SOYBEAN
(*Glycine max* (L.) Merrill)

Organic Soybean Production

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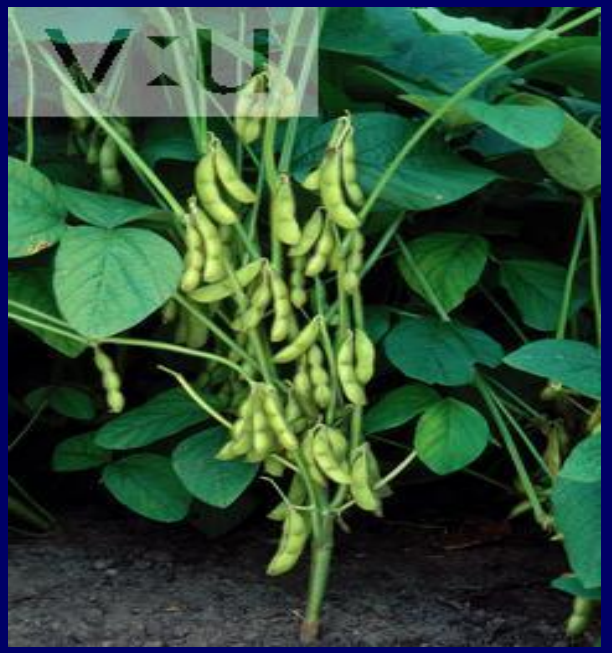
Glycine max L.
Fabaceae



The soybean plant is called a legume because it collects nitrogen from the air and releases it back into the soil. This is important for growing healthy crops and maintaining soil quality.

- **Soybean is native to eastern Asia, Australia, and several of the Pacific Islands. It has been called soya bean, soja bean, Chinese pea, Manchurian bean, Japan pea, Japan bean, and Japanese fodder plant.**

Chemical composition of the seed : the oil and protein content together account for about 60 %of dry soybeans by weight; protein at 40 % and oil at 20 %

- **The remainder consists of 35 % carbohydrate and about 5 % ash. Soybean cultivars comprise approximately 8 % seed coat or hull ، 90 %cotyledons and 2 %hypocotyl axis or germ.**

- **Soybeans are traditionally grown in sub-tropical and temperate climates during the summer. The world's largest producer is the USA.**

Range of oil content (%) of some oilseed crops.

Crop	Oil % range
Soybean	15-25
Sunflower	25-50
Rapeseed	35-45
Groundnut	45-50
Sesame	45-55
safflower	25-35

- **The soybean is a warm – season crop that has climatic requirements similar to those of corn.**

- **Soya is basically a warm-temperate, short-day plant,**

- **SOYBEAN GROWTH**

- **Soybeans begin germination when the soil temperature reaches 10°C. In most areas of southern, this temperature is reached in mid-May so this is when most soybean planting occurs. Growth is best with summer temperatures of 22°-27°C.**

VARIETIES

- **Soybean varieties are classified for their morphological (form and structure) growth habit, and for their day length and temperature requirement to initiate floral or reproductive development.**

The indeterminate growth habit is typical of most corn belt soybean varieties and is characterized by a continuation of vegetative growth after flowering begins.

- **Determinate soybean varieties characteristically have finished most of their vegetative growth when flowering begins and are typically grown in the southern United States.**

Soybean Maturity Classes:

- **Soybean is a photosensitive plant i.e., it begins to produce flowers when a critical dark period is reached. Day length varies with latitude.**

- **And cultivars vary in their night length requirement for flower initiation. This situation means that most cultivars cannot be moved, generally, more than about 100 miles either north or south from their area of greatest adaptation.**

- **The maturity grouping that is used today in the United States was proposed by Morse in 1949 and was the culmination of 30 years of research into cultivars response to photoperiod. Morse's early-maturing group of cultivars were designated :**

- **MG 0 and recommended for the northernmost areas of the United States, while cultivars adapted to the southernmost tier of states were categorized as MG VIII. Today this system places cultivars into 1 of 13 groups, 000, 00, 0, I, II to X.**

- **The lower numbers are adapted to more northern areas and classification progresses to X as one moves southward, with group X being adapted to the tropics.**

- **Certified Organic**

- **In order to sell your crop as certified organic, you must be certified by one of the certifying agencies listed on the Organic Information Fact Sheet. Each certifying agency has its own rules, but in general, they will require the following:**

1. **No synthetic fertilizers for three years**
2. **No synthetic pesticides (fungicides, insecticides, herbicides) for three years.**
3. **Crop rotations (at least three out of four years); necessary for breaking up weed, insect and disease cycles and maintaining soil fertility**
4. **No synthetic hormones or antibiotics for livestock; organic feeds and pastures required.**

Minnesota ranks third in the nation for number of acres in soybean production. Organic soybean production in Minnesota ranges from 25,000 to 30,000 acres per year. Net returns for organic soybean production tend to be similar to those for conventional production. The table below shows net returns per acre of soybean in Minnesota for organic and conventional producers, 2006-2008 (adapted from FINBIN, 2009).

Operation	2006	2007	2008
Organic	-19.83	94.75	162.53
Conventional	32.76	134.63	86.71

- **Why grow organic soybeans and what practices do I need to follow?**

Organic soybeans are easier to grow than corn or small grains:

- Soybeans are a legume and can be produced without nitrogen fertilization.
- Yields of organic and conventional soybeans compare well.

Land Preparation

Variety selection

Organic producers must use organically grown seed unless unavailable, in which case, conventional seed is allowed if it is untreated and non-GMO.

Soybean variety selection has several important considerations listed below in order of importance. These include: maturity, yield potential, disease resistance, and other traits.

Maturity group

Selection of a soybean variety will be based primarily on the relative maturity (RM) required for a given locale.

Varieties have a narrow range (north to south) of adaptation.

A variety must reach physiological maturity (95 percent of pods show their genetically determined mature color) before frost in order to obtain maximum yield and quality.

There are different recommended soybean relative maturities for the different regions of the state. The recommended maturities are 0.0 to 1.0 for northern Minnesota, 0 to 1.5 for central Minnesota, and 1 to 2.3 for southern Minnesota. Because many organic farmers delay planting, their choices in relative maturities may be lower than conventional farmers.

Fertilization

Soybean is a nitrogen-fixing legume crop that will provide its own nitrogen when the correct Rhizobia bacterium is present in the soil and good nodulation is achieved. In adequate nitrogen can be an issue if producers have persistent poor nodulation.

Soybean will generally need to be inoculated with the proper Rhizobium (which must be approved for organic production) every time that it is planted.

Potassium and phosphorus will need to be provided when growing soybean if these nutrients are found to be low in soil tests. Usually in Minnesota, other secondary nutrients do not require direct supplementation as supplies in soil are adequate.

Manure is a good source of the nutrients that soybean requires and can increase yields.

When supplementary phosphates are required in an organic system, they are usually supplied as rock phosphate.

Potassium is generally supplied in the form of sulfate of potash-magnesia and selected sources of mined potassium sulfate.

Fertilizer requirements:

- May need moderate amounts of mined potash, rock phosphate or lime
- Compost and animal manure can be used
- Nitrogen fertilizer is not normally needed because soybeans are a legume crop that can fix its nitrogen requirements from the air.
- Manure can be used earlier in the crop rotation.

Soil pH in the 6.0 to 7.3 range is optimum for soybean, and a wide variety of soils are tolerated.

Planting
-Seeding Rate

Growers need to plant at a seeding rate to optimize yield and to make the crop competitive with weeds. Seeding rate depends on a number of factors, including the variety grown and the productivity of the soil.

Many organic producers in Minnesota plant at least 160,000 seeds/acre or more. A higher planting rate can help counter seedling losses that occur during weed control operations.

The row widths that organic producers use for soybean in Minnesota vary. Some plant in 22-inch rows, and feel that the narrower rows lead to soybeans that are more competitive because a faster-forming canopy closure will shade weeds better.

Others plant in wider rows (30- to 38-inches). Wide-row systems may provide greater flexibility in equipment and timing for weed control operations.

Planting Depth

An optimal planting depth for soybean is typically one to one-and-a-half inches depending on soil conditions.

Soybeans should never be planted deeper than two inches.

Soybean emergence results from elongation of the hypocotyls, or the region of the stem between the primary root and the cotyledons.

Planting Date

Organic producers tend to plant soybean one to two weeks later than conventional growers, generally between May 20 and June 1 in Minnesota.
Planting in the middle of June may cause a 30 % loss of yield.

While delayed planting will reduce yield, it gives producers more time to manage weeds. Organic producers should choose earlier-maturing varieties when using later planting dates.

Weed management

Weed management is important for maximizing organic soybean yield. Weeds that are problematic in organic soybean production.

Reduce risk: weed management.

Weeds are easiest to control when they are small. Use a diversity of mechanical weed control methods. Rotate with non-row crops if possible.

Pest Management

Soybean aphid, soybean cyst nematode, and white mold are some of the common pests that organic producers in the Upper Midwest have to manage. Crop rotation and selecting resistant varieties are the first lines of defense in organic pest management.

Harvesting

An indication of physiological maturity for soybean is when the pods have no green color remaining. Harvest will generally occur about two weeks after physiological maturity. Soybean is traded at a standard 13 percent moisture concentration, but soybean grain moisture drops rapidly after physiological maturity.

Soybeans can be harvested at up to 18 percent moisture, but artificial drying will be necessary.

A general guideline is to begin harvest when grain moisture drops below 15 percent. Mold can occur when soybeans are harvested at moisture levels higher than 13 percent, while harvesting at lower moistures can cause beans to split and increases gathering losses resulting from shattering of pods when stems are hit by the combine's cutter bar.


NEW HOLLAND


wiseGEEK


ORGANIC VALLEY
SOY
ORIGINAL


a
b
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