

Row Width in Soybean Production

Row width is one of the management practices most often considered by growers as potentially important to increased soybean yields and profits. Extensive research studies conducted over many locations and years have compared drilled narrow rows vs. 30-inch rows in soybeans, and have generally shown a significant yield advantage for drilled narrow rows. In recent years, however, drilled soybeans have fallen out of favor in many areas, likely due to inferior seed placement and singulation capabilities of drills vs. planters, and the cost of planting additional seeds. As a result, soybeans planted in 15-inch rows have gained in popularity as a way to capture some of the yield benefit of drilled narrow rows while using a planter instead of a drill. Research on soybeans in 15-inch rows is less extensive, having been conducted mostly within the last 10 to 15 years as this row spacing has gained popularity.

Recent Row Spacing Research

A review of soybean row spacing studies published within the past 10 years generally confirms previous results comparing 30-inch rows and drilled narrow rows. In five studies, drilled soybeans outyielded 30-inch row soybeans by an average of **4.1 bu/acre** (Figure 1, Table 1). Six studies that compared 30-inch rows and 15-inch rows found similar results, with 15-inch rows holding a **3.6 bu/acre** yield advantage. Yields were similar between 15-inch row and drilled narrow-row soybeans in these studies.



Because most of these studies used higher seeding rates with narrower rows, increased seed costs partially offset the narrow-row yield benefit. Higher seeding rates with narrower rows have been a common practice, particularly with drilled soybean; however, not all research supports this practice. A study conducted in 2008-2009 (Cox and Cherney, 2011) found no row spacing by seeding rate interaction for soybeans planted in 7.5-inch, 15-inch, and 30-inch spacings. Recent research conducted in Iowa had similar results, indicating that narrow-row systems do not necessarily require a greater harvest stand to maximize yield (Pedersen, 2008). Historically, less accurate seed placement made higher seeding rates necessary with drills; however, improved seed placement with newer precision drills has reduced this need. In light of these findings, seed cost may not be a requisite consideration for row spacing decisions.

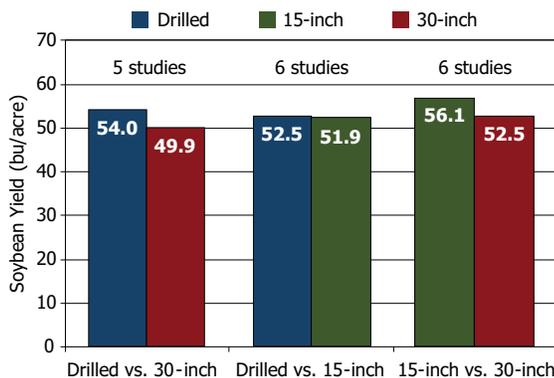


Figure 1. Average yield results from seven soybean row spacing studies published during the last ten years.

Table 1. Locations, years and row spacings included in soybean row spacing studies summarized in Figure 1.

Study	Location	Years	Row Spacing (in)		
			7.5	15	30
1	Indiana	05-06	X	X	X
2	Iowa	04-06		X	X
3	Maryland	00-02	X	X	
4	New York	08-09	X	X	X
5	Ontario	98-00	X	X	X
6	Wisconsin	97-99	X	X	X
7	Wisconsin	97-01	X	X	X

1: Hanna et al., 2008; 2: De Bruin and Pedersen, 2008; 3: Kratchovil et al., 2004; 4: Cox and Cherney, 2011; 5: Janovicek et al., 2006; 6: Bertram and Pedersen, 2004; 7: Pedersen and Lauer, 2003.

Current Row Spacing Trends

In recent years, soybean acreage in North America has been somewhat evenly divided between drilled, 15-inch, and 30-inch row spacings. However, row spacing practices vary widely across different areas. Among the four largest soybean-producing states there are substantial differences in row spacing practices, with a majority of growers in Illinois and Indiana favoring 15-inch and narrower spacings, compared to Iowa and Minnesota where soybeans planted in 30-inch rows are much more common (Figure 2). Row spacings of 36 inches and wider are rare in the northern and central Corn Belt, but more common in southern raised-bed systems. Similarly, 22-inch rows are common in sugar beet producing areas such as Minnesota, but not generally found elsewhere.

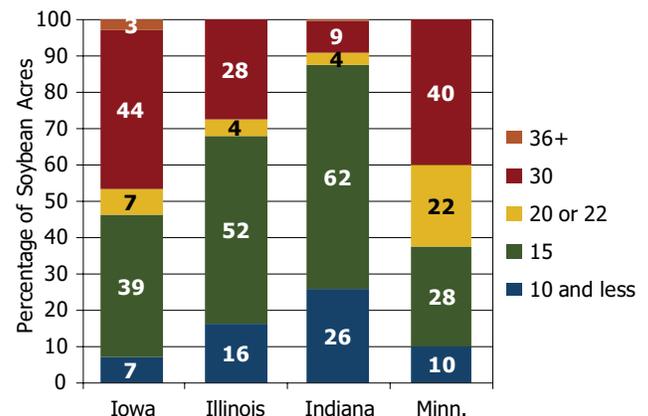


Figure 2. Soybean row spacings (in inches) in the four largest soybean-producing states in 2009 as a percent of total acres (USDA-NASS).

One consistent trend across North America over the last several years has been the move away from drilled soybeans. Drilled soybeans have declined from 29 percent of soybean acres in 2006, to 21 percent in 2011 (Figure 3). Even in areas such as Canada and the northeastern U.S. where drilled narrow rows is still the most common soybean row configuration, drilled acreage has dropped over the last five years. Planters generally provide better seed placement and seedling emergence than drills, which has helped reduce seeding rates and associated costs, although improvements in seed placement with newer drills make this less of an issue than it has been in the past (Holshouser et al., 2006).

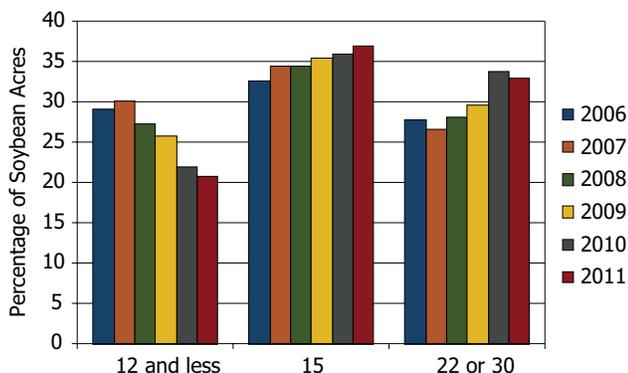


Figure 3. Changes in soybean acreage planted in the most common row spacings from 2006 to 2011 in North America. *Source: Pioneer Brand Concentration Survey.*

In many cases, this decline in drilled soybeans has been accompanied by an increase in acres planted to 15-inch rows, which is now the most common row spacing for soybean. However, acreage planted to 30-inch rows has also increased in almost all regions of North America over the last few years, reversing the long-term trend away from wide rows. In some areas this increase has been substantial. For example, Illinois went from 18 percent to 29 percent of soybean acres planted to 30-inch rows over the last five years (USDA-NASS survey). This recent shift toward wider row spacings runs counter to the higher yields consistently demonstrated in narrower rows, which indicates that other factors beyond yield are driving grower decisions in this area.

Factors Driving Row Spacing Trends

Equipment and Time Management

Other than yield, the most important factor driving soybean row spacing practices is equipment and time management during the planting season. One of the key issues growers must consider is whether the economics of their farm justify having a machine dedicated specifically to planting soybeans. Larger farms are more able to justify the expense of a dedicated soybean planter and provide an operator for it. Thus, they are more likely to be planting soybeans in 15-inch rows (Figure 4). For smaller farms, it may be more practical to share a soybean planter with another crop, such as a drill with wheat or a 30-inch planter with corn. This often results in more 30-inch or drilled soybeans for smaller farms.

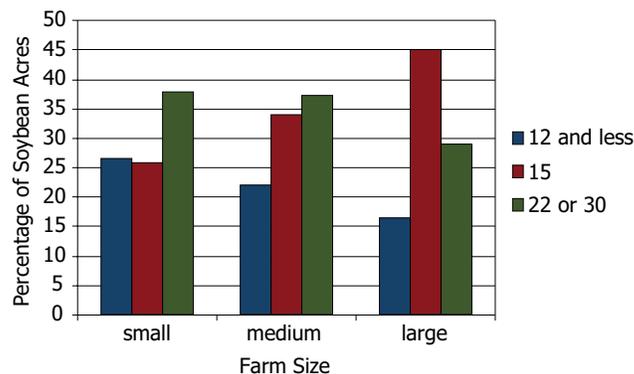


Figure 4. Soybean row spacing utilization according to farm size in 2011 (Small = 100-249 soybean acres, medium = 250-499 soybean acres, large = 500+ soybean acres). *Source: Pioneer Brand Concentration Survey.*

As farms get larger, more acres must be planted in a shorter amount of time. To plant more acres during the available window, some growers have opted to use their 30-inch planter for soybeans. Because 30-inch planters are typically wider than 15-inch planters, they can cover the ground more quickly. Another option – owning a second planter specifically for soybeans – allows both crops to be planted at the same time, resulting in earlier completion of soybean planting. However, the total number of operator hours spent planting would be greater and the second planter would require a second operator, which may not always be feasible. It is difficult to weigh the potential yield benefit of narrow-row soybeans against equipment costs, time constraints and operator availability required. Equipment and workload considerations are unique for every farm operation and ultimately come down to the needs of each individual grower.

White Mold

A key factor driving the recent increase in soybeans planted in 30-inch rows is Sclerotinia stem rot (*Sclerotinia sclerotiorum*), or white mold. White mold development is favored by cool and wet conditions during soybean flowering, conditions that were widespread in the Midwestern U.S. in 2009. Soybean variety selection, row spacing and seeding rate are important factors influencing white mold development and a good management strategy should address all three. Seeding rate generally appears to have a greater effect on white mold severity than row spacing (Lee et al., 2005). Changing from drilled narrow-row soybeans to 15-inch row spacing in areas where white mold is prevalent is likely a good move, particularly when accompanied by a reduction in seeding rate. The benefit of moving to a 30-inch spacing is less clear and is not generally recommended by university pathologists for reducing white mold, particularly given the likely reduction in yield potential. However, in areas with frequent white mold incidence, wide rows may provide some benefit.



Other Row Spacing Considerations

Foliar Fungicide and Insecticide Applications

The need for fungicide and/or insecticide applications may also impact row spacing decisions. When an application is made during vegetative growth, plants are generally able to compensate for damage caused by the sprayer wheels with little reduction in yield. For applications made following the R1 growth stage, which would include most foliar fungicide and insecticide applications, wheel damaged areas will have lower yield. A research study conducted in Delaware and Virginia found significant yield reductions due to sprayer wheel damage in R4 soybeans planted in 7.5-inch and 15-inch row spacings, whereas soybeans planted in 30-inch and wider row spacings did not sustain any sprayer wheel damage (Holshouser and Taylor, 2008). Actual yield loss due to wheel traffic will vary according to boom width (Table 2).

Table 2. Soybean yield loss due to sprayer wheel damage in 7.5-inch and 15-inch row spacings with four different boom widths (Holshouser and Taylor, 2008).

Row Width	Boom Width			
	45	60	90	120
	-----% yield loss-----			
7.5 inch	3.8	2.8	1.9	1.4
15 inch	4.5	3.5	2.3	1.7

Weed Control

The growing prevalence of weed populations resistant to glyphosate has made weed management more challenging in some areas; consequently, it is becoming increasingly necessary to consider the impact of cropping system factors such as row spacing on weed growth. In general, weed growth will be reduced in soybeans planted in narrower row spacings and earlier shading by the soybean canopy will help suppress the emergence of new weeds. The extent of this effect will vary by weed species and weed emergence timing relative to the crop (Hock et al., 2006).



Planting and Harvest Efficiency

Crop residue can be an important consideration when planting soybeans, particularly in the northern Corn Belt where residue management is more of a challenge. Some growers in high residue systems prefer wider rows because there is more

room to deposit residue between the rows, which helps prevent residue interference with planting and emergence.

Narrow-row soybeans offer some harvestability advantages over soybeans in 30-inch rows. The lowest pods will tend to be higher in narrow-row soybeans, potentially reducing harvest losses. The more even distribution of plants in narrow rows also allows plants to feed into the combine head more smoothly, although some growers have found that harvesting 30-inch row soybeans at an angle can help improve harvestability.

Conclusions

Recent research studies have shown a three to four bu/acre yield advantage for soybeans planted in drilled narrow rows or 15-inch rows compared to 30-inch rows. In spite of this clear advantage, row spacing preferences vary greatly across North America, and 30-inch row soybeans are common and even gaining in many areas. This demonstrates that many different considerations beyond simply yield potential can affect the best practices for each individual grower. Factors such as equipment costs, workload management, and disease management all play an important role. When those issues are accounted for, narrow-row planting is not necessarily the best economic choice for all operations. Because of this complexity, no one-size-fits-all answer should be applied. Rather, each grower should carefully consider the costs, risks and benefits of soybean row spacing options in their operation.

References

- Bertram, M.G., and P. Pedersen. 2004. Adjusting management practices using glyphosate-resistant soybean cultivars. *Agron. J.* 96:462-468.
- Cox, W.J., and J.H. Cherney. 2011. Growth and yield responses of soybean to row spacing and seeding rate. *Agron. J.* 103:123-128.
- De Bruin, J.L., and P. Pedersen. 2008. Effect of row spacing and seeding rate on soybean yield. *Agron. J.* 100:704-710.
- Hanna, S.O., S.P. Conley, G.E. Shaner, J.B. Santini. 2008. Fungicide application timing and row spacing effect on soybean canopy penetration and grain yield. *Agron. J.* 100:1488-1492.
- Hock, S.M., S.Z. Knezevic, A.R. Martin, and J.L. Lindquist. 2006. Soybean row spacing and weed emergence time influence weed competitiveness and competitive indices. *Weed Science.* 54:38-46.
- Holshouser, D.L., R.D. Grisso, Jr., and R.M Pitman. 2006. Uniform stand and narrow rows are needed for higher double-crop soybean yield. Online. *Crop Management* doi:10.1094/CM-2006-0417-01-RS.
- Holshouser, D.L., and R.D. Taylor. 2008. Wheel traffic to narrow-row reproductive-stage soybean lowers yield. Online. *Crop Management*. doi:10.1094/CM-2008-0317-02-RS.
- Janovicek, K.J., W. Deen, and T.J. Vyn. 2006. Soybean response to zone tillage, twin-row planting, and row spacing. *Agron. J.* 98:800-807.
- Kratchovil, R.J., J.T. Pearce, and M.R. Harrison, Jr. 2004. Row-spacing and seeding rate effects on glyphosate-resistant soybean for Mid-Atlantic production systems. *Agron. J.* 96:1029-1038.
- Lee, C.D., K.A. Renner, D. Penner, R. Hammerschmidt, and J.D. Kelly. 2005. Glyphosate-resistant soybean management system effect on *Sclerotinia* stem rot. *Weed Technol.* 19:580-588.
- Pedersen, P. 2008. Row spacing in soybean. Department of Agronomy. Iowa State University Extension. <http://extension.agron.iastate.edu/soybean/documents/RowSpacing.pdf>
- Pedersen, P., and J.G. Lauer. 2003. Corn and soybean response to rotation sequence, row spacing, and tillage system. *Agron. J.* 95:965-971.
- USDA-NASS Objective Yield Surveys <http://www.nass.usda.gov/>