



# UT Biofuels Initiative

## Adjusting and Calibrating a Drill for Planting Switchgrass for Biofuels

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**P**lanting the proper amount of switchgrass seed at the appropriate depth can be assured by accurately adjusting and calibrating the drill before each planting. This process is very important in the successful establishment of switchgrass, as proper calibration can mean the difference between successful planting and complete failure.

This fact sheet provides steps for calibrating and adjusting a seed drill to plant switchgrass. Though adjustment mechanisms differ by manufacturer, the outlined calibration process will work for all drills. The basic steps to correctly using a drill for switchgrass planting are:

1. Determine the required seeding rate.
2. Clean the drill and adjust the seed metering mechanism.
3. Set the drill seeding depth.
4. Set the drill to the proper seeding rate.

### Step 1. Determine the required seeding rate

For switchgrass planted as a feedstock for biofuels, the recommended seeding rate is currently 6 pounds of pure live seed (PLS) per acre. Percent PLS is determined by multiplying the total germination rate by the seed purity and dividing by 100. Both of these numbers can

be found on the seed tag. Total germination rate is calculated by adding percent germination and percent dormant seed. For example, if a seed lot has a total germination rate of 77 percent and is 86 percent pure, the %PLS is determined as follows:

$$\frac{77 \times 86}{100} = 66.2 \text{ \% PLS}$$

Since this seed lot is 66.2 percent pure live seed, you will need to drill more than 6 pounds of seed per acre to actually plant 6 pounds of PLS. To determine the amount of seed needed per acre, divide the desired seeding rate by the %PLS of the seed lot and multiply by 100. Continuing with the example, the seed is 66.2 %PLS and needs to be drilled at 6 pounds PLS per acre. The actual drilling rate can be determined as follows:

$$\frac{6 \text{ lbs PLS per acre} \times 100}{66.2 \text{ \% PLS}} = 9 \text{ lbs of seed per acre}$$

In this example, 9 pounds of seed per acre must be planted to achieve the target seeding rate of 6 pounds of pure live seed per acre.

**Tools needed for drill setup and calibration:**

100-foot measuring tape  
 Ruler with 1/16 increments  
 Pliers  
 Scale

Bags to catch seed  
 Tape  
 Calculator

**Step 2. Clean the drill and adjust the seed metering mechanism**

The first step in calibrating a seed drill is to thoroughly clean the drill and check that it is functioning properly. This is especially important if the drill is rented. Clean out all the seed boxes, seed tubes and the entire path the seed must travel within the drill. In addition, lubricate any pivot points and grease fittings.



Switchgrass should be planted using the small seed box. Because of the size of the switchgrass seed and the relatively low rates at which it is sown, poor adjustment of the small seed box metering mechanism can result in a significant amount of variation in the amount of seed metered to each row unit. Some drill manufacturers use a system of adjustable stop collars on the metering mechanism drive shaft. These collars are placed on both sides of the solid and fluted rollers. Return the small seed box adjustment lever to the zero or closed position and measure the length of the exposed fluted

roller outside the seed cup nearest the lever adjustment mechanism. Use a ruler with a minimum gradation of 1/16 inch. **Small variation in measurements can have significant effects on the amount of seed metered.** Measure the remaining fluted rollers in the same way and loosen and move stop collars to eliminate deviation from the original measurement.

Check that seed flows through each tube by filling the small seed box and turning the drive wheel on the drill or by pulling the drill a short distance with the drive mechanism engaged.

**Step 3. Set drill seeding depth**

Proper seeding depth is absolutely critical when drilling any seed. For switchgrass, the recommended seeding depth is 1/8 to 1/4 inch below the surface. Seed drilled deeper than recommended are unlikely to germinate and emerge.

Drills vary in the method by which the seeding depth is set. Some drills have an optional depth ring available, which provides greater control of seed placement. Take the time to understand the depth control mechanism on the drill so the seeding depth can be set correctly. Varying soil type, soil moisture and crop residue conditions can



greatly affect the adjustment of the seed depth mechanism and seed placement. These factors are especially important when adjusting depth in a no-till planting situation. In situations where tillage is used, the seedbed should be smoothed and firmed using a cultipacker prior to planting. **For successful establishment, it is absolutely vital that the seed depth is set appropriately.**



### Step 4. Set drill to proper seeding rate

The easiest way to determine how much seed is drilled per acre is to catch the seed drilled over 100 feet, and then use this number to calculate the number of pounds of seed drilled per acre. This step in the calibration process is simple, but does require a few tools. These include a 100-foot tape measure, small bags, an accurate scale that reads in ounces or grams, and a calculator. All of these items, except a scale, are generally readily available around a farm. Be certain to borrow or purchase an accurate scale and familiarize yourself with its operation prior to planting. A screwdriver and pliers will be useful as well. Following are the steps to calibrating a seed drill's seeding rate.

- Place the seed tubes ends from the small seed box in bags. Set the drill seeding control mechanism to the desired rate according to the guide on the drill.
- Engage the drill and pull it 100 feet. Remove and weigh each bag of seed. Be sure to subtract the weight of the bag when weighing the seed. Use this as an opportunity to check the uniformity of the drill by comparing the amount of seed in each bag. If one



$$\text{Pounds of seed per acre} = \frac{\text{Seed weight (grams)} \times 43560}{454 \times \text{area drilled (ft}^2\text{)}}$$

If the seed was weighed in ounces, use the following formula.

$$\text{Pounds of seed per acre} = \frac{\text{Seed weight (ounces)} \times 43560}{16 \times \text{area drilled (ft}^2\text{)}}$$



bag contains considerably more or less seed than the others, check the associated seed tube, etc. for an obstruction, malfunction or poorly adjusted seed-metering mechanism.

- Add the weights of all the seed collected together to calculate the total amount of seed drilled over the 100-foot pull. To determine the drill-seeding width, multiply the number of rows by the average row width. Multiply the drill-seeding width (in feet) by 100 feet (length pulled) to determine the total area drilled in square feet. If the seed is weighed in grams, use the following formula to calculate seeding rate.

- If the seeding rate is more than 5 percent above or below the desired rate, adjust the drill seeding control mechanism as needed and repeat the calibration process.
- To simplify these mathematical operations, a drill calibration worksheet in Microsoft Excel™ can be downloaded at: <http://eastern.tennessee.edu/ag/BIO-FUELS.htm>.

**Calibration Example**

From the example in step 1, 9 pounds of switchgrass seed are needed to plant 6 pounds PLS. After cleaning a 6-foot wide drill and attaching bags to each of the nine seed tubes, the drill was engaged and pulled 100 feet. Each bag of seed was weighed, subtracting the weight of the bag itself each time. The results are shown in Table 1.

<b>Table 1.</b>	
Weight of seed in each bag	
Bag #	Weight (grams)
1	6.1
2	6.8
3	5.9
4	6.3
5	6.4
6	5.9
7	7.0
8	6.6
9	5.6
Total	57.5 grams

The area drilled is calculated by multiplying the drill width (6 ft) by the length the drill was pulled (100 ft).

**Area drilled = 6 ft x 100 ft = 600 ft<sup>2</sup>**

The seeding rate is calculated using the following formula, and with the following results.

$$\text{Pounds of seed per acre} = \frac{\text{Seed weight ( grams)} \times 43560}{454 \times \text{area drilled (ft}^2\text{)}}$$

$$\frac{57.5 \times 43560}{454 \times 600} = \frac{2504700}{272400} = 9.19 \text{ lbs of seed per acre}$$

In this example, this drill seeded 9.19 pounds of seed per acre.

**Conclusion**

Successful planting of switchgrass using a seed drill is proven to be reliable if the proper steps are taken. Accurate drill calibration of both seeding rate and depth is essential. The calibration process is simple and can be accomplished quickly. The time and effort put forth in calibrating and adjusting the drill are vital to the successful establishment of switchgrass.

**Useful conversion factors**

1 lb = 16 oz. = 454 grams

1 acre = 43560 ft<sup>2</sup>

1 mile = 5280 ft

1 ft = 12 in = 30.48 cm



Visit the UT Extension Web site at <http://www.utextension.utk.edu/>

For more information about the UT Biofuels Initiative, please visit <http://www.UTbioenergy.org>

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