Illinois Soybean Management 2025

Illinois is one of the largest soybean producers in the United States. In 2024, Illinois produced approximately 688 million bushels of soybean across 10.75 million acres. This publication is a quick reference for information on soybean management in Illinois, including variety selection, planting practices, and fertilizer and pest management. This guide offers advice to assist soybean producers and crop consultants and should be adapted to suit specific conditions in their cropping system.

Variety Selection

Maturity, herbicide and disease resistance, and yield potential are key plant traits when choosing a variety. Most soybean acres in Illinois are planted with maturity groups II, III, and IV, from north to south. Early II varieties are typically grown in northernmost Illinois, while early to mid IV varieties are best adapted in the southernmost region of the state. Growing soybeans that fully utilize the growing season and produce sufficient leaf area can improve yield, provided that growing conditions remain favorable. However, very late-maturing varieties may not always produce higher yields than those maturing slightly earlier, even if they complete seed filling before frost.

Figure 1 displays the yield response to maturity groups from the University of Illinois Variety Testing trials conducted over the past 15 years from 2009 to 2023. In these trials, planting dates ranged from May 5 to May 15. Across all regions, mid-maturity varieties consistently outperformed both early and late varieties. On average, though, varieties within one bushel of the highest yield spanned about 0.5 maturity units on either side of the maximum yield.

Herbicide tolerance traits are also important when selecting a soybean variety, especially in areas where herbicide-resistant weeds have hindered production. There are many trait packages on the market for herbicide tolerance that can be used alone or in combination for better weed control. Further, refine the selection by considering the variety's genetic resistance to prevalent pest problems on the farm. Most seed companies provide information on how their varieties respond to critical pests.

Yield and yield stability are also key factors to prioritize when choosing soybean varieties. Since the environmental conditions vary from year to year, it is essential to look for varieties that consistently perform well across multiple locations and years in the area. Selecting varieties within 0.5 units of the maturity group with the highest yield allows crops to mature over a week or two, which helps stagger the harvest without significantly affecting grain yield.

The University of Illinois Variety Testing program conducts annual soybean performance tests on public and private varieties, including data on yields, average yields from the past two to three years, and protein and oil concentration. Test data are available at vt.cropsci.illinois.edu/soybean/. It's also important to consult knowledgeable seed company representatives, as they offer the most accurate and up-to-date information on variety performance.

Planting Practices

Seed Treatment

Most seed companies offer fungicide and insecticide seed treatment packages to protect emerging seedlings. Consider a fungicide treatment for early-planted situations or no-till soils, including cold and wet soils, damp seedbeds, and when planting into a field with a history of problems with stand establishments.

Inoculation

Soybean inoculation with nitrogen-fixing bacteria is recommended for new soybean fields, fields out of soybean production for five years or more, or fields with a history of poor nodulation. *Bradyrhizobium japonicum* is one of the most commonly used species. Soybeans take up ~5 lbs. of N per bushel, so 70-bushel soybean would need ~350 lb. N per acre. About 50 to 60% of the total nitrogen required by the crop is supplied by the biological nitrogen fixation process, whereas the remaining comes from the soil.

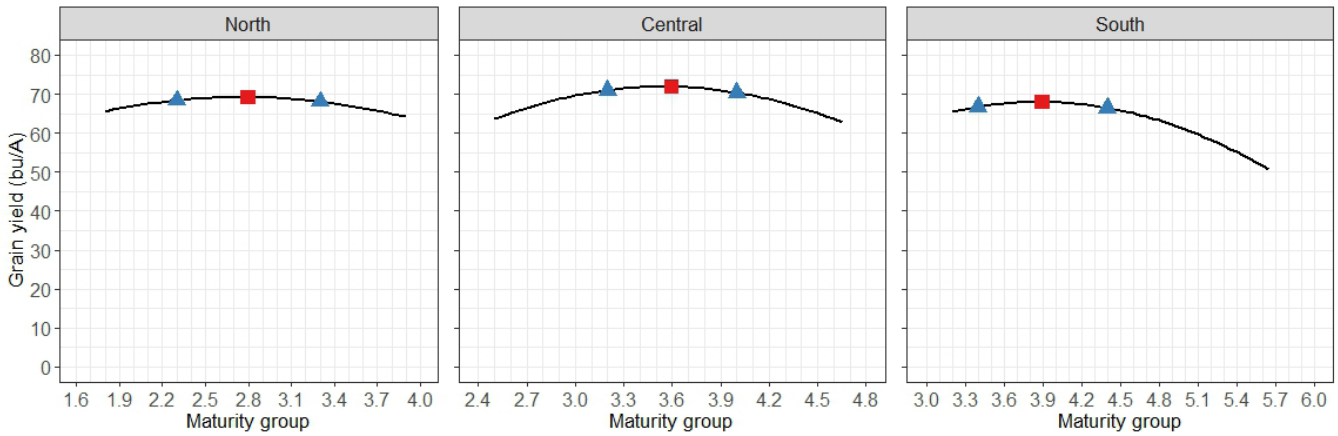

Fig 1. Soybean yield response to maturity group (MG) in the University of Illinois Variety Testing trials in northern, central, and southern Illinois over 15 years (2009-2023). The red square in each line indicates the maximum yield for each region (MG 2.8 for northern, MG 3.6 for central, and MG 3.9 for southern Illinois). Blue triangles indicate the ends of the range over which yields are within 1 bushel per acre of the maximum.

Planting Date

University of Illinois studies show that the optimum planting date for soybeans is between mid-to-late April and within 2% of maximum yield, as shown in Figure 2. Yields declined gradually with planting in early May, reaching 94% of the maximum by May 15. However, yield losses became more rapid after that, dropping to 88% by May 31, 80% by June 15, and 77% by June 20. Such late planting tends to result in a shorter soybean plant with considerably fewer leaves, reducing the yield potential per plant.

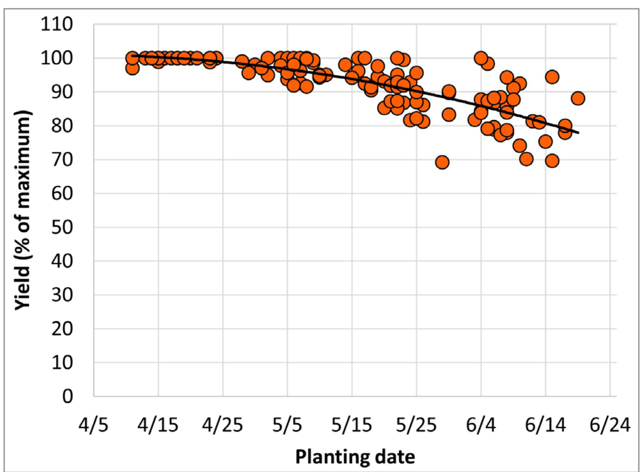

Fig. 2. Response of soybean yield to planting date across 32 Illinois trials. Yields are percent of the maximum yield at each site. The average maximum yield was 73.1 bushels per acre, so each percent change in yield is 0.73 bushels per acre.

Another important consideration when deciding when to start planting is the soil condition and forecasted weather for the next 7 to 10 days. Planting into wet soils or mudding in can increase the risk of sidewall compaction and poor root development, especially if the weather turns hot and dry after planting. Reduced plant stand, delayed emergence, and restricted root growth will negatively impact yield.

Row Spacing

Studies have shown yield benefits when using narrow rows compared to 30-inch rows. Key benefits of narrow rows include early canopy closure, which enables more light interception to drive photosynthesis and weed control. Yield benefits for narrow rows are typically more pronounced with later planting dates and earlier maturity groups. In one set of trials across 40 Illinois sites from 2010 to 2018, 15-inch rows outyielded 30-inch rows at about half the sites. The average difference for the 40 sites overall was just over two bushels per acre in favor of 15-inch rows.

Seeding Rate

Research in Illinois and the Midwest has shown that soybean farmers can achieve maximum yields with harvested stands of 100,000 to 125,000 plants per acre. Recommended seeding rates at seeds per acre are often 20 to 25% higher than the target final stand to account for seed germination rate and potential establishment challenges. Double-crop soybeans, planted after winter wheat harvest and therefore always planted late, often benefit from narrow rows and high seeding rates.

Planting Depth

Studies on soybean planting depth typically show that the depth that produces the best stand and yield varies a great deal between seasons and soils. In general, emergence will be more rapid and stand more uniform if soybeans are planted at consistent depths of 1.25 to 1.75 inches. When planting in warm and dry conditions, there might be an advantage to planting deeper than normal to reach soil with enough moisture to get seeds to germinate. This should probably be no deeper than 2.5 to 3 inches and maybe a little shallower in heavier-textured soils.

Fertilizer Requirements

Fertilizer application before soybean crops is not a common practice in Illinois. Although most soybeans grown on productive soils in Illinois do not often show symptoms of nutrient deficiencies, soybean yields will decrease when they lack essential nutrients. Soybeans need an adequate supply of nutrients throughout the growing season for optimum growth.

Soybeans remove considerably higher amounts of nutrients per bushel compared to other crops, such as corn and wheat. Recent Illinois studies showed that 60-bushel soybeans remove approximately 180 lbs. of N, 45 lbs. of P2O5, 70 lbs. of K2O, and 10 lbs. of S per acre with harvested grains.

Soil Tests

Testing soil is the first step of a good nutrient management program since it provides information to guide accurate fertilizer decisions. Sampling is recommended every two to four years to monitor soil testing levels in your field, especially in high-yielding environments with large nutrient removal. When fertilizer prices are high, such information can help guide decisions on lime, phosphorus, and potassium applications, resulting in fertilizer savings and increased profitability. The Illinois Agronomy Handbook soil-test interpretations are based on a 7-inch sample depth and provide guidance for soil sampling density.

Fertilization programs that are based on soil samples collected during the fall season prior to the previous corn crop and applied as either annual or biennial applications should consider crop removal of the previous crop.

Phosphorus and Potassium

The Illinois Agronomy Handbook recommends maintaining Bray P1 soil test levels at 40 to 50 pounds per acre to ensure that soil P availability will not restrict crop yield. There is research-based evidence in the upper Midwest that the probability that P fertilizer is needed for high P testing soils is extremely low and unlikely to cover the cost of the application. For instance, soil testing >70 pounds of Bray P1 per acre is considered in the Very High category in Iowa. In Illinois, there is little to no agronomic advantage in applying P for soybeans when Bray P1 values are higher than 60 to 70 pounds per acre.

Potassium fertilizer can be advantageous in soil testing very low or low in soil potassium. In these situations, either broadcast and incorporate or band as a starter fertilizer. Potassium should not be placed in direct seed contact because of possible salt injury. Soil ammonium acetate or Mehlich-3 test K levels should be slightly higher than the critical level of 260 pounds of K per acre for low CEC soils (<12 meq/100 grams) and 300 pounds of K per acre for high CEC soils (>12 meq/100 grams).

Application of P and K prior to the corn year of a corn-soybean rotation has been shown to be equally effective as annual applications to each crop. An eight-year (2017-2024) study at the Northwestern Illinois Agricultural R&D Center near Monmouth showed that no preference of soybean to what year in the rotation P and K were applied.

Fig 3. Typical foliar symptoms of potassium deficiency in soybeans are yellowing of leaf margins that begin at the leaf tip and extend down the margin towards the leaf base. Photo by: Giovani Preza Fontes, University of Illinois Urbana-Champaign

Fig 4. Foliar symptoms of Manganese (Mn) deficiency in soybeans — interveinal chlorosis. Yellowing of the tissue between the veins of the leaves while the veins remain green. Photo by: Giovani Preza Fontes, University of Illinois Urbana-Champaign

Crop Removal Rates

Removal rates are best done when soil test P and K levels are within the desired range for optimum yield. Applying amounts removed by recent crops is designed to keep soil test levels within the optimal range. Crop removal rates for Illinois were updated a few years ago based on several thousand corn and soybean samples collected over three years from 2014 to 2016. The removal number for soybeans is 0.75 lb. P2O5 and 1.17 lb. K2O per bushel. When applying P and K to supply enough nutrients for a complete rotation, consider all crops and use prevailing yields.

Nitrogen

About half of the total nitrogen needed by soybean crops is taken up from the soil solution, while the other half is supplied by biological nitrogen fixation. Soil nitrogen is the first choice because this process requires less energy than the nitrogen fixation process. Research in Illinois and other states shows that nitrogen fertilizer application to soybeans in productive soils seldom results in yield benefits and is unlikely to cover the cost of the application.

Sulfur

Most of the sulfur in soil is found in organic matter, and as it mineralizes, it releases plant-available sulfur to crops. Sulfur is also very mobile in the soil, and leaching is common. Therefore, sulfur deficiency is more likely to appear in sandy or coarse-texture soils with low organic matter.

Heavier soils with high organic matter tend to be cooler and wetter in April around conditions that affect mineralization. Early-season S symptoms may disappear as S availability increases during the summer, and root systems develop to exploit greater soil volume.

Sulfur deficiency in soybeans appears as a pale green to yellow leaf color without prominent veins or necrosis in the youngest trifoliate leaves. Studies in Iowa and Indiana have shown yield increases from adding 10 to 15 lbs. S per acre in lighter-texture soils with low organic matter.

Micronutrients

Iron, manganese, boron, and zinc are other nutrients that can be limiting in soybeans. Deficiencies of these nutrients are not common, making it challenging to study, and to correlate and calibrate soil tests. Previous studies have shown that yield increase from fertilization when soil or foliar is applied is unlikely except for areas with specific soil and environmental conditions that favor deficiency of a particular micronutrient.

Soil pH and Liming

Soil pH tests measure soil acidity or alkalinity and should be used to determine if lime should be applied. The Illinois Agronomy Handbook provides liming recommendations for soils with pH 6.0 or less for soybean systems. When determining application rates, consider lime chemical and physical quality. The effective neutralizing value (ENV) of liming material increases with higher calcium carbonate equivalence or chemical quality and smaller particle sizes or physical quality.

Weed Management

Eliminating or reducing the deleterious effects of weeds on agronomic crops is the ultimate goal of weed management. Integrated weed management includes all practices that enhance a crop's competitive ability and decrease weeds' ability to reduce yield. Successful weed management requires identifying relevant species and understanding their biological characteristics to tailor management to the weeds in individual fields.

Accurate identification is critical. Identifying seedling weeds is necessary for selecting an

Fig. 5. Morning glory seedlings among vegetative soybean plants.

appropriate postemergence herbicide, while identifying mature weeds often indicates which species will populate a particular field the following season. Most weed species in Illinois agronomic cropping systems are either broadleaves or grasses. Broadleaf species are generally easier to differentiate than grasses, especially at early growth stages, as seen in Figure 5.

Most weeds of agronomic cropping systems are herbaceous, but a few species that can become established in reduced-tillage fields are woody, such as maple trees. Weeds can be categorized according to their life cycle or how long they live: annual, biennial, and perennial. Knowledge of life cycles is essential to reducing the potential for weeds to produce viable seed or vegetative structures that aid in weed dispersal.

Currently, the most common method of managing weeds is herbicides. Many options are available, each with distinct advantages and disadvantages. There are also several methods by which herbicides can be applied. Whatever the herbicide or method of application, the goal is to prevent weeds from contributing to crop yield loss by reducing the amount of competition exerted by the weeds. Other weed management practices in Illinois agronomic crops include cultural and mechanical approaches.

See [Weed Management](#) in the Illinois Agronomy Handbook for more detailed information on chemical weed management.

Insect Management

Seedling Pests

Soybean stands can be reduced prior to and just after emergence by several insect pests. Grape colaspis, seedcorn maggot, white grubs, and wireworms feed below ground on the developing seed and roots of soybean seedlings. Black cutworms and variegated cutworms feed on emerged seedlings, cutting plants off just above the soil line.

Cutworms are most common when broadleaf winter annual weeds are burned down with a herbicide application shortly before planting. Slugs, though not insects, can be a severe stand-reducing pest, particularly in fields with high levels of organic residue, such as no or reduced tillage or a cover crop in wet conditions.

Injury from seedling pests is exacerbated when cool temperatures occur after planting. The resulting delayed emergence and slow growth places plants in a vulnerable stage for a longer period.

Insect Defoliators

Several insect pests feed on soybean foliage in Illinois, including green cloverworm, bean leaf beetle, Japanese beetle, grasshoppers, and many sporadic or minor pests, as seen in Fig. 6). The injury from these different species has a similar impact on yield, and economic thresholds are based on the level of defoliation. Consider a control action if the percent defoliation of the soybean canopy reaches 30% from V1-R2, 10% from R3-R5, or 15% at R6. If a threshold is reached, determine the insect species responsible and verify its continued presence in the field before choosing a control tactic.

Fig. 6. Defoliation injury to vegetative soybeans caused by insect feeding.

Stem Pests

Dectes stem borer has become a relatively common pest in the southern third of Illinois over the last several years. The dectes stem borer larva tunnels within the pith of the soybean stem. When the plant matures, the larva girdles the stem to create an overwintering chamber at the base of the stem, which can result in stem breakage and lodging if harvest is delayed. The impact of this stem girdling is a larger concern than the tunneling itself, which typically results in little to no reduction in yield.

Signs of dectes stem borer infestation include dead and dying petioles, followed by piles of sawdust near the base of stems that have reached maturity. Control of adults with an insecticide is possible, but timing is critical, and economic reductions in stem tunneling lodging have not been observed consistently. Management should focus on the timely harvest of infested fields.

Fluid Feeders

Colleagues in Minnesota and Iowa have observed populations of soybean aphids that are resistant to pyrethroid insecticides. However, soybean aphids have become an infrequent pest in Illinois over the last 10 to 15 years, and insecticide control is rarely necessary. Several natural enemies help to suppress aphid populations. Consider an insecticide application for soybean aphids if the density exceeds 250 aphids per plant.

Spider mites can result in tremendous injury during periods of drought conditions. While widespread spider mite problems have not occurred in Illinois in recent years, localized infestations occur relatively frequently in hot and dry conditions and can affect soybeans at any growth stage. The recent loss of chlorpyrifos from the agricultural marketplace has limited the availability of chemical control options. Miticide products labeled for use in soybeans include active ingredients such as abamectin, bifenthrin, dimethoate, and etoxazole. When making a treatment decision for spider mites, consider the area of the field affected and the likelihood of continued drought conditions.

Pod and Seed Feeders

Stink bugs injure soybean seeds directly with their piercing-sucking mouthparts. Stink bug injury has become more widespread in Illinois in recent years compared with historical trends. The increase is likely due to a combination of warm winters and the expansion of the invasive brown marmorated stink bug seen in Fig. 7 in Illinois and surrounding states.

Begin scouting for stink bugs at R5 and consider an insecticide application for encounters of nine stink bugs as adults or nymphs of any species per 25 sweeps using a sweep net or one per row foot using a drop cloth or visual observation.

Bean leaf beetles feeding on pods result in scarring, which becomes an entry point for moisture and pathogens as the pod matures. Scarring can result in a loss of yield or quality through discounting when the crop is sold, even though not all scarred pods result in seed injury. Consider an insecticide application for bean leaf beetle control if pod scarring is approaching 10% of pods, bean leaf beetles are still present, and pods are still green.

Fig. 7. Immature brown marmorated stink bugs.

Note: Pre-harvest intervals for insecticides often used for bean leaf beetle control typically prohibit an application within 18 to 30 days of harvest. Follow all label instructions when using any pesticide.

See Managing Insect Pests in the Illinois Agronomy Handbook for more detailed information on identification, biology, and risk factors for these and other insect pests.

Disease Management

Multiple soybean diseases have the potential to reduce yields in Illinois. The soybean cyst nematode, or SCN, and seedling blight are chiefs among the yield-reducing threats. In addition, several fungal infections of the stem (e.g., white mold) or the foliage (e.g., frogeye leaf spot) vary on yield impact depending on environmental conditions each year.

Resistant varieties are the most effective management for SCN. The source of the resistance should be rotated each year to avoid selecting nematode populations that can overcome the resistance. Nematicides also offer some control of SCN. A complex of multiple species of Pythium, Fusarium, and Rhizoctonia causes seedling blight. The best weapons we have against this disease are seed treatments that include mixtures of fungicides, where one has FRAC code 4 and another fungicide from a different code. The idea is to protect the seedling from all the pathogen species and avoid selecting pathogen populations that are insensitive to our active ingredients. Seed treatments are critical if planting in cold soils at <55 F.

Red crown rot is continuing to spread throughout the state, with new counties confirming its presence. In severely affected fields, yield losses can reach up to 50 percent. Rotating to non-host crops for two or more years may help reduce soil inoculum levels. Treating soybean seeds with a fungicide labeled for red crown rot can provide protection against early infections by the pathogen. As a relatively new disease, additional management strategies are actively being explored.

Other soybean diseases have had a varied impact in the last few years. The principles of plant disease management indicate that the first step is correctly identifying the disease. For instance, red crown rot is often mistaken for sudden death syndrome. The University of Illinois Plant Disease Clinic can help with the proper identification.

After receiving an accurate diagnosis, review the revised Managing Diseases section of the Illinois Agronomy Handbook for comprehensive and up-to-date integrated plant disease management information for all soybean diseases in Illinois.

Plant disease management is an integrated part of overall crop management. For example, if continuous soybeans after soybeans are planted, it is more likely that diseases of minor importance develop into severe epidemics that affect yields.

Continue using the proper cultural practices for disease management, such as ensuring good seedbed preparation and drainage. On the other side, avoid the indiscriminate use of foliar fungicides. Foliar fungicides are not recommended unless there is an early arrival of a pathogen capable of producing a severe epidemic, such as soybean rust.

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