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Soil Fertility Guide

MARYLAND DEPARTMENT OF AGRICULTURE

Mo Cu S K Co B Mn
Ca P Fe Zn N Mg Cl

EC-3

CALIBRATION OF A LIQUID MANURE SPREADER USING THE LOAD-AREA METHOD

Introduction

Calibration is a way of checking and/or adjusting a manure spreader to ensure that a nutrient source is being applied uniformly and at the desired rate. It is important to properly calibrate a manure spreader to minimize the potential for over- or under-applying nutrients to your crops.

The load-area method is a reliable method of calibrating manure spreaders when using liquid manure. This method requires knowledge of the spreader capacity. It involves spreading several loads with the spreader filled to capacity, using the same spreader settings and tractor speed. The area spread (which we will refer to as the ***application area*** for the rest of this publication) is then measured for each load, and the application rate for each application area is calculated. The average application rate for all loads is then projected to a per-acre basis.

Manure application rates across a field for some types of spreaders can be quite variable even at the same ground speed and with identical equipment settings. Multiple measurements of actual application rates are needed to ensure that the calculated average rate is truly representative of the average rate across the field.

> **NOTE:** A minimum of three measurements is recommended for the load-area method of calibration.

Before continuing, determine the spread pattern of the spreader. For some spreaders, the swath width is the width of the spreader. For many liquid spreaders, material is spread for some distance on each side of the spreader and the ***effective swath width*** must be determined to maximize application uniformity. Consult EC-1, "Calibration of Manure Spreaders: Uniformity, Spread Patterns and Effective Swath Width," in the *Soil Fertility Guide* series for information.

Weather Conditions

It is important to take note of the weather conditions before conducting a calibration. If the weather is windy or rainy, it would be a good idea to reschedule the spreader calibration for a different day as both of these conditions can affect the accuracy of your measurements.

Using the Load-area Method

The following equipment is needed to perform the load-area method of calibration:

- tape measure and/or measuring wheel
- equipment manual or University of Maryland Extension (UME) Fact Sheet 176, "Determining the Amount of Manure in a Pile or a Pool"

The steps for using the load-area method of calibration are as follows:

Step 1. Make note of equipment settings using the information at the top of the worksheet on page 5 as a guide for the kind of information you want to track. Record these settings on the top of the worksheet.

In addition to recording equipment settings, use the worksheet to record calibration data. Calculations used in the load-area method are provided on the worksheet.

Step 2. Determine the capacity (volume in gallons) of your manure spreader. Consult the equipment manual or refer to UME Fact Sheet 176 for an explanation of how to determine manure spreader volume. Record the actual maximum volume in gallons on line **A1** of the worksheet.

Step 3. The effective volume of a liquid manure spreader is typically 90 percent of the actual volume of the spreader. Calculate the effective volume in gallons and enter the value on line **A2** of the worksheet.

Step 4. Spread a load of manure on the desired field. If possible, spread the manure in a rectangle or square for easier calculation of the application area. Use the effective swath width that you have previously determined is necessary to maximize application uniformity (refer to EC-1, "Calibration of Manure Spreaders: Uniformity, Spread Patterns and Effective Swath Width").

Step 5. Measure the length and width of the application area in feet and enter the values on lines **B1** and **B2**, respectively, of the worksheet.

Step 6. Calculate the application area in square feet. Enter the value on line **B3** of the worksheet.

Step 7. Calculate the application rate in gallons per square feet. Enter the value on line **C1** of the worksheet.

Step 8. Repeat Steps 4 through 7 for two more loads of manure.

Step 9. Calculate the average application rate in gallons per square feet. Enter the value on line **C2** of the worksheet.

Step 10. Convert the average application rate in gallons per square feet to gallons per acre. Enter the value on line **C3** of the worksheet.

If the current application rate is different from the recommended application rate, adjust the settings on the manure spreader or change your driving speed to increase or decrease the application rate, as needed. Repeat the calibration procedure until you identify the tractor speed and manure spreader settings that will enable you to approximate the recommended application rate. Maryland Department of Agriculture (MDA) policy requires that the average application rate should be within 10% of the recommended rate.

Two copies of the worksheet are included so all data for each calibration attempt can be recorded.

Recalibrating the Spreader

Recalibrate whenever the consistency of a manure is different from the manure used for the last calibration. Changes in consistency of manure can be caused by any of the following changes in:

- bedding
- feed components
- manure management practice
- any factor that affects the moisture content of manure

Application rates change over time as equipment gets older and components wear. Periodic recalibration of spreaders is encouraged even if all factors appear to be similar.

Record Keeping

Keep calibration worksheets and nutrient application records with your nutrient management plan. This information will be needed in the event that MDA conducts a plan implementation review.

References

Brodie, H. L. 1990. *Determining the Amount of Manure in a Pile or a Pool*. Fact Sheet 176. University of Maryland Extension, Department of Biological Resources Engineering, College Park, MD 20742.

Brodie, H. L. and G. L. Smith. 1993. *Calibrating Manure Spreaders*. Fact Sheet 419. University of Maryland Extension, Maryland Institute for Agriculture and Natural Resources, College Park, MD 20742.

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WORKSHEET
EC-3, "Calibration of a Liquid Manure Spreader Using the Load-area Method"

Tractor_____ Spreader model_____ Ground speed_____

Gear_____ Gate setting_____ PTO_____

Other_____ Date of spreader calibration_____

(**A**) calculation of effective volume (gal)

A1) actual maximum volume (gal)	
A2) effective volume (gal) (**A1** x **0.90** = **A2**)	

(**B**) calculation of application area (sq ft)

	application area 1	application area 2	application area 3
B1) length of application area (ft)			
B2) width of application area (ft)			
B3) application area (sq ft) (**B1** x **B2** = **B3**)			

(**C**) calculation of application rate (gal/ac)

	application area 1	application area 2	application area 3
C1) application rate (gal/sq ft) (**A2** / **B3** = **C1**)	**(a)**	**(b)**	**(c)**
C2) average application rate (gal/sq ft) (see line **C1)** ([(**a**) + (**b**) + (**c**)] / **3** = **C2**) where 3 = number of application areas			
C3) application rate (gal/ac) (**C2** x **43,560** = **C3**) where 1 acre = 43,560 square feet			

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