

Application Equipment Calibration



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[HTTPS://WWW.YOUTUBE.COM/WATCH?V=AJISPAKJNMM](https://www.youtube.com/watch?v=AJISPAKJNMM)

Calibration



Very Important Component of Implementing a Nutrient Management Plan

- **Right Recommendation** +
 - **Right Application rate** =
 - ✦ Economical production
 - ✦ Good Yields
 - ✦ Satisfied Client
 - **Wrong application rate** =
 - ✦ Wasted resources - manure, money
 - ✦ Poor Crop Yields
 - ✦ Dissatisfied Client

Fertilizer and Manure Application Terms



Broadcast-material applied evenly to a field, on the soil surface, crop usually NOT established

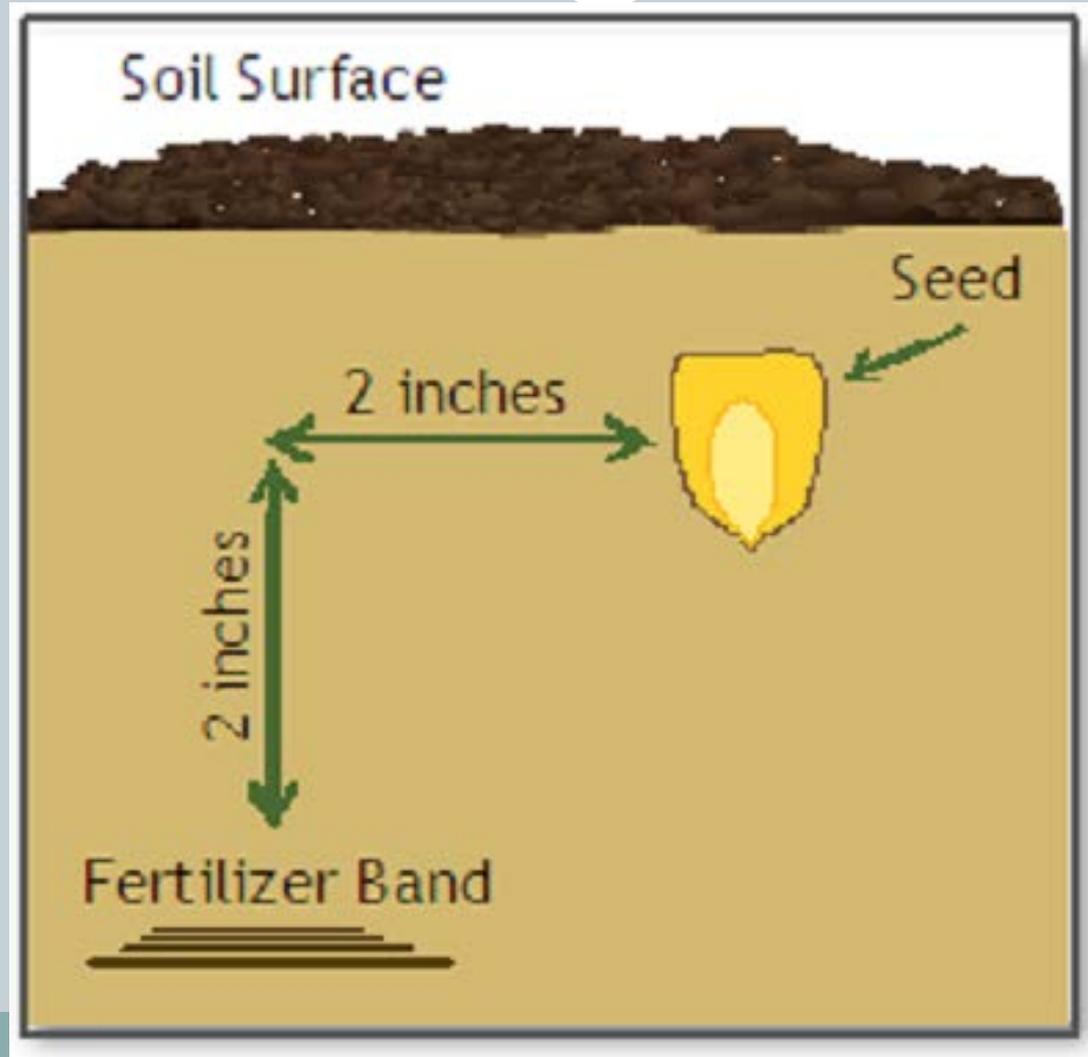
Topdress- material applied evenly to a field, crop is present

Sidedress- (fertilizer applications) material is applied in narrow bands between rows of growing crop. Material is usually surface applied, but may be incorporated or injected.

Banded – (starter fertilizer applications) material is precisely placed in a narrow band near seed or plant.

- 2X2 band placement-band of fertilizer is located 2” to the side and 2” below the seed.

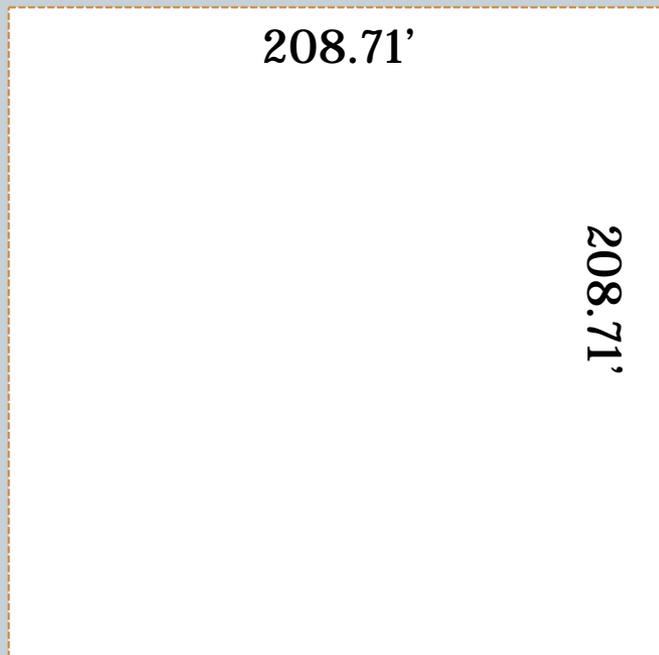
2X2-Banded Fertilizer Placement



Calibration Basics



- 1 Acre = 43,560 sqft.



Calibration Basics



- 1 Acre = 43,560 sqft

968'

45'

Calibration Basics



Dry Spreaders –

- Truck

- Pull type-ground drive



Calibration Basics



Sprayers

- Commercial Sprayers

- Farmer Sprayers



Calibration Basics



Manure Spreaders



Remember this!!!!



The basis of ALL calibration determination is:

HOW MUCH

Is applied to

What area

RATE



LB/ Ft²

Tons/Acre

Kg/Ha

Gal/Acre



Example – Calibration of Litter spreader



Weigh the truck empty, then weigh it loaded. The farmer spread two passes. Then weigh the truck again.

Width of spread is 75 ft. Length of spread is 1480 ft.

Weight of off loaded poultry litter is **10,340** lbs.

Area spread is 75' x 1480'. This equals 111,000 Ft²

Amount/Area

$$10,340\#/111,000\text{ft}^2 = .0931531 \#/\text{ft}^2$$

$$10,340\#/111,000 \text{ ft}^2 = .0931531 \text{ \#/ft}^2$$

Now convert this per square foot rate to a per acre rate.

$$.09315 \text{ \#/ft}^2 \times 43,560 \text{ ft}^2 = 4057.6 \text{ \#}$$

per acre

Convert pound per acre to tons per acre.

$$4057.6 \text{ \#} \div 2000 \text{ \#/ton} = 2.03 \text{ tons / acre}$$

Calibration –Dry Applicator



Exercise 1:

You have pulled a dry fertilizer spreader, with a 45 ft spread pattern through a 184 ft course and collected 57 pounds of material. What is the application rate in pounds per acre?

Calibration –General Rule



1. Determine area covered during calibration
2. How much material was applied

Formula:

Pounds of material \div Area (sqft) = Pounds/sqft

Pounds/sqft \times 43,560 = Pounds/ac

Pounds/sqft \times 1,000 = Pounds/1,000 sqft



Complete Fertilizer Spreader Calibration

Exercise 1

Calibration – Dry Fertilizer Spreader

Exercise -1



Formula:

Pounds of material \div Area (sqft) = Pounds/sqft

$$57 \text{ lbs} \div 8280 \text{ sqft} = .00688 \text{ lbs/sqft}$$

Pounds/sqft X 43,560 = Pounds/ac

$$.00688 \text{ lbs/ sqft} \times 43,560 \text{ sqft/ac} = \mathbf{299.86 \text{ lbs/ac}}$$

Pounds/sqft X 1,000 = Pounds/1,000 sqft

$$.00688/\text{sqft} \times 1,000 \text{ sqft} = \mathbf{6.88 \text{ lbs/sqft}}$$

Calibration – Non Ground Drive



- 1. Pounds of material collected**
 - a. Determine time needed to cover application course
 - b. Calculate area of course
 - c. Amount of material collected in the time interval
- 2. Calculate amount of material applied per sqft (in lbs or gallons)**
- 3. Multiply by 43, 560 sqft to get rate**

Calibration Exercise – Pull type sprayer

Exercise 2



- 40 ft. Boom (24 nozzles X 20” spacing)
- 5 mph application speed
- 50 psi application pressure
- Tip Size - 8003 TP
- 8003 TP @ 50 psi delivers 44 ounces/minute



Complete Pull Type Sprayer Calibration Exercise 2

Calibration Exercise 2 – Pull type sprayer



1. Distance to cover one acre:

$$43,560 \text{ sqft} \div 40 \text{ ft boom} = 1089 \text{ feet for 1 acre}$$

2. Time to cover 1 acre:

$$1089 \text{ ft} \div 7.33 \text{ ft/sec} = 148.56 \text{ seconds}$$

$$(1.47 \text{ ft/sec} = 1 \text{ mph};$$

$$1.47 \text{ ft/sec} \times 5 \text{ mph} = 7.33 \text{ ft/sec})$$

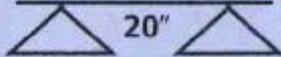
Calibration Exercise – Pull type sprayer



- 3.** In 149 seconds you collect 109 ounces of water/nozzle –
 $(2.48 \text{ minutes} \times 44 \text{ ozs/minute} = 109 \text{ ozs})$
- 4.** $109 \text{ oz/nozzle} \times 24 \text{ nozzles} = 2,616 \text{ ounces}$
 $2,616 \text{ oz} \div 128 \text{ oz/gallon} = 20.44 \text{ gallons/ acre}$

TeeJet Nozzle Specification



 	 PSI	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	 20"											
				GPA								GALLONS PER 1000 SQ. FT.			
				4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH	2 MPH	3 MPH	4 MPH	5 MPH
TP6503†	30	0.26	33	19.3	15.4	12.9	9.7	7.7	6.4	5.1	3.9	0.88	0.59	0.44	0.35
TP8003	35	0.28	36	21	16.6	13.9	10.4	8.3	6.9	5.5	4.2	0.95	0.63	0.48	0.38
TP11003	40	0.30	38	22	17.8	14.9	11.1	8.9	7.4	5.9	4.5	1.0	0.68	0.51	0.41
(50)	50	0.34	44	25	20	16.8	12.6	10.1	8.4	6.7	5.0	1.2	0.77	0.58	0.46
	60	0.37	47	27	22	18.3	13.7	11.0	9.2	7.3	5.5	1.3	0.84	0.63	0.50

Calibration – Manure Spreaders



- **Tarp Method** - Lay a tarp(s) of known area in the field where manure is being applied, spread the area of the field, pick up the tarps with the manure and weigh.
- **Load-area Method** – Spreading a load of known weight or volume and measuring the area covered by that load.

Manure Spreader Calibration- Tarp Method

Exercise - 3



- 14 pounds of poultry litter is spread on a 10 ft X 10 ft tarp.
- The dry manure spreader holds 12 tons of litter.

Part 1 – What is the rate per acre of poultry litter?

Part 2 – How many acres will one spreader load cover?



Complete Manure Spreader Calibration, Tarp Method - Exercise 3

Manure Spreader Calibration -Tarp Method

Exercise 3



Part 1:

$$\frac{\text{Amount applied}}{\text{Area covered}} \times 43,560 = \frac{\text{Pounds/acre}}{2,000 \text{ lbs}} = \text{Tons/ac}$$

$$\frac{14 \text{ pounds}}{100 \text{ sqft}} \times 43,560 = \frac{6,098/\text{acre}}{2,000 \text{ lbs}} = 3.05 \text{ tons/ac}$$

Part 2:

$$\frac{12 \text{ tons (spreader load)}}{3.05 \text{ tons/acre}} = 3.93 \text{ acres}$$

Calibration Table –Tarp Method

TABLE 1. CALIBRATION OF MANURE SPREADERS

Pounds of Manure Applied to Sheet	Size of Plastic Sheet		
	8' x 8'	10' x 10'	12' 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

Calibration – Load-area Method



- Liquid Manure spreader holds 3,000 gallons
- Spread pattern 10 ft wide
- Spreader travels 2,100 ft to apply one load

What rate of manure was applied per acre?

$$\frac{\text{Amount Applied (gallons)}}{\text{Travel Dist. (ft)} \times \text{Spread Width (ft)}} \times 43,560 \text{ sqft} = \text{gals/ac.}$$



Complete Manure Spreader Calibration, Load-Area Method - Exercise 4

Spreader Calibration – Load-area Method

Exercise 4



Amount Applied (gallons) X 43,560 sqft = gals/ac.
Travel Dist. (ft) X Spread Width (ft)

$$\frac{3,000 \text{ gals}}{21,000 \text{ sqft} \quad (2,100 \times 10)} \times 43,560 = 6,223 \text{ gals/ac}$$



• **Questions?**