Optimum Planting Conditions and Seed Placement for Soybean

- Planting soybean seed when soil temperatures are optimum is critical for emergence and stand establishment.
- Planting depth, row spacing, and planting population are important for stand establishment and plant development.
- Growers have the ability to control these factors and proper implementation can help improve soybean yield potential.

Optimum Temperatures
Soybean seed can germinate at a soil temperature of 54° F, but a temperature of 60° F is optimal. Below optimal temperatures can cause seeds to become more vulnerable to diseases, insects, and animal predators. Soybean seed should be planted when soil temperatures have had time to warm and within the target dates for the region. Planting into cold and/or wet soils can lead to numerous problems.

Saturated and Flooded Soils
Along with soil temperature, adequate soil moisture and high soil oxygen concentrations are favorable for germination and plant growth. Saturated soils, which may include flooded or ponded soils, can have a negative impact on emergence. The main side effects include plant growth restriction and decreased oxygen availability to the plant. For instance, saturated soils can inhibit root growth, leaf area expansion, and the photosynthetic process. Young plants may develop yellow leaves due to slowing of photosynthesis and plant growth. A prolonged period of saturated soil can reduce germination and emergence due to lack of oxygen. In addition, portions of roots may die as a result of no oxygen. However, there is still a chance for survival unless the growing point is damaged.

The longer an area remains saturated, the higher the risk of plant death, and warm air temperatures during this time can shorten plant survival. For soybeans, yield losses are not typically noted in fields flooded for two days or less. Flooding for four days or more can stress the crop, delay plant growth, and cause shorter plants with fewer nodes. Six days of flooding can cause significant soybean yield loss, and flooding for a week or more can result in loss of the entire stand.

Soil Compaction
Soil compaction takes place when soil particles are pressed together resulting in decreased pore space and increased soil density. Compaction can result in yield reductions due to decreases in seedling germination, root and plant growth, and nutrient uptake. The majority of soil compaction is created from equipment passes over a field. Research indicates approximately 80% of soil compaction happens on the first pass, while subsequent passes cause additional, but progressively less, compaction. The way to manage compaction is prevention. That means staying out of the field until conditions for field work have improved. If mud sticks to the tires and ruts are deeper than an inch, it is too wet to be in the field.

Soil Crusting
Soil crusting can occur when a crust layer forms on the soil surface as wet soils dry. The crust layer can delay or prevent seedlings from emerging. In addition, soybean hypocotyls can easily be broken when trying to push through the crust. Crusting may be more common in fields with fine textured soils, low organic matter, and little surface residue. A rotary hoe can break up the crust and aid in seedling emergence. Timing is essential and breaking the crust as soon as possible is most beneficial to the young plants. Cooler soils allow seedlings infected with disease to survive longer when trying to break through the crust.

Soybean Planting
Soybean seed should never be planted too deep. Generally, soybean seed should be planted 1 to 1.75 inches deep and no deeper than 2 inches. Soybean plants emerge as the hypocotyl straightens and carries the cotyledons to the surface. The plant requires a lot of energy to complete this process. Therefore, planting too deep can burn energy that could be used later by the plant. In addition, planting too deep can inhibit emergence in stressful situations, such as soil crusting and compaction.
Row Spacing and Plant Population
Soybean population recommendations will vary by soil type and geography. Generally, there should be 100,000 healthy and uniformly distributed soybean plants per acre to produce a good crop. A general recommendation rate between 120,000 and 150,000 seeds per acre for 15- or 30-inch rows will be necessary to obtain a desirable population. The lower rate can be used with high germination seed (>90%), optimal soil conditions, or when using a vacuum planter. The higher rate may be necessary with extremely early planting, low germination seed (<90%), wet soils or high residue situations, or very late planting dates.

The right row spacing can vary by planting date, soil type, weather, and the soybean product. Rows narrower than 30 inches, down to 20- or 15-inch rows, can potentially produce higher yields. Narrow rows can provide a yield advantage because the soybean canopy develops quicker and intercepts more light throughout the growing season. Drilled soybeans have the potential to perform better, but because the seed does not tend to be uniform in depth when drilling, any potential gains are usually offset by the inconsistent planting depth. Planting with gravity flow drills also require a higher seeding rate.

Improved planter technology and increased seed quality have resulted in more accurate plant populations and stand establishment. Split-row planters, newer precision drills and narrow-row planters offer improved seed placement, which can help reduce the need for high seeding rates. Today’s innovative farming technologies allow equipment to work with various seed sizes for more accurate seed placement, reducing the skips and doubles.

Summary
Planting when soil temperature and conditions are favorable, at the proper depth, seeding rate, and row configuration is very important to give the crop the best chance for emergence and stand establishment. Waiting for warm soil temperatures and conditions can help avoid seedling diseases, reduced oxygen situations, and other plant growth restrictions. Although it is important to plant within the acceptable planting window, rushing to plant in cold, wet conditions can lead to yield-reducing problems later in the season.

Sources
Web sites verified 3/8/17. 140216060210