments in either tractor speed or spreader output may have to be made. After any change is made, the spreader should be recalibrated. It may take several tries to get the proper adjustment to apply the desired rate. When several passes are being made through the field, a small amount of the manure being spread should overlap what is on the ground from the previous pass. Too much overlap leads to overapplication and too little gives a low application rate and poor distribution of nutrients. The following example and worksheet can be used to determine the application rate.

Worksheet for Calibrating Solid or Semisolid Manure Spreaders

		Example	Your Farm
1.	Weight of empty bucket and sheet	_____ lb.	_____ lb.
2.	Weight of bucket and sheet with manure	_____ lb.	_____ lb.
3.	Weight of bucket, sheet, and manure (step 2) minus weight of bucket (step 1)	_____ lb.	_____ lb.
4.	Tons applied per acre (from Table 1)	_____ lb.	_____ lb.

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5. If the table in step 4 cannot be used because pounds of manure on sheet or size of sheet are not listed, multiply the pounds of manure on sheet by 21.8, then divide that number by the size of the sheet used (in square feet)

Example: $\frac{28 \text{ lb} \times 21.8}{36 \text{ sq ft}}$ = 16.9 tons/acre

Your Farm: $\frac{\text{lb} \times 21.8}{\text{sq ft}}$ = _____ tons/acre

Worksheet for Calibrating Liquid Manure Spreaders

		Example		Your Farm	
1.	Spreader capacity in tons or gal	____ tons 4000 gal		____ tons ____ gal	
2.	Distance tractor tire covered in one revolution	15	ft.	____	ft.
3.	Number of tire revolutions to spread load.	80	revol-ution	____	revol-ution
4.	Distance tractor tire covered in one revolution (step 2) multiplied by number of revolutions (step 3)	15 X 80 = 1200	ft. revol. ft. = traveled	____ ____ ____	ft. revol. ft. traveled
5.	Feet traveled to spread load (step 4) multiplied by width manure is spread, divided by number of sq. ft. in one acre.	1200ftX15ft / 43,560 sqft/acre = 0.4	acres	ftx ft / 43,560 sqft/acre = ____ ____	acs.
6.	Amount of manure applied (step 1) in gal. or tons divided by acres on which it was applied (step 5).	4000 gal		____ tons or gal ____ acres	
7.	Quantity of manure applied per acre	= 10,000 gal/acre		= ____	tons or gal/acre