IOWA STATE UNIVERSITY

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Managing Soybean for High Yield

Key Facts

Producers continually strive for high yielding soybeans. The state-wide average yield for Iowa is now more than 50 bu./acre. The "yield plateau" reported by many producers does not exist, and is a perception largely brought on by misuse of an oversimplified management system. High yielding soybeans are achieved through improved and targeted management decisions. Improved agronomic decisions for soybeans are critical since soybean is very sensitive to stresses that influence soybean growth, development and yield.

Soybean varieties have a maximum yield potential that is genetically determined. This genetic yield potential is obtained only when environmental conditions are perfect, however such conditions rarely exist. The actual yield potential for soybean varies considerably according to environment and management decisions. The highest recorded soybean yield is 155 bu./acre.

After genetic yield potential, environmental conditions and agronomic decisions have the most influence on soybean growth, development and yield. The goal of every management decision should be to increase yield by providing optimum conditions during specific growth periods that impact yield.

Checkoff-funded research was conducted from 2004 through 2006 to determine the maximum yield potential of soybeans grown in Iowa. The research was designed to challenge our current recommendations on growing soybeans. The research was executed at three locations representing diverse environmental conditions and soil types.

The highest soybean yield was obtained in western Iowa near Whiting, where yields near 100 bu./acre were achieved every year. In eastern Iowa, 80 bu./acre was consistently achieved. However, in central Iowa, in the Des Moines Lobe soil region, 65 to 70 bu./acre seems to be the maximum yield potential with our current commercial varieties and agronomic practices. This research clearly showed that obtaining high yield is possible in Iowa but it is greatly dependent on environment, soil type, variety selection and agronomic decisions.

Soybean yield is determined much earlier than most people think; a good August rain is not enough to achieve high yields. To achieve maximum yield, row closure must be achieved by beginning pod set (R3) to maximize light interception during the critical pod and seed filling period. This is achieved by reducing stress from weeds, insects and pathogens and then planting early and in narrow rows. Early row closure is also critical to achieving higher yield because it reduces soil moisture loss. Understanding how a soybean plant develops throughout the growing season will provide insight into the selection of best management practices that lead to maximum yield. Simply putting more inputs into an inferior management system will not improve yield.

Achieving high soybean yield

There are no magic bullets, or "quick fixes" that can be applied to increase soybean yield. Producing high yielding soybeans is achieved through a combination of optimizing all manageable variables and making the right agronomic decisions to reduce stress.

Seven steps are needed to maximize your yield in Iowa no matter where your farm is located:

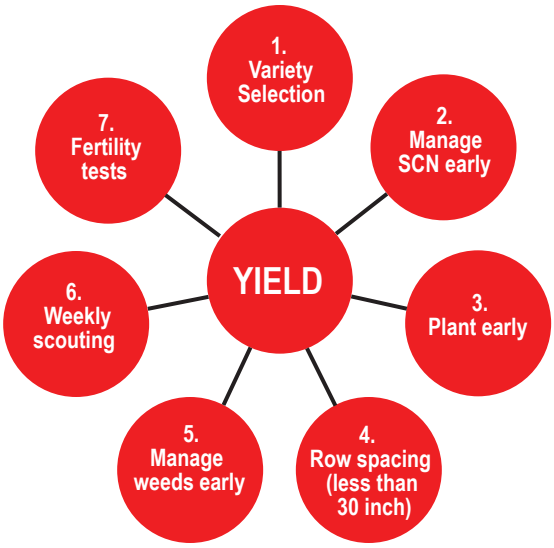

Figure 1. *High yielding soybeans has nothing to do with a "silver bullet." It is a combination of many agronomic and cultural variables that are manageable).*

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1. Variety selection is the most important decision a producer makes to achieve high soybean yield. Producers must select high-yielding varieties with agronomic traits that match the ever-changing stresses in each field. Today's monoculture production system of soybean/corn rotation has resulted in additional stress from diseases.

Use replicated data from multiple locations when selecting varieties. If planting a new variety without yield data, take a cautious approach and only plant a small amount to determine performance.

2. Soil test and manage soybean cyst nematodes (SCN). SCN appeared to be the greatest limiting factor of soybean yield in our research. The best management practice for fields with SCN is to rotate high-yielding SCN resistant varieties with a non-host crop such as corn. Today's SCN varieties are yield competitive. Soybean cyst nematode resistant varieties can also help minimize the impact of many pathogens such as sudden death syndrome, brown stem rot, iron deficiency chlorosis and *Pythium*.

3. Plant early. The optimum time to plant soybeans in Iowa is April 25 for the southern two thirds of the state and May 1 for the northern one third if the seedbed is satisfactory.

4. Plant soybeans in rows less than 30-inch rows. Soybean rows need to close quickly to improve light interception. Increased light interception is essential to promote rapid growth beginning at flowering.

5. Manage weeds early to promote early canopy development. Soybeans are sensitive to early-season competition from weeds, which reduce canopy development. Use of a pre-emergence herbicide can minimize the risk of early-season weed competition.

6. Remove plant stresses from yield robbing insects. Weekly scouting is a must to help minimize the impact of any in-season stresses that can rob "easy bushels." By scouting weekly, population densities of particular insects can be monitored carefully so they can be managed at economic thresholds using integrated pest management strategies. Bean leaf beetles and soybean aphids are insects that should be monitored frequently. Scouting can also be used to plan for next year's crop since it is often much easier to see what the yield limiting factors are in the field during the growing season than just looking at the yield monitor.

Figure 2. *Checkoff funded research near Nevada, Iowa. Investigating agronomic practices using new technologies.*

7. Soil fertility tests should be conducted at least every other year to verify that appropriate fertility levels are maintained. The best time to sample soil is in the fall. Consider taking soil samples to assess SCN population densities at the same time.

Conclusions

Matching soybean varieties to a specific field is the foundation of maximizing soybean yields. Unfortunately, a soybean variety's genetic yield potential is only achieved when environmental conditions are perfect and such conditions rarely exist. Agronomic decisions, however, have much greater impact on yield than most people think. The soybean crop has to be raised as a "biomass" generator without any stress and optimum light interception early in the growing season since lack of biomass and vegetative nodes prior to flowering hold down the yield potential. Understanding how a soybean plant develops through the season will provide insight into selection of management practices that should lead to maintaining the yield potential. Simply putting more inputs into a management system will not improve yield if the crop does not get the right start.

Figure 3. *Quick canopy closure and rapid crop growth rate starting at flowering is important to keep photosynthesis going at a high rate to maximize pod and seed set.*

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