

MANAGEMENT STRATEGIES IN SOYBEANS FOR INCREASED YIELDS

Are You Ready for Planting Season?

Soybeans can be managed more intensely through:

- ▶ Optimizing narrow row spacing
- ▶ Seeding for higher populations
- ▶ Planting dates
- ▶ Selecting the best variety

(See Pg 1)

Ensuring Hearty, Healthy Soybeans

Soybeans cannot maximize their yield without the proper nutrients available in the soil. Soybeans require large amounts of nitrogen (N) & potassium (K), and smaller amounts of phosphorus (P), sulfur (S), & other micronutrients. (See Pg 2)

It's a Disease, It's SCN, It's an Insect?

Environmental pressures from soybean cyst nematode, several diseases, and insects continue to impact the soybean crop throughout its growing season. Reducing the impact from these when needed will help promote higher yielding plants. (See Pg 4)



Are You Ready for Planting Season?

Global soybean yields need to increase by 2.4% annually to meet the demand the population will require by 2050. Currently, the yield is increasing by 1.3% nationally. North Dakota is one of the few states that is increasing its soybean yields above the average. Preseason decision factors, including variety selection, row widths, planting dates, and seeding rates, will help keep the yield increase above average.

Variety Selection

This is the most important management decision that can be made pre-season, impacting the end soybean yield by as much as 15 bushels per acre. Due to the variability across fields, selecting proper soybean seed that carries the desired traits and disease resistance packages can help better manage yield limiting factors in season (drought, disease, insects, etc.) that the plants can encounter. This is done by working with your agronomist or seed sales rep to ensure the right variety gets placed on the right acre.

Row Widths

Narrower row spacings (planted 15 inch rows and solid seeded) have been found to provide a yield benefit averaging 4 bushels per acre



Management Factors Effects on Soybean Yields!

Rank	Management Factor	Yield (bu/ac) Difference
1	Variety selection*	15
2	Planting date	8
3	Weed control**	8
4	Phosphorus fertility	5
6	Crop rotation	5
5	Row spacing***	3
6	Seeding rate	3

*Three-year average performance difference among varieties from 2011-2013 in South Dakota State University trials.

** One week delay in weed control on 30-inch rows

***Multi-state study from 2009-2011 funded by the United Soybean Board, led by Seth Naeve, University of Minnesota.

For more information:

[Why Soybean Variety is Critical to Improving Farm Yield](#)

over 30 inch row spacings of wider. Other advantages found with narrower row is reduced erosion and earlier canopy closer to help control weeds. The use of narrower row spacing is coinciding with more intense management practices in controlling diseases, such as white mold.

Planting Dates

Earlier planting dates have been found to reach higher yields due to the increased number of pods per plant and increased sites for reproductive development. It is recommend that soybeans be sowed during the first half of May to achieve optimum yields. Studies have found that soybeans planted beyond this time window can potentially lose 0.25 bushels per acre, per day.

Seeding Rates

Lower seeding rates are able to achieve the same yields as higher seeding rates were achieving in years past. This is due to several factors, including improved seed genetics and germination and increased accuracy and precision of today's planters. For North Dakota, a seeding rate that achieves 150,000 plants per acre across all what row spacing options is a good target. However, a rate of around 175,000 is found to be best for the 12 to 15 inch rows and populations closer to 200,000 for the solid seeded acres.

For more information on these topics:

[Row width in Soybean Production](#)

[Maximizing Soybean Yields by Improving Agronomic Practices](#)

[Soybean Sowing Date: The Vegetative, Reproductive, and Agronomic Impacts](#)

[Why Soybean Variety is Critical to Improving Farm Yield](#)

[Soybean Production Field Guide for North Dakota and Northwestern Minnesota](#)

Ensuring Hearty, Healthy Soybeans

Nitrogen (N)

Soybeans supply much of their own N through N fixation. A symbiotic relationship between a soil bacteria, *rhizobium*, and the roots of the soybean plant. Typically no additional N is needed as the plant is able to produce what it needs. However, as the yields continue to improve, it is projected that N deficits will start to be seen once yields start to break 60 bu/acre.

Did You Know?

- * To produce a bushel of soybeans on average, the following nutrients are needed:
 - 3.8 lbs of Nitrogen
 - 0.8 lbs of Phosphorus
 - 1.5 lbs of Potassium
- * In 2014 the Average soybean yield in ND was 34.5 bu/ac
 - This would have required 131 lbs of Nitrogen, 28 lbs of Phosphorus, and 52 lbs of Potassium
- * To get the most available nutrients for soybean growth, soil pH should be maintained between 6.0 and 7.0.
- * A 50 bushel soybean crop will use 60% more Potassium than a 150 bushel corn crop.
- * A 60 bushel soybean crop will use more Nitrogen than a 200 bushel corn crop.

For more information:

[Nitrogen Fertilizer for Soybean?](#)
[Soybean Soil Fertility](#)



Potassium (K)

A large amount of K is required by the soybean crop for it to yield well. This nutrient can help with the metabolism, breakdown, and translocation of carbohydrates, water use efficiency, & disease resistance in the plant. K fertility is difficult to determine as deficiency symptoms can show up, even if soil tests come back with acceptable levels in the soil. In North Dakota, follow NDSU's recommendations when determining K application.

Phosphorus (P)

P is used by the plant to help with cell growth, root and seed formation, and energy storage and transfer. North Dakota soils are typically low in P and additional P is needed to maximize soybean yields. According to Dave Franzen (NDSU Soil Science specialist) broadcast applications of P have shown greater yield increases over banded. However, banded application of P is still the more common method of application in North Dakota.

Iron (Fe)

Fe is essential to photosynthesis and chlorophyll & enzyme synthesis in the plant. In North Dakota, the pH levels of the soils and higher level of salts and calcium carbonates tend to tie of the Fe, leading to Iron Deficiency Chlorosis (IDC). IDC is common in North Dakota soils due to high soil pH and cannot be corrected during the growing season. However, application of an Fe-Chelate in-furrow at planting and selecting tolerant varieties can help IDC.

Sulfur (S)

Most of the S in the soil is found in the soil organic matter. The amount needed then at time of planting is difficult to determine as soil tests are poor at predicting this nutrient. Soils that are at greater risk of being deficient and would most likely need a S application, are coarse textured soils that are low in organic matter. NDSU recommends to apply 10 lbs of sulfate to these soils if above normal precipitation occurred from fall until time of planting.

For more information on these topics:

[Nitrogen Fertilizer for Soybean?](#)

[Soybean Soil Fertility](#)

[Micronutrients for Crop Production](#)

[Maximizing Soybean Yields by Improving Agronomic Practices](#)

[Knowing nutrient mobility is helpful in diagnosing plant nutrient deficiencies](#)

[Plant Nutrition and Soil Fertility](#)

It's a Disease, It's SCN, It's an Insect?

The crop is in & fertilized, now what's the problem?

Even after fertility and preseason decisions have been made, other in season pressures can still arise and cause yield loss to crop. Knowing how to better manage for these if they are on your farm and/or how to prevent them from spreading to your acres can help protect your soybean from further yield loss.

Soybean Cyst Nematode

This microscopic pest has been found to cause losses greater than 50% if infested areas have been improperly managed. The spread of this pest is most commonly done through contaminated equipment, but can also be spread through wind erosion or flooding. Crop rotations and clean equipment can help reduce the number of nematodes in the field. Resistant varieties can also be planted to control any outbreaks and works best when multiple sources of resistance are used in the rotation.

Diseases

Above Ground Diseases: There are several disease including, White mold, Downy Mildew, & Septoria brown spot, that can threaten the soybean. White mold is one of the more common diseases that can reduce yields by 15% if not managed properly. White mold can be managed through wider row spacing, crop rotations, and selection for tolerant varieties.

Below Ground Diseases: Phytophthora root rot, Rhizoctonia damping off and root rot, Fusarium root rot, & others can threaten the soybean below ground. In the Red River Valley, Phytophthora is the most common and has been found to wipe out entire fields in severe cases.

Insect Pressures

Soybean aphids are the main pest to cause damage to the soybean crops in the Midwest. However, there are several other pests that can become damaging if not managed. These pests can include cutworms, wireworms, leafhoppers, spider mites, and grasshoppers.

For more information on these topics:

[Soybean Production](#)

[Soybean Production Field Guide for North Dakota and Northwestern Minnesota](#)
[Maximizing Soybean Yields - Overcoming SCN, Disease, and Insect Problems](#)



Soybean Aphids

This pest was first introduced to the United States in 2000 and spread to North Dakota by 2001. Since then it has become the major pest in soybean production in the Midwest.

The Soybean Aphid is light yellow in color and can very small. The adults have been found to range in size from 1/16 to 1/8 of an inch long with the nymphs being smaller yet.

Aphids suck sap from the soybean plants and when populations are large enough, the feeding can result in stunted plants, reduced seed & pod numbers, and puckered yellow leaves. Also as they feed, they can transmit other viruses (ex: soybean mosaic) to the plant.

Insecticides are the primary control tactic for this pest. Scouting for the pest should begin around the V4 stage. Control is needed when there are 250 aphids/plant in 80% of the field. No control is needed after the R5 stage.

For more information:

[Soybean Production](#)

[Soybean Production Field Guide for North Dakota and Northwestern Minnesota](#)