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G99-1395 Soybean Seeding Rates

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## Soybean Seeding Rates

Recommended soybean seeding rates, stand assessment and replanting rates based on Nebraska field research are addressed in this NebGuide.

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The soybean stand looked horrible late that May. The field had a good seed bed at planting, but rain after planting crusted the soil over the seed furrows. Rain was in the short-term forecast. All other row crops were planted and looked fine, but this field concerned the producer. Should the producer replant? Stand counts were taken — 70,000 to 80,000 plants/acre remained. That would have been enough if plants were relatively uniformly spaced and if weed control were good; however, subsequent weed control wasn't good and yields were poor.

- What is the minimum stand necessary to achieve reasonable yields in situations like the one described above?
- What is the recommended seeding rate for soybeans in Nebraska?
- Does the recommended seeding rate vary across the state?
- Does it vary in rain-dependent versus irrigated fields?
- Is it the same for all varieties?
- Does it matter whether the crop is planted with or without tillage?
- Should seeding rates increase with narrower row spacings?
- If replanting is necessary, what seeding rates are recommended?
- What about double crop seeding rates?
- When are seeding rates higher than 150,000 viable seeds per acre recommended?
- Why have we based seeding rate recommendations on seeds per acre rather than on pounds per

acre?

Seeding rate is the most easily managed yield component for optimum soybean performance. Farmers have little direct control over other yield components: pods/plant, seeds/pod, and seed weight. In the example above, only 90,000 seeds per acre were planted. If seeding rates were initially higher, the situation might not have arisen.

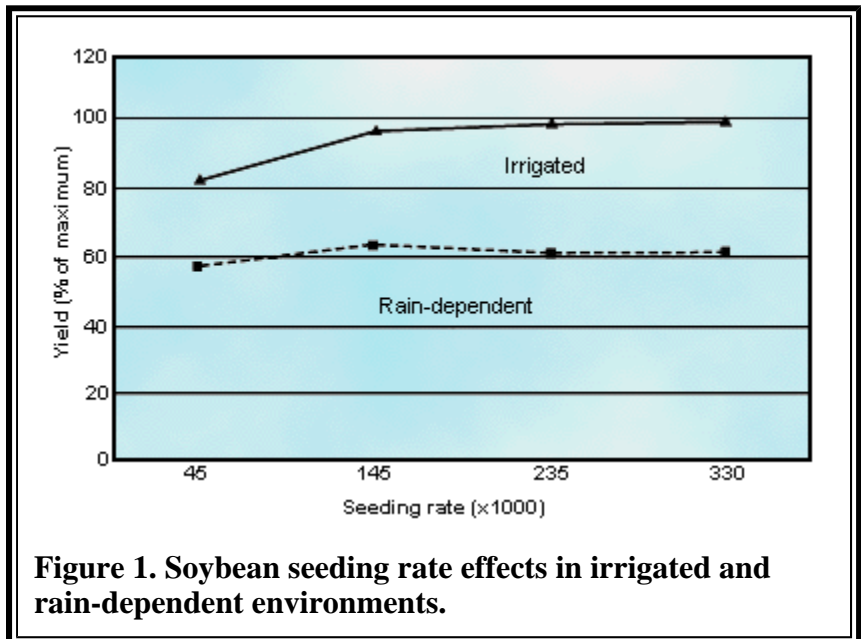
### What is the recommended seeding rate for soybeans in Nebraska?

Results from numerous seeding rate experiments across Nebraska over the years have shown the same thing: seeding about 150,000 viable seed per acre will optimize yield. *Figure 1* shows data from one of those studies. Seeding rates over 150,000 seeds/acre will neither increase nor decrease yield if plant lodging does not occur. This planting rate with normal plant losses during emergence and the remaining growing season will result in 100,000 or more harvestable plants. Plants in fields with harvest stands with fewer than 100,000 plants per acre will be short, have thick stems, be particularly heavy branched at the lower nodes, and will have many pods close to the ground, making harvesting difficult. Furthermore, weed control is more difficult with poor soybean stands as the producer in the above example found.

Plants in fields with seeding rates above 150,000 seeds/acre will be tall, spindly, and more susceptible to lodging. Yields may decrease because not only does lodging make harvest difficult, resulting in greater harvest losses, but it also disrupts the leaf canopy, often limiting grain development and yield.

### Does the recommended seeding rate vary across the state?

No. Results from across Nebraska as well as most midwestern states show the same thing. Seeding rates of about 150,000 viable seeds per acre will optimize yields.



**Figure 1. Soybean seeding rate effects in irrigated and rain-dependent environments.**

### Is the seeding rate recommendation the same for both rain-dependent and irrigated fields?

Yes. Results from research sponsored by the Nebraska Soybean Board show that soybean responses to seeding rates are the same in both rain-dependent and irrigated Nebraska fields (*Figure 1*).

### Is it the same for all varieties?

Almost always. Most varieties grown in Nebraska have indeterminate growth habits. They flower over a relatively long period and continue to grow vegetatively during flowering. Indeterminate varieties usually respond to increases in seeding rates like the averages shown in *Figure 1*; however, in some

cases they do not respond at all to changes in seeding rate. In these cases, yields at 45,000 - 50,000 seeds per acre are the same as those from 140,000 to over 300,000 seeds/acre. Nebraska producers grow a few determinate varieties (semi-dwarfs). They flower over a shorter time and the stem stops elongating at the onset of flowering resulting in shorter plants (20-25 inches). These plants are extremely resistant to lodging and were intended for high-yield environments where lodging reduces yield potential. The soybean breeder who developed determinate varieties found that they perform best with planting rates 50 percent higher than conventional, indeterminate varieties. Nebraska data do not indicate this is necessary. In our studies, determinate varieties followed the same trends shown in *Figure 1*; however, higher seeding rates will increase plant height and the lowest pod heights which may be an advantage for determinate varieties.

### **Does it matter whether the crop is planted with tillage?**

No. The above recommendations have been proven in trials with both conventional and no-till systems. It is important to achieve good seed-soil contact in any planting system.

### **Should seeding rates increase with narrow row spacings?**

No. The data shown in *Figure 1* are averages over 10-, 20-, and 30-inch row spacings. Soybean response to seeding rate was the same in all three row spacings. Research on normal, very large, and very small seeded soybean varieties shows the same thing: no difference in soybean responses to seeding rates between 10- and 30-inch rows. This answer presumes that good seed-soil contact is possible with the narrow-row planting equipment (drill) and optimum soil conditions at planting. Yield response is also best optimized in narrow rows when plants are more uniformly distributed in the row. If these presumptions are not met, consider increasing seeding rates by about 10-20 percent.

### **What is the minimum stand necessary to achieve reasonable yields?**

Poor stands can result from soil crusting, pathogens, hail, frost, herbicide injury, etc. Several factors must be considered when assessing stand counts. The expected yield loss from the reduced stand must be balanced against the anticipated yield loss from replanting after the optimum planting date (mid to late May). Leaving a poor stand may result in poor weed control or increased herbicide costs. Replanting entails many additional costs for seed, tillage, and replanting in addition to the potential yield penalty imposed by a later-than-normal planting date.

Obtaining stand counts is the first step to assessing the field. Count plants that have a good chance of recovery. Soybean plants can recover from stem damage if the stem is not severed below the cotyledonary (seed leaf) node. This is the first node on the seedling; the two fleshy-like cotyledons are attached to this node. Buds on each side of this node can produce regrowth if they are still present. If the plant is broken off below this node, it will not survive.

Once stand counts are established, refer to *Figure 2* to estimate plants/acre. Although yield is reduced when plant populations fall below 100,000 plants per acre, the yield loss is not proportional to stand loss. A general guideline is to leave a field alone if plant populations are greater than 50,000 plants per acre,



the stand is uniform, and the field can be kept weed free. More information on assessing hail loss in soybeans is in *Soybean Yield Loss Due to Hail Damage*, NU Cooperative Extension NebGuide G762.

**If replanting is necessary, what seeding rates and other practices are recommended?**

Late-planted soybeans are usually shorter. Use a narrow row spacing if possible and higher seeding rates to hasten canopy closure (*Figure 3*). Faster canopy closure will suppress weeds. Avoid using very early maturing varieties. They will flower quickly, resulting in short plants. Tall, medium maturing varieties for your area offer the best hope of minimizing potential yield loss from planting late. These ideas apply for double-cropped soybeans as well.

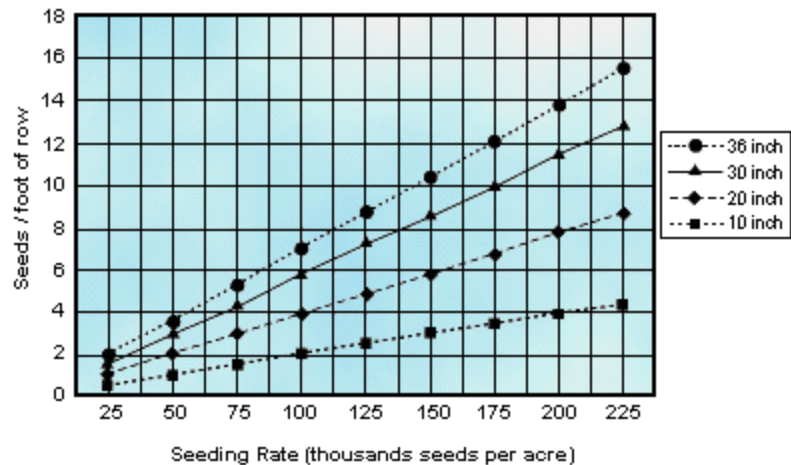
**When are seeding rates higher than 150,000 viable seeds per acre recommended?**

Situations may occur in replanting or late-planting situations where seeding rates should be increased. They include: with narrow rows where drills do not provide good seed-soil contact; to increase lowest

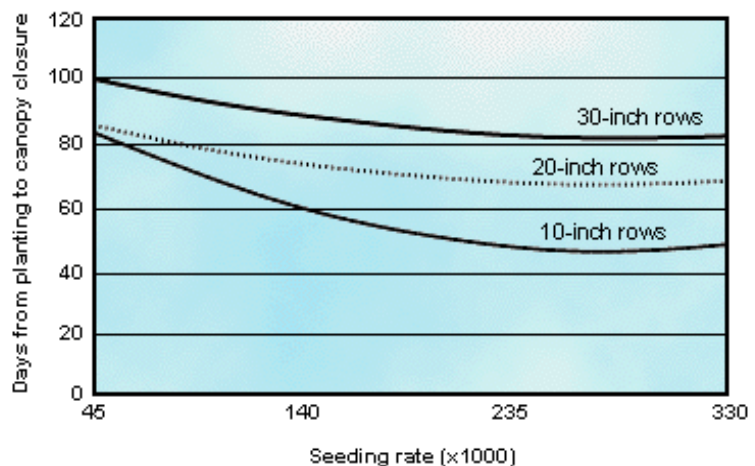
pod heights; and with determinate varieties to increase plant heights. Another case that may justify increased seeding rates is where early canopy closure is important for weed control. As with earlier planting dates, higher seeding rates and narrower rows both hasten canopy closure (*Figure 3*). This may be especially important with "thin-line" or "narrow canopy" varieties.

**Why have we based seeding rate recommendations on seeds per acre rather than on pounds per acre?**

Seed weights vary considerably among varieties and among production seasons. This can affect seeding rates and final stands. For example, planting a bushel per acre of a variety with 2000 seeds per pound would result in 120,000 seeds/acre. Planting a bushel per acre of a variety with 3500 seeds per pound would result in 210,000 seeds/acre. *Table 1* illustrates the effects of seed size on planting rates. Seed tags may have seed per pound listed; if not, ask your seed dealer to provide you with seed weight



**Figure 2. Soybean within row seed spacing for different seeding rates and row spacings.**



**Figure 3. Soybean canopy closure as affected by seeding rate and row spacing.**

information. Once your planter is set up, check actual seed drop to insure you are getting what you want. Figure 2 provides information on seeds per linear foot for various seeding rates and row spacings.

**Table I. Seed requirements for three seeding rates and different seed sizes.**

General seed-size categories based on seed/pound	Seed size (seed/pound)	Seeds per 50-pound bag	Seeding rate/acre		
			150,000	175,000	200,000
			pounds of seed per acre		
Very large <sup>1</sup>	1800	90,000	83	97	111
	1900	95,000	79	92	105
	2000	100,000	75	88	100
Large	2200	110,000	68	80	91
	2400	120,000	63	73	83
Medium	2600	130,000	58	67	77
	2800	140,000	54	63	71
Small	3000	150,000	50	58	67
	3200	160,000	47	55	63
Very small <sup>1</sup>	3500	175,000	43	50	57
	4000	200,000	38	44	50
	4500	225,000	33	39	44
	5000	250,000	30	35	40
	5500	275,000	27	32	36
	6000	300,000	25	29	33

<sup>1</sup>'Very large' and 'very small' soybeans are for specialty food markets.

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