Soybean Replanting Considerations for Maximizing Returns

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Soybean Replanting Considerations for Maximizing Returns

Soybean producers whose crops suffer poor stand emergence may wonder whether or not replanting presents a viable, economic alternative. Sometimes growers elect to replant deficient stands, but doing so can add considerable expense to their operations through the costs for seed, tillage operations, and perhaps even herbicides. The economic risk compounds if a grower suffers a loss in potential yield due to late seeding, which eventually leads to a reduction in net profit. Making the decision to either replant or stick with a somewhat deficient field is difficult. To that end, the information in this circular is intended to help growers decide which course of action will present them with the best economic return.

The Compensation Level of Soybeans Versus Replanting

One of the most important features of the soybean plant is its large capacity to compensate for low plant populations. When deficient stands occur early in the growing season, soybeans planted next to the gaps in deficient stands can compensate for lost yield: when soybeans are planted next to a gap, they have more room to branch out, thus producing more seeds and pods than soybeans planted in full, crowded rows. Because of the soybean's ability to compensate in this way, irregular or uneven stands often yield surprisingly well.

Most of the soybeans grown in Illinois exhibit indeterminate growth habit, although a few varieties with a determinate growth habit have been introduced. Illinois field studies have shown that, when initial stands are planted in a timely fashion (at the beginning of the growing season when weather first permits), the soybean's growth habits do not affect the plant's ability to compensate for yield in deficient stands. However, when serious delays in planting occur, particularly into late June, determinate varieties adapted to the Midwest often appear less capable of filling in the soybean leaf canopy in typical 30-inch rows. Lack of full canopy development by the late flowering or early pod stages will limit a crop's potential yield.

Rarely does the yield potential of replanted soybeans equal that of soybeans planted at the beginning of the growing season. A two- or three-week delay in planting generally results in measurable reductions in yield. Further reductions can occur if replanting follows a delayed seeding date. If replanting is to be a profitable alternative, growers should replant as soon as possible in order to minimize the yield penalty (loss in yield) associated with delayed planting.

If a deficient soybean stand seems to result from a limited water supply, the grower should examine ungerminated seed at a number of locations throughout the field to determine whether or not the seed still exhibits the potential to germinate and grow. If the embryo color remains light yellow, the seed can probably still germinate and produce a healthy plant. Also, it is not uncommon for rain to bring about a second flush of germinating seed, thereby essentially completing a stand. If ungerminated seed still appear sound, then replanting may be neither wise nor profitable.

Warmer soil temperatures associated with advancing dates in the growing season generally enhance the rate of soybean emergence after replanting. However, low soil moisture at the time of replanting increases the risk of a second, poor stand. If replanted soybeans fail to emerge adequately, the grower may be in a worse position than before.

Research that has generated random deficiencies in soybean stands provides data that support replanting decisions in fields that develop uneven stands in 30-inch rows. However, before replanting, the grower needs to determine both the percentage of total row occupied by gaps and the stand count in the remaining row sections: both factors will influence the degree of compensation expected from a deficient stand and ultimately, the yield. A comparison needs to be made between the expected yield and subsequent dollar return from a less than perfect stand with that from a replanted crop. Too often a grower feels compelled to replant due to constraints stemming from the landlord, banker, or neighbors. Replanting decisions should be based solely upon the factors that help in identifying the best economic opportunities. Also, if the crop is insured against yield loss due to poor stands, the grower should have the field inspected by an insurance adjuster before deciding to replant.
Evaluating Stand Deficiency and Plant Density

Evaluating irregular soybean stands is the single, most important step before making a decision to replant. The percentage of stand deficiency will most often be the determining factor in whether or not a grower will stick with the potential yield from a less than uniform full stand or choose to replant in the hope of increasing yield potential with an improved stand. The following Tally Sheet and sampling method have been devised for determining the levels of stand deficiency in 30-inch row soybeans.

The Tally Sheet

The tally sheet is used to record three types of information: data on the extent of stand deficiency, data on remaining, uniform stand sections, and calculations for determining the average number of plants per foot of row in remaining row sections. A grower can use this information to calculate whether or not replanting presents a viable, economic alternative. The use of the tally sheet will be explained in conjunction with recording data and figuring calculations.

Evaluating Stand Deficiency

Select a location representative of the stand deficiency and apply the Boot-Toe Method as described in this section. Be sure to have your tally sheet and a pencil with you.

1. Starting at the edge of the field and at a point between a pair of rows, walk at least 25 paces into the field. Be sure that you are well into the field and not in the turn rows at the field edge.

2. Walk five paces down the space between the rows and stop. You are at the location of the first of 50 observations that you need to make.

3. First, take your tally sheet and make a "hash mark" on the first blank line of the column headed Number of observations: this mark records your first observation. Eventually, you will have five hash marks on this line to designate the 5 observations you will make for the first pair of rows. (The number 1 to the left of the column designates this as the first set of paired rows.)

4. Next, note and record any gap 12 or more inches long that occurs either to the left or the right of the toe of the boot with which you took the last pace. Record this information in the same way on the first blank line of the column headed Number of gaps: make one hash mark for each gap. You have the possibility, then, of recording two hash marks for this observation and of recording up to ten hash marks for this pair of rows. Remember, you count only the gaps that are 12 or more inches in length. Generally, gaps of less than 12 inches are fully compensated for by the remaining plants and are not considered a liability to potential yield. Figure 1 illustrates the type of gap to record when making an observation.

5. Take 10 more paces, stop, and again record any gap 12-inch or longer gaps you find to your left or right. Then, move on, stopping every ten paces until you have recorded your observations a total of 5 times for this pair of rows. Do not continue farther down the space between the rows.

6. Next, moving either to the left or to the right, cross 9 or a greater odd number of rows and stop. Then, begin your observations as before, until you have recorded the same type of information 5 times for this
second pair of rows. Your information will go on the next set of lines on your tally sheet, in the space provided for recording the second pair of rows. Repeat the observation process until you have recorded the gaps for ten pairs of rows.

7. After you have recorded your data on the 10 pairs of rows, add the total number of gaps you recorded, and write this figure at the bottom of the Number of gaps column: this number will be your estimate for the percent of stand deficiency in your soybean crop. You can add to this information by repeating the observation process in other areas of the field that exhibit stand deficiencies. However, one series of observations (50 stops, 2 observations per stop) can provide an accurate estimate of your crop's stand deficiency, provided the area you sampled was representative of the field as a whole.

After collecting the data on stand deficiency, the next step is to determine the density of plants per foot of row in the uniform sections of the field. This information will be used along with that on stand deficiency to determine the percent of full yield potential in your field and ultimately, whether or not replanting will be of economic benefit.

**Evaluating Plant Density**

Return to the same area of the field that you used for the last sampling. Use the following procedure to collect your data on plant density. Be sure to bring your tally sheet and a pencil.

1. Identify at random 10 row sections that appear to have a full or fairly uniform plant stand.
2. For each row section, count the number of plants you find in a single 3-foot section of that row.
3. Record the number of plants from that 3-foot section on one of the blank lines under Plants per 3 foot of row on your tally sheet. Repeat this procedure for each of the 10 sections.
4. After recording your 10 plant counts, add the ten lines and divide that total by 30 to determine the average number of plants per foot of row. Record this figure on the blank line in the section of your tally sheet entitled Plants per foot of row.

**Predicting the Relative Yield Potential**

Table 1 provides you with a means for predicting the relative yield potential of your field. The table provides values for stand deficiency and for plant density in remaining row sections. You can compare these values against the estimates for stand deficiency and plant density that you recorded on your tally sheet. The left column of Table 1 (Percentage of stand reduction) lists percentages of stand reduction from 0 (a full stand without gaps) up to 60 percent (only 40 percent of the stand remaining). The three values under Plants per foot of row represent the average number of plants (8, 6, or 4) found in a remaining row section of a stand deficient field. Values within the table represent estimated percentages of full or average yield potential you might expect for various combinations of stand reductions and remaining plant densities within a row. The following example will show you how to use this table to predict the relative yield potential of a soybean crop that has a stand deficiency problem.

Suppose that your percentage of stand deficiency is 34 percent. You will want to compare your percentage with the one most closely approximating it in the table under the column headed Percentage of stand reduction. Since that number is 30, you will read to the right across the line of the table on which 30 appears: this will enable you to determine the yield potential of your field according to the average number of plants you have per foot of row and taking into account your crop's percentage of stand deficiency. But let's return to our example to see your specific calculation.

Things seldom come out in even numbers, so let's imagine that your plant count averages 7 plants per foot of row. If you read straight across to the right, the next number is 93 (or 93 percent). If you read directly above to the top of the column, you will find that 93 percent is the relative yield potential of your field if you average 8 plants per foot of row. This estimate is slightly to the high side of what your estimate would be, but it is still fairly close. To gain a more accurate range for determining your estimate, read to the right of the number 93 and you will find the number 90 (or 90 percent), the estimated percentage of yield potential if you average 6 plants per foot of row in full-growing stands. Obviously, this number is slightly to the low side, but now you

<table>
<thead>
<tr>
<th>Percentage of stand reduction</th>
<th>Plants per foot of row</th>
<th>Plants per foot of row^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100 97</td>
<td>95</td>
</tr>
<tr>
<td>10</td>
<td>98 96</td>
<td>93</td>
</tr>
<tr>
<td>20</td>
<td>96 93</td>
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<td>30</td>
<td>93 90</td>
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<td>50</td>
<td>84 81</td>
<td>78</td>
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<tr>
<td>60</td>
<td>78 75</td>
<td>73</td>
</tr>
</tbody>
</table>

^a Plants per foot of row in sections without gaps.
have a range of 90 to 93 percent from which you can estimate the yield potential of your own crop.

The preceding example shows you how to reach a fairly accurate estimate for your crop's yield potential by using the information from your tally sheet and from the table. But remember that the numbers in the table are used to calculate the percentage of full yield potential for a field that was planted on time but that suffers stand deficiency to some degree. The yield potential calculated from this table will be realized only if the plants remaining in the field are healthy and kept free of weeds.

**Comparing Reduced Yield with Yield Obtained from Replanting**

Determining the percentage of full yield for a deficient stand will not provide you with all the necessary information for making a replanting decision. A figure for average base yield must be determined so that you can ultimately compare the yield from a somewhat deficient crop with that from a crop with replanted soybeans. This comparison will allow you to determine whether or not replanting will increase yield and thus, profitability. The average base yield differs from grower to grower but is simple to calculate. The average base yield will be the number that represents the yield a grower believes can be achieved from a particular field for the variety of soybean grown there and under the management system (including the original planting date) used for that field. The figure for average base yield will represent an average level of production for the field when a full stand of soybeans is achieved.

After estimating your average base yield, multiply that number by the percentage of full yield expected from a reduced stand (the percentage you took from Table 1). Multiplying these two numbers will give you the estimated yield potential in bushels per acre for your field. For example, if your field has a 30 percent stand deficiency with 6 plants per foot of row in the remaining sections, your estimate for full yield potential is 90 percent. If your average base yield is estimated to be 50 bushels per acre, then the estimated yield potential for your field is 45 bushels per acre. Of course, this estimate is based on the assumption that your remaining plants are healthy and that weeds can be controlled in those areas lacking soybean plants.

Next, multiply the figure for average base yield by the percentage of full yield that can be expected from replanting. The following percentages of full yield can be anticipated after replanting, depending upon the average number of plants per foot of row that you achieved from the replant:

- 8 plants .................. 89 percent
- 6 plants .................. 86 percent
- 4 plants .................. 83 percent

To return to our preceding example, if the percentage of full yield you expect after replanting is 89 percent (8 plants per foot of row) and you multiply your average base yield of 50 bushels per acre by that percentage, then the estimated yield potential after replanting is 44.5 bushels per acre. Again, the estimated percentages of full yield for 8, 6, and 4 plants per foot of row after replanting are based on the assumption that a uniform stand will be achieved through replanting. Also note that the plant density within each row will also influence the potential yield.

Finally, compare the potential yield in bushels per acre from the deficient stand with that expected from replanting: in our preceding example, 45 bushels per acre compared with 44.5 bushels per acre. The difference by which the yield from replanting is greater (if any) than that from the deficient stand will represent the gain associated with replanting. However, even if replanting seems to offer you more harvestable beans, other factors you need to consider may not make replanting the most economical option.

**Evaluating Returns from Replanting**

Once you have calculated a figure that represents a gain in yield (if any) associated with replanting, you need to compare the market value of this yield increase with the costs of replanting. Generally, replanting costs will include those for seed, fuel, equipment, labor, and interest on investment. If the dollar value of your increased yield will more than pay for these costs, you may decide that replanting provides an economic benefit to your crop returns. However, if only 30 to 40 percent of your stand consists of gaps, you will most likely find no justification for replanting.

Whatever your decision, two other factors you should weigh in conjunction with replanting are weed control in stand gaps and disease problems in the remaining plants. Gaps provide a favorable environment where weeds can flourish and thus reduce the potential yield if you decide to stick with a less than desirable stand. On the other hand, replanting often requires a chemical weed control program as well. If seedling disease problems cause gaps to occur, you stand a fair chance of your remaining plants being either infected or at least stressed for the remainder of the growing season. If the remaining plants in an irregular stand are diseased, replanting may be justified. At present, researchers have not yet been able to forecast the effects posed by the additional stress of disease on already irregular stands. But it is a safe assumption that soybeans will only be able to compensate for yield in irregular stands if the majority of the remaining plants are disease free.
Summary

Be sure to observe the following points when deciding whether or not to replant soybeans if deficient stands occur.

1. Evaluate the level of stand deficiency by using the Boot-Toe Method of stand evaluation.
2. Estimate the potential yield for your field, taking into account the level of stand deficiency.
3. Estimate the yield potential from replanting.
4. Compare the yield potential of your field with the existing gaps against that of a replanted field which you assume will emerge well to give you a full stand.
5. Compare the economic returns of your two alternatives (keeping the somewhat deficient crop or replanting). Use the accompanying Work Sheet to record your estimates.
6. Check your insurance policy on crop damage before proceeding with replanting.

Work Sheet

Stand reduction estimate using Boot-Toe Method _____% Base yield for field (bu/A)_________

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Percent full yield expected (read from Table 1 after using Boot-Toe Method)</td>
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<tr>
<td>2.</td>
<td>Estimate of deficient stand yield potential (base yield for field \times line 1)</td>
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<tr>
<td>3.</td>
<td>Projected return from crop harvested (estimated market price \times line 2)</td>
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<tr>
<td>4.</td>
<td>Weed control cost associated with a poor stand.</td>
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<tr>
<td>5.</td>
<td>Return per acre if no replanting is done (line 3 minus line 4)*</td>
</tr>
<tr>
<td>6.</td>
<td>Replanting percentage of full yield (for 8, 6, or 4 plants per foot of row)</td>
</tr>
<tr>
<td>7.</td>
<td>Estimate of replanted yield potential (base yield \times line 6)</td>
</tr>
<tr>
<td>8.</td>
<td>Yield \times estimated market price</td>
</tr>
<tr>
<td>9.</td>
<td>Cost of replanting (seed, herbicide, etc.)</td>
</tr>
<tr>
<td>10.</td>
<td>Returns from replanted field (line 8 minus line 9)*</td>
</tr>
</tbody>
</table>

* Compare the value in line 5 with value in line 10 to determine the returns expected from keeping a poor stand versus a replanted one.
# Tally Sheet

<table>
<thead>
<tr>
<th>Number of paired rows (total of 10 pairs)</th>
<th>Number of observations (5 needed)</th>
<th>Number of gaps (maximum of 10 on each line)</th>
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<tbody>
<tr>
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<td>10</td>
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</tbody>
</table>

Total = percent stand deficiency (total of all gaps)

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**Plants per 3 foot of row** (for each of 10 sections)

1. __________  6. __________
2. __________  7. __________
3. __________  8. __________
4. __________  9. __________
5. __________  10. __________

Plants per foot of row (sum of preceding plant counts divided by 30)

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