Factsheet NM-4
2016

Estimating Corn Grain Yield

Introduction

Corn grain is an important feed crop grown in Maryland and is highest in total digestible nutrient content of all grain crops. Corn grain can remove large amounts of available nutrients from the soil, especially nitrogen. Corn grain production can affect the fertilizer management practices on a field, particularly the amount of nitrogen that should be applied.

Realistic Yield Goal

A realistic yield goal is the primary criterion used to determine how much nitrogen should be applied to (or how much phosphorus may be removed from) a field. A producer can determine a long-term realistic yield goal for corn grain by estimating the average grain yield on a given field or management unit over a number of years. There are several acceptable methods that may be used to derive such an estimate.

State Regulations

Nitrogen application rates for corn grain are based upon expected crop yields or production goals for a specific field or management unit. The State of Maryland Nutrient Management regulations specify the process to determine yield goal [from COMAR 15.20.08.05C (1) & (2)].

(1) The calculation of expected crop yield shall be based upon one of the following:

(a) An average of the 3 highest-yielding years for the crop out of the latest consecutive 5-year cropping sequence; or
(b) If yield information exists for more than 5 years for a given field or management unit, crop yield calculations may be based on the average of 60 percent of the highest-yielding years for all consecutive years that crop yield information is available.

(2) If field or management unit-specific yield or plant production goal information is unavailable or unrepresentative due to the inclusion of new seed varieties, irrigation, or new technologies, a consultant or certified farm operator shall use one of the following:

(a) Any soil productivity information;
(b) The average yield based upon an average of the 3 highest-yielding years for the crop out of the latest consecutive 5-year cropping sequence from nearby fields or management units with similar soil type and management conditions; or
(c) Any data acceptable to the Department.

Published Soil Productivity Information

The most up-to-date soil productivity information can be found on the Web Soil Survey (WSS), an online tool available from the U.S. Department of Agriculture at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. The WSS provides users with electronic access to full soil survey report information as well as the most current soils data for counties in Maryland.

In time, this published information may become out of date due to crop cultivar improvements and other advances in technology that influence crop yields. Published yield estimates may be lower than actual yields obtained by a good farm manager. Therefore, using published estimates may result in the under-application of nutrients.

For example, if a producer is able to show a long-term yield of 175 bushels per acre and the published grain estimate is 140 bushels per acre, the producer should apply 175 pounds of nitrogen rather than the 140 pounds recommended for the lower yield. Long-term, field-specific yield goals is the most reliable means for determining nitrogen application rates.

Methods of Estimating Yield

Two different methods to measure corn grain yield using specialized equipment follow.

- A yield monitor utilizes satellite technology to provide yield measurements at different locations in a field and determines an average yield for that entire field.
- Weigh wagons or drive-on scales can be used to weigh wagons or trucks full of harvested grain. Divide the weight by the exact acreage of the field.

If the previous methods are impractical or the exact field acreage is unknown, a simple, alternate method can be used to estimate corn grain yield.

Note: In fields impacted by foraging wildlife, a weighed yield at the time of harvest will result in a lower estimate of yield than what was actually produced in the field. In this situation, an alternate method for estimating the average corn grain yield in undamaged parts of the field is highly desirable.

Alternate Method for Estimating Corn Grain Yield

Estimating corn grain yield involves (1) choosing sample areas; (2) obtaining and weighing the samples; (3) determining the grain moisture content in the samples; and (4) calculating the corn grain yield.

Corn grain yield should be estimated as close to harvest time as possible.

The following equipment is needed to estimate corn grain yield:

- hanging scale;
- tripod;
- tub with rope for weighing collected corn ear samples;
- 5-gallon buckets or bushel baskets for collecting and transporting harvested corn; and
- tape measure for measuring row width and length of harvest area.

Choosing Sample Areas

The first step in estimating corn grain yield is to randomly select five areas in the field to sample. It is very important to **randomly** select sample areas so that preference is not shown toward better areas of the field (Figure 1).

Figure 1. Example grid shows five randomly selected sample areas in a field

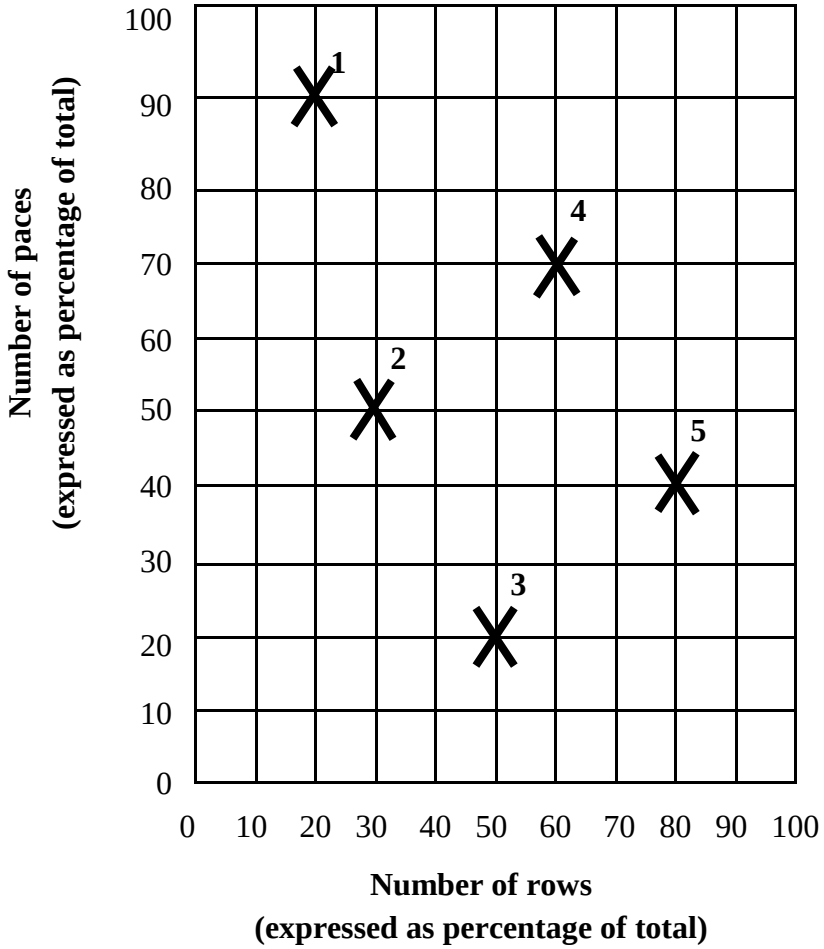

Table 1 shows how the five random sample areas in Figure 1 are selected in a field.

Table 1. Process used to locate the five sample areas in Figure 1

Sample Area	Sample Row	Number of Paces in Sample Row to the Sample Area
1	0.2 x number of rows	0.9 x number of paces
2	0.3 x number of rows	0.5 x number of paces
3	0.5 x number of rows	0.2 x number of paces
4	0.6 x number of rows	0.7 x number of paces
5	0.8 x number of rows	0.4 x number of paces

To locate each sample area:

1) Count the number of rows across the field, omitting turn rows. Record the number of rows on the top of the Corn Grain Estimate Worksheet on page 8 (hereafter called "worksheet").
2) Determine the length of the outside row by counting the number of paces, again avoiding turn rows. Record the field length in paces on the top of the worksheet.
3) Based on the number of rows and paces, determine actual sample areas (*Sample Row* and *Paces to Sample Area*) in the field and record in Section **(A)** on the worksheet.

Dealing with Atypical Areas

Sample according to the predetermined pattern unless the area shows a severe limitation such as wind or animal damage. If a severe limitation is present, continue along the row until you are out of the damaged area. Once out, take five paces and measure the sample area from that point.

If the damage reoccurs throughout the field, continue to sample according to the predetermined pattern.

Obtaining and Weighing Samples

The next step in estimating corn grain yield is to collect and weigh corn ear samples according to the steps outlined in Table 2.

Table 2. Collecting corn stalks and estimating yield in a given field

Step	Action
1	Weigh the tarp or tub to be used or place it on the hanging scale and tare the scale to zero.
2	Determine the row spacing (inches between the rows). Record on the top of the worksheet.
3	Consult Table 3 to determine the corresponding row length that needs to be counted (the row length represents 1/1000th of an acre). **Table 3. Row spacing and corresponding row length** **Row Spacing** / **Row Length to Count (1/1000th of an acre)** 36” / 14’6” 30” / 17’5” 20” / 26’3” 15” / 34’10”
4	Go into the field and harvest the exact areas as planned starting at pre-determined sampling locations and walking determined row length from Table 3. 1) Pick all the ears within the designated row length. Strip the ears of husks and place them in a bucket or basket. 2) Use Section **(A)** on the worksheet as a guide.
5	Weigh the corn ears from the first sample area and record in the right column of Section **(A)** on worksheet under *Moist Corn Ears (lbs.).* Make sure the tub hangs freely and is not touching or resting on anything but the scale.
6	Repeat this sampling procedure for sample areas 2 through 5.
7	Calculate the total weight of moist corn ears harvested and record at **A6** on the worksheet**.**

Determining Grain Moisture Content

The steps for determining grain moisture content can be found in Table 3.

Table 3. Determining grain moisture content

Step	Action
1	Randomly select 1-2 ears from each of the five samples.
2	Shell the grain and mix the kernels thoroughly from each sample. Select a small quantity from each sample and mix well to form a composite sample for moisture determination.
3	Determine the percent moisture for the sample: • take the composite corn grain sample to a grain elevator where percent moisture can be measured with a moisture meter; **or** • use a canister-type moisture meter to estimate moisture; **or** • weigh a portion of the sample, then dry it overnight in a conventional oven at 150 degrees Fahrenheit (or lowest setting possible if thermostat cannot be set as low as 150 degrees Fahrenheit) and weigh again. o If weighing and drying the sample yourself, calculate the percent moisture by using the procedure in Section **(B)** on the worksheet.

Calculating Corn Grain Yield

The steps for calculating corn grain yield can be found in Table 4.

Table 4. Calculating corn grain yield

Step	Action
1	Use Table 8 on page 7 to find and record the equivalent weight (in lbs) of corn ears at the percent moisture at harvest and record at **C1** on the worksheet.
2	Calculate grain yield expressed as bushels of corn grain per acre at 15.5% moisture. Enter the value at **C2** on the worksheet.

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Table 8. Equivalent weight of corn ears (weight of corn ears at a range of moisture contents equal to 1 bushel of shelled corn grain at 15.5% moisture)

Grain Percent (%) Moisture	Equivalent Weight of Corn Ears (lbs.)		Grain Percent (%) Moisture	Equivalent Weight of Corn Ears (lbs.)
11.0	66.04		22.5	79.62
11.5	66.50		23.0	80.31
12.0	66.97		23.5	80.99
12.5	67.46		24.0	81.68
13.0	67.97		24.5	82.37
13.5	68.49		25.0	83.06
14.0	69.02		25.5	83.75
14.5	69.57		26.0	84.44
15.0	70.13		26.5	85.14
15.5	70.70		27.0	85.83
16.0	71.28		27.5	86.53
16.5	71.87		28.0	87.22
17.0	72.47		28.5	87.91
17.5	73.09		29.0	88.61
18.0	73.71		29.5	89.30
18.5	74.34		30.0	90.00
19.0	74.98		30.5	90.69
19.5	75.62		31.0	91.39
20.0	76.28		31.5	92.08
20.5	76.94		32.0	92.78
21.0	77.60		32.5	93.48
21.5	78.27		33.0	94.18
22.0	78.94			

Adapted from the Agronomy Guide, Penn State University

CORN GRAIN ESTIMATE WORKSHEET

Field #_____ _____ **# of Rows in Field**_____

Row Spacing (in.)_____ **Field Length in Paces**_____

(A) Choosing Sample Areas and Weighing Samples

Sample Area	Sample Row	Paces to Sample Area	Moist Corn Ears (lbs.)
1	0.2 X # of rows = _____	0.9 X # of paces = _____	**A1 =**
2	0.3 X # of rows = _____	0.5 X # of paces = _____	**A2 =**
3	0.5 X # of rows = _____	0.2 X # of paces = _____	**A3 =**
4	0.6 X # of rows = _____	0.7 X # of paces = _____	**A4 =**
5	0.8 X # of rows = _____	0.4 X # of paces = _____	**A5 =**
A6	**Total weight of moist corn ears harvested (lbs.) (A1+A2+A3+A4+A5)**		**A6 =**

(B) Determining Grain Moisture Content

Sample Area	Weight	
B1	weight of container	
B2	weight of container and moist grain	
B3	weight of container and dry grain	
B4	weight of water **(B2-B3)**	**B4 =**
B5	weight of moist grain **(B2-B1)**	**B5 =**
B6	percent moisture **(B4/B5) X 100**	**B6 =**

(C) Calculating Corn Grain Yield

C1	Equivalent weight of corn ears of harvested grain (consult Table 8)	
C2	Grain yield (bu/A) at 15.5% moisture **[A6 x 1000] / [5 x C1]** • where 5 is the number of sample areas in the field, and • 1,000 is the number of sampling areas per acre	

This worksheet is used in conjunction with the University of Maryland Extension Factsheet NM-4, "Estimating Corn Grain Yield."

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