How to Maximize Soybean Yield Potential

Although maximum yield potential of soybean is genetically determined, actual yield potential depends on increase in stress tolerance, environmental conditions, and management practices. Several agronomic practices can benefit soybean yield potential including variety selection, early planting, row configuration, and planting population. Nutrient deficiency and weed, disease and insect pressure can affect stress levels of soybean plants. Mitigation of stresses with fertilizer or inoculant, herbicide, fungicide, and insecticide can help achieve maximum yield potential.

Nutrient Availability

Approximately 50 to 75% of the soybean plant’s N uptake requirement comes from biological nitrogen fixation (BNF); the remainder must be supplied from soil mineralization or fertilizer. Soybeans require more nitrogen than corn so it is important that the nitrogen fixing bacterium Bradyrhizobium japonicum is present in the soil. Seed inoculation can increase nitrogen fixation and may improve the yield potential. Under some soil conditions the supply of the N from the soil and nodules may not be adequate. In such circumstances, benefits can be achieved from applying N fertilizer.

One bushel of soybeans removes up to 3.8 lbs N, 0.84 lbs P₂O₅, and 1.3 lbs K₂O² and high-yielding soybeans (101 bu/acre) may take up 11.4 lbs/N/acre/day. A soil pH of 6.5 should be targeted for proper nutrient availability to soybeans.

Because soil test results cannot accurately predict the need for N fertilizer in soybean, growers should consider these field conditions when determining need for supplemental N:
- Crop does not have a uniform dark green color.
- Soil is acidic with a pH of less than 5.5.
- Soil is light colored/eroded/compacted.
- Soybeans have not been grown in the field for some time.
- Active nodules are absent from roots.
- The crop was not inoculated and deficiency symptoms are present.

Soybean nodulation begins after VE stage and N fixation is initiated between the V2 and V3 stages, thus N applications are recommended closer to early pod fill, when N is in greatest demand by soybean plants.

Insect and Disease Management

Soybeans have the ability to compensate for damage by adjusting number of pods, seeds per pod, and seed size until plants approach R5 stage.

Loss of leaves becomes important between R4.5 and R5.5 stages, as complete leaf loss can result in approximately 75% yield loss. Severe foliar damage from insects and disease can reduce the rate of plant functions and physiological pathways enough to affect yield. For instance, soybean aphids can reduce photosynthetic rates up to 50% on infested leaflets and nitrogen fixation rate in plants by 80%.

Genetics

Growers should select the best genetics and traits to help deliver maximum yield potential. Knowing the characteristics and history of a particular field will aid in identifying the best genetics and traits for each field. Decisions on variety selection should be based on the best genetic and trait package available for the desired maturity group. Standability and disease and nematode tolerance are factors that can all play an important role in achieving maximum yield potential.

Early Planting

Early soybean planting can help increase the yield potential by increasing canopy photosynthesis throughout the season.

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period, and increasing crop growth rate during pod set, leading to a greater seed filling rate. In addition, early canopy development can help in conservation of soil moisture, which is critical during reproductive periods.

When planting early, it is important to wait until good soil and seedbed conditions exist. Planting when soil is too wet can result in compaction, poor seed placement and stand establishment. Soybeans planted in wet soils will likely negate any yield advantage from planting early.

Early planting may help soybean plants to flower early, increase vegetative nodes, and improve the potential of early harvest. In comparison, late planting may contribute to yield loss due to a combination of weather conditions and disease development during bloom and pod fill. These stresses can reduce pod number and consequently reduce the yield potential.

Researchers at the University of Wisconsin found that soybean yield decreased by 0.4 bu/acre per day, when planting was delayed past the first week of May10.

**Row Configurations**

Using narrower than 30 inches can improve yield potential. Research has shown that narrow rows (less than 30 inches) yield greater than wide rows (30 inches or greater). In Iowa, on an average 4.5 bu/acre increase can be expected when using 15-inch row spacing, compared to 30-inch row spacing8. A Monsanto trial showed that 30-inch twin rows provided a yield advantage over 30-inch rows.

Canopy closure is needed by the start of pod set (R3) for maximum pod formation and seed filling9. In addition, better weed control, reduced soil moisture loss, and an easier and more efficient harvest can be achieved with a 30-inch twin row spacing.

**Planting Population**

Higher populations can contribute to improved soybean yields as well. Monsanto demonstration trials have shown higher populations improve yields, but can vary by Relative Maturity (RM). It was found in 2011 that soybean yield increased with an increase in population from 140,000 to 200,000 seeds/acre for a 3.1 RM soybean product, but the yield remained the same or decreased with an increase in population for the 2.9 and 3.3 RM products.

Final plant population depends on seedbed conditions and planter settings. Poor seedbed conditions, seed quality, inaccurate planter adjustment, soil crusting, extremely wet soil, disease and insect pressure, and hail or frost damage are factors that can reduce plant population.

Greater seeding rate is usually required to achieve the intended final plant population. Iowa State University estimates a 15 to 30% increase in seeding rate over the desired final plant stand is recommended to compensate for any plant loss11.

**Summary**

Genetics ultimately determine maximum soybean yield potential; however, management practices should be evaluated, especially during years with strong commodity prices. A variety of agronomic practices such as row configuration, plant population, planting date along with genetic traits can be used to help increase soybean stress tolerance, plant growth resources, and biomass production. The take home message is that changing the management practices while considering soybean products can help in maximizing the yield potential.

**Sources:**

8 Pedersen, P. Row Spacing in Soybean. Iowa State University Extension.

**Individual results may vary**, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

**ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.**

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