Narrow-Row Soybeans: What to Consider

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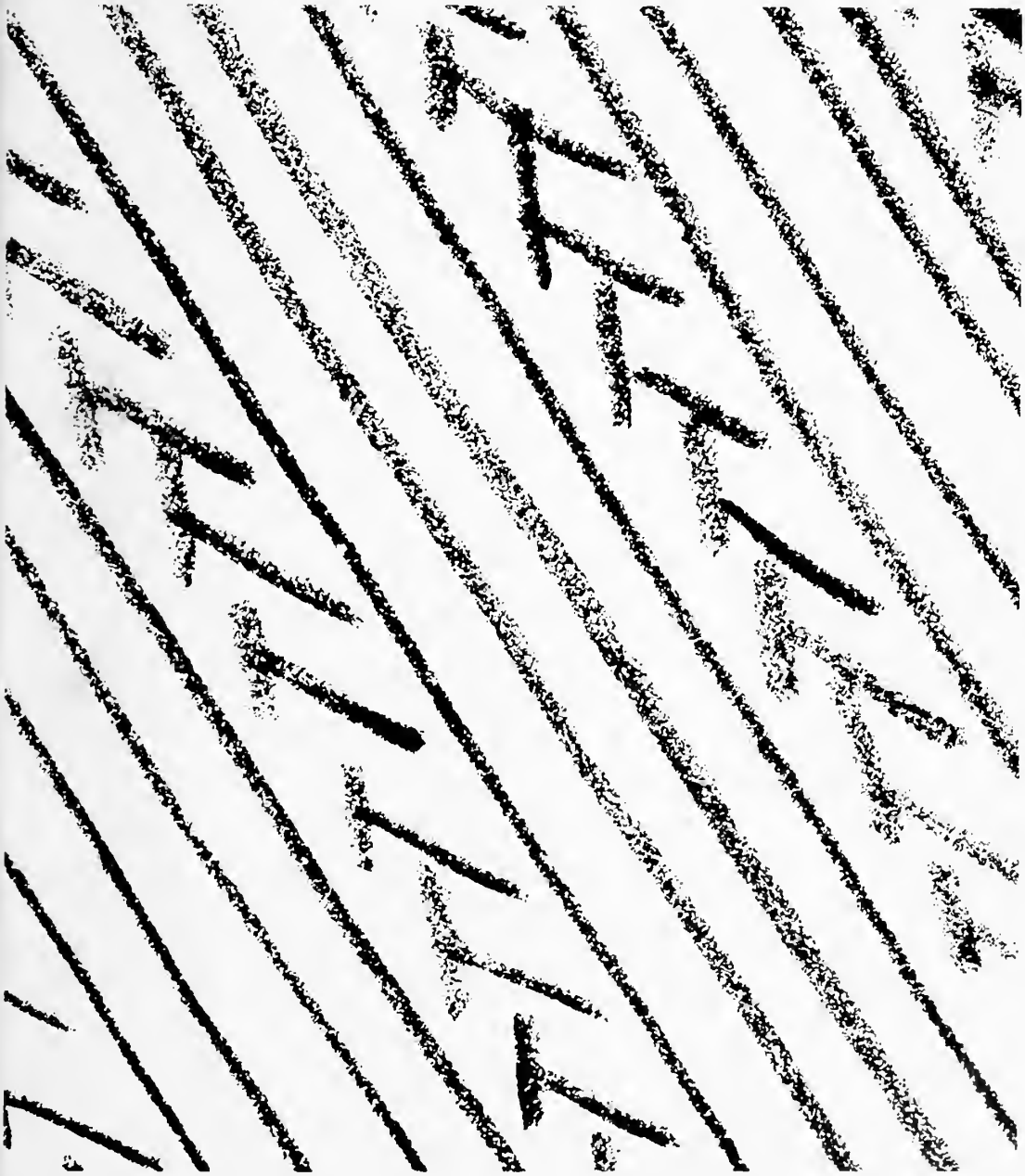

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In 1977 nearly half of the soybean producers in Illinois used rows spaced 36 inches or wider. Many producers probably sacrificed yields because of this wide spacing. According to much research in the Middle West, a row width narrower than 36 inches will probably help to improve soybean yields.

The term "narrow row" is not associated with any particular width. No single width is ideal, since many factors affect the way soybeans respond to row space. Moreover, what seems narrow to one producer may seem wide to another. Thirty inches, for example, may appear narrow to producers using 38 inches but wide to those using 15 inches.

Potential Yield Increase

The main reason for planting soybeans in narrow rows is the potential yield increase. The increase is due primarily to the quicker development of a full canopy in narrow rows and to the reduced competition between plants within the rows.

The sooner a canopy develops enough to fully shade the soil and intercept all available sunlight, the earlier in the season the plants may reach maximum production. As shown in Table 1, soybeans in narrow rows can shade the soil in fewer days than those in wide rows. Table 1 also indicates that a relatively high plant density helps to shade the soil sooner. Illinois soybean fields typically have 100,000 to 160,000 plants per acre.

When soybean plants are redistributed in narrow rows, the space between plants in the rows is increased, cutting down competition between plants. Up to a point, reduced competition improves a plant's yield by reducing lodging and increasing the number of pods per plant. Too little competition, however, is not desirable. Pods may form too near the ground and side branching may increase, so that harvesting is hindered. Competition needs to be great enough to prevent these undesirable effects.

Yield increases will vary from one producer to the next. The amount of increase from narrow rows depends on variety, planting date, and other management practices.

Effect of Soybean Variety on Narrow-Row Yields

We do not yet have a method of predicting how a variety will respond to a reduction of row width. We do know, however, that not all varieties will respond the same. Variation in response among several varieties is seen in Table 2. Inconsistent yield increases when these varieties are grown in narrower rows seem to suggest some varietal influence, but the reason for this is not fully understood. Any given variety can also be expected to have variable responses to narrower rows from year to year or from one location to another.

One possible explanation for differences in response is related to canopy size. When planted in narrow rows, small-canopied crop plants have greater yield increases than plants with large canopies. Relatively early-maturing soybean varieties generally have smaller canopies than full-season varieties. In central Illinois, varieties from maturity groups I and II should usually be more responsive to narrow rows than varieties from the later maturity groups III and IV.

Table 1. — Days Needed for Hawkeye Soybean Canopy to Shade the Soil at Various Row Widths and Plant Populations

Plants/acre	Row width, inches			
	5	10	20	40
		days		
26,136	[a]	81	69	78
52,272	63	60	61	78
104,544	53	55	57	66
209,088	47	49	52	66

[a] The soil was never completely shaded.

Source: R. Shibles and C. Weber, Iowa State University.

Table 2. — Soybean Yield Increases Obtained in Several Studies of Narrow Row Widths

Variety, maturity group	Row widths, inches	Yield increase with narrower width, pct.	Location
Corsoy, II	7 vs. 30	13.4	Urbana, Ill.,
Williams, III	7 vs. 30	15.7	1976
Elf, III	7 vs. 30	3.0	Urbana, Ill.,
Williams, III	7 vs. 30	1.4	1976
Wells, II	7 vs. 34	22.0	West Lafayette,
Amsoy 71, II	7 vs. 34	18.0	Ind., 1975-76
Woodworth, III	7 vs. 34	3.0	
Corsoy, II	8 vs. 30	0	Elwood, Ill.,
Wells, II	8 vs. 30	0	1976
Corsoy, II	8 vs. 40	15.6	Hartsburg, Ill.,
Williams, III	8 vs. 40	1.9	1976
Amsoy 71, II	15 vs. 38	42.8	Carbondale,
Williams, III	15 vs. 38	31.0	Ill., 1977
Kent, IV	15 vs. 38	0	
Corsoy, II	28 vs. 39	7.8	Ames, Iowa,
Amsoy, II	28 vs. 39	6.3	1974

In trials at three locations, earlier maturing varieties did generally respond more favorably to narrow rows than did those maturing later (Table 2). However, the earlier varieties may not necessarily produce the highest absolute yields on any one farm even when grown in the narrow row widths.

Varieties such as Elf, which have small canopies due to determinate growth, may respond quite positively to narrow rows. In trials at Urbana, Elf showed a definite yield increase when row width was decreased (Table 3). Williams, a larger canopied variety, had a much smaller yield increase.

The data for both Williams and Elf also illustrate that the largest yield increases are associated with the first reduction in row width, that is, from 32 to 20 inches. This suggests that producers currently using 36- and 38-inch rows have a very good chance of increasing their yields by simply reducing row widths to 30 inches.

Narrower rows do not always result in yield increases (Table 2), but neither do they reduce yield if reasonable stands of soybeans are achieved in narrow rows and if the environment for soybean production is favorable.

Rate and Date of Seeding

Some producers think they must greatly increase the seeding rate with narrow row widths. This is a misconception. Even if you double the number of rows per acre, doubling the seeding rate is both unnecessary and undesirable. Remember that plants are redistributed in narrower rows and hence are farther apart within the row. For example, the plants are 1½ to 2 inches apart in 30-inch row widths, but 3 to 4 inches apart in 15-inch rows. Be prepared, however, to increase plant numbers if the soybean canopy at your current population does not completely intercept the sunlight relatively early in the season. Yields stand a far better chance of improving the sooner the canopy is complete.

At 30- to 40-inch row widths, populations of 100,000 to 150,000 plants per acre at harvest are usually adequate for top yields from most varieties commonly grown in Illinois. Rows spaced 7 to 10 inches apart might possibly benefit from populations of 150,000 to 175,000 at harvest. Consider the canopy size when choosing the best population for your fields. Plant short varieties such as Elf at slightly higher populations than tall, full-canopied varieties such as Williams.

Yields are usually highest when soybeans are planted in May. If soybeans follow wheat in a double-crop program, they cannot be seeded until late June or early July, so yields will be reduced. The amount of yield reduction can be minimized, however, by planting in narrow rows. Late-planted beans are quite responsive to narrow widths because they develop smaller canopies than early-planted beans. The later the planting

Table 3. — Yields of Large- and Small-Canopied Soybeans at Three Row Widths

Row width, inches	Large canopy (Williams)	Small canopy (Elf)
	bu/A	
8	52.7	53.7
20	52.6	53.6
32	50.8	48.4

Source: J. S. Beaver and R. R. Johnson, University of Illinois.

Table 4. — Effect of Planting Date and Row Width on Soybean Yields

Planting date	Row width, inches		Yield increase
	24	40	
	bu/A		
May 21	41.0	38.5	2.5
May 31	42.5	39.0	3.5
June 23	37.0	31.0	6.0

Source: J. Pendleton, R. Bernard, and H. Hadley, ARS-USDA and University of Illinois.

date, the greater the response to narrow rows (Table 4). However, the highest absolute yields usually result from the combination of narrow rows and a May planting date.

Equipment

Mechanical planting, cultivating, and harvesting of soybeans are standard practices. But an obvious problem develops when a producer decides to use a row width too narrow for standard field equipment. Few row planters can be adjusted to widths of less than 20 inches. Unit planters can be used on a tool bar and adjusted to relatively narrow rows, but this requires investment in a number of unit planters. Producers who want to avoid this expense can use a grain drill, if available, as an alternative method. The drill should be equipped with a slow-speed meter drive. Otherwise, the drill meter adjustment will probably result in many split soybean seeds. A harrow or other tillage tool should be placed in front of the drill to eliminate tractor wheel tracks and to level the soil (Figure 1). Failure to do this will normally reduce the uniformity of the stand.

Cultivation for weed control is impossible when tractor tires are wider than the row spacing. This problem can be solved by using a skip-row planting pattern in which a wider space is left every few rows to accommodate the tractor tires. Because most of the field is planted in narrow rows, yield increases can still be obtained when skip rows are used. Figure 2 illustrates a skip-row arrangement using 15-inch rows and 30-inch tire spaces.

In most cases, harvesting narrow-row soybeans with currently available combine headers is relatively free of problems. However, producers who purchase a row crop header for their combine will have to fit their rows to the dimensions of the header, that is, to a minimum of 30 inches.

Figure 1. Press-wheel drill (top) and end-wheel drill (bottom) in tandem with packer mulcher. (Photos courtesy of R. Nave, ARS-USDA and University of Illinois.)

Weed Control

Weed control is helped by the rapidly developing canopy and the consequent early shading of the soil in narrow-row soybeans. Although shading alone does not give total control, it does help suppress weed growth. This suppression, along with proper selection and application of herbicides, will improve total weed control.

When narrow rows prevent cultivation for weed control, a preplant or preemergence herbicide for grasses is essential. Grasses are often the worst weed problem in soybeans, but to date postemergence herbicides for grass control in soybeans are only in the experimental stage. For broadleaf control, use preemergence, preplant-incorporated, or postemergence herbicides. To prevent plant damage from equipment operations, apply postemergence herbicides while the plants are still small. Late application can of course be made aerially.

Choose the system that gives the greatest probability of successful control. For additional protection, plant narrow-row soybeans only in fields where you know from past experience that weed problems are

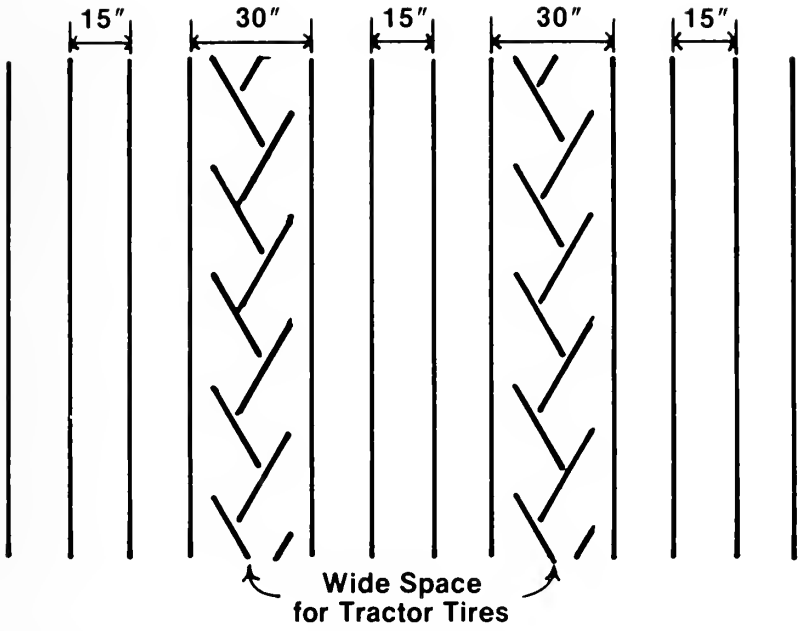

Figure 2. Skip-row pattern with 15- and 30-inch widths for planting narrow-row soybeans. This arrangement allows spaces wide enough to accommodate the tractor tires for mechanical weed control.

manageable. It would be unwise, for example, to plant in a field with a history of severe johnsongrass or morningglory problems.

With the skip-row method of planting, you can use mechanical cultivation, as well as herbicides and shading pressure from the crop, to help control weeds. If skip rows are used, then the methods used for weed control are essentially the same as those for wider rows.

Good Management Necessary

The recent trend toward growing soybeans in row widths of 30 inches or less is backed up by considerable research. Provided that other management practices are adequate, the changeover to narrower rows can possibly increase yields. The narrow row is simply another management tool to be used after the crop is being well managed in traditional, wider rows. Yield increases are generally greatest for the first reduction in row width; increases become smaller as the width becomes narrower. So with good management, many producers now using 36- to 38-inch widths will probably have better yields by planting at 30 inches, and widths of even less than 30 inches may, in some cases, lead to improved yields.

This circular was prepared by G. E. Pepper, Extension agronomist, University of Illinois at Urbana-Champaign. The position is funded by the Illinois Soybean Program Operating Board.

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