Seeding Soybeans in Narrow Rows

A3079

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This information is intended to give some general guidelines for raising soybeans in narrow rows. For this purpose, 18" row widths or less will be considered narrow rows. The narrow rows system may or may not include cultivation. Solid seeded soybeans refer to those planted in 10" rows or less without cultivation. These guidelines consist of a summary of experiences and data obtained the past 4-5 years from:

- University research and Extension trials (particularly Wisconsin)
- Chemical company/farmer trials
- Farmer experiences and innovations.

These guidelines are general in nature and should be evaluated for the specific conditions on a farm or field. Farmers trying narrow rows or solid seeding for the first time should do so with caution, until they are satisfied with the system.

Field Selection

Most geographical areas and soil types have shown positive responses to narrow rows. However, the greatest responses have occurred under conditions which reduce plant growth and where conventional wide rows fail to develop a full canopy. Some examples are very late planting and less productive or lighter soils. The advantages of reduced soil erosion provided by solid seeding are particularly beneficial on more sloping land. Select the most weed free fields when adopting narrow rows for the first time.

Soil Preparation

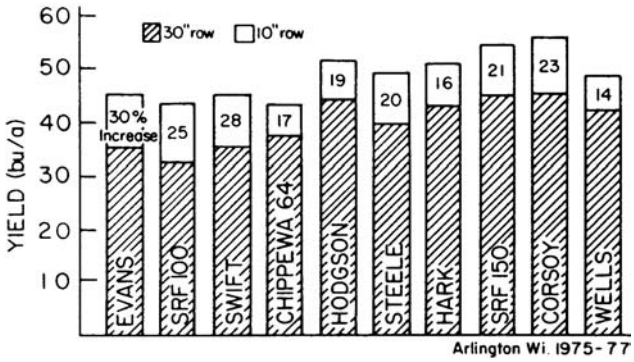
Proper soil preparation is more critical for solid seeding than for conventional wide rows. Much of the available equipment for narrow rows (mostly grain drills) cannot compensate for poorly prepared seedbeds as well as the conventional planters. Fall plowing is generally most desirable in soil which is not subject to erosion. Reduced tillage methods which leave considerable crop residue on the surface often make depth control and seed covering more difficult with standard grain drills. Many of the new planter options help minimize these problems.

If a disc or field cultivator is used, two tillage operations are generally required to prepare the seedbed and to incorporate the grass herbicide prior to planting. Coupling the second tillage device between the tractor and the drill eliminates wheel tracks. Power tillers have also been used ahead of the drill to perform a once-over tillage and incorporation ahead of the planter. It is important to conserve moisture prior to planting regardless of the system used.

Variety Selection

Most soybean varieties currently available were developed for conventional wide rows. Only recently have comparisons been made with some varieties. Several states now include narrow row tests in their evaluation trials. In the near future varieties developed specifically for solid seeding will be available. Generally, the shorter, less branched and slightly earlier maturing varieties for an area respond best to narrow row widths. (Fig. 1).

Figure 1. Soybean Variety Response to Narrow Rows



In southern Wisconsin, Group 0 varieties averaged 28% higher yields when planted in 10" rather than 30" rows. Group I and II varieties gave a 19 increase.

It is recommended that a number of varieties of different types and maturities be evaluated the first two or three years of planting in narrow rows. Be cautious when selecting your favorite wide row variety for narrow rows because the yield response may be different under the different cultures.

Fertilization

Because solid seeding is a relatively new practice, specific fertilizer requirements have not been defined. However, since there are generally higher plant populations and a higher yield potential in narrow rows, the crop will require more nutrients. Obtain a soil test and fertilize for high P and K levels. It is also suggested that fertilizer rates be increased 10-20 over those used in conventional wide rows. Since most narrow row planting equipment will not have fertilizer attachments, fertilizer will need to be broadcast and incorporated prior to planting.

Seeding Rate

The seeding rate of a given variety should be increased 20-25% over the ideal rate in wide rows. Increasing the seeding rate in solid seedings is necessary to:

- Compensate for potentially greater stand losses die to a less uniform planting depth, crusting, and rotary hoeing.
- Insure a full, uniform stand to aid in season-long weed control.

However, overseeding should be avoided especially with:

- Varieties susceptible to lodging.
- Droughty soils and areas normally receiving low seasonal rainfalls.

Even though solid seeding reduced soil evaporation early in the season, over population can increase plant transpiration beyond the saving effect. This could result in increased drought stress during the pod-filling period.

The ideal seeding rate varies considerable between different varieties and conditions, thus, specific seeding rate recommendations are impossible. The following are general guidelines which might be helpful when solid seeding for the first time.

1. If planting in 11”-20” rows, use 150,000 *viable* seeds/acre as a base. For 10” rows or less, use 175,000.
2. Add 10% if planting very early or very late in the season.
3. Add 10% if planting short, thin line, or early maturing varieties.
4. Add 10% if planting in a poor seedbed.
5. Subtract 10% is planting in deep fertile soils where lodging is generally a problem.
6. Subtract 10% if planting in ideal conditions for the area, i.e. planting date, seedbed, soil moisture, and temperature.

When determining the seeding rate, consider the percentage of germination and seeds/pounds. If both factors are available, use Table 1 to determine the seeding rate in pounds/acre. If seeds/pound are unavailable, use Table 2 to determine the seeding rate in seeds/foot of row. During the growing season, plant populations are best determined by counting the number of plants per square yards (9 square feet) at several places in the field and using Table 3 to determine plants per acre.

Table 1. Seeding Rate Based on lbs. of Seed Per Acre

Seeds/Pounds	Desired Viable Seeds/Acre			
	125,000	150,000	175,000	200,000
2,000	63	75	88	100
2,100	60	71	84	95
2,200	57	68	80	91
2,300	54	65	76	87
2,400	52	63	73	83
2,500	50	60	70	80
2,600	48	58	67	77
2,700	46	56	65	74
2,800	45	54	63	71
2,900	43	52	60	69
3,000	42	50	58	67
3,100	40	48	56	65
3,200	39	46	54	63
3,300	38	45	52	61
3,400	37	44	51	59
3,500	36	43	50	57

To compensate for germination use the following formula:

$$\frac{\text{Desired Lbs/Acre}}{\text{\% Germination}} = \text{Actual Lbs/Acre Required}$$

Example: 65 lbs/A desired at 90% germination=

$$\frac{65}{.90} = 72 \text{ lb/A required}$$

Table 2. Seeding Rate Based on Seeds/Foot of Row

Row Spacing	Desired Viable Seeds/Acre			
	125,000	150,000	175,000	200,000
30”	7.2	8.6	10.0	11.5
20”	4.8	5.7	6.7	7.7
18”	4.3	5.2	6.0	6.0
15”	3.6	4.3	5.0	5.7
12”	2.9	3.4	4.0	4.6
10”	2.4	2.9	3.3	3.8
9”	2.2	2.6	3.0	3.4
8”	1.9	2.3	2.7	3.1
7”	1.7	2.0	2.3	2.7
6”	1.4	1.7	2.0	2.3

To compensate for germination use the following formula:

Desired Seeds/Foot = Required Seeds/Foot
% Germination

Example: 2.7 Seeds/ft. desired at 90% germination=

2.7 = 3.0 seeds/ft/ required
.90

Table 3. Soybean Stand-Plants Per Square Yd. vs. Plants/Acre*

Plants/sq. yard	1,000’s of plants/A	Plants/sq. yard	1,000’s of plants/A	Plants/sq. yard	1,000’s of plants/A
15	73	25	121	358	169
16	77	26	126	36	174
17	82	27	131	37	179
18	87	28	136	38	184
19	92	29	140	39	189
20	97	30	145	40	193
21	102	31	150	41	198
22	106	32	155	42	203
23	111	33	160	43	208
24	116	34	165	44	213

*Example- If there are 31 plants per square yard (9 sq. feet), the plant population is 150,000 per acre.

PLANTING

Adequate planting equipment for narrow row or solid seeding has been limited to the past. Equipment manufacturers recently have responded to the increasing interest in solid seeding be developing several new planters with improved options designed specifically for soybeans. Even though some drills are less than ideal, they still produce significantly higher yields than conventional wide rows, Table 4.

Table 4. Average Yield of ‘Hodgson’ and ‘Wells’ Soybeans Planted with Different Equipment. Arlington, WI 1976078

		Yield	
Equipment	Row Width	Bu/A	% Increase
Soybean planter	30”	44.5	--
Soybean planter	10”	56.0	26
Drill (single disc)	7”	50.0	12

Rotary Hoeing

In solid seeded soybeans, the plants are spaced individually within the rows and cannot depend on mutual support for emerging through a crust. If soil becomes crusted prior to the time of emergence, do not hesitate to rotary hoe. Rotary hoeing may reduce stands by 10%; however, a heavy crust could reduce stands by as much as 100%. Driving on the emerging beans generally will not reduce the stands significantly or cause long-term effects in the wheel tracks.

Weed Control

In conventional, wide row soybeans, weed control throughout the season is accomplished by three primary factors- herbicides, cultivation, and soybean competition (ground shading or canopy effect). In solid seeded and certain other narrow row systems cultivation is not possible, so the other two factors must compensate. Recent experiences suggest that these two factors will produce season-long weed control if the following guidelines are followed:

1. Preplant incorporate a herbicide or herbicide combination for control of annual grasses and broadleaf weeds. For specific

recommendations see University herbicide bulletins.

2. Just prior to planting, till the soils to further incorporate the herbicide, to remove and germinating weeds, and to smooth and firm the seedbed. If possible, this tillage machine should be coupled between the tractor and soybean planter to remove the reactor wheel tracks and to conserve moisture.
3. Adjust seeding rates to provide good assurance of a full uniform stand.
4. If broadleaf weeds such as velvetleaf, cocklebur, smartweed, and others escape prior herbicide treatments or, if a broadleaf herbicide was not applied, apply Basagran post-emergence when the soybeans are between the unifoliate and second fully expanded trifoliate (V1-V3) stages of growth. This period generally corresponds to 14 to 25 days after planting, but weather extremes may alter this timing.

The herbicide rate is determined by weed size and species. Read the label for details. Application should be made early, before the soybean canopy begins to interfere with good spray coverage of the weeds and while weeds are small and very susceptible. Basagran may be applied by air. However, driving over the soybeans with ground sprayers will generally cause no adverse effect, provided the soybeans are smaller than the third trifoliate leaf stage and the soil is not excessively wet.

Harvesting

Harvesting solid seeded soybeans in the past has created some problems because of heavy weed infestation and/or plants wrapping at the end of the reel. Some equipment manufacturers now offer options which separate out the beans ahead of the reel. Most growers with new or modified headers agree that harvesting narrow row soybeans is easier and more efficient than harvesting soybeans in conventional rows.

With weed control achieved as outlined above, harvesting narrow rows has several advantages over conventional rows:

1. There are no cultivar ridges so growers can harvest in any direction to accommodate lodging, wet spots, etc. Headers are less likely to dig into the ground and pick up rocks.
2. Harvest losses are reduced because pods set higher, lodging is usually less severe, and there are no ridges to interfere with header operation.
3. Combine efficiency is increased. The even distribution of plants makes them easier to cut. Plants feed into combine more evenly. Full width of headers is utilized.

Economics

Wisconsin data indicate that narrowing rows from 40” to 30” will result in approximately 8% higher yields. Reducing row width from 30” to 10” or less gives an additional 20%+ boost in yield. Assuming average yields of 35 bu/a in 40” rows at $6.25/bu, this means an added income ranging from $17.50 to $67.50 per acre, depending on the changes made (Table 5). In addition, one cultivation can generally be saved when going from 40” to 30”. If planting in 10” or less rows, two cultivations may be saved.

Production expenses are slightly higher with narrow rows (Table 5). Additional planter units may be needed to plant in 30” rather than 40” rows, or a new drill may be needed. Herbicides, seed, and fertilizer costs may be slightly higher. For purposes of this comparison, the added herbicide costs include half the cost of a post emergence herbicide. This added expense may be eliminated by some growers who intend to use the same herbicide on solid seeded soybeans as they do on their conventional rows. In solid seeding, the cost of one rotary hoeing is also added.

Table 5. Added Profit for Narrow Rows

	Reducing row width from		
	40" to 30"	30" to 10" or less	40"to 10" or less
Added Income			
- Higher yield @ 6.25/Bu.	$17.50	$50.00	$67.50
-Less cultivation @3.00/A each	$20.50	$53.00	$73.50
Total	$20.50	$53.00	$73.50
Added expenses			
-Herbicides	---	$9.00	$9.00
-Seed @ 12.00/Bu.	$1.20	$3.60	$4.80
-Fertilizer (+20%)	---	$3.60	$3.60
-Planter Costs	$1.20	$2.00	$2.00
-Rotary Hoeing	---	$2.00	$2.00
Total	$2.40	$20.20	$21.40
*Net Profit	$18.10	$32.80	$52.10

* Based on these assumptions, net profits can be increased $18/A if row widths are reduced from 40" to 30". However, these net profits can increase another $32/A by switching from 30" to 10" or less. Finally, growers currently planting in wide 38-40" rows, may be able to realize a $52/A increase in profit by switching to the narrow row system. Growers are encouraged to use these figures as guidelines to calculate their own profit potential for their farm.

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