CROP FOCUS

Soybean Stand Establishment and Seeding Rate Considerations

Introduction

- Establishing healthy, uniform stands is important to maximize soybean profitability, even though soybeans respond to reduced stands better than many other crops.
  - » Increased lateral branching can compensate for lower stands that are still relatively uniform (such as stand shown at right) but only partially for gaps.

- Because there are many factors that affect soybean stand establishment, optimum seeding rates vary considerably by region, cropping practice, and field.
  - » Listing factors known to influence stands in each field, and adjusting seeding rates to account for potential stand losses is a practical way to make the best seeding rate decisions.
- Use of seed treatments improves stand establishment and uniformity by protecting seeds and emerging seedlings from biotic causes of stand loss, including disease infection and insect feeding.
- Stand issues due to abiotic causes (crusting, residue interference, other seed-soil contact issues, cold water imbibition, hail, etc.) are not remediated by seed treatments.
- This *Crop Focus* will discuss factors affecting soybean stand establishment and how to adjust seeding rates to compensate for common losses of stand.

Stands that emerge uniformly with no large gaps or skips have highest yield potential.

Western Canada Seeding Rate Distribution

- Each year, DuPont Pioneer conducts a grower survey that documents soybean seeding rates used by customers on their soybean acres. Below are 2014 Western Canada results:

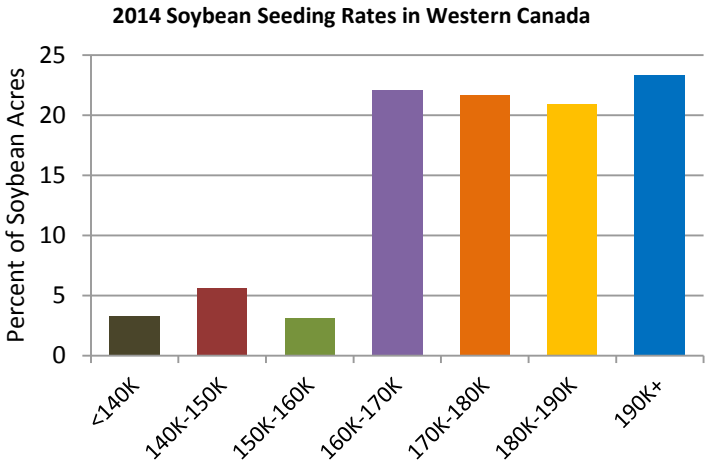

Figure 1. Seeding rate distribution by percent of soybean acres planted in Western Canada. Source: 2014 DuPont Pioneer brand concentration survey.

- Figure 1 shows that 23% of soybean acres in Western Canada are planted at 190,000 seeds/acre or above, and an additional 65% of acres are planted at 160,000 to 190,000 seeds/acre.
  - » Differences in soil type, tillage/residue cover, planting equipment/row width, planting date, variety/maturity group, local disease risks, grower preferences, etc., lead to this diversity of rates within provinces or regions.

Factors Affecting Soybean Seeding Rate

The primary factors affecting soybean seeding rate in Western Canada are listed below. Agronomists suggest increasing seeding rates by 5 to 10% for factors that reduce stand.

- **Soil Type:** Soils with high clay content are much more likely to crust and restrict soybean emergence. Low-lying clay soils (i.e., "lake-bed clays") often remain wet in the spring, favoring certain seedling diseases, most notably Phytophthora and Pythium.
- **Tillage/Residue Cover:** No-till systems provide a less hospitable environment for soybean emergence due to colder soils, more residue, and possible seed placement/soil contact challenges.
- **Planter or Drill:** Planters have traditionally done a better job of seed singulation and placement, increasing plant counts and stand uniformity. Growers using drills may need higher seeding rates to establish equally productive stands.

Soybean stand reduced by a soil crust at emergence.

- **Row Width**: Higher seeding rates have traditionally been recommended for narrow-row soybeans.
- **Planting Date:** Early planting usually means colder, wetter soils and slower emergence. These factors commonly reduce stands. Soybeans planted very late, including double-crop beans, require higher rates because they are destined
- **Soybean Maturity Group.** Studies have shown that very early soybean varieties (MG 00, 0, and 1) require higher populations to optimize yield.
- **Iron Deficiency Chlorosis Risk:** Recent research studies have shown that increasing seeding rates can result in reduced chlorosis symptoms.
- **Seedling Disease Risk:** Some regions have higher seedling disease risk due to soil types, weather patterns, and pathogen race shifts. Higher seeding rates are needed to establish target stands in areas or fields with a history of higher disease risk. In fields with a high risk of white mould, very high seeding rates are not recommended.

Calculating Seeding Rate

- After deciding on a final stand target, the grower must account for non-germinating and non-emerging seeds to calculate his seeding rate, according to the following equation:

$$\text{Seeding rate} = \frac{\text{Targeted final stand}}{(\%\ \text{germination} \times \%\ \text{emergence})}$$

Example 1

- In order to reduce gaps, maximize profitability, and minimize replant risk, a grower planting a maturity group 00 soybean variety in 15-inch rows in a well-tilled seedbed in mid-May targets a final stand of 160,000 plants/acre.
  - The seed tag indicates that germination is 90%, and because he is planting under relatively good conditions, he estimates emergence at 90%. His seeding rate is calculated as:

160,000 / (.90 x .90) = 160,000 / 0.81 = **197,500 seeds/acre**

Example 2

- A grower drilling a maturity group 006 soybean variety in 7.5-inch rows in a no-till field in mid-May targets a final stand of 170,000 plants/acre.
  - Because he is planting early in a no-till system, he anticipates cool soils and potential seedling disease challenges. Consequently, he estimates % emergence at 85%.
  - The seed tag show that germination is 90%. Thus, his seeding rate calculation is:

170,000 / (.90 x .85) = 170,000 / 0.765 = **222,000 seeds/acre**

Agronomic Advantages of Maintaining Moderate to High Seeding Rates

- Thicker seeding rates can enhance plant and pod height, which is especially important on sandy soils or with late-planted or earlier maturity soybeans that tend to have shorter plants.
- Quicker canopy closure due to higher seeding rates can also benefit in weed control strategies by providing shade to slow down or inhibit weed emergence and early growth.
- Higher seeding rates can provide a buffer against the need to replant due to light to moderate stand reduction events, such as hail.
- Higher seeding rates enable quicker canopy closure, which can be a benefit in drought and/or heat prone environments. High levels of heat reflected from the soil surface can reduce early vegetative growth.

Soybeans emerging uniformly are positioned for highest yields.