



## Optimal plant populations / seeding rates for soybean

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Selecting the appropriate seeding rate for a soybean production system can affect optimal yield potential, economical net returns as well as some negative factors including potential for lodging. Choosing the optimal seeding rate for a given production system should be based on several factors. Desired plant population, soil type, planting date, and maturity group selected influence the recommended seeding rate. Other factors that affect optimal seeding rates include roughness of soil, type of planter or drill, percent germination of seed, and in some cases seed vigor. The following criteria and/or situations can be used to help in selecting an optimal seeding rate.

### Higher seeding rate situations

- Planting extremely early (March – early April)
- Heavy clay soils
- Group 3's or early to mid-group 4 varieties
- Planting with a gravity flow drill
- Rough soil conditions
- Low germination seed

### Lower seeding rate situations

- Late planting (late April through mid-May)
- Sandy soils
- Group 5 varieties
- Vacuum planter
- Smooth or optimal soil conditions
- High germination seed (>90% germination)

The decision to use a higher or lower seeding rate should be made on a field by field basis. A combination of the factors listed above rather than just one of the listed factors should be considered when selecting an optimal seeding rate. Deviating significantly from your individual comfort zone with respect to your historical seeding rates may result in a final plant population that may not reach optimal yield potential or an excessively thick stand having the potential for lodging.

The table listed below contains recommended final stand plant populations (plants/acre) for group 3, 4, and 5 soybean varieties across various soil types and planting dates. Additional tables (2-4) include required seeding rates and the number of seed to plant per foot of row for a range of row spacings in to achieve recommended plant populations based on the assumption that 80% of the seed planted will emerge.

Step by step information on how to calculate a seeding rate to result in a desired plant population is also included on the final page of this factsheet.

**Table 1. Recommended plant populations (final stand) for soybean.**

<b>Maturity group</b>	<b>Soil type</b>	<b>Planting date</b>	<b>Optimal final stand plant population (plants/acre)</b>
<b>Three's</b>	Heavy clay	March 25 – April 5	150,000
		April 5 – April 20	140,000
		April 20 – May 15	130,000
		After May 15	130,000
	Mixed	March 25 – April 5	140,000
		April 5 – April 20	140,000
		April 20 – May 15	130,000
		After May 15	130,000
	Light (loamy)	March 25 – April 5	140,000
		April 5 – April 20	130,000
		April 20 – May 15	120,000
		After May 15	130,000
<b>Four's</b>	Heavy clay	March 25 – April 5	130,000
		April 5 – April 20	120,000
		April 20 – May 15	110,000
		After May 15	130,000
	Mixed	March 25 – April 5	130,000
		April 5 – April 20	120,000
		April 20 – May 15	110,000
		After May 15	130,000
	Light (loamy)	March 25 – April 5	120,000
		April 5 – April 20	110,000
		April 20 – May 15	100,000
		After May 15	130,000
<b>Five's</b>	Heavy clay	March 25 – April 5	120,000
		April 5 – April 20	110,000
		April 20 – May 15	100,000
		After May 15	120,000
	Mixed	March 25 – April 5	120,000
		April 5 – April 20	110,000
		April 20 – May 15	100,000
		After May 15	120,000
	Light (loamy)	March 25 – April 5	110,000
		April 5 – April 20	100,000
		April 20 – May 15	100,000
		After May 15	120,000

**Table 2. Narrow-row soybean: seeding rates based on recommended plant populations from table 1, (estimating 80% of all seed planted will emerge).**

Optimal plant population (from table 1)	Seeding rate	Row spacing (inches)							
		7.5	8	10	15	18	20	25	30
<b>plants/acre</b>	<b>seed/acre</b>	<b>seed per ft of row to be planted</b>							
100,000	125,000	1.8	1.9	2.4	3.6	4.3	4.8	6.0	7.2
110,000	137,500	2.0	2.1	2.6	3.9	4.7	5.3	6.6	7.9
120,000	150,000	2.2	2.3	2.9	4.3	5.2	5.7	7.2	8.6
130,000	163,000	2.3	2.5	3.1	4.7	5.6	6.2	7.8	9.3
140,000	175,000	2.5	2.7	3.3	5.0	6.0	6.7	8.4	10.0
150,000	187,500	2.7	2.9	3.6	5.4	6.5	7.2	9.0	10.8

**Table 3. Wide-row and twin-row soybean: seeding rates based on recommended plant populations from table 1, (estimating 80% of all seed planted will emerge).**

Optimal plant population (from table 1)	Seeding rate	Wide-row (inches)		Twin-row*	
		38	40	38-inch row	40-inch row
<b>plants/acre</b>	<b>seed/acre</b>	<b>seed per ft of row to be planted</b>			
100,000	125,000	9.1	9.6	4.5	4.8
110,000	137,500	10.0	10.5	5.0	5.3
120,000	150,000	10.9	11.5	5.5	5.7
130,000	163,000	11.8	12.4	5.9	6.2
140,000	175,000	12.7	13.4	6.4	6.7
150,000	187,500	13.6	14.3	6.8	7.2

**Table 4. Drilled soybean: seeding rates based on recommended plant populations from table 1, (estimating 70% of all seed drilled will emerge).**

Optimal plant population (from table 1)	Seeding rate	Row spacing (inches)						
		7.5	8	10	12	15	18	20
<b>plants/acre</b>	<b>seed/acre</b>	<b>seed per ft of row to be planted</b>						
100,000	143,000	2.0	2.2	2.7	3.3	4.1	4.9	5.5
110,000	157,000	2.3	2.4	3.0	3.6	4.5	5.4	6.0
120,000	171,500	2.5	2.6	3.3	3.9	4.9	5.9	6.6
130,000	186,000	2.7	2.8	3.6	4.3	5.3	6.4	7.1
140,000	200,000	2.9	3.1	3.8	4.6	5.7	6.9	7.7
150,000	214,000	3.1	3.3	4.1	4.9	6.1	7.4	8.2

## Calculating seeding rate based on desired plant population:

Step 1. Identify recommended plant population from table 1 (above).

Step 2. Determine the percent of seed planted or drilled that will emerge.

- Find the % germination listed on the seed bag.
- Estimate the % of viable seed that will actually emerge.

**This estimate should be determined on a field by field situation and is dependant on the type of planter or drill, field conditions (i.e. roughness), planting depth according to moisture conditions, etc. The % emergence estimate is not provided on the seed tag and is an arbitrary number to be determined prior to planting. Typically 90% percent emergence is a good rule of thumb, but should not be used in all situations.**

**Example:** % germination listed on the bag is 90% and you estimate that 85% of all the viable seed will actually emerge.

- $0.90 \times 0.85 = 0.77$  or **77% of the seed planted will emerge.**

Step 3. Divide desired plant population by % emergence calculation to determine seeding rate.

**For example:** assume a grower is planting a group 4 variety on April 10 and has a mixed soil type. The recommended plant population (table 1) is 120,000 plants / acre. The bag states 80% germination and the grower assumes 90% of the viable seed will actually emerge.

Here are the calculations to go through to get the desired seeding rate for this scenario.

First calculation:  $0.80 \times 0.90 = 0.72$  or 72% of all seed planted will emerge

Second calculation:  $\frac{120,000 \text{ (desired plant population)}}{0.72 \text{ (percent germination)}}$  = **167,000 seed / acre** is the recommended seeding rate to plant