

Optimum Seeding Rates for Small Grains in the Upper Midwest

Albert Lea Seed, 2023

For Grain

1. Small grain seeding rates have been studied and defined by optimum final **stands** to achieve highest grain yields.
2. When planted with a drill, about 10-15% of small grain seed doesn't result in viable seedlings. This is beyond what won't germinate due to the documented germination rate less than 100 percent. This observed phenomenon is likely due to seed that has been dropped double or triple, too shallow, or too deep to result in a viable plant. Most drills used for small grain in the U.S. have limited planting capabilities. Drills used in Europe that singulate the seed at planting (similar to our row crop planters) and that have improved depth control, result in a higher success rate. Considering percent germination in the equation, seeding rates need to be about 20% higher than the target STAND. Broadcast seeding without incorporation will result in an even lower stand relative to the planting rate. Broadcast applications with shallow incorporation and a firming pass can, though, result in very good small grain stands.
3. All small grains vary in their number of seed per pound based on species, and individual seed lots can vary widely (e.g. wheat from 13,000-16,000 seeds/lb.). In addition, environmental conditions during the growing season contribute to different seed sizes for each seed lot, each year.
4. Ideally, planting by seed count will help optimize grain yields. This takes a large effort, as we can't be sure what seed lot a grower will receive. After they have received their seed, we can find the seed count in Pilot to help them with calibration. In this scenario, there is a possibility that they could be short seed, if their seed lot has very large seed. The best example of this is two-row barleys which, by nature, produce large seeds.
5. Unfortunately, not ALL seed lots have seed counts that we can access.
6. It could be a help if we generate an AVERAGE seed count for each small grain species each year from among our available seed lots and use that when calculating seed volumes for customers.
7. The seeding rates below are based on seeding into medium-to high fertility soils with good water-holding capacity. Reduce seeding rates for planting in more stressed environments such as on soils with lower water-holding capacity or in areas with lower rainfall.
8. **Adjusting seeding rate for delayed planting.** In general, seeding during recommended time frames will allow small grains to tiller and set seed for optimal yields. Later planting results in less time available for tillering. Consider higher seeding rates as planting is delayed.

Formula for Calculating Small Grain Seeding Rate for Grain Production

$$\text{Seeding rate (pounds per acre)} = \frac{[(\text{desired stand in plants per acre}) / (1 - \text{expected stand loss})]}{[(\text{seeds per pound}) \times (\text{percentage germination})]}$$

For Forage

1. We can make good estimates from grain-based seeding rates when seeding for forage production. Good stands for grain will also make good forage.

For Cover Crops

1. Seeding rates are expressed in either pounds or bushels/A. The fact that small grains vary in their pounds per bushel: rye is 56 lbs/A bu; wheat 60 lbs/bu; barley, 48 lbs/bu; oats, 32 lbs/bu; and triticale, 50 lbs/bu; may make it easier to work in pounds/A. Rates here are for pure stands of individual species. These rates can be reduced in cover crop mixes.

2. **Rolled-Down Rye** The exception to this is when planting rye in the early fall with the intention to roll it down for weed suppression in organic soybeans, dry beans, or vegetable transplants the following year. Best recommendations are by seeds/A. By checking seed counts from various seed lots, we can quickly translate this to pounds/A.

Seeding Rates for Small Grains in the Upper Midwest, 2023 (on good soils)

	Small Grains								
	Oats	Spring Wheat	Spring barley	Spring Triticale	Winter Wheat	Winter Rye	Hybrid Winter Rye	Winter barley	Winter Triticale
Proposed use	Desired stand-----OR----Planted Seeds/A-----OR-----lbs/A-----OR----bu/A								
Grain, seeds/A	1.25 to 1.3 mill. plants/A Drop ~ 1.5 mill. seeds/A	1.3 to 1.4 mill. plants/A Drop ~ 1.6-1.7 mill. seeds/A	1.25 to 1.3 mill. plants/A Drop ~ 1.5 mill. seeds/A	None available in 2023	0.9 to 1.0 plant stand Drop ~1.2 mill. seeds/A	90-112 lbs	800,000 live seeds/A	0.9 to 1.0 plant stand Drop ~1.2 mill. seeds/A	0.9 to 1.0 plant stand Drop ~1.2 mill. seeds/A
Grain, bu or lbs/A*	112 to 128 lbs/A 3.5 to 4.0 bu/A	115-135 lbs/A or 2.0 to 2.25 bu/A	2-row —163 lbs/A 6-row ----110 lbs/A	100 to 120 lbs/A	100-110 lbs/A 1.67 to 1.8 bu/A	80-112 lbs/A	Use lbs on seed tag for calibration	80 to 90 lbs/A (smaller seed)	100-110 lbs/A (larger seed)
Forage @ boot, milk, or dough stage	3.5 bu/A	120 lbs/or 2 bu/A	132 lbs/A (large seed)	100 lbs/A	100 lbs/A	80-112 lbs/A	800,000 live seeds/A	80 lbs/A (smaller seed)	100 lbs/A (larger seed)
Hay companion	1.5 bu/A for mid height; to 3.0 bu/A for short oat	50-100 lbs/A	48-90 lbs/A	Select another small grain for hay comp	40-60 lb /A seeded in spring	N/A Can frost seed in red clover	N/A Can frost seed in red clover	N/A Can frost seed in red clover	N/A Can frost seed in red clover
Cover crop,** spring or fall	0.5- 2 bu/A	40-60 lbs/A	48-72lbs/A	50-75 lbs/A	30-75lbs/A	50-150 lb/A	N/A	48- 72lbs/A	30-75 lbs/A
Cover crop, rolled for mulch mat	N/A	N/A	N/A	N/A	Less biomass than rye	3,000,000 seeds/A	Not thoroughly tested	Untested	3,000,000 seeds/A Less biomass than rye

*Pounds /A for grain seeding rates were derived by averaging seeds/lb for several 2023 seed lots for each species and class and dividing that number into the desired number of seeds to be planted per acre to achieve the desired stand.

-----Of the seed lots included in these averages, Ascend-SD spring wheat had the smallest seed size, with 16,000 seeds/lb. ND Genesis spring barley had the largest seed size with 9,427 seeds/lb.

**Increase seeding rates by up to 50% for broadcast, unincorporated seeding

Reference: Seeding Rate for Small Grains <https://extension.umn.edu/planting-small-grains/seeding-rate-small-grains#general-formula%3A-seeding-rate-469911>