Increasing Soybean Yields

What you need to know

There are several key agronomic decisions that impact soybean crops and should be considered to increase yields.

– Seth Naeve, University of Minnesota Agronomist

HOW SOYBEAN PLANT GROWTH IMPACTS YIELD

The efficient capture of sunlight is a key component of higher soybean yields. Soybean plants convert sunlight – nutrients from the soil and carbon dioxide from the air – into complex forms of chemical energy that’s eventually harvested as beans. The maximum amount of sunlight in a growing area occurs during June and July, with the longest day length at the summer solstice. Bigger plants with more leaf area in these critical months have higher sunlight capture potential.

Adopting management practices that increase the efficiency of CO₂ capture will improve the chances for increased yields. Leaves grown in full sunlight fix more CO₂ than leaves grown under reduced sunlight.

Reducing soil water evaporation also increases soybean yield potential. When the plant canopy closes earlier in the season, less sunlight hits the soil surface keeping it cooler and reducing soil water evaporation. Air and soil temperatures are cooler early in the season (late April/early May), which helps reduce soil water evaporation until the canopy closes.

Node development is also critical to soybean yield increases. A node is a group of buds that can produce leaves, branches and flowers. More nodes equal more yield potential. Nodes begin to develop at the V1 stage in soybean growth. Soybean plants generally develop about 2 nodes per week until R5 stage, when seed enlargement begins in the uppermost stem nodes.
Studies have found that the more physical aspects of soybean production – row spacing, plant population, tillage, light interception – play an important role beyond adding products. Agronomic practices may in fact deliver the greatest impact on yield and profitability.

**PLANTING DATE**

Early planting ensures soybean plants can collect as much sunlight as possible. Once the canopy has closed, the crop is collecting nearly all of the incoming sunlight from that day forward. Plant as early as is possible — soil and weather conditions permitting — to take advantage of the longest day/shortest night cycle of the summer solstice. A soybean crop planted in late April or early May is likely to close its canopy within a week of the summer solstice. Planting date also impacts the calendar date when V1 occurs – which is also the earliest date that nodes can start to develop. The rate of node accumulation from V1 to R5 is not impacted by the planting date. But, earlier planting increases the number of days in between V1 and R5, increasing the number of nodes per plant. Soybean germination and emergence are temperature sensitive and earlier planting will increase the number of days from planting to V1 stage. Later planted soybeans simply do not have the opportunity to catch up to the soybean node development of earlier planted soybeans. Planting date also induces the beginning of the flower (R1) stage to occur closer to the summer solstice. Only plant soybeans early when seed bed conditions are favourable. The yield reward for planting early only pays if the seed bed is ready.

**ROW SPACING**

Narrow row spacing is a risk management tool that helps stabilize yields in stressful environments. To clarify row spacing, wide rows are 30 inch rows, medium rows are 15-20 inch rows and narrow rows are 7.5 inch rows. Most of the narrow row results refer to 15-20 inch rows, not 7.5 inch rows. Narrow and medium rows provide a yield advantage because the soybean canopy develops more quickly and intercepts more light throughout the growing season, increasing crop growth rate, dry matter accumulation and seed yield. Canopy closure of 15 inch rows can happen up to 15 days earlier than 30 inch rows. This can be important since canopy closure is needed by the start of pod set (R3) for maximum pod formation and seed filling. Due to earlier canopy closure, narrow rows can have a larger yield advantage when the soybean planting date is delayed into June. Often soybeans grown in 30 inch rows fail to achieve canopy closure by this (R3) critical yield-determining growth stage.

The impact of row spacing on soybean yield can be influenced by the field environment. Medium and narrow row spacings generally increase yield in high yielding environments. But when soybean yield potential is low because of stress, medium or narrow rows may not provide a yield advantage. Diseases like white mold and brown stem rot are less likely in wide rows so, fungicides may not be needed in a wide row situation. Disease incidence is often the cause for medium and narrow rows to yield the same as wide rows.

Other benefits of narrow rows and early canopy closure include:

- better weed control
- reduced soil moisture loss
- easier, more efficient harvesting

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**Note:** The Roundup Ready® Xtend Crop System isn’t available in corn.
SEED PLACEMENT
Soybean seed is more sensitive to seeding depth than corn seed. Proper soybean planting depth is essential to maintain high yield potential. Under most conditions, soybeans should be planted between 1-1.5 inches deep. Soil type has the most effect on soybean seed planting depth.

<table>
<thead>
<tr>
<th>Plant at the shallower end when:</th>
<th>Plant at the deeper end when:</th>
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<tbody>
<tr>
<td>Early planting</td>
<td>Late planting</td>
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<tr>
<td>High residue conditions</td>
<td>Coarse textured soils</td>
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<tr>
<td>Fine textured soils</td>
<td>Dry soils</td>
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<td>Moist soils</td>
<td>Large seed size</td>
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SEEDING RATE
Previous recommendations suggest increasing soybean seeding rates as row spacing narrows. Current research actually suggests that a uniform harvest population of 100,000 plants/acre or more will maximize yield and profitability regardless of row spacing. Research shows a seeding rate around 140,000-150,000 seeds/acre results in the most profitability.

SOIL TEMPERATURE
The temperature of the soil moisture that first hits soybean seeds is important for overall yield. Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) research by Horst Bohner found that soybean seedling vigour, growth and development were greatly impacted when the temperature of the soil moisture first taken up by the seed was cold, compared to seeds exposed to warm soil and warm soil followed by cold conditions.

SUMMARY
Agronomic decisions can have a greater impact on yield and profitability than any product could spread or spray.

– Seth Naeve, University of Minnesota agronomist

References:
Ohio State University, 2011. Three reasons why soybean planting date matters.
Horst Bohner, OMAFRA