Calibrating Drill Seed Meters

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Grain drills are designed to plant seed at the proper rate and with precision, if the proper adjustments are made to the seed metering system. Seeding at the proper rate and desired depth are essential to get a good stand to maximize yield. This makes planting one of the most important jobs in the crop production process.

Seed size varies between varieties, and the size of seed of the same variety may vary from one year to the next. This requires that drill metering systems be calibrated so the correct amount of seed is planted. You should calibrate your seeder at least once a year for each seed size being planted.

Seed metering systems are based on a ***volume*** displacement. Therefore, if one lot of seed varies in size and weight from another, two different amounts or number of seeds will be metered if the drill setting is not changed. For this reason, metering systems should be calibrated when seeding pounds per acre to obtain a particular plant population.

The seeding rate tables found in the operator's manual or on the inside of the seed hopper cover are based on a standard seed size and weight per bushel for various crops. Wheat has a standard weight of 60 pounds per bushel. Due to differences in seed varieties, the seed size and weight may vary from the standard.

To determine the amount of seed to plant, you need to decide what plant population is desired at harvest time. This has a major affect on yield. Figure 1 lists desired plant populations for maximum crop yields. These recommendations are suggested by NDSU extension agronomists. For example, a spring wheat plant population of 1,250,000 plants per acre at harvest is desired in eastern North Dakota. A slightly lower plant population will depend on more plant tillers to produce yield, but main stem heads will usually yield better than heads on tillers. The little extra seed will ussually be easily recovered in higher yields. These recommendations may vary slightly for individual areas.

Figure 1. Plant populations at harvest time needed to maximize yield in North Dakota.*

Crop	West	East
Spring Wheat	1,000,000	1,250,000
Winter Wheat	800,000	1,000,000
Durum	1,000,000	1,250,000
Barley	800,000	1,000,000
Oats	1,000,000	1,250,000
Soybeans		150,000
Sunflower		
Oil	20,000	20,000
Conf.	17,500	17,500
Corn	hybrid specific	hybrid specific
Dry Beans		
Pinto		60,000
Navy		75,000-85,000

*Plant populations provided by NDSU Extension Agronomist.

Drill Calibration Procedure

To arrive at a particular plant population, include an estimate of the field stand loss. This can often be as low as 10 percent or as high as 40 percent. An estimate needs to be based on previous years' experiences. Often, a 10 to 20 percent loss occurs due to disease organisms, weed competition, and seed damage during handling.

Usually not all seed grows due to less than 100 percent germination. A germination test should be done on all seed so the amount planted can be increased to account for this loss.

A drill calibration should be completed using one of the following procedures. Calculate the number of seeds to plant by:

A. Determining the seeds in a pound of seed.

Workspace for your Seeder

1. Count out 100 seeds. (Count out a larger amount if your scale has marginal accuracy.)

2. Weigh on a gram scale as it will give more accurate results (some elevators have a gram scale). ____________

3. Calculate seeds per pound. Use this formula:
   Note: There are 453.6 grams in one pound.

$$\text{Seeds/lb} = \frac{453.6 \text{ g/lb}}{\text{Wt. of 100 seeds (g)}} \times 100 \text{ seeds} = \text{seeds/lb}$$ ____________

Example: 100 seeds weigh 2.89 grams

$$\text{Seeds/lb} = \frac{453.6 \text{ g/lb}}{2.89 \text{ g}} \times 100 \text{ seeds} = \text{seeds/lb}$$ ____________

Seeds/lb = 156.95 X 100 = 15,695 seeds/lb ____________

B. Desired stand at harvest is 1,250,000 plants per acre. _____________

Example:
Field stand loss is 10 percent
Germination is 95 percent

A 10 percent field stand loss plus a 5 percent germination loss requires a 15 percent increase in seeding rate. Or, multiply the desired plants per acre by 1.15.

To determine the desired number of seeds to plant:

1,250,000 x 1.15 =1,437,500 seeds per acre ____________

C. Determine pounds of seed per acre to plant:

$$\frac{1{,}437{,}500 \text{ seeds to plant}}{15{,}695 \text{ seeds/lb}} = 91.6 \text{ lbs/ac. or}$$ ____________

92 lbs/ac

D. How many seeds per square foot must be planted to be seeding 92 lbs. per acre?

1. Seed count is 15,695 seeds/lb.
   15,695 seeds/lb X 92 lb/ac = 1,443,940 seeds/acre ____________

2. There are 43,560 square feet/acre. Dividing the seeds per acre by 43,560 sq. ft. per acre gives the number of seeds per square foot. This is the number you will use in a following step when you are checking the number of seeds your drill is planting.

$$\text{Seeds/sq. ft.} = \frac{1{,}443{,}940 \text{ seeds/acre}}{43{,}560 \text{ sq. ft./ac}} = 33 \text{ seeds/sq. ft.}$$ ____________

E. Check Your Drill

A simple way to check calibration is to count the number of seeds dropped in a foot of drill row. To do this:

1. With seed in your drill, operate it on a firm soil surface at or near your normal operating speed.

2. Count the seeds dropped in 1 foot of drill row. Lay a tape measure along side a seeded drill row and count the seeds laying in the row. (Make several counts to obtain an average.)

For example: You made five seed counts and found the following number of seeds in a foot of drill row:

$$\text{Average} = \frac{17 + 15 + 15 + 16 + 17}{5 \text{ (no. of seed counts)}} = 16 \text{ Seeds/ft.}$$

3. Multiply the single row seed count by the drill row adjustment factor (Table 1). The drill row adjustment factor is a multiplication factor that converts the seeds in a lineal foot of drill row into seeds planted per square foot. This factor depends on the row spacing of your drill.

Table 1. Drill row adjustment factors.

Drill Row Spacing (inches)	Adjustment Factor
6	2.0
7	1.7
8	1.5
10	1.2
12	1.0

Example: Your drill has a 6 inch row spacing and your seed has 14,400 seeds per pound. After running your drill over firm soil dropping seed, you find an average of 16 seeds per foot of drill row after making several counts. From Table 1, the drill row adjustment factor for a drill with a 6 inch row spacing is 2. Multiply your seed count per foot of row by 2. This means you are planting 32 seeds per square foot.

16 seeds/ft. of row X 2 (drill row adj. factor) = 32 seeds/sq. foot

4. Compare the number of seeds counted from your drill to the value found in section D, part 2. Make adjustments if necessary and repeat your calibration.

F.

Another good method is to remove drop tubes from the openers, tie bags to the drop tubes, and collect seed over a measured distance of travel. You can do a stationary calibration by collecting the seed in bags or on a tarp under the openers. This will require engaging the metering system with the drill lifted and the press wheels that drive the metering system lifted off the ground. The calibration procedure is the same as used for air seeder calibration; refer to section G.

G. Air Seeder Calibration

All air seeder manufacturers include a calibration method in their operator's manual. These units usually require collecting seed from the air delivery tubes over a measured distance of travel. This is best done by placing bags over each opener to collect the seed. The seed collected at the openers is weighed and the average seeds per square foot or seeds per lineal foot of drill row can be calculated by multiplying the weight of seed caught from the individual openers (pounds of seed) times the seeds in a pound of seed. Then, divide this value by the number of feet of travel distance. This gives the average number of seeds per lineal foot of drill row. Spreading a tarp under the seeder, collecting the seed and weighing will give the total amount of seed metered.

1. Start by determining the circumference of the seed meter drive wheel. Measure the wheel diameter in inches and use this formula:

Your numbers

$$C_{(ft)} = \frac{\text{diameter in inches X 3.14}}{\text{12 inches per foot}} = \text{circ. in feet}$$

____

2. Determine the drive wheel revolutions required to equal 1/10 acre. Look in the following chart (Table 2) to find the distance of travel for your seeder width. Divide the travel distance for 1/10 acre by the metering wheel circumference. This is the number determined in step 1 and needs to be in feet.

Table 2. Travel distance for 1/10 acre.

Drill Width (Ft)	Distance (Ft)
16	272
20	218
24	181
28	156
32	136
36	121
40	109
44	99
48	91

Example: An air seeder has a metering wheel diameter of 28 inches and the drill is 32 feet wide. How many revolutions must the metering wheel be turned for 1/10 acre?

$$C_{(ft)} = \frac{\text{28 in. in dia. x 3.14}}{\text{12 in./ft.}} = \text{7.33 ft. in circ.}$$

____

Look in Table 2 and find the travel distance for a 32 ft. unit. A 32 ft. air seeder must operate over 136 feet for 1/10 acre.

$$\text{Drive wheel rev.} = \frac{\text{Distance to cover 1/10 acre (ft)}}{\text{Circm. of drive wheel (ft)}} = \text{rev.}$$

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$$\text{No. of revolutions of the drive wheel} = \frac{\text{136 ft.}}{\text{7.33 ft.}} = \text{18.6 rev.}$$

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3. Place a bag over the outlets of each air delivery tube. A cloth bag or a paper bag can be used. The cloth bag should be tied around the shank, but the bag must allow the air to escape. A paper bag can be set on the ground under each air tube and the top of the bag must extend up above the air tube outlet and the top must be left open to allow the air to escape. A bag at each outlet is best so the flow from each outlet can be measured. An alternative is to lay a tarp under the entire air

seeder to collect the seed metered.

4. Place seed in the tank and start the air delivery fan. Place a mark on the metering system drive wheel and rotate the drive wheel the number of turns calculated in step 2. If you are using a conventional press drill, you will need to engage the metering system drive unit and lift the press wheels off the ground so the drive wheel can be turned. Then, turn the press wheel the number of revolutions calculated in step 2.

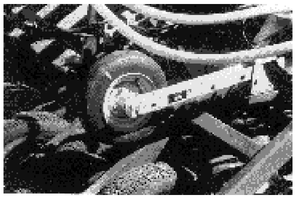

Figure 1. Determine the number of metering wheel revolutions for 1/10 acre.

Figure 2. Collect the metered seed for 1/10 acre on a tarp.

Figure 3. Weigh the seed from 1/10 acre.

5. Weigh the seed in each bag to be sure all tubes are delivering equal amounts. It is best to use a gram scale as it will give the most accurate results. After checking for equal amounts of seed from all tubes, add all samples together and weigh. This is the weight of seed for 1/10 acre. Multiply this number times 10 to obtain the pounds of seed being planted on a full acre. Compare this value to the pounds of seed found in part C. If this is not what you want to plant, make an adjustment to your metering system and repeat the calibration.

Example: Your 32 foot air seeder has 48 seed tubes (8 inch spacing) from which you collected an average of 105 grams of seed from each tube. Your air seeder is planting how many pounds of seed per acre? The first thing to do is convert grams into pounds.

105 grams
------------ = 0.231 pounds
453.6 g/lb

Your numbers ____________

Multiply the pounds of seed collected by the number of seed tubes to give the number of pounds of seed metered over 1/10 acre.

0.231 lb. seed X 48 seed tubes = 11.1 pounds ____________

To determine the seed for a full acre, multiply by 10.

11.1 lb. per 1/10 acre X 10 = 111 pounds per acre ____________

This should equal the pounds of seed found in part C. If this is not correct, make an adjustment and repeat the calibration.

If you want to bypass collecting seed from each individual seed tube, spread a tarp under your seeder, add some seed to the tank, start the air delivery system and turn the metering wheel the number of revolutions previously determined for 1/10 acre. Weigh the seed collected and multiply times 10 to determine the pounds of seed per acre.

6. If you want to determine the average number of seeds in a lineal foot of drill row for an air seeder, multiply the weight of seed collected from one seed tube (first part of step 5) times the number of seeds in a pound of your seed. Then, divide this number by your travel distance in feet. This gives the average number of seeds per lineal foot of seed row. The last thing is to multiply the number of seeds per lineal foot of row times the drill row adjustment factor to give you the seeds planted per square foot. This number should equal the number you determined in part 2, section D. The following example may help:

Example: You collected an average of 105 grams from openers on your 32 foot air seeder which has an 8 inch row spacing. You collect seed over 136 feet of travel which is 1/10 of an acre. How many seeds per lineal foot are you planting and how many seeds per square foot are you planting? From previous work you determined that your seed lot contains 14,400 seeds per pound. We converted grams into pounds in an earlier step so you can continue with the following step.

Multiply: 0.231 lb. X 14,400 seeds per lb.= 3,325 seeds collected

Divide seeds collected by distance traveled:

3,325 seeds / 136 feet = 24 seeds per lineal foot ___________

Then, multiply by the drill row adjustment factor of 1.5 for an 8 in. row spacing:

24 seeds per lineal ft. X 1.5 = 36 seeds per sq. ft. ___________

Compare this number to the number found in part 2, section D. This is your seeding rate in seeds planted per square foot. If this is not correct, make an adjustment and repeat your calibration.

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