

Maximizing Soybean Yield Potential

Achieving maximum soybean yield potential will likely depend on increases in stress tolerance, efficient use of all plant growth resources, and increased biomass production. A variety of agronomic practices have shown benefit to increasing soybean yield potential. Selecting what works best on your farm requires careful consideration and implementation.

Choose the Right Variety

Growers should choose the right maturity group for the region. Planting early maturity soybeans to facilitate early harvest may be sacrificing yield, while planting later maturity varieties may increase yield potential by lengthening the reproductive growth stage.

Additionally, growers should select the best genetics and traits to deliver maximum yield potential for their farming operation. Knowing the characteristics and history of a particular field will aid in identifying the best genetics and traits for each situation. Decisions on variety selection should be based on the best genetic and trait package available for the desired maturity group, as factors such as standability, and disease and nematode tolerance, can all play an important role in achieving maximum yield potential.

When Genuity® Roundup Ready 2 Yield® soybeans were managed intensively, they yielded an average of 7.4 bu/acre more than when they were grown under a low-input system of two in-crop applications of Roundup® agricultural herbicide (Figure 1)¹. Roundup Ready® soybeans only showed an average yield increase of 4.2 bu/acre when managed intensively compared to a low-input system¹.

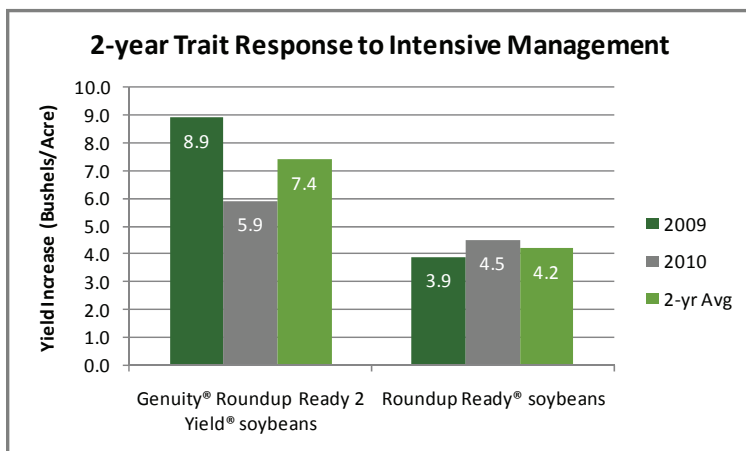


Figure 1. Yield increase as a result of intensive management by trait. Source: 2009-2010 Monsanto data¹.

Plant at the Optimum Time for the Geography...

...NOT after all the corn is planted. Soybeans can germinate at soil temperatures around 50° F at a 2-inch depth, but germination is slow². Temperatures below the optimum can cause seeds to sit dormant and become more vulnerable to diseases, insects, and animal predators. Crops should be planted when soil temperatures are optimal and within the target dates for the region.

Early planting results in the following²:

- Increase in canopy photosynthesis throughout the season
- Greater number of main-stem nodes
- More rapid crop growth rate during pod set
- Potential for earlier flowering and therefore, a longer reproductive period
- Greater seed filling rate.

Optimize Fertility

Fertility is one of the most overlooked areas of high-yield soybean production. If nutrients are limited, water transport, photosynthesis, and production of protein, oil, and carbohydrates do not occur at proper rates. This can lead to a decrease in growth and yield production. Proper soil pH is important for nutrient availability. A soil pH of 6.5 should be targeted in soybeans.

One bushel of soybeans removes up to 3.8 lbs N, 0.84 lbs P₂O₅, and 1.3 lbs K₂O³. Additionally, yield levels illustrate how fertilizer rates can be affected (Table 1). A soil

Table 1. Nutrient removal (lbs) by targeted soybean yield.

Soybean Yield	P ₂ O ₅	K ₂ O
45 bu/A	38	59
60 bu/A	50	78
75 bu/A	63	98

Source: Calculations made using International Plant Nutrition Institute data³.

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test can indicate whether a field or area of a field requires additional fertilizer to reach a critical value. When soil test values are below a critical value, a crop often responds to additional fertilizer. The farther below the critical value the soil test is, the more likely a yield response is.

Approximately 50 to 75% of the soybean plant's N uptake requirement comes from biological nitrogen fixation (BNF)⁴; 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 yield potential.

Boron, calcium, iron, molybdenum, sulfur, and zinc are some of the more important minor nutrients involved in plant processes such as photosynthesis, N-fixation, and protein synthesis. Tissue tests can confirm deficiencies. Foliar fertilizers to correct deficiencies may be an option.

Maximize Canopy Development

By managing soybeans for early canopy development, the following can occur:

- Canopy photosynthesis increases
- Number of main-stem nodes and biomass increases
- Potential for earlier flowering, and therefore longer reproductive period
- Soil moisture is conserved for critical reproductive periods.

Growers can promote earlier canopy and increase light interception in the following ways:

Planting early. Soybean yield response to intensive management was improved with earlier planting dates in 2010 (Figure 2)¹. The earliest planted soybeans (May 6–18) provided the largest yield gain from intensive management¹. Results from 2009 also showed a yield advantage from earlier plantings (May 1–15) when intensive management practices were implemented.

Narrow rows. Studies in 2009 and 2010 revealed that planting soybeans in narrow rows (less than 30-inch rows) may help to increase crop yield potential as results reported numerically higher yields⁵.

Appropriate seeding rate. Soybeans have the ability to adjust and compensate for different plant populations. Therefore, seeding rate may not be as critical as with other crops such as

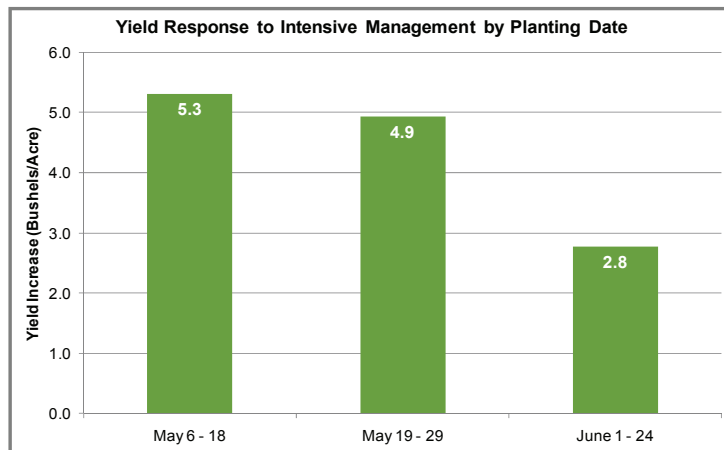


Figure 2. Yield results by planting date. Source: 2010 Monsanto data¹.

corn. In the past, higher seeding rates were recommended to help offset high weed pressure. With current weed management programs, high plant populations are not necessary. Data from Iowa State University indicates that a seeding rate of 125,000 to 140,000 seeds per acre is adequate to maximize yield potential in optimum planting conditions⁶. This guideline holds true for both 15- and 30-inch rows. When planting into wet soils, high residue situations, or if germination is below 90%, use a higher seeding rate.

Using Acceleron® Seed Treatment Products. A three year summary (2008–2010) of field data with varying levels of insect and disease pressure indicated soybeans treated with Acceleron® insecticide/fungicide seed treatment products had performance gain wins 73% of the time compared to untreated soybeans⁷. In addition, data from the same trials indicated that Acceleron® seed treatment products improved soybean stand and vigor.

Minimize Stress

Monsanto has conducted stress mitigation trials for the past four years, giving a total of 66 site-years. The individual and collective responses of insecticide, fungicide, residual herbicide, and seed treatment were examined. Four years of data demonstrated an average yield increase of 7.3 bu/acre when soybeans received intensive management (Figure 3)¹. When examining the yield contribution of each of the four

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treatment components, insecticide + fungicide contributed 89% and 73% of total yield response in 2009 and 2010, respectively (Figure 3)¹. The four-year average also illustrates the positive yield effect provided by seed treatment. While yield improvement due to individual management component varies, there is a consistent positive response to the entire management system.

Fungicide application timing was also examined in the 2010 soybean stress mitigation trials. Foliar fungicide was applied at V3, V6, R3, or R5 stage with various herbicide treatment combinations. Applying fungicide at V3 and V6 with Roundup PowerMAX® herbicide showed little or no yield improvement¹. The highest yield was observed with the following treatment combination: Valor® XLT, followed by Roundup PowerMAX® herbicide (V6 stage), followed by Headline® fungicide (R3 stage)¹.

In summary, selecting the appropriate variety and applying sound agronomic management practices in order to capitalize on the opportunities available in each growing season are critical in achieving maximum yield potential.



Sources: ¹High yield management in Genuity® Roundup Ready 2 Yield® soybeans. 2010. Monsanto national research summary.

²Pedersen, P. Soybean planting date. Iowa State University, Department of Agronomy.

³International Plant Nutrition Institute. Average nutrient removal rates for crops in the north central region. Online at <http://nanc.ipni.net/>

⁴Pedersen, P. Seed inoculation. 2007. Iowa State University Extension.

⁵Interaction of plant population, row spacing, and variety selection on soybean yield potential. 2010. Monsanto national research summary.

⁶Pedersen, P. Soybean plant population. Iowa State University Extension.

⁷2008-2010 Monsanto small plot and strip plot trials.

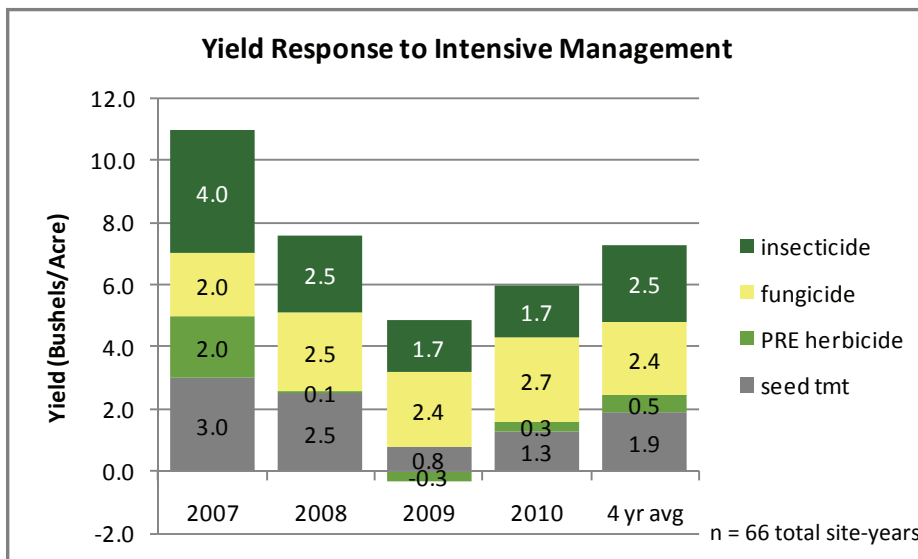


Figure 3. Yield contribution of each of the four management components by year. Source: 2007-2010 Monsanto data¹.

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