High Yield Production Practices for Soybeans

Achieving top soybean yields requires intensive management. All critical aspects of soybean production must be considered, including variety selection, planting practices, seed treatments, soil fertility, fungicide/insecticide applications (when needed), crop rotation and timely weed control.

Variety Selection for Top Yields

Matching soybean varieties to the specific requirements of individual fields is a core practice for maximizing yield. Geographic location alone can impact maturity, drought stress potential and pest pressure. Soil type, drainage and soil condition (e.g., compaction) affect stand establishment and moisture stress. Soil pH can result in iron deficiency chlorosis in some varieties. Field history of soybean cyst nematode (SCN), Phytophthora, white mold, sudden death syndrome and other diseases determine resistance traits needed in the variety. Previous crop can heighten or moderate expected disease pressure and thus impact variety selection.

In addition to appropriate disease and SCN resistance for the growing environment, all varieties considered should have high yield potential, good standability and ability to withstand environmental stresses. Your local Pioneer sales professional can help you select the best soybean varieties for each field, with proven yield performance across multiple environments.

Newest Varieties - Soybean breeders at DuPont Pioneer make yield gains and agronomic improvements every year using new genetic tools such as the Accelerated Yield Technology (AYT™) system and marker-assisted selection. Sampling top new varieties each year and ramping these up to substantial acreages quickly can have a significant impact on overall farm yields.

Planting Practices

Row Width - A review of soybean row-spacing studies published within the past decade generally confirms previous results comparing row widths (Figure 1). In 5 studies, drilled narrow rows outyielded 30-inch rows by an average of 4.1 bu/acre. Six studies that compared 30- and 15-inch rows found similar results, with 15-inch rows holding a 3.6 bu/acre yield advantage. Yields were similar between 15-inch and drilled narrow rows. For that reason, many growers wanting better uniformity of planting depth and seed placement, or in areas where white mold is common, have chosen 15-inch rows.

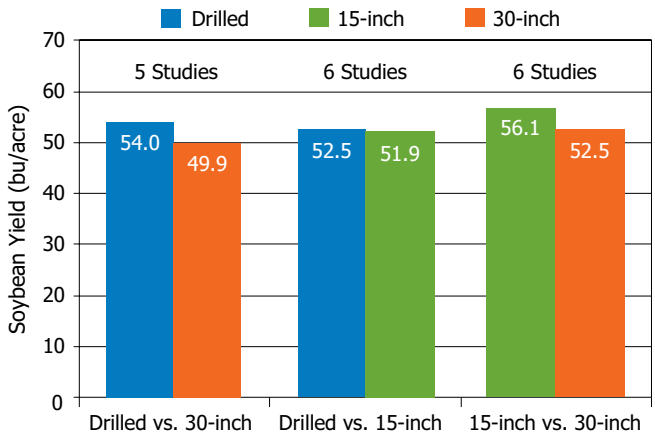


Figure 1. Average yield results from 7 soybean row spacing studies published during the last 10 years.

Full-season soybean variety.

Planting Date - Soybean planting is trending earlier, particularly in operations with a planter dedicated to soybeans. DuPont Pioneer and university studies have shown that planting soybeans in the last half of April or first part of May often increases grain yield. Early planting extends reproductive growth by initiating flowering earlier. This allows the crop to accumulate more nodes, increasing the potential for greater pod and seed number. In addition, recent studies indicate that full-season varieties respond better to early planting than short-season varieties.

Seed Treatments - Because of earlier planting and higher levels of crop residue on fields, soils are generally colder and wetter at planting, and seedling diseases have increased as a result. Consequently, more growers are seeing an advantage for fungicide seed treatments. Pioneer Premium Seed Treatment choices include next-generation fungicides with multiple modes of action that provide enhanced protection against a broad spectrum of early-season diseases including Rhizoctonia, Fusarium and Pythium. Adding an insecticide to the treatment reduces insect feeding that provides an entry port for disease infection.

Soil Fertility

Phosphorus (P) / Potassium (K) - Some soybean producers depend on residual corn fertility to supply nutrients to their soybean crop. When soils are routinely maintained at high or very high levels of P and K, this may be a safe strategy, but when P and K are low, yield reductions are likely. A 60 bu/acre soybean crop removes, in the grain, about 48 lbs P_2O_5 and 84 lbs K_2O from the soil. This is 33% less P but 55% more K than a 200 bu/acre corn crop removes in the grain. Soil testing can determine if field levels are adequate to supply these or other required amounts.

Soil pH - Many chemical and biological processes in the soil are affected by pH, and maintaining pH in the proper range will maximize the efficiency of other crop inputs and decrease the risk of yield losses. Soybeans thrive in the pH range of 6.0 to 6.8 (in mineral soils). Liming acid soils or utilizing varieties with good iron deficiency chlorosis scores on high pH soils will help prevent yield reductions.

Nitrogen (N) - Soybeans are high in protein and therefore in N, removing 3.5 to 4.0 lbs from the soil for each bushel of grain produced. This compares to less than one lb of N removed per bushel of corn grain produced. However, soybeans supply most of their own N needs by N fixation, and additional N is supplied by soil mineralization.

An N "budget" developed from a summary of over 100 research studies shows that soil and fixed N are generally sufficient to supply N needs at yields up to 60 bu/acre (Salvagiotti et al., 2008). As yields increase to 80 bu/acre and higher, an N deficit may result. This deficit grows at yields of 80 to 100 bu/acre, raising the possibility of a need for N fertilizer or manure to supplement natural sources. However, research studies have not shown consistent yield increases from N applications; rather, they have more often demonstrated that N fixation may be inhibited in the presence of elevated levels of soil nitrate (NO_3). Thus, much more research is needed regarding the yield benefit and cost-effectiveness of N applications to high yielding soybeans.

Foliar Fertilizer and Banding - In studies conducted in Iowa, foliar feeding increased yields only 15 to 20% of the time; however, it may be useful when soil nutrients are inadequately supplied, such as production on sandy soils or high-yielding irrigated fields. Studies in Iowa and Minnesota with banding fertilizer close to the row have not shown benefit; rather, stands were reduced and yields were not improved.

Foliar Fungicide/Insecticide Application

Between 2007 and 2011, DuPont Pioneer researchers conducted 148 trials comparing yield of untreated soybeans to those treated with a foliar fungicide and 52 trials that included an insecticide in the treatment. Trials were located in 11 states and 2 Canadian provinces. Across these trials, the average yield response to a foliar fungicide application was 2.5 bu/acre, with a positive response in 82% of the trials (Figure 2). When an insecticide was included, the average response increased to 5.3 bu/acre, and a positive yield response was observed in 94% of the trials.

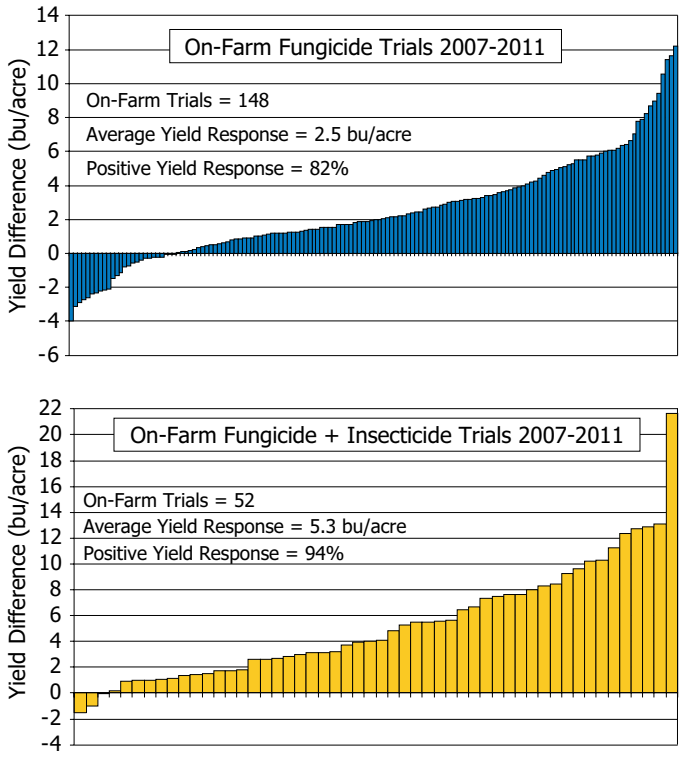


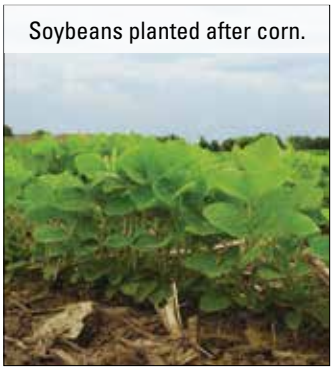
Figure 2. Average soybean yield response to foliar fungicide (top) and fungicide + insecticide (bottom) across DuPont Pioneer on-farm trials conducted from 2007 to 2011.

Fungal diseases that can be managed with foliar fungicides include anthracnose, Septoria brown spot, Cercospora leaf blight, frogeye leaf spot, pod and stem blight, and soybean rust. The most common insects with potential to lower soybean yield include soybean aphids, bean leaf beetles and a variety of stink bugs (green, brown, red-shouldered, red-banded and brown marmorated). Scout to determine if insect levels exceed economic thresholds, and use established integrated pest management (IPM) practices.

Crop Rotation

Crop rotation is important in all crops to break disease and insect cycles and increase yield. Diseases such as soybean cyst nematode, white mold, brown stem rot and sudden death syndrome survive in the soil or in crop residue and readily attack a successive soybean crop. Most soybean diseases survive more than one or two years in the soil, so rotation does not eliminate the problem. However, time away from soybeans diminishes the amount of disease inoculum available to infect the next crop, and thereby lessens its severity.

Rotation studies in MN and WI showed that soybeans in a corn/soybean rotation yielded 8% more than continuous soybeans. These studies were conducted in good growing environments where moisture was not severely limiting. Soybeans following 5 years of continuous corn yielded 15 to 17% more than continuous soybeans.


Soybeans planted after corn.

Other Practices for Increasing Soybean Yields

Tillage has long been used to bury crop residue, prepare a seedbed and control weeds. Current planting equipment and herbicides now allow growers to achieve excellent soybean stand establishment and weed control with little or no tillage. Research has shown that soybean yields are similar across conventional, minimum till and no-till. For this reason, growers can choose a tillage system that makes sense economically, environmentally and logistically, and focus on optimizing other management practices within that tillage system.

Weed Control - If weeds compete with soybeans for moisture, light and nutrients during the critical development period from the second trifoliate stage to beginning flowering, yield may be reduced even if weeds are ultimately controlled. The development of more and more weed populations resistant to glyphosate makes the use of other herbicide modes of action an important component of a weed management system. Use of a pre-emergence herbicide followed by glyphosate allows for multiple active ingredients to be applied, while also controlling weeds earlier than glyphosate-only programs.

Reference

Salvagiotti, F., K.G. Cassman, J.E. Specht, D.T. Walters, A. Weiss, and A. Doberman. 2008. Nitrogen uptake, fixation, and response to fertilizer N in soybeans: A review. Field Crops Res. 108:1-13.