

Soybeans

General Information

Soybeans (*Glycine max*) are an ancient crop from the Orient. The first written record of their cultivation was in 2838 BC in China. The plant made it to Europe in 1712, and then came to the USA via clipper ship in 1804. Most of the early uses of the plant were to make legume hay or plowed under as a green manure crop.



Now, soybeans are grown for oil (which comprises about 20% of their weight), animal feed, or as whole or processed beans for human consumption. Soybean varieties that have a dark hilum (the scar that marks where the bean attaches to the pod) are used for feed and have about 35% protein. Clear or yellow hilum soybeans, which contain about 40% protein, are generally processed into tofu or soymilk. Soybeans can be grown much like other dry beans, but require warm weather and, because they are sensitive to daylight, different varieties require growing seasons of varying lengths.

Preparation & Planting

Several different cropping systems are used in the northeast to bring soybeans to the bin. Soybeans need a good, level seedbed (many growers use a culti-packer in the spring, just before planting), and a pH level of 6.0-7.5. Ideal soils are medium-textured loam with high levels of P and K, but low to medium levels of nitrogen. If nitrogen levels are high in soybean fields, nitrogen fixation will be diminished and weed pressure will increase. Moisture must be available in the upper layers of the seedbed, especially during germination, flowering, and pod-filling. When choosing soybean varieties, take note of the yield, number of days to maturity, lodging, and disease resistance. Soybeans are divided into varying maturity groups depending on latitude, so that the lowest group is well-suited for areas in Canada and groups 9-10 do well in the tropics. Soybeans in the 0-1 maturity group are suitable for northeast climates. Seed distributors should have information (including hilum coloration and maturity group) available for different soybean varieties.



Growers recommend cultivating the seedbed immediately before planting to eliminate any early weeds. Soybeans can be planted in 30-inch rows with a corn planter; high populations (160,000 to 200,000 plants per acre) are necessary, so special soybean seed cups or drums may be needed. Soybeans can also be planted with a grain drill on 7 to 10 inch rows, in which case the population should be even higher (270,000 to 280,000 plants per acre). The best drills for this purpose have double disc openers and packing wheels over the row. Since soybeans range from 1800 to 2700 seeds per pound, adjustments must be made to the pounds per acre to get the desired population of plants. This means growers should carefully consider both the size and weight of their seed when determining a seeding rate.

Soybean seeds are planted 1 to 1½ inches deep in June, or when soil temperatures have reached 55-60°F (organic/untreated soybeans should not be planted in soils colder than 60°F, to ensure proper germination). In order to germinate, soybean seed needs to absorb 50% of its weight in water, so good seed-to-soil contact is essential. (By comparison, corn needs 30% of its weight in water to germinate, while small grains need only 10% of their weight in water.) All seed should be inoculated with nitrogen-fixing bacteria (peat- or clay-based, granular, or liquid inoculations are available) for better yields and nitrogen fixation. If no soybeans have previously been grown on the field before (which is typical in New England), double the rate of nitrogen-fixing bacteria.

Cultural Practices

In general, two planting options exist for soybean growers to control weeds: soybeans grown in 30-inch rows will require mechanical cultivation, while 7-inch rows will create a denser canopy to smother weeds (and often lead to higher yields). In either case, a pre-emergence cultivation with a tine-weeder or a rotary hoe may be useful, and because soybeans are a warm, late-season crop, there is plenty of time in the spring for cultivation. After the soybean plants are 4-8 inches high, they can be cultivated again. Soybeans should not be cultivated when they are below 4 inches in height, since the hypocotyl arch, or neck, that the seedling forms as it emerges from the ground is very brittle and can be broken, thus killing the plant. Soybeans are also relatively easy to rip from the soil while cultivating and ideally should not be mechanically cultivated until well-established.

Because soybeans are adapted to warm temperatures and soybeans do not establish solid canopy cover quickly, weed pressure is often one of the biggest problems for soybean growers in the northeast. As with all crops, practicing good crop rotation is an important part of weed control. Soybeans should not be planted in the same fields two years in a row but grow well (with high yields) following small grains, corn, or clover. Because they fix nitrogen, soybeans are a great crop to use for improving low-quality soils and rebuilding solid soil structures.

White mold (*Sclerotinia sclerotiorum*) has been known to cause problems in soybean crops, especially in wet years and during the flowering stage. This issue can be minimized with wide

row spacing, to allow adequate air flow between plants. If well-established in soybeans, *Sclerotinia* can easily remain in the soil and carry over to the following year's crop.

Harvesting & Storage

Careful and timely harvesting will increase soybean yields and reduce seed damage tremendously. A flat level seedbed is needed for harvest, since the plant sets its seed close to the ground. However, soybeans that are planted close together (2-3 inches apart) will generally have pods higher on the plant and are more easily combined. If soybeans are planted more sparsely, the pods will be low to the ground and more difficult to harvest. Soybeans should be harvested at 12-14% moisture, and can be picked up with a combine. The first use of a combine to harvest soybeans was in 1924 by the Garwood Brothers of Stonington, Illinois. Until then, reaper binders and stationary threshers were used and the seed-shattering was excessive.

Standard grain combines may need a bit of adjustment for optimum yields and minimal field loss (such as the use of a floating cutter bar or row crop heads, run as close to the ground as possible and at a low ground speed). Most soybean loss during harvest comes from shattering at the head of the combine, but harvesting with at least 12% moisture will decrease shattering. It is often beneficial to harvest in the evenings, when dew will help minimize shattering. Swathing increases shattering damage and is not recommended. Soybeans generally thresh easily with a lower cylinder speed and medium cylinder spacing. It is often better to wait until after the first frost to harvest soybeans, as this allows the soybean stems (as well as weeds) to dry.

Good yields for soybeans in the northeast are between 2000 and 3000 lbs per acre, with a test weight of close to 60 lb per bushel. Clean beans and remove weed seeds and debris, then store the crop at 13% moisture in a container that keeps rodents and insects out. For safe long-term storage, keep the forced hot air temperature lower than 120°F to avoid heat stress cracks in the soybeans. If saving your own soybean seeds or marketing seed to other growers, take particular care to avoid damage (including bruising, shattering, or seed coat damage) during harvesting or handling. Seed two years or older will be more likely to have low germination rates and poor seedling vigor.



After harvesting soybeans, a winter cover crop can be sown with little tillage, since plant residue breaks down quickly. In addition, wheat yields (both no-till and conventional) are high when planted on land that previously grew soybeans.

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