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# G90-963 Narrow-row Soybeans

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**G90-963**


# Narrow-row Soybeans

**Narrow-row spacing of soybeans may be a profitable practice with modern herbicides and new lodging-resistant varieties. This NebGuide describes considerations for producing narrow-row soybeans.**

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Early in this century crop row spacing was determined by the breadth of the animals used to work the fields. Spacing had an impact on methods of weed control and the varieties of soybeans developed. Even a decade ago row spacing was determined by tractor tire size since cultivation was required. Also, the tall varieties of soybeans lodged severely in narrow-row systems. However, the broad spectrum of herbicides now available and lodging-resistant soybean varieties have made narrow-row soybeans more practical.

Narrowing soybean row spacing can increase yields if light utilization is the yield-limiting factor. The main purpose of narrow rows is to intercept more light. Unlike fertilizers and water which can use the soil as a reservoir, light falling on bare soil cannot be used.

Decreasing row spacing results in more rapid canopy closure and increased light interception. Canopy closure at or shortly after flowering will maximize yields in ideal conditions. However, Nebraska's growing seasons are rarely ideal. Any yield limiting factor like lodging, weed growth, moisture stress, soil compaction, high soil pH, or nutrient deficiency will reduce soybean yield responses in narrow rows.

## Yield Responses

With the many factors involved, don't be surprised to find that narrow-row soybean production does not consistently increase yields. Nevertheless, several studies here have shown positive yield responses with narrow rows. A recent compilation of 14 studies conducted during the last 20 years in Nebraska shows that 10-inch rows increased yields an average of 1.0 bushel per acre over 20-inch rows. The study found

that 20-inch rows increased yields 2.2 bushels per acre over 30-inch rows *(Table I)*.

**Table I. This table is a summary of row spacing effects on soybean yields from 14 Nebraska experiments.**

| Row Spacing | Soybean Yield bu/acre | Yield Range bu/acre |
|---|---|---|
| 10" | 47.8 | 41.5 - 54.0 |
| 20" | 46.8 | 42.1 - 51.5 |
| 30" | 44.6 | 38.9 - 50.0 |

In lower yielding conditions (low side of yield range in *Table I*), yields in 10-inch rows were similar to those in 20-inch rows while yields in 20-inch rows were 3.2 bushels per acre better than in 30-inch rows. In higher yielding situations (high side of yield range in *Table I*) the yield advantage of 10-inch rows over 20-inch rows is 2.5 bushels per acre. The 20-inch rows had a slight (1.5 bushels per acre) yield advantage over the wider rows. In high yielding conditions, maximum yields can be obtained with 10-inch rows. In lower yielding conditions either 10 or 20-inch rows would maximize yield. Wider rows, 36 to 40 inches, generally result in 5-10 percent less soybean yield than 30-inch rows.

If weeds are controlled on soils low in pH and management is similar in both systems, narrow-row yields will usually be increased or at least not differ from yields of wide rows. Narrow-row soybean yields are rarely less than with wide-row soybeans. However, narrow-row soybeans should not be grown on high pH soils where iron chlorosis or Platte Valley Yellows are possible. A combination of proper variety selection, wide rows (30 inches or greater), planting density, and in some cases soil chemical applications can result in profitable soybean production on these soils. (Consult NebGuide *G89-953, Soybean Chlorosis Management* for more information.)

## Variety, Planting Date, and Plant Population Responses

Most currently available varieties were developed in wide rows. When they are planted in narrow rows you might expect their relative yields to change. However, this does not happen. In experiments across the Midwest and in Nebraska the highest yielding varieties in wide rows have also been the highest yielding varieties in narrow rows. Although in theory thin-line (narrow canopy), early varieties should have a yield advantage over bushy, late varieties, we have not found this. This means that the relative performance of varieties in wide-row yield performance tests is applicable to any row spacing.

These row spacing responses were for May planting dates. As planting dates are delayed into and past the middle of June, narrow rows have a larger yield advantage. However, narrow rows usually will not compensate for the yield loss due to late planting.

Most experiments have shown that plant population recommendations of 150,000 live seeds per acre at planting for indeterminate varieties and 225,000 for determinate varieties are the same for wide and narrow rows. However, if narrow-row soybeans are planted with a grain drill, use 10 to 30 percent more seed to ensure adequate stands. These higher seeding rates will increase bottom pod heights and help decrease harvest losses.

## Weed Control Considerations

Weeds are a principal concern in soybean production regardless of row spacing. Uncertainty about weed

control has been a major obstacle to planting soybeans in narrow rows. Weed control is possible but probably will require more intensive management with narrow rows. Since cultivation options are limited with narrow-row soybeans, a postemergence herbicide may be needed.

Narrow-row soybeans reach canopy closure sooner than wide-row soybeans. Once the soil surface is shaded, further weed seed germination is stopped. The strongest weed competitors are those that emerge with the crop and remain in the row. Those that emerge more than six weeks after planting have little effect on yield; therefore, it is important to focus on early season weed control.

A successful weed control program for narrow-row soybean production can be developed with careful planning.

1. Select fields which do not have serious infestations of hard-to-control weeds like velvetleaf, cocklebur, sunflower, and perennial weeds like field bindweed. The first time soybeans are to be planted in a field, plant in rows that can be cultivated. Consider narrow rows only if there is no history of problem weeds.
2. Preplant incorporated treatments may be cheaper than preemergence herbicides. They also may perform more consistently because they are less dependent on timely rainfall.
3. A rotary hoe can be used in narrow-row soybeans by driving perpendicularly or diagonally to the rows. Less wheel track damage is done to small soybeans than might be expected. Wait until daytime air temperatures are warm and soybean plants are not brittle.
4. Many postemergence herbicides are available for backup broadleaf and grass weed control. These are usually applied within 21 days from planting. Minimal damage will be done when operating ground sprayers perpendicular to crop rows before flowering. Apply postemergence herbicides before canopy closure so weed seedlings are not shielded from spray solution. (See *EC90-130, A Guide for Herbicide Use in Nebraska*.)

Weed control may be the biggest challenge when depending solely on herbicides in reduced tillage systems, regardless of row size. Herbicide costs will increase if preplant and/or postplant cultivation are eliminated. Successful herbicide programs can be developed for reduced tillage, but greater management skills are required. (See NebGuide *G89-899, Weed Control in No-till Corn, Grain Sorghum, and Soybean Production*.)

## Erosion Considerations

Researchers in northeast Nebraska found that 10-inch rows had 7 percent more residue cover after winter weathering and spring fertilizer knifing than 30-inch rows. Increased residue cover results in decreased erosion. Researchers in other states found that narrow rows can decrease erosion rates up to 40 percent on contoured fields and up to 60 percent on fields planted up and down the slope compared to wide rows.

## Equipment Considerations

A common method of seeding narrow-row soybeans is with a grain drill. If the seedbed is well prepared, a drill will work well if the tractor's wheel tracks are removed with shovels in front of the drill. In a rough seedbed, a row crop planter will result in better stands. An increased seeding rate may be necessary with grain drills. Splitting row centers with two passes of a row crop planter is another alternative for narrow-row soybean planting. Ensure that the planter units are calibrated for the correct plant population. More planter units could be added to a planter tool bar to do the same thing in one pass.

A skip-row planting system in a high-yield environment will provide some of the yield increase associated with narrow rows and still allow tractor access. A skip-row planting system is one in which

several narrow rows are alternated with nonplanted strips that are wide enough to accommodate tractor tires. Furrow irrigators who are normally restricted to 30-inch rows or wider also could use a skip-row planting system with alternate-row irrigation. This possibly could reduce water application rates.

Harvesting equipment also can prescribe row spacing. Row-crop headers automatically eliminate the possibility of narrow-row production. Harvest losses were less with a row crop head (1.4 percent) than with a flexible cutter bar (3.8 percent) in 30-inch rows in an Illinois study. With 7-inch rows the flexible cutter bar had a 2.4 percent harvest loss. (One percent more harvest loss than the row-crop head in 30-inch rows). If a switch is made from a row-crop head to a platform head and narrow rows, the normal 5 to 10 percent yield advantage associated with narrow-row production would more than offset the increased harvest losses. Harvest losses in narrow- row planting can be reduced by increasing plant populations. This keeps the bottom pods higher off the ground.

Research on sandy soils in northeast Nebraska has shown that row spacing responses are similar with different tillage systems. Residue amount and row spacing are important to its success. Excellent no-till, narrow-row drills are available. Several manufacturers produce dual tool bar, no-till planters with staggered seed units to achieve 15- inch or wider row spacings. Good soybean seed placement can be achieved with this equipment. Every grower's situation will be different, but narrow rows and conservation tillage are compatible.

## Economic Comparisons

Switching row spacings will typically require several changes in production. Budget considerations are listed in *Table II*.

**Table II. Budgeting Considerations when switching to narrow rows**

*Possible equipment/operation changes*

**Planter:** Modify (additional planter units, different tool bar), trade, equip an additional planter, or switch to drill.
**Spray Equipment:** Use broadcast sprayer instead of band attachment on planter.
**Tillage Equipment:** Additional tillage to incorporate broadcast herbicide. Trade cultivators, buy an additional cultivator, or discontinue cultivating.
**Harvesting Equipment:** Switch from row crop to platform head.

*Possible changes in equipment use and cost*

Tractor, planter, drill and tillage equipment use per year will likely change. This may affect annual ownership costs. Changes in spraying and harvesting equipment also will affect annual ownership costs.
Changes in operations (e.g., adding a disking to incorporate broadcast herbicide, eliminating row crop cultivation), changes in equipment used and changes in operating time per acre will affect fuel, lubrication, repairs and labor costs per acre.
**Seed:** Drilling can require up to 30 percent more seed and rhizobia inoculation depending on the drill and seedbed conditions. (Consult Nebguide *G84-737, Soybean Inoculation -- When Is It Necessary?* for more information on inoculations.)
**Herbicide:** Switching to broadcast application and any change in material will affect the cost per acre.

*Other possible changes*

Irrigation procedures may need to be changed, particularly under gravity irrigation.

Field harvesting losses will likely be affected by changes in the header and row spacing used.

The system changes associated with a change in row spacing involve several cost components. *Tables III* and *IV* illustrate budgeting a switch from row crop planting in 30-inch rows to drilling in 10-inch rows with a drill that is currently used for small grains. The budgeted costs reflect the use of a preemergence herbicide band at planting followed by two cultivations with 30-inch rows. The narrow-row budget is based on a broadcast incorporated herbicide with no cultivation. Switching from a custom hired harvest with a row-crop head to a platform head is budgeted with a 0.5 bushel per acre added harvest loss.

*Table IV* suggests a cost increase when switching to 10-inch drill rows of $4 per acre. This would have to be offset by additional receipts from any higher yields. (See *EC90-872, Estimated Crop and Livestock Production Costs* for help in budgeting costs.) *Table V* lists advantages and disadvantages of narrow-row soybeans.

**Table III. A farm comparison of estimated ownership and repair costs when switching soybeans from wide to narrow rows[a]. Equipment, operation, and level of use changes when switching 200 acres of soybeans from wide to narrow rows.**

| | New Cost | Useful Life (acres) | Annual Use (acres) | | Years to Trade | | Percent Useful Life at Trade | | Trade-in Value | | Repairs (per acre) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 30" | 10" | 30" | 10" | 30" | 10" | 30" | 10" | 30" | 10" |
| Row crop planter | $12,300 | 6,000 | 800 | 600 | 7[1] | 10 | 93[1] | 100 | $500 | $500 | $1.45 | $1.62 |
| Drill | 5,500 | 6,000 | 100 | 300 | 20 | 20 | 33 | 100 | 500 | 50 | .19 | .73 |
| Broadcast sprayer | NA[2] | Custom | 0 | 200 | NA | | NA | | NA | | NA | |
| Disk | 11,300 | 20,000 | 1,800 | 2,000 | 11 | 10 | 99 | 100 | 500 | 500 | .33 | .33 |
| Cultivator | 3,700 | 10,000 | 1,600 | 1,200 | 6 | 8 | 96 | 96 | 300 | 300 | .37 | .37 |
| Combine | NA | Custom | 900 | 900 | NA | | NA | | NA | | NA | |
| Tractor | 52,000 | 10,000[3] | 600[3] | 560[3] | 10 | 10 | 60 | 56 | 15,400 | 15,400 | $3.74* | $3.50* |

**Depreciation, interest and repair cost estimates**

| | Annual Depreciation | | Annual Interest | | Annual Repairs | |
|---|---|---|---|---|---|---|
| | 30" | 10" | 30" | 10" | 30" | 10" |
| Row Crop Planter | $1,685 | $1,180 | $ 725 | $ 700 | $1,160 | $ 972 |
| Drill | 250 | 275 | 30 | 30 | 19 | 219 |
| Broadcast Sprayer | NA | NA | NA | | | |
| Disk | 980 | 1,080 | 640 | 645 | 594 | 660 |
| Cultivator | 565 | 425 | 230 | 220 | 592 | 444 |
| Combine | NA | NA | NA | | | |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tractor | 3,660 | 3,660 | 3,555 | 3,555 | 2,244 | 1,960 |
| TOTAL | $7,180 | $6,620 | $5,180 | $5,150 | $4,609 | $4,255 |
| Per Acre (200 acres soybeans) | 35,90 | 33.10 | 25.90 | 25.75 | 23.05 | 21.28 |

[a] Base cropping plan of 600 acres corn, 200 ares soybeans planted in wide rows and 100 acres of small grains. The revised plan with narrow rows is the same except the 200 acres of soybeans are planted with drill instead of a row crop planter.
[1] Useful life of the planter, for example, is 6000 acres. With wide rows 800 acres are planted annually giving a useful life of 6000, 800 = 7.5 years. If traded in seven years, the useful life exhausted at trade is 7÷7.5 = 93 percent.
[2] NA = Not applicable.
[3] Refers to hours of use, rather than acres.
* Cost per hour.

**Table IV. An estimate of total cost changes when switching to narrow rows.**

**Table IV. An estimate of total cost changes when switching to narrow rows.**

| | *30" Rows* | | | *10" Rows* | | |
|---|---|---|---|---|---|---|
| | *Item* | *$/A* | *Subtotal* | *Item* | *$/A* | *Subtotal* |
| Extra disking .09 hr/ac | | | | Fuel & Oil<br>Labor | .37<br>.57 | .94 |
| Planting .2 hr/ac vs. .18 hr/ac | Fuel & Oil<br>Labor | .53<br>1.27 | 1.80 | Fuel & Oil<br>Labor | .47<br>1.14 | 1.61 |
| Additional Seed | | | | .3 bu @ $13 | | 3.90 |
| Herbicide | 15" Band | | 9.50 | Broadcast | | 14.50 |
| Custom Spraying | | | | Custom Rate | | 3.00 |
| Cultivations (2) .19 hr/ac | Fuel & Oil<br>Labor | 1.28<br>2.40 | 3.68 | | | |
| Additional harvest loss | | | | .5 bu @ $5.50 | 2.75 | |
| Custom Combine | Custom Rate | | 21.00 | Custom Rate | 18.00 | |
| Depreciation<br>Interest<br>Repairs | | 35.90<br>25.90<br>23.05 | 84.85 | | 33.10<br>25.75<br>21.28 | 80.13 |
| Total Ownership and and Operating Costs | | | $120.83 | | | $124.83 |
| Cost change | | | | | | + 4.00 |

**Table V. Advantages and disadvantages of narrow-row soybeans.**

**Advantages**

- Yield advantage in high yield conditions.
- Larger yield advantage with late planting.
- More rapid canopy closure results in reduced weed seed germination and decreased erosion.
- Increased bottom pod height results in decreased harvest losses with platform head.
- Potentially higher profit than wide rows.

**Disadvantages**

- Less (or no) yield advantage in low yield conditions.

- Increased planting rate and inoculation material may be necessary.
- Cultivation and row crop head not possible in narrow rows.
- Increased harvest losses vs wide rows with row crop head.
- Potentially higher cost of production.
- Not for high pH soils that are prone to iron chlorosis or Platte Valley yellows
- Not recommended for weedy fields since more intensive weed management is required.

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