

## University of Missouri Extension

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# Drilled Soybeans in Missouri

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Drilled (solid) seeding of soybeans is a continually growing practice in Missouri. More than 1 million acres were drilled in 1986, compared to just 300,000 acres in 1979. Solid seeding was predominant when soybeans first became popular in Missouri and the crop was used primarily for hay. At that time, some weed growth in the hay crop was tolerable. As emphasis shifted to production for beans, producers shifted to row culture to permit cultivation for weed control.

Improvements in soybean chemical weed control materials now allow adequate control of most weeds in solid-seeded stands. Because they can control weeds, farmers are returning to solid seeding to increase yields. Several long-term research projects (some sponsored by your soybean checkoff dollars) have allowed us to evaluate the yield potential and economics of solid-seeded soybeans throughout Missouri. The following discussion reports some of the important findings of those studies and recommended production practices.

## Advantages

Advantages of solid-seeding compared to row cropping are as follows:

- Erosion is reduced, assuming soil is properly prepared for planting. This is because less cultivation is needed and because complete groundcover is established earlier in the growing season (Table 1).

**Table 1**  
Days to groundcover

| Row width | Approximate days to full canopy |
|-----------|---------------------------------|
| 7 inches  | 30 days                         |
| 10 inches | 35 days                         |
| 30 inches | 55+ days                        |
| 38 inches | 70+ days                        |

- Harvest loss is reduced because you can operate the combine closer to the ground. Pod height is generally higher, possibly 1 to 2 inches above rowed soybeans.
- Harvest efficiency increases because you can operate the combine with or across the rows.
- More acreage is actually growing soybeans in each field because of more complete use of turn rows. This may mean from 5 to 10 percent more land grows soybeans on small or uneven fields. It also improves land use on terraced fields.
- Lodging may be reduced if you don't use excessive planting rates.
- Productive use of water increases through decreased runoff and less evaporation from the soil surface. The impact isn't substantial.
- Late-season weed control improves because the narrow rows create a canopy faster, which suppresses

late-germinating weeds. Giant ragweeds (horse weeds) and established perennial weeds, however, reportedly can "break" the soybean canopy. The approximate times required to achieve full groundcover at four different row spacings are shown in Table 1.

### **Yield increases are possible**

Yield response to drilling depends on location, variety, planting date and weather conditions. Yield increases have been greatest under the following circumstances:

- In northern Missouri
- With lower yielding varieties
- At very early or very late planting dates
- On soils that provide adequate moisture and nutrients during pod fill

Table 2 presents yield trial results over several locations and years in Missouri. The results show a positive response to drilling when yields are averaged over a large number of varieties. In dry situations, however, such as those encountered at Columbia in 1980 and 1983, drilled seeding did not increase average yields.

## **Disadvantages**

Advantages of solid-seeding compared to row cropping are as follows:

- Good early season weed control is essential until the canopy develops. This requirement places a high reliance on herbicides for weed control and may make the use of narrow rows on some weedy fields undesirable.
- Perennial weeds are difficult to control without some cultivation. Solid stands prevent shovel cultivation and reduce opportunities to use "over-the-top" applications with recirculating sprayers or ropewick applicators. By the time the perennials overtop the soybeans sufficiently to be treated, tractor wheels will probably damage soybean plants. So fields with many perennial weeds may be unsuitable for solid seeding.
- Seed costs increase. Emergence may be poorer in drilled seeding because planting depth is less uniform and because each seedling must emerge on its own. Rotary hoeing also reduces stand. Use of a seeding rate slightly higher than that recommended for 30-inch rows is necessary.

## **Requirements for success**

For successful drilled soybeans, you need a uniform stand and a canopy with no "holes" that permit late season growth.

These requirements are related to:

### **Depth control**

The new soybean drills with press wheels provide better depth control than the older drills. Many farmers, however, continue to use the older drills successfully.

Avoid excessive speeds that give drill unit bounce. Four to five miles-per-hour should be the top speed with any drill, even on a smooth seedbed.

Use some device, such as small sweep or tines behind tractor wheels, to prevent a compacted seedbed in wheel tracks and a varied depth of seeding. You can also obtain a uniform seed depth and soil coverage by adjusting the pressure on the drill's disk openers that run in the tractor tracks.

### **Seeding rates**

Generally, two viable seeds per foot of row in 7-inch rows and three viable seeds per foot of row in 10-inch rows provide for a good stand, a good canopy and maximum yields without significantly increasing lodging. If you plan to use a rotary hoe, increase the seeding rate by 10 percent to compensate for plants destroyed by hoeing. Increase rates by 20 percent for double-cropped soybeans or fields planted late.

### **Weed control**

Use of chemicals is generally required for early-season weed control, although rotary hoeing is feasible. It is important to carefully select and properly apply chemicals. Decisions about chemicals are even more critical if cultivation is impossible.

While good soil-applied grass control materials are available and are widely used, you might need post-emergence grass chemicals for grass escapes and perennial grasses.

Post-emergence materials that control many broadleaf weeds give an extra safety factor. Some growers use these materials as their only broadleaf control. Best results occur when broadleaf chemicals are applied from 14 to 24 days after planting (first to third trifoliolate stage of soybean development). Weeds will be small and may appear insignificant at this time, but early control is more effective and usually suffices until the canopy closes.

The rotary hoe is often useful with solid-seeded stands. When application of pre-emergence chemicals is followed by dry conditions, rotary hoeing may destroy many weed seedlings that are emerging. It also breaks soil crusts that form after a heavy rain. Research indicates that producers can run over soybeans up to 8-10 inches high with tractor wheels one time without affecting yields. Running over beans two times in the same wheel tracks causes some harm, however, and three or more times can badly injure both stand and productivity. Judicious use of the tractor is wise when rotary hoeing or applying "over-the-top" herbicides.

### **Harvesting**

Solid seeding tends to make harvesting more efficient. First pods tend to be higher; the even distribution of plants makes cutting easier; feeding into the machine is more uniform; and the full width of the header is used.

Drilled bean plants tend to wrap around the reel ends, so harvesting solid-seeded beans requires one combine adaptation. You must put separation snouts on the outside ends of the header or add end-enclosed reels. These changes also reduce harvesting loss that is caused by reel ends catching and throwing plants.

## **Additional considerations**

### **Desirable drill features**

A drill for planting solid-seeded soybeans should provide accurate seed metering (without damaging the seed), uniform depth control and good soil-to-seed contact. Uniform seed spacing in the row is desirable, but slight variation in the spacing distances has less effect on soybean yield than on corn yield.

You can set some old drills, but others may need changes to enable the throat to open wide enough to avoid seed damage without overseeding. Seed depth control is usually less uniform than with a conventional planter. With a level, well-prepared seedbed, however, depth and seed-to-soil contact will be acceptable.

Grain drills designed for use as soybean planters have good metering devices and uniform depth control, and they provide good seed-to-soil contact. Tests on metering devices indicate no significant difference in seed germination, seed spacing or yield between the fluted roller meter, the double-run cup meter, the air drum meter or the conventional plate planter. Many of these drills use press wheels that control planting depth and

provide good seed-to-soil contact.

### Fertility

High-yielding soybeans require adequate nutrition. While specific fertility requirements for solid-seeded soybeans have not been defined, the higher yield potential of the system requires more nutrition.

Obtain a fertilizer recommendation based on a soil test. Allow for the increase in yield potential. The concept of applying fertilizer in accordance with expected crop yield is built into MU's soil test recommendations. You should uniformly broadcast and incorporate fertilizer before planting.

### Planting date

As with row-planted soybeans, you can generally expect highest yields from drilled plantings made early in the season. As you delay, total yield may be less than from plantings made earlier in the season.

### Varieties

Varieties respond differently to drilled seeding. Tests in central and southeastern Missouri show that the highest-yielding varieties in rows also produce the highest yields in narrow rows. These varieties do not, however, produce the greatest response to drilling. Low-yielding varieties tend to perform proportionally better than high-yielding varieties in narrow rows but do not overcome the initial advantage of the best varieties based on evaluations in 30-inch rows (Table 2).

**Table 2**

Yield of soybeans in 30-inch and 10-inch rows in Missouri.<sup>1</sup>

| Location   | Varieties     | Year | Yield (bushels per acre) |              |          |
|--|---------------|------|--------------------------|--------------|----------|
|  |               |      | 30-inch rows             | 10-inch rows | Response |
| Portageville                                     | 30            | 1980 | 37.2                     | 38.1         | +0.9     |
|  | 47            | 1981 | 36.3                     | 34.4         | -1.9     |
|  | 51            | 1982 | 37.8                     | 40.9         | +3.1     |
|  | Weighted mean |      |                          | +0.7         |          |
| Columbia   | 80            | 1980 | 13.2                     | 10.6         | -2.5     |
|  | 65            | 1981 | 45.8                     | 51.0         | +5.2     |
|  | 72            | 1982 | 47.7                     | 51.7         | +4.0     |
|  | 93            | 1983 | 19.7                     | 19.4         | -0.3     |
|  | Weighted mean |      |                          | +1.3         |          |
| Marshall   | 65            | 1981 | 43.3                     | 44.6         | +1.3     |
|  | 72            | 1982 | 48.0                     | 53.4         | +5.4     |
|  | Weighted mean |      |                          | +3.5         |          |
| Mid-Missouri on-farm demonstrations <sup>2</sup> | 20            | 1980 | 29.8                     | 32.4         | +2.6     |
|  | 20            | 1981 | 40.8                     | 45.0         | +4.2     |
|  | 20            | 1982 | 48.3                     | 51.7         | +3.4     |
|  | 20            | 1983 | 24.3                     | 25.5         | +1.2     |
|  | 20            | 1984 | 31.5                     | 34.0         | +2.5     |

|  |  |               |      |
|--|--|---------------|------|
|  |  | Weighted mean | +2.8 |
|--|--|---------------|------|

<sup>1</sup>Sponsored by the Missouri Soybean Merchandising Council.

<sup>2</sup>Tests conducted in Audrain, Boone, Callaway, Cole, Cooper, Howard, Moniteau and Osage counties; some tests irrigated.

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## Related MU Extension publications

- G9217, Soil Sampling Hayfields and Row Crops  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G9217>
- M171, 2009 Missouri Pest Management Guide: Corn, Grain Sorghum, Soybean, Winter Wheat  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=M171>

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