ROW SPACING DECISIONS

In the mid-1970's, most of the soybean varieties grown in the Midsouth were determinate MG's 5 through 7 and were planted in wide rows (36 to 40 in.). Post-planting cultivation was an important component of weed control.

Plants of these varieties were generally tall with lateral branches that resulted in the formation of a complete canopy when grown in wide rows. In fact, these varieties grew to a height that often led to lodging that completely obscured the wide middles between rows.

During the decade of the mid-1970's to mid-1980's, many research projects included a row spacing component where wide and narrow rows were compared in various production systems. Results from these studies showed little to no advantage to planting the above varieties in narrower rows.

Change

In the late 80s/early 90s, things changed. Herbicides that controlled most commonly occurring weeds in soybean production systems became prominent weed control tools. Thus, post-planting cultivation was no longer a necessary component of weed management systems.

The Early Soybean Production System (ESPS) with its use of indeterminate, non-branching, short-statured, early-maturing varieties proved to be a better production system that subsequently became the paradigm for soybean production on a majority of the acreage in the Midsouth.

Today, essentially all soybeans in the midsouthern US are grown in narrow rows because research has shown that increased yields and better canopy closure with subsequent better weed management (Bradley 2006, Knezevic et al. 2003, and Smith et al., CFTM 2019) will result when compared to wide rows.

What is a narrow row?

The definition of a narrow row has become a point for debate. In some situations, a 30-in.-wide row may be considered narrow. For those who broadcast soybeans, a 7- or 8-in.-wide row may be the definition of narrow. Anything in between these two extremes, then, would also be considered narrow.

A hybrid row spacing system involves having a wide space (>30 in.) between the rows that are adjacent to the tractor wheel tracks. Rows between and outside the wheel tracks are narrowly spaced (usually 15 to 20 in.). This system can be set up to accommodate either single- or dual-wheel tractors (Poston 2007, slide 9).

Below are a few points to consider when deciding what "narrow" row spacing to use for soybeans in the midsouthern US.

Soil texture and row spacing

With adequate rainfall and/or irrigation to replenish depleted soil water, loamy soils (silty clay loam, silt loam, and fine sandy loam) promote rapid soybean growth and development because of relatively easy soil water availability. Conversely, clayey soils (generally >50% clay particles) with adequate rainfall and/or irrigation to replenish depleted soil water will promote relatively slower growth because of their slow release of water.

Thus, a variety planted on a particular early date on most loamy soils will produce a larger plant than will that same variety planted on the same date on most clayey soils. Therefore, ESPS plantings grown in 30-in.-wide rows on loamy soils will probably form a complete canopy, while the smaller-statured plants that will be produced on clayey soils will require a narrower row, say 20 in. or less, to achieve complete canopy closure.

Thus, the definition of "narrow" should be considered in concert with the soil texture of the field.

Beds

This topic is included here because it ties in with the discussion in the following section.

- Regardless of soil texture, risks associated with early planting of soybeans in the midsouthern US will decrease when beds are used.
- A bed planting system will reduce potential stresses associated with early-season surface water accumulation and/or soil saturation.
- Beds, or rather the resulting furrows, will facilitate surface irrigation during the growing season.
- The attributes of beds will benefit corn and grain sorghum that may be grown in rotation with soybeans.

Experience and observation have shown that beds constructed on 30 in. or narrower centers are not practical. They do not keep their integrity during the months between construction and planting, they are not easily planted, and they do not provide enough furrow and bed height to facilitate drainage and irrigation.

Conversely, beds that are 38 and 40 inches wide can be constructed effectively. They will most likely maintain themselves during the off-season, especially if rolled flat following formation to minimize bed degradation during high-rainfall winter months.

A PMN Webinar gives an excellent overview of using a bed system for soybean production in the Midsouth. Using a bed system may be especially advantageous for ESPS plantings and for irrigated plantings made on the cracking clay soils in the Midsouth.

Results from 2 years of studies conducted in the Mississippi Delta at Scott, Miss. confirm the yield advantage from planting soybeans on raised beds, especially those that are irrigated. In those studies (2008, 2009), soybean varieties ranging in maturity from MG 4.4 to 4.9 produced 6% to 8% more yield when planted on beds and flood-irrigated. In 2008, yields from beds averaged about 88 bu/acre vs. about 83 bu/acre from flat-planted beans, while in 2009, the yield spread was 80 vs. 74 bu/acre, respectively. Similar results have been obtained from on-farm trials.

A wide-bed planting system should also be considered. These beds can be constructed in the fall soon after harvest using an implement that combines sweeps to dig furrows with wings to distribute the resulting loose soil over a wide area, say 80 inches (MSU Bulletin 1072).

A wide bed will accommodate various narrow row spacings, and will be suitable for different crops that may have varying row spacing requirements. This is probably the most manageable bed system for clayey soils. This system will also facilitate furrow and flood irrigation on clayey soils that crack and allow lateral movement of irrigation water between the widely-spaced furrows.

Soybeans grown in ESPS plantings will be harvested from late July through early September. Since this is normally the driest time of year in the midsouthern US, there should be no ruts left by the combine. Thus, a bed system can remain in place from year to year if there are no harvest ruts, and can be refurbished without destructive primary tillage in the fall when necessary.

Twin rows

A twin-row planting system is being used with increasing frequency (DFP 2005, Mascagni et al. 2008, Grichar 2007, and Bruns 2011). Research in the midsouthern US has generally shown that yields from a twin-row system will be greater than those from 38- and 40-in.-wide rows, which is what they are generally compared to. However, yields from twin-row and narrow-row systems are usually similar (Smith et al, CFTM Nov. 2019).

This system allows planting on 38- or 40-in.-wide beds but at row spacings that are less than the bed width. For example, twin rows spaced 8 inches apart on a 38-inch-wide bed give the same spacing between rows on adjacent beds as a single row planted on a 30-

inch-wide bed. This row spacing is preferred for corn and grain sorghum, and is adequate for soybeans planted on loamy soils.

The 30-in.-wide row spacing in the twin-row system may be too wide for ESPS plantings made on clayey soils because of the growth differences between loamy and clayey soils described above. The problem, then, is how to construct and maintain a bedded planting system on clayey soils that require narrow row spacings to ensure canopy closure.

The above-described wide-bed system with its flexibility for various narrow row spacings for a majority of the rows may be the answer. This system likely will result in better canopy closure, and subsequently, better weed control than will a system of soybeans grown in both twin rows and wide rows (Smith et al, CFTM Nov. 2019).

Dr. John Orlowski, former Delta Soybean Agronomist at MSU-DREC, posted an article on the MCS blog site that dealt with missing rows in twin-row soybeans. A summary of his findings follow.

- On both silt loam and clay soils, there should be no yield loss if only a single row in a set of twins is missing or if there are missing rows in separate sets of twins. The plants in the remaining twin row were able to compensate for the missing row. They also provided sufficient canopy development to prevent weed growth.
- On both silt loam and clay soils, there will be yield loss if both rows in a set of twins are missing. Also, the loss of canopy because of the loss of both rows in a twin set will allow weed escapes that will need attention.

Planting date and Row Spacing

Results reported in a thesis titled "Impact of planting strategies on soybean (*Glycine max* L.) growth, development, and yield" that was authored by Mr. Shane Carver with the MSU-ES SMART program under the direction of Dr. Trent Irby provided the following (click here for detailed summary).

- Choice of row spacing for soybean plantings is not as important as planting early.
- Using narrow rows will not overcome lower yields from June soybean plantings in the Midsouth.

Summary

- Today's soybeans should be grown in "narrow" rows in the Midsouth. This is now a foregone conclusion and is supported by results from research summarized below (Smith et al., CFTM Nov. 2019).
- The determination of the proper "narrow" row spacing should be made with soil texture in mind. Generally, a wider "narrow" row spacing can be used on loamy soils than on clayey soils.
- A twin-row system is a variation of a narrow-row system and is better suited for loamy soils than for clayey soils. However, it generally is no better than a narrow-row system for soybean production.
- The combination of a wide-bed system with a narrow-row configuration matched to a site's soil series offers the best management option for soybean production in the midsouthern US.
- Missing rows in a twin-row system will be of consequence only if both rows in a twin set are missing.
- Planting soybeans early in the Midsouth is more important for increased seed yield than is selection of row spacing.
- Using narrow rows in late Midsouth soybean plantings may be an important agronomic decision, but will not improve yields from these late plantings.

Recent Midsouth Research Results

Results from recent research that was funded by the MSPB confirm all of the above summary statements. Specific details from that research follow.

- Irrigated studies were conducted in 2016 and 2017 at Stoneville, Miss., and in 2016 at Hollandale, Miss. Both sites were predominantly Sharkey clay and were furrow-irrigated.
- A MG IV soybean variety was planted on 9 April,

2016 and 8 April, 2017 at Stoneville, and on 10 May at Hollandale.

- Row spacing treatments were: 1) a single row planted on a 40-in.-wide bed; 2) 2 twin rows that were planted 8 in. apart on a 40-in.-wide bed; and 3) 4 narrow rows spaced 20 in. apart on an 80-in.-wide bed.
- Seeding rate treatments in each row spacing were 100, 140, and 180 thousand seeds/acre.
- Soybeans grown in narrow-row and twin-row systems had greater canopy closure than did soybeans grown in wide rows. This resulted in increased light interception in these two systems. Canopy closure in narrow rows was generally greater than that in twin-rows.
- A seeding rate of 140 thousand/acre generally resulted in the greatest canopy closure regardless of row spacing configuration. Since seed yield was not affected by seeding rate, these results suggest that a seeding rate that is no greater than 140 thousand/acre is sufficient.
- Seed yield from soybeans grown in narrow rows was the greatest at Stoneville, whereas seed yield from both the narrow-and twin-row systems at Hollandale were similar and greater than yield from the wide-row system.
- Net return to soybeans grown in the narrow- row system was greater compared to those from soybeans grown in wide rows at both locations.
- The economic advantage of switching to a narrow-row system was $62/acre greater than switching to a twin-row system at the Stoneville site. At Hollandale, the economic advantage of narrow rows over twin rows was small and not significant.
- The authors concluded that the above results suggest that using a narrow-row system for furrow-irrigated soybeans in the Midsouth can increase soybean yield and economic returns compared to the other systems used in their study. Also, their results indicate that a seeding rate no greater than 140 thousand/acre is sufficient for both canopy closure and profitable seed yield.

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