



BEST MANAGEMENT PRACTICES

Chapter 6:
Selecting Soybean Varieties



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Many agronomists believe that variety selection influences profitability more than any other routine management decision. Therefore, take some time in making your decision. When selecting your next year's varieties, it is important to consider the factors listed in Table 6.1. Discussion of these factors is provided in this chapter.

Table 6.1. Factors to consider when selecting a variety.

- Availability and seed cost.
- Yield potential and maturity groups.
- Traits and management practices to address common pests and soil conditions.
- Third-party (university) variety performance trial results.

Availability and seed cost

The first step, though simple, is to ask seed companies for price sheets or quotes of available soybean varieties in your region. The additional seed cost of one variety over another can be covered by a relatively small increase in yield, assuming a real yield benefit exists. For example, the difference in the price per bag may only be \$9.00 from the cheapest to the most expensive variety within a company. Results from the South Dakota State University soybean variety performance trials (available at extension.sdstate.edu) demonstrates a significant yield difference exists between soybean varieties within and between companies that could easily cover the added cost of some varieties over another.

Early pay discounts provided by companies often allow for some flexibility where bags or units can be paid for without specifying the variety until later. Please check with your seed company on this policy. The advantage of this option is that it allows for results from variety performance trials to be made available, which is important information in the variety selection process. However, if certain varieties have a relatively tight seed supply, a first-come-first-serve rule usually applies. Please discuss availability of particular varieties with your seed company representative.

Increasingly, soybeans are being sold based on seed count (140,000 seeds per bag), not weight, therefore selection for seed size is less of a cost consideration than it once was. Under most conditions, seed size does not affect germination and emergence. However, planting equipment should be adjusted to account for the seed size being used to ensure that the desired seeding rate and uniformity of spacing is obtained.

Planting more than one or two soybean varieties with diverse genetic backgrounds on your farm will help increase the genetic pool and minimize your risk for a particular environmental condition or pest to preferentially impact a particular variety. It is important and helpful to document where varieties are planted on the farm and within particular fields. It is generally recommended not to mix varieties with different herbicide-resistance traits or vastly different maturity groups within the same field to avoid potential management complications.

Yield potential and maturity groups

The yield potential for a soybean plant is genetically determined and is only achieved when environmental conditions are optimized. The yield potential of soybeans has been estimated to be about 250 to 300 bu/acre, with the highest realized field-level yield of 160.6 bushels per acre by Mr. Kip Cullers of Stark City, MO. However, numerous yield-limiting factors exist that cannot be controlled by even the most savvy soybean producer. Climate and soil factors are largely uncontrollable, whereas variety selection and other management factors that minimize yield loss from the potential are under producer control.

Producers across South Dakota and other states are attempting to minimize yield-limiting factors in high yield trials (Chapter 1). Winners of the South Dakota soybean contest are optimizing yield and learning how to minimize yield loss. More information about the South Dakota contest is available at <http://www.sdsoybean.org/>. Production records from these trials are being compiled and shared with producers attending winter meetings in an effort to inform others how yield was optimized.

The maturity rating (or group) of a variety is a general indication of when that soybean cultivar is able to start flowering based on the night length, since soybeans are photoperiod sensitive. However, some other factors such as high temperatures can affect flowering date. For example, moving a Group II soybean too far north (where nights are shorter in midsummer) causes delayed flowering and an increased risk of frost damage during seed fill. Likewise, moving a Group 0 too far south (where nights are longer in the midsummer) will lead to earlier flowering and limit yield potential. Selecting an appropriate maturity that utilizes the full growing season provides the best chance to achieve the highest yield. Yield data from variety performance trials and from your own experience often provide a good approach to determine the most appropriate range of maturity groups to plant in your region. The maturity group zones common to eastern South Dakota are shown in Figure 6.1.

It is recommended to reduce the maturity rating, from what is normally planted as a full-season soybean in your area, when planting is delayed past mid-June. The final planting date for full insurance coverage is June 10 in South Dakota with delayed planting coverage until July 5 (Chapter 46). Consider reducing the maturity rating by 0.5 from normal if planting is delayed into mid-June and by 1.0 if planting into early July to minimize the risk of frost damage during seed fill (Chapter 51). Increasing the seeding rate with late-planted soybeans can help improve yield in some years.

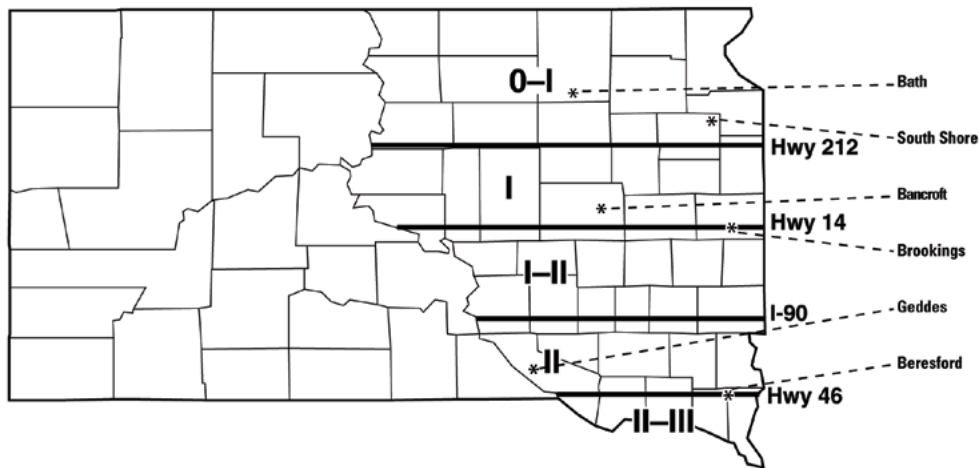


Figure 6.1. Map of soybean maturity zones for South Dakota and sample trial location sites.
(Source: Hall et al., 2012)

Traits and management practices

Pinpointing yield-limiting factors, identified in your scouting records (Chapter 2), is critical for matching those problems with management and genetic solutions. This step is based on the availability of “good” field records (Chapter 2). Scouting your fields or hiring someone to scout on a regular basis provides data needed for problem solving. Your first time out in the field after planting should not be with the combine. Different fields and locations within a field are likely to have different yield-limiting factors and that these deficiencies can be reduced by matching the varietal traits to specific problems.

Most seed companies provide ratings for several common yield-limiting factors since resistance or tolerance differences exist between varieties. Variety ratings on phytophthora root rot (PRR), brown stem rot (BSR), white mold, soybean cyst nematodes (SCN), iron deficiency chlorosis (IDC), and sudden death syndrome (SDS) are important to consider along with other traits like herbicide-resistant technology. Use this information and work with your seed company representative or agronomist to utilize variety selection to minimize these yield-limiting factors.

Links for variety disease ratings

Monsanto: Channel Bio

http://www.channel.com/Products/Pages/seed_finder.aspx

Dow: Prairie Brand

<http://prairiebrand.com/soybeans/product-finder/>

Dupont: Pioneer

<https://www.pioneer.com/home/site/us/products/soybean/>

Syngenta: NK

<http://www.syngenta.com/country/us/en/agriculture/seeds/soybean/Pages/seed-finder.aspx>

AgReliant: Wensman

<http://www.wensmanseed.com/soybeans.html>

Note: These lists are provided for the convenience of the reader and do not imply endorsement.

For example, SCN-resistant soybean varieties can yield 23-63% more than susceptible varieties when SCN pressure is high (Smolik and Draper, 2007). Management practices to minimize yield loss from SDS include delaying planting, improving drainage, reducing compaction, and variety selection (Chapters 27 and 59). In fields with a history of SDS, later planting and selection of varieties with higher tolerance to SDS highlights how management practices are combined with variety selection to minimize yield loss. More information on diseases is available in Chapters 57 through 60.

In the near future, one of the best approaches is to match varieties with problems (SCN, IDC, etc.) that have high spatial variability is to adopt a site-specific management program. In site-specific variety management, different varieties can be seeded in different management zones. Today many growers have the capacity to: 1) track their field locations using onboard GPS technology; 2) use air seeders (planters in the near future) to plant seed from two or more hoppers; and 3) vary the population level. These innovations are moving agronomic management into a new era where varieties will be selected to maximize yield based upon site-specific soil physical, chemical, and other conditions (Chapter 20). To prepare for site-specific variety management, consider collecting:

- Precision scouting reports.
- Field monitor data.
- Site-specific soil samples and soil survey maps.

Over the past several years, management trends suggest that site-specific management is becoming conventional management. This change is attributed to high crop values, high input costs, and precision management practices that are becoming easier to seamlessly implement. Research documenting the economic benefits from adopting site-specific variety management is needed.

Third-party (university) variety performance trial results

A producer is influenced by marketing campaigns, farm partners, neighbors, seed dealers, university and independent variety performance trials, and more when selecting varieties each year. The high turnover rate of recently released varieties and the phase out of older varieties compound the difficulty in making a sound decision. South Dakota State University and other universities in the north central region of the U.S. are part of the University Crop Testing Alliance (<http://www.ucta.org/>) that conducts annual variety performance trials (Fig. 6.2).

The South Dakota State University Crop Performance Testing uses replicated and statistically sound analyses to present the data on days-to-maturity, yield, and lodging between submissions from soybean seed companies. Six locations each year are spread out across South Dakota's dominant soybean production regions (example shown in Figure 6.1). Information on weather, site conditions, and management are collected. The top performance group of varieties for the current crop year and a two-year average, if available, are clearly identified in the reports at extension.sdstate.edu. A least significant difference ($LSD_{0.05}$) value is reported for each site by maturity group. Those LSD values are used to determine if two varieties are significantly different. For example, if the LSD value is 5 bu/acre and Variety A has a yield of 50 bu/acre and Variety B has a yield of 40 bu/acre, then the difference between the two varieties is 10 bu/acre. Because the difference, 10 bu/acre, is greater than the $LSD_{0.05}$ (5 bu/acre), they are significantly different.

Assessing variety performance under different environmental conditions is possible by looking at the supplemental data provided for a given site and year. If a variety is frequently in the top performance group across sites and years, it has good yield stability. Selecting a variety with a stable yield potential is a good approach for reducing risk.



Figure 6.2. Harvest of a South Dakota soybean variety performance trial.
(Photo courtesy of K. Kirby, SDSU)

Summary

Variety selection is a very important step towards increasing profitability. Due to the importance of this decision, an appropriate amount of time should be allocated for variety selection. When making this decision, consider seed availability and cost, yield potential, yield stability, maturity groups, available traits, and management practices to address common pests and soil conditions, and third-party variety performance trial results.

South Dakota's variety testing information is posted as quickly as possible (extension.sdstate.edu). However, the earliest pay discounts that seed companies offer often expire prior to completion of harvest, thus before results from variety trials are available. As stated before, please check with your seed representative as you may be able to pay for a particular number of bags or units and select the variety later. This will hopefully allow you to utilize variety performance trial results during your variety selection.

References and additional information

Hall, R.G., K.K. Kirby, and S. Hawks. 2012. 2012 annual report: soybean variety performance trials results. SDSU Extension.

Smolik, J.D., and M.A. Draper. 2007. Soybean cyst nematode. South Dakota Extension Fact Sheet 902-A.

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(3) email: program.intake@usda.gov.

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