

Estimating Corn Yields

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Estimating corn yields can be helpful when making crop management decisions such as when to harvest a field or in making grain marketing decisions. Estimating corn yields can also be misleading if care is not given to the yield estimation process.

Equation to Estimate Corn Yield:
 (kernels per ear) x (ears per acre) /
 (kernels per bushel) = (bushels/acre)

The procedures to estimate corn yield are targeted at determining or estimating each of the terms in this equation. All of the procedures to estimate corn yield require counting kernels per ear. Simpler methods for estimating yield include making assumptions about ears per acre and kernels per bushel. The procedures outlined here range from the very simple but not very accurate to the more complicated but more accurate methods of estimating corn yields.

Simplest and Least Accurate Method

The simplest and least accurate method is to select an ear or ears that represent the average ear size in the field. Count the number of kernels per ear and multiply by 0.300 to get a very rough yield estimate. To determine number of corn kernels per ear, multiply number of rows on an ear by number of kernels in a row. Do not count kernels near the tip that are less than half the size of kernels midway up the ear.

Example 1:

You count 12 rows per ear and 50 kernels per row to equal 600 kernels per ear.

$$600 \times 0.300 = 180 \text{ bushels/acre}$$

To add a little more accuracy to the simplest method, you can count the kernels on each ear of 10 consecutive ears in a row. Then you average the counts from the 10 ears to have a better estimate of kernels per ear.

While this method is a very fast way of estimating yield, it makes several assumptions and could be misleading. The multiplier of 0.300 assumes 27,000 ears per acre and an average seed size of 90,000 kernels per bushel. Changes in either ears per acre or kernel size affect this multiplier. Seeding rate, stress on developing plants, and pests can all change the final number of ears per acre. Stressful weather conditions such as drought during seed filling will reduce kernel size, while ideal growing conditions can increase kernel size.

Adjusting for Population and Seed Size

Not every field will have 27,000 ears per acre. If you wish to estimate the number of ears per acre, assume 1,000 to 2,000 ears less than the targeted plant population. If you want to adjust seed size based on the growing season, you can use the multipliers in Table 1 when making your yield estimate.

Example 2:

You count 12 rows per ear and 50 kernels per row to equal 600 kernels per ear.

If you assume 25,000 ears per acre, then:

- In an average year, $600 \times 0.278 = 167$ bushels/acre.
- In a highly stressful year, kernel size will be smaller and $600 \times 0.227 = 136$ bushels/acre.
- In a highly productive year, kernel size will be larger and $600 \times 0.357 = 214$ bushels/acre.

If you assume 30,000 ears per acre, then:

- In an average year, $600 \times 0.333 = 200$ bushels/acre.

If you assume 22,000 ears per acre, then:

- In an average year, $600 \times 0.244 = 146$ bushels/acre.

Table 1. Multipliers based on ears per acre and kernel size to calculate expected yield. Determine the number of kernels per ear and multiply that number by the correct multiplier to make a yield estimate.

Ears/ Acre	Kernel Size		
	Kernels per Bushel		
	Large 70,000	Medium 90,000	Small 110,000
Multipliers			
21,000	0.300	0.233	0.191
22,000	0.314	0.244	0.200
23,000	0.329	0.256	0.209
24,000	0.342	0.267	0.218
25,000	0.357	0.278	0.227
26,000	0.371	0.289	0.236
27,000	0.386	0.300	0.245
28,000	0.400	0.311	0.255
29,000	0.414	0.322	0.264
30,000	0.429	0.333	0.273
31,000	0.443	0.344	0.282
32,000	0.457	0.356	0.291
33,000	0.471	0.367	0.300
34,000	0.486	0.378	0.309
35,000	0.500	0.389	0.318

So, in an average year, yield estimates for 600 kernels per acre can range from 146 to 200 bushels per acre by adjusting ear population from 22,000 to 30,000 ears per acre.

Using Ear Counts to Estimate Ears per Acre

Knowing ear number per acre is critical when estimating corn yield. Plant population is not a useful number since some plants may be barren and others may have two ears. There are several ways to determine ear population per acre. Many people count the ears in 1/1,000th of an acre (0.001 acre). This method is easy to follow since ear counts in 1/1,000th of an acre can be multiplied by 1,000 to equal ears per acre. Table 2 provides the row width and length of row needed to equal 1/1,000th acre.

Example 3:

You count 12 rows per ear and 50 kernels per row to equal 600 kernels per ear. You count 26 ears in 1/1,000th acre to equal 26,000 ears per acre.

- In an average year (medium kernel size), $600 \times 0.289 = 173$ bushels/acre.

Table 2. Row width and length of row needed to equal 1/1,000th acre. Ear counts should be multiplied by 1,000 to equal ears per acre.

Row Width (inches)	Row Length (to equal 1/1000th acre)	Multiplier (to equal one acre)
15	34 feet 10 inches	1,000
20	26 feet 2 inches	1,000
22	23 feet 9 inches	1,000
30	17 feet 5 inches	1,000
36	14 feet 6 inches	1,000
38	13 feet 9 inches	1,000

Improving Estimate of Ears per Acre

While counting ears in 1/1,000th acre is a relatively easy way to calculate ears per acre, the length of a row counted is only 17 feet 5 inches in 30-inch rows. Counting ears in longer sections (e.g., 100 feet of row) likely will provide more accurate estimates of ears per acre. Most farmers in Kentucky raise corn in 30-inch rows. Table 3 allows you to count the number of ears in either 50 or 100 feet of row to estimate the total number of ears per acre.

Table 3. Number of ears per acre based on the number of ears counted in either 50 or 100 feet of row in 30-inch row widths.

50 ft row length (125 sq ft)		100 ft row length (250 sq ft)	
Ears/area	Ears/acre	Ears/area	Ears/acre
40	13,939	80	13,939
60	20,909	120	20,909
65	22,651	130	22,651
70	24,394	135	23,522
75	26,136	140	24,394
80	27,878	145	25,265
85	29,621	150	26,136
90	31,363	155	27,007
100	34,848	160	27,878
		165	28,750
		170	29,621
		175	30,492
		180	31,363
		200	34,848

When making ear counts from row lengths of 50 or 100 feet, the calculated number for ears per acre in Table 3 will be more accurate than ears per acre in Table 1 or Table 2. The number of ears per acre obtained using Table 3 can be rounded to the nearest number in Table 1 to calculate expected yield, or the number from Table 3 can be used directly in yield calculations.

As you can see from Example 4, the difference in yield estimates between Option 1 and Option 2 is only one bushel per acre. For most yield estimates, the additional accuracy in Option 2 probably does not warrant the extra effort.

While most farmers currently raise corn in 30-inch rows, some farmers are using different row widths. Table 4 outlines the multipliers needed for 50 and 100 feet of row at various row widths.

Example 4:

You count 12 rows per ear and 50 kernels per row to equal 600 kernels per ear. You count 145 ears in 100 feet of row, which equals 25,265 ears per acre.

Option 1: Round 25,265 to 25,000 ears per acre and use the multiplier in Table 1

- In an average year, $600 \times 0.278 = 167$ bushels/acre.

Option 2: Use 25,265 ears per acre as part of the yield calculation:

- kernels per ear \times ears per acre / kernels per bushel = bushels/acre.
- In an average year, $600 \times 25,265 / 90,000 = 168$ bushels/acre.

Table 4. Multiplier needed to equal ears per acre for specified row widths and row lengths.

Row Width (inches)	Row Length (feet)	Multiplier (one acre)
15	50	696.96
20	50	522.72
22	50	475.20
30	50	348.48
36	50	290.40
38	50	275.12
15	100	348.48
20	100	261.36
22	100	237.60
30	100	174.24
36	100	145.20
38	100	137.56

Follow Example 5 to calculate yields in row widths other than 30 inches.

Example 5:

You count 12 ears per row and 50 kernels per row to equal 600 kernels per ear. You count 110 ears in 100 feet of row in 20-inch rows, which equals 28,750 ears per acre (110×261.36). Round 28,750 to 29,000 and use the multiplier in Table 1 to calculate expected yield.

- In an average year (medium kernel size), $600 \times 0.322 = 193$ bushels/acre.

Keeping Yield Estimates in Perspective

Remember that yield estimates are only as accurate as the field area that was sampled. The yield calculations mean little if you have selected the best or worst area in the field to estimate yield. Repeating yield estimates in several areas of a field will improve accuracy.

Water availability, insects, weeds, diseases, and other factors can affect seed fill and final yields. As the corn plant approaches black layer or maturity, environmental stresses have less impact on final yield. The exceptions to this are when a catastrophic stress causes severe yield losses, such as a heavy rain that knocks down corn. Since environmental stresses have less impact on final yield as the corn matures, yield estimates made on corn that is closer to maturity should be more accurate than yield estimates made on corn that is in the early stages of seed development.

The simpler and less accurate methods are better suited to making yield estimates when the corn is in the dough and dent stages. The more complicated but more accurate methods are better suited to making yield estimates when the corn is in the dent stage or past black layer.