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Soybean replant issues

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Abstract
Replant decisions are usually made without a valid stand count to determine plant populations because visual estimations are made that will probably underestimate the plant population. Seedlings are usually in the early vegetative stages with only a few leaves expressed. If a good ground cover does not exist, or gaps occur within the row, the conclusion may be to replant the soybean crop. Narrow row width may exaggerate the impression because there are larger spaces between plants within rows. Replanting is not recommended unless the cause of the previous poor stand has been corrected. To avoid unnecessary replanting, make sure you have a valid stand count before making a replanting decision.

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Replant decisions are usually made without a valid stand count to determine plant populations because visual estimations are made that will probably underestimate the plant population. Seedlings are usually in the early vegetative stages with only a few leaves expressed. If a good ground cover does not exist, or gaps occur within the row, the conclusion may be to replant the soybean crop. Narrow row width may exaggerate the impression because there are larger spaces between plants within rows. Replanting is not recommended unless the cause of the previous poor stand has been corrected. To avoid unnecessary replanting, make sure you have a valid stand count before making a replanting decision. Other factors to consider include

1. cause of stand reduction,
2. uniformity of remaining stand,
3. yield potential of remaining stand,
4. weather conditions,
5. date of replanting,
6. yield potential of replanted stand,
7. cost of replanting, and
8. convenience of task compared with other jobs.

Often, the stand reduction is not uniform in the row or the field. Gaps often occur in rows, but if the gap is less than 2 feet in diameter, the adjacent soybean plants are capable of filling those gaps by developing branches to occupy the space. These branches develop additional pods and seed to help compensate for seed production lost by the reduced stand. Gaps greater than 2 feet in diameter will probably contribute to lost yield. Uniformity within a field is another problem. Stand reductions are frequently patchy in their distribution across the field. The size and location of the poor stand area must be considered before replanting. If the area is less than 1 acre and isolated in the middle of a field the effort needed to replant, and the potential damage to the existing crop by driving equipment to the location, may not be worth the return gained by replanting. **A "quick fix" by replanting into the existing stand is not recommended**. Replanting into the existing stand results in nonuniform plant size, which results in uneven competition for light, moisture, and nutrients. The younger plants suffer due to the competition from larger, adjacent plants and may produce fewer soybean seeds or not survive the competition.

A study at the University of Minnesota evaluated the effect of stand reduction at different growth stages on yield over seven-location years. Full-yield potential was assumed to be the highest yield at the VC stage, but due to experimental variability some yields at the V3 stage were higher and resulted in potential yields greater than 100 percent. Yield losses were 3

percent or less when stands were thinned to 75,000 plants (even with 1-ft gaps) at the VC and V3 stages. When the plant density was thinned to 100,000 or more the yield losses were 2 percent or less with all three thinning stages. The 2-ft gaps at 75,000 plants resulted in yield losses of 8 percent or more at each thinning stage. Acceptable compensation occurred at plant densities of 75,000 plants per acre or more for all three stages of thinning, except at V6 with 1-ft and 2-ft gaps. However, adjacent soybean plants were less able to compensate for the reduced stands of 50,000 plants per acre when thinned at the V3 and V6 stages. Nonuniform stands with 1-ft gaps produced similar yields when thinned at the VC or V3 stages. Nonuniform stands with 2-ft gaps at the same stand density yielded significantly less.

Table 1. Effect of plant density established at three stages of growth on soybean yield.

	Thinning stage		
Plant density	**VC***	**V3**	**V6**
Plants/acre	**Percent of full-yield potential**		
50,000	92	85	74
75,000	98	99	92
100,000	100	107	98
125,000	99	102	100
150,000	100	101	100
1-ft gaps (75,000)	97	97	89
2-ft gaps (75,000)	92	92	86

*VC, cotyledon stage; V3, third node stage; V6, sixth node stage.

If the surviving stand is uniform and 75,000 plants or more, the producer must evaluate the economics of replanting by estimating the yield potential due to late planting and other associated costs. In Table 1, stands of 75,000 plants were consistently above 90 percent yield potential, except when the stand was nonuniform (1-ft and 2-ft gaps) and the stand reduction occurred at the V6 stage. **A soybean stand, which has the potential to yield 90 percent or more, should be saved and not replanted.**

Date of planting studies have provided information that is useful in determining the potential yield loss due to delayed planting or replanting. Studies at Iowa State University evaluated dates of planting at five locations (two in northern Iowa, one in central Iowa, and two in southern Iowa) from 1994 to 1996. The results are shown in Table 2.

Table 2. Effect of planting date on soybean yield in Iowa (1994-1996).

Planting date	Northern Iowa	Central Iowa	Southern Iowa

	Percent of potential yield		
Late April	100*	96*	98*
Early May	96*	100*	100*
Mid-May	99*	96*	98*
Early June	81	93	89
Mid-June	61	59	82
Early July	33	45	47

*, not statistically different.

Planting soybeans on or before mid-May allows an equal opportunity to produce the potential soybean yield because there was no statistical difference among those dates for each zone of Iowa. **Delays in planting until early June resulted in significant loss in potential yield for each zone.**

Understanding how to determine estimated plant stand is critical to replanting decisions. Wait several days after the stand is damaged and count only live plants when determining plant stand. If the soybean plant has been cut off and is healthy it should start regrowth in a few days with optimum environmental conditions. Bruised plants may or may not survive depending on the severity of the bruise and the presence of disease organisms. Leaf removal is a less serious damage than stem damage and will have little effect on yield if some leaf tissue remains on the plant. If hail has caused the stand reduction, a hail-adjusting professional should be consulted for accurate yield loss estimates.

To determine plant stand, select the area of the field with the most damage, or lowest plant stand, and make at least 10 random stand counts in an area where the stand is reasonably uniform. Use a tape measure and mark off 1/1,000 th of an acre for each count. Average the counts for plants per foot of row in the area and use the information in Table 3 to determine the estimated plant density for that area of the field. The lengths of rows to equal 1/1,000th of an acre with different row widths are as follows:

38-inch row width = 13 feet,9 inches

36-inch row width = 14 feet, 6 inches

30-inch row width = 17 feet, 5 inches

20-inch row width = 26 feet, 2 inches

15-inch row width = 34 feet, 10 inches

10-inch row width = 52 feet, 3 inches

7-inch row width = 74 feet, 9 inches

Table 3. Plant density for common row widths based on the average number of plants per

foot of row.

	Plants per acre (x 1,000)						
	Row width (inches)						
Plants per foot of row	38	36	30	20	15	10	7
2	27.5	29.0	34.8	52.3	69.7	104.5	149.3
4	55.0	58.1	69.7	104.5	139.4	209.1	298.7
6	82.5	87.1	104.5	156.8	209.1	313.6	
8	110.0	116.2	139.4	209.1	278.8		
10	137.6	145.2	174.2	261.4			
12	165.1	174.2	209.1	313.6			
15	206.3	217.8	261.4				

Example: 10 plants per foot of row in a 30-inch row width = 174,200 plants per acre.

Table 4 provides the information to determine the plant density if plant counts are based on plants inside a circle. A hula-hoop can be used to take rapid stand counts, especially in narrow row widths. Toss or roll the hoop into the area to be counted and allow it to fall at random. Then count the plants inside the circle and use the information in Table 4 to estimate the plant density. At least 10 samples should be averaged for a reliable estimate.

Table 4. Plant density per square yard and circle measurements based on number of plants counted per area.

		Plants per acre (¥ 1,000)			
	Circle measurements (inside diameter)				
No. of plants	38"	36"	34"	32"	30"
10	55	62	69	78	89
12	66	74	83	94	107
14	77	86	97	109	124
16	89	99	110	125	142
18	100	111	125	140	160
20	111	123	138	156	178

22	122	136	152	172	196
24	133	148	166	187	213
26	144	160	179	203	231
28	155	173	193	218	249
30	166	185	207	234	266
32	177	197	221	250	284
34	188	209	235	265	302
36	199	222	249	281	
38	210	234	263	297	
40	221	247	277		
42	232	259	290		
44	243	271	304		
46	255	284			
48	266	296			

Example: 24 plants counted inside a 34-inch circle = 166,000 plants per acre.

After determining the cause of the stand reduction, uniformity of remaining stand, and yield potential of remaining stand the producer must evaluate the alternative of replanting. The decision should be made by considering the weather conditions, estimating the date of replanting, estimating the real costs to replant, estimating the yield potential of the crop if replanted, and weighing the convenience of replanting. **If the soybean stand is healthy and uniform, the date of replanting is early June or later, and has at least 73,000 plants per acre the stand is probably worth keeping.** However, if a reduced stand is saved, weed control must be a priority. Reduced soybean stands allow more light to reach the soil surface and more weeds will probably germinate. Watch the field closely and use appropriate weed management practices or the soybean yield will be reduced by weed competition.

Before a decision is made to replant, the real costs of replanting must be calculated. These costs include seed, fuel, pesticides, depreciation, and labor costs. Other costs, such as interest on a loan to replant, risk of yield loss due to frost damage in the fall on late-planted soybeans, and the opportunity costs and convenience associated with the replanting task, also should be considered. If the decision is made to replant, consider planting the crop in intermediate or narrow row widths and at slightly higher plant densities than normal. Soybean flowering is affected by day-length, and flowering occurs shortly after the longest day of the year. Soybeans planted in mid-June or later will probably flower before they reach normal height and will not develop the same height as soybeans of the same variety planted earlier. Shorter plants will not close the canopy as rapidly as normal, and plants will not be able to use the environment efficiently to maximize yield. Weeds also may be a problem in late-planted soybeans if the plant size is smaller and canopy closure does not occur rapidly.

Reduced soybean stands may not be ideal, but replanting may not be cost efficient either.

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