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Soybean Seeding Rates in Minnesota

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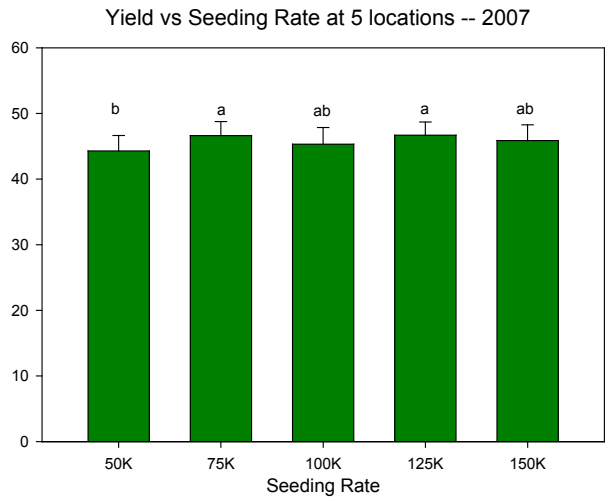
As commodity prices have risen to record levels, input costs have continued to track upward. While it is essential that producers focus on maximizing yields, careful management of inputs will ensure maximum profits.

One such input is soybean seed. Since 1998, weed control costs have been shifting more heavily onto the seed in the form of technology fees related to glyphosate resistance. Now soybean seed costs tend to be larger than soybean herbicide costs. This has led many producers to consider reducing seeding rates.

Before discussing seeding rate recommendations, it is important to focus on some of the underlying principles of populations and yield. Soybean plant populations do not create yield, yet, maximum yields require sufficient populations. Soybean stands must be large enough to maximize light interception throughout the growing season and provide an abundance of fruiting sites (leaf axils) so that pod set can be maximized. More plants allow more *potential* places for seed to set and mature. For this reason, the minimum plant stand at harvest to maximize yield is the critical number to strive for. Initial seeding rates help to determine spring-time stands. These spring stands then help to determine the number of plants that will ultimately bear seed and produce yield.

Many years of studies related to hail injury have taught us that soybean stands of 100,000 plants per acre or more at harvest are sufficient for maximizing soybean yields. While most of this research has been conduced in Southern Minnesota and Iowa, this value is likely to be only slightly conservative for producers in Northern Minnesota. Again, seeding rates serve only to establish this minimum stand. Increasing seeding rates provides returns only when stand establishment is poor. Increased seeding rates can serve as "insurance" against poor stand establishment due to cold soils, or crusting, but when severe injury occurs (eg hail), replanting is rarely averted by small increases in seeding rates.

Seeding rate research conducted by University of Minnesota Extension faculty, Fritz Breitenbach, Lisa Behnken, Ryan Miller, Dave Nicolai, and Liz Stahl, examined five seeding rates from 50,000 to 150,000 live seeds per acre (in 30" rows) at five southern Minnesota locations in 2007. They confirmed earlier work that showed very low seeding rates under good conditions lead to maximum yields. They found only the lowest seeding rate (50,000) to provide significantly lower yields than higher rates. In fact, seeding at a mere 75,000 live seeds per acre in these trials maximized soybean yield.



If final stands drive yield potential, what affects final stands? Seeding rate, seed quality (as measured by standard germination, cold tests, and/or accelerated aging test), soil type, and soil conditions at planting and throughout emergence, stand establishment, and late season growth all affect final stands. Higher seeding

rates result in a greater percentage reduction in fall stands due to inter-seed or inter-plant crowding. This effect is accentuated in wide rows where inter-plant distances are much smaller. Seeding equipment plays a large role in determining emergence and final stands. Seeding equipment that distributes the seed poorly linearly (within the row) and/or vertically will lead to fewer plants at harvest relative to seed planted.

How does row spacing affect seeding rate? In a 12 site*year study, we have found no interaction between row spacing and plant population. Therefore, narrow rows receive no greater yield benefit from higher seeding rates than do wide rows. We have seen a 5 bushel per acre increase when moving from 30" to 10" rows. About half of this was noted between 30" and 20" in rows and half was seen between 20" and 10" rows. Therefore, 22" rows should provide about a 2 bushel advantage over 30" rows, but are probably at a 2 bushel disadvantage when compared with 15" rows. In the absence of a row spacing by population interaction, farmers need not plant narrow-row soybeans at a higher rate than those planted in wide rows. Again, planter type will affect seeding rate needed to achieve minimum required stands. Grain drills and air seeders require higher seeding rates, not due to their narrow row arrangement, but because of poor linear and vertical distribution of seed.

Under ideal conditions, soybeans in Southern Minnesota should be planted at about 140,000 live seeds per acre. It appears that soybeans grown in central and northwestern Minnesota require harvest stands of 125,000 to 150,000 plants per acre to maximize yields. This is likely due to shorter-statured soybeans with fewer total nodes that are often produced in these regions. Increased seeding rates are required in central and northwestern Minnesota. Therefore a system based on soybean maturities has been developed to point producers toward reasonable soybean seeding rates:

Maturity Group II soybeans	140,000 live seeds/acre
Maturity Group I soybeans	150,000 live seeds/acre
Maturity Group 0 soybeans	160,000 live seeds/acre
Maturity Group 00 soybeans	170,000 live seeds/acre

Cautions:

- Recommendations are independent of row spacing.
- Recommendations are based on live seed. Carefully examine germ rates provided on seed tags.
- Seeding rate suggestions are based on excellent to ideal planting conditions. Planting early or into cold and/or wet soils may require increased seeding rates. Seeding into heavy clay soils will likely require greater seeding rates when compared with light or sandy soils.
- Seeding with planting equipment that distributes the seed poorly either linearly or vertically will require greater seeding rates. Likewise, greater seeding rates will be required when soybeans are planted at an excessive speed. High rates of speed through the field decrease the precision of both linear and vertical seed placement.
- Soybeans planted in high pH areas that are prone to iron deficiency chlorosis (IDC) may benefit from higher seeding rates. This benefit is amplified when soybeans are planted in wider rows (22 – 30").
- Due to the myriad variables affecting final stands, producers should utilize liberal seeding rates until they clearly understand how their planting equipment, planting date, soil type, and spring conditions affect their actual plant populations. This will require taking stand counts in all fields each year, but the pay-off will be an eventual fine-tuning of seeding rates that reduces input costs while providing sufficient plant population "cushion" to avoid replant situations in those years when Mother Nature does not cooperate.