Maximize Soybean Yield Potential

• Because yield potential is primarily determined by genetics in soybean, select products that perform well in yield trials over a wide geographical range and over several years.
• Fertility, weed management, and insect and disease management can improve yield potential.
• Research has shown that planting considerations including early planting, narrower row spacing, and higher plant populations lead to quicker canopy closure, which can increase yield.

Nutrient Availability

Soybean can obtain 50 to 75% of its nitrogen (N) requirements from biological nitrogen fixation (BNF), so it is important that the nitrogen fixing bacterium Bradyrhizobium japonicum is present in the soil. The remainder of the N must be supplied from soil mineralization or fertilizer. Seed inoculation with B. japonicum can increase nitrogen fixation and may improve yield potential. When the supply of N from the soil and nitrogen-fixing nodules is not adequate, benefits can be achieved from applying N fertilizer.

Soils tests are an important management tool for determining soil pH and fertility needs. Use soil tests to determine whether the pH is in the proper range for nutrient availability and to assess phosphorus and potassium needs.

Because soil tests cannot accurately predict the need for N fertilizer in soybean, growers should consider these field conditions when determining the 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 N deficiency symptoms are present.

If additional N is needed, application is recommended closer to early pod fill, the R5 to R8 growth stages, when N is in greatest demand by soybean plants.

Weed Management

The critical period of weed control (CPWC) is a period in the crop’s lifecycle when weed competition causes crop yield loss. Several studies have been conducted to determine the CPWC in soybean. Field and crop conditions including soybean seedling establishment, weed density, weed species, crop row spacing, and tillage system are some of the factors affecting weed management decisions and the CPWC. The beginning of this period, which is the critical time for weed removal, has been reported to be between the V1 and V3 soybean stage, depending on row spacing. A yield loss of 2% for each leaf stage of delay after the critical time for weed removal has been reported when weed removal has been postponed.

Residual herbicides are a key component of early weed control. Consider rate, site-of-action, tank-mixes, and timing when using residual herbicides. Early-season weed control is important for early canopy development and maximizing yield potential in soybean. Plants that develop canopies early may have increased flowering time and number of main-stem nodes.

Insect and Disease Management

Soybean yield can be negatively impacted by insect pests, fungi, bacteria, viruses, and nematodes. In general, an integrated pest management (IPM) approach is the most economically sound way to protect yield potential while limiting input costs and environmental hazards. An IPM approach utilizes host resistance with biological control, pest monitoring, chemical control when thresholds are reached, and good agronomic management practices to mitigate yield losses. Management decisions are usually made on a field by field basis and control tactics will depend on the particular pests or diseases present.

Soybean plants can withstand as much as 35% foliage loss from insect feeding, up to the blooming period (R1). During blooming and when pods begin to form and fill out, excessive foliage loss may impact yield. Soybeans can compensate for insect feeding damage by adjusting the number of pods, seeds per pod, and seed size. Foliage feeders are targeted when insect populations are at or above the number required to cause defoliation levels listed for the developmental stage of the plants. Stem feeders are usually targeted from plant emergence to 10 inches in height when plant stand is being reduced below recommended plant populations.

Some soybean pests, such as soybean cyst nematode, cannot be eradicated from a field once established. To protect yield potential, nematode population densities can be controlled through crop rotation, soybean resistance, and good agricultural practices (Figure 1).

Figure 1. Damage due to soybean cyst nematode (L) and soybean aphids (R).
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Genetics
When selecting soybean products it is important to choose those that perform well in yield trials over a wide geographical range and over several years. Besides increased yield potential, soybean products on the market can be selected for maturity groups, standability, plant height, disease and insect resistance, and nematode resistance. Soybeans engineered with herbicide tolerance traits are also available. Consider the characteristics of the field, the planting history, and the history of disease and insect problems before selecting the next season’s soybean products.

Early Planting
Researchers at the University of Wisconsin found that soybean yields decreased by 0.4 bushels per acre per day when planting was delayed past the first week of May. Planting soybeans earlier allows for earlier canopy closure which can help increase yield potential. This can maximize light interception and capitalize on a longer period for photosynthesis. It can also lead to an increase in the number of plant nodes, earlier flowering, a longer reproductive period, and an increased crop growth rate during pod set leading to a greater seed filling rate, and earlier harvest. 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 may result in compaction, poor seed placement, and reduced stand establishment. Additionally, seeds planted in cool, wet soils may sit dormant and can become more vulnerable to diseases, insects, and animal predators. Planting soybeans in wet soils will likely negate any yield advantage from planting early.

Row Configurations
Using narrow rows can improve yield potential. Research has shown that narrow rows (less than 30 inches) yield greater than wide rows (30 inches or greater). Narrow rows help promote quicker canopy closure, which, in turn, improves light interception, weed control, and soil moisture retention. In Iowa, an average 4.5 bushels per acre increase can be expected when using 15-inch row spacing, compared to 30-inch row spacing. A Monsanto demonstration trial showed that 30-inch twin rows provided a yield advantage over conventional 30-inch rows. The attraction of the twin row configuration is based on the ability to utilize the same planter for corn and soybeans, utilize the 30-inch harvest equipment in corn and possibly still see a benefit in soybeans similar to what would be expected in narrow row spacing.

Planting Population
Higher plant populations have some advantages including quicker canopy closure, greater light interception, and decreased weed competition. However, yield does not always increase as soybean plant population increases. To maximize yield potential, growers should have no less than 100,000 plants per acre in 7.5- and 15-inch rows and no less than 80,000 plants per acre in 30-inch rows.

Sources


For additional agronomic information, please contact your local seed representative. 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.