Estimating Corn and Soybean Yield Potential

**Key Point**
- Estimating yields can be helpful when making management decisions such as harvest planning, feed supply, and grain marketing decisions.

Estimating yields can be helpful when making management decisions such as harvest planning, feed supply, and grain marketing decisions. Yield estimations can also be misleading if care is not given to the yield estimation process.

Crop uniformity has a large influence on the accuracy of any estimation method. Samples should be taken randomly throughout a field to provide the best yield estimate. One sample for every 10 to 15 acres should be sufficient unless conditions are variable. More samples will be needed to represent a non-uniform field and improve the accuracy of the estimate.

**Corn -Yield Component Method**

This method is used widely and can be used as early as the R3 (milk) stage of corn growth. It is based on the assumption that grain yield can be estimated using the number of ears per acre, number of kernel rows per ear, number of kernels per row, and kernel weight. The first three components can be measured from field samples but kernel weight is unknown until physiological maturity and must be represented by a calculated factor. The average value for kernel weight (90) is derived using 85,000 kernels per 56 pound bushel. Because kernel size has increased since this formula was first developed many years ago, some agronomists think that 80 to 85 is a more appropriate factor for current use.³

**Step 1.** At each sample site, measure 1/1000th of an acre (17 feet, 5 inches for 30-inch rows or 23 feet, 10 inches for 22-inch rows) then count and record the number of harvestable ears. Don’t sample abnormal ears, nubbins, aborted kernels, or count ears on severely lodged plants or dropped ears. Count kernels where there are complete rings of kernels around the cob and avoid counting kernels on the extreme ends of the ear.³

**Step 2.** Count the number of kernel rows per ear on every fifth ear and determine the average. On the same ears, count the number kernels per row and determine the average.

**Step 3.** To determine an estimate of yield potential per acre at each sample site, multiply the number of ears times the average number of rows times the average number of kernels and divide by 90 or the factor that best represents growing conditions (Table 1).

**Step 4.** Repeat this procedure at a representative number of sample sites in the field. Calculate the average yield potential for all of the sites to get an estimate of the yield potential of the entire field.

**Example:** Harvestable ear count is 26. The average number of kernels per ear from every fifth ear is 600. Growing conditions were average (85). The estimated yield potential for that site would be (26 times 600) divided by 85, or a 183.5 bu/acre estimate of yield potential.³

Poor conditions during grain filling can cause lower kernel weights, resulting in an underestimation of yield potential with the yield component method. On the other hand, it can overestimate yield potential if kernel weight is higher than normal, during superior growing conditions.² Kernel size and weight can vary by corn product and environmental conditions, which can compromise the accuracy of the estimate.

**Corn- Ear Weight Method**

This method should only be used after corn has reached physiological maturity. This method may be more accurate than the yield component method because it is based on actual kernel weight. It does have a factor to account for average shellout percentage.²

**Sample several representative sites in a field. Count the number of harvestable ears in 1/1000th of an acre at each site. Weigh every fifth ear and calculate the average ear weight per site. Hand shell kernels from those ears and determine the average grain moisture with a moisture tester.**

Calculate the estimated yield potential using the steps on the following page.

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**Table 1. Kernel number/bu based on growing conditions during grain filling.³**

<table>
<thead>
<tr>
<th>Growing Conditions</th>
<th>Factor</th>
<th>Range in Kernel Number/bu.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>75 to 80</td>
<td>75 to 80,000</td>
</tr>
<tr>
<td>Average</td>
<td>85 to 90</td>
<td>85 to 90,000</td>
</tr>
<tr>
<td>Poor</td>
<td>95 to 105</td>
<td>95 to 105,000</td>
</tr>
</tbody>
</table>
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Step 1. Count the number of plants in 1/1000th of an acre (see the Table 2), and multiply this number by 1000 to get plants per acre. Example: Using this method, a field planted in 15-inch rows was found to have 122,000 plants per acre.

Step 2. Count the pods on each plant for 10 successive plants in a row; do not skip plants that are smaller in size. Calculate the average number of pods per plant. Example: At one location, a total of 220 pods was counted on a total of 10 consecutive plants. The total number of pods (220) is divided by the total number of plants (10) for an average of 22 pods per plant.

Step 3. Estimate seeds per pod. Healthy plants average 2.5 seeds per pod. For soybeans under stress, this value may decrease to 2.0, 1.5 or fewer per pod. Example: The majority of pods have 3 seeds while some have 2 seeds. The overall estimate is 2.5 seeds per pod.

Step 4. Estimate seeds per pound, which may be the most challenging part of the yield estimate process. Some research indicates a value of 2,500 seeds per pound is a good average, but some locations have reported 3,400 seeds per pound. Original seed size from a seed bag may provide a reasonable indication of soybean seed size. When the seed tag is not available, 2,500 seeds per pound should be used.

Step 5. Estimate bushels per acre. One bushel of soybeans weighs 60 pounds. Estimate bushels per acre using the following formula: (Plants per acre x Pods per plant x Seeds per pod ÷ Seeds per pound ÷ Pound per bushel = Bushels per acre)

Example: (122,000 x 22 x 2.5 ÷ 2,500 ÷ 60) = 45 bushels per acre.

Yield estimates made more closely to harvest are more likely to represent final yield potential.

Effects of Stress. Stress to soybeans from R4 through R6 growth stages can cause more yield reduction than at any other time of the season. The most critical period is from late pod formation through early seed fill. Yield reduction at this time is mainly from a decrease in the number of pods per plant and seeds per pod. Young pods and seeds are more prone to abort under stress than older pods and seeds.

Seed fill (R5 through R6) requires water and nutrients from the rest of the plant. About one-half of the required nitrogen (N), phosphorous, and potassium is redistributed from vegetative plant parts and the other one-half comes from N fixation and root uptake. The plant is less able to compensate for stress and vegetative damage during this time, and leaf loss of 100% can reduce yields by 80%. At this stage, stress lowers yields by reducing pod number, the number of beans per pod, and by reducing seed size.

By the time the seeds and pods begin to mature at R7, stress has little to no effect on yield. The exception would be if pods fall to the ground or seeds are lost to shattering. While stress conditions may have lengthened the time between vegetative growth stages earlier in the season, stress may actually shorten the time between reproductive stages.

Sources

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Leaf Design® is a registered trademark of Monsanto Company. Channel® and the Arrow Design® and Seedsmanship At Work® are registered trademarks of Channel Bio, LLC. All other trademarks are the property of their respective owners. ©2014 Monsanto Company. 130816033001 AMH08302013

Table 2. Row width and length of row needed to equal 1/1000 acre.

<table>
<thead>
<tr>
<th>Row Width (inches)</th>
<th>Length of Row to Equal 1/1000 acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>87 feet 1 inch</td>
</tr>
<tr>
<td>7</td>
<td>74 feet 8 inch</td>
</tr>
<tr>
<td>7.5</td>
<td>69 feet 8 inch</td>
</tr>
<tr>
<td>15</td>
<td>34 feet 10 inch</td>
</tr>
<tr>
<td>30</td>
<td>17 feet 5 inch</td>
</tr>
</tbody>
</table>

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