If you would like to receive Corny News Network articles and other corny information by email, contact R.L. (Bob) Nielsen . Other Corny News Network articles can be viewed at the CNN Archives.

Published 18 July 2004 (Rev. 7/19/04)

Estimating Corn Grain Yield Prior to Harvest

URL: http://www.kingcorn.org/news/articles.04/YieldEst-0718.html

Printer-Friendly Format

R.L. (Bob) Nielsen
Agronomy Dept., Purdue Univ.
West Lafayette, IN 47907-2054
Email address: rnielsen@purdue.edu

Fancy colored yield maps are fine for verifying grain yields at the end of the harvest season, but bragging rights for the highest corn yields are established earlier than that down at the Main Street Cafe, on the corner of 5th and Earl. Some patrons of the cafe begin "eyeballing" their yields as soon as their crops reach "roasting ear" stage. Some of the guys there are pretty good (or just plain lucky) at estimating yields prior to harvest, while the estimates by others are not even close to being within the proverbial ballpark. Interestingly, they all use the same procedure referred to as the **Yield Component Method**.

Other pre-harvest yield prediction methods exist (Lauer, 2002; Thomison, 2003), but the **Yield Component Method** is probably the most popular because it can be used well ahead of harvest; as early as the so-called "roasting ear" or milk (R3) stage of kernel development. Under “normal” conditions, the kernel milk stage occurs about 18 to 22 days after pollination is complete (Nielsen, 2004a). Estimates made earlier in the kernel development period risk being overly optimistic if subsequent severe stresses cause unforeseen kernel abortion (Nielsen, 2004b).

The **Yield Component Method** is based on the premise that one can estimate grain yield from estimates of the yield components that constitute grain yield. These yield components include number of ears per acre, number of kernel rows per ear, number of kernels per row, and weight per kernel. The first three yield components (ear number, kernel rows, kernels/row) are easily measured in the field.

Final weight per kernel obviously cannot be measured until the grain is mature (kernel black layer) and, realistically, at harvest moisture. Consequently, an average value for kernel weight, expressed as 90,000 kernels per 56 lb bushel, is used as a proverbial "fudge factor" in the yield estimation equation.

Crop uniformity greatly influences the accuracy of any yield estimation technique. The less uniform the field, the greater the number of samples that should be taken to estimate yield for the field. There is a fine line between fairly sampling disparate areas of the field and sampling randomly within a field so as not to unfairly bias the yield estimates up or down.

1. At each estimation site, measure off a length of row equal to 1/1000th acre. For 30-inch (2.5 feet) rows, this equals 17.4 feet.

    TIP: For other row spacings, divide 43,560 by the row spacing (in feet) and then divide that result by 1000 (e.g., [43,560/2.5]/1000 = 17.4 ft).

2. Count and record the number of ears on the plants in the 1/1000th acre of row that you deem to be harvestable.

    TIP: Do not count dropped ears or those on severely lodged plants unless you are confident that the combine header will be able to retrieve them.

3. For every fifth ear in the sample row, record the number of complete kernel rows per ear and average number of kernels per row. Then multiply each ear's row number by its number of kernels per row to calculate the total number of kernels for each ear.

    TIPS: Do not sample nubbins or obviously odd ears, unless they fairly represent the sample area. If row number changes from butt to tip (e.g., pinched ears due to stress), estimate an average row number for the ear. Don't count the extreme butt or tip kernels, but rather begin and end where you perceive there are complete "rings" of kernels around the cob. Do not count aborted kernels. If kernel numbers are uneven among the rows of an ear, estimate an average value for kernel number per row.

4. Calculate the average number of kernels per ear by summing the values for all the sampled ears and dividing by the number of ears.

    EXAMPLE: For five sample ears with 480, 500, 450, 600, and 525 kernels per ear, the average number of kernels per ear would be (480 + 500 + 450 + 600 + 525) divided by 5 = 511.

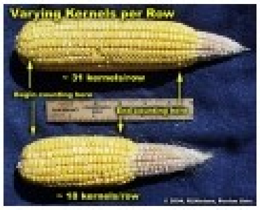
5. Estimate the yield for each site by multiplying the ear number by the average number of kernels per ear, then dividing that result by 90. The value of '90' represents the average number of kernels (90,000) in a bushel of corn.

    TIP: Use a lower value (e.g., 80) if grain fill conditions have been excellent (larger kernels, fewer per bushel) or a larger value (e.g., 100) if grain fill conditions have been stressful (smaller kernels, more per bushel).

Click on image to open a larger version. To close popup window, click on larger image.

Example of 18-row ear.

Example of 14-row ear.



Ears w/ varying kernel numbers per row.

Example

Let's say you counted 30 harvestable ears at the first sampling site. Let's also assume that the average number of kernels per ear, based on sampling every 5th ear in the sampling row, was 511. The estimated yield for that site would (30 x 511) divided by 90, which equals 170 bu./ac.

Repeat the procedure throughout field as many times as you deem to be representative. Calculate the average yield for all the sites to estimate the yield for the field.

Remember that this method for estimating pre-harvest grain yield in corn indeed provides only an estimate. Since kernel size and weight will vary depending on hybrid and environment, this yield estimator should only be used to determine “ballpark” grain yields. Yield will be overestimated in a year with poor grain fill conditions (e.g., low kernel size and weight from a drought year) and underestimated in a year with excellent grain fill conditions (e.g., larger kernel size and weight from non-stress grain fill periods).

You can try to improve the yield estimation for unusual grain fill conditions by adjusting the estimation formula . For example, if you believe that kernel weight will be lower due to stress during grain fill, you may elect to replace the value of "90" in the equation with "100" to reflect the potential for smaller and lighter kernels (i.e., more kernels per 56 lb. bushel). Conversely, in a good crop year, you may elect to replace the value of "90" in the equation with "80" to reflect the potential for larger and heavier kernels (i.e., fewer kernels per 56 lb. bushel).

Recognize that the **Yield Component Method** for estimating corn grain yield is probably only accurate within plus or minus 30 bushels of the actual yield. Obviously, the more samples you measure within a field, the more accurately you will "capture" the variability of yield throughout the field. Use the yield estimates obtained by this method for general planning purposes only.

**** Thanks to Emerson Nafziger, Univ. of Illinois, for suggested revisions to the kernel number calculations.**

Illinois Agronomy Handbook. 2004. **Estimating Corn Yields.** (An Online Calculator) Univ. of Illinois. Online at http://www.ag.uiuc.edu/iah/index.php?ch=ch2/est_corn_yield.html&m=CFAR. (URL verified 7/11/04, but temporarily off-line as of 7/18/04)

Lauer, Joe. 2002. **Methods for Calculating Corn Yield.** Agronomy Advice, Univ. of Wisconsin-Madison. Online at http://corn.agronomy.wisc.edu/AAdvice/2002/A033.pdf. (URL verified 7/11/04)

Nielsen, R.L. (Bob). 2004a. **Grain Fill Stages in Corn.** Corny News Network, Purdue Univ. Online at http://www.kingcorn.org/news/articles.04/GrainFill-0705.html. (URL verified 7/18/04)

Nielsen, R.L. (Bob). 2004b. **Yield Loss Potential During Grain Fill.** Corny News Network, Purdue Univ. Online at http://www.kingcorn.org/news/articles.04/GrainFillStress-0705.html. (URL verified 7/18/04)

Thomison, Peter. 2003. **Estimating Corn Yields Prior to Harvest.** C.O.R.N. Newsletter, Ohio State Univ. Online at http://corn.osu.edu/archive/2003/aug/03-28.html#linkc. (URL verified 7/11/04).

For other Corny News Network articles, browse through the CNN Archives at http://www.kingcorn.org/news/index-cnn.html.

For other information about corn, take a look at the Corn Growers' Guidebook at http://www.kingcorn.org.

End of document