



Lesson Plan: Corn Cob Yield Components

Course: Plant Science / Agronomy / Introduction to Agriculture	Grade Level: 9-12
Lesson Length: 50-60 minutes	Topic: Corn ear development and yield-component observation

GROWMARK agronomists examine corn ears and other field measurements to gather clues about a crop's yield potential. They combine these observations with information from across the field to help the farmers better understand how the crop is developing.

Essential Question

What can the number and condition of kernel rows on a corn ear tell us about ear development, and what additional measurements are needed to estimate yield?

National AFNR Standards Alignment

Applicable AFNR Connections

- Plant Systems: PS.03.02. Develop and implement a management plan for plant production.
- Career Ready Practices: CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.

Learning Intention

We are learning to observe corn, compare multiple samples that are the same variety and age, and predict possible yield outcomes using the information available.

Success Criteria- I can:

- Observe and record visible conditions of a corn ear.
- Count rows of corn kernels compare ears of similar age and variety.
- Compare kernel observations and consider other field conditions to determine corn ranking.
- Create and share a prediction for yield outcome.
- Clearly communicate observations and possibilities with the information that is known.

Materials Needed

- Mature or well-developed field-corn ears from representative plants
- One teacher-prepared ear cut or approved cutting tool and stable cutting surface
- Safety glasses and cut-resistant glove for the person making cuts
- Student observation sheet, clipboards, pencils, and calculators
- Measuring tape or ruler

Safety: Cutting a corn cob can require substantial force. The recommended classroom procedure is for the instructor to prepare the cross sections in advance. Students should not use knives or similar cutting tools.



Vocabulary

Corn Ear	Kernel Row
Yield Component	Pollination
Kernel Weight	Ear Population
Representative Sample	Yield Potential

Lesson Sequence at a Glance

Time and Lesson Component	Purpose / Facilitator Focus
5 min Bell Ringer	Predict what ear characteristics may relate to yield potential.
10 min Direct Instruction	Introduce yield components and limits of a single-ear observation.
5 min Demonstration	Model safe cross-section viewing and kernel-row counting.
20 min Corn Cob Investigation	Count rows, observe ear condition, and compare representative ears.
10 min Yield Connection	Identify the additional field measurements used for yield estimates.
5 min Closure / Exit Ticket	Explain what row counts reveal and what they cannot determine alone.

Bell Ringer / Opening Prompt (5 Minutes)

Display two different corn ears. Ask students:

“Which ear appears to have greater yield potential, and what evidence would you need before making that conclusion?”

Students record two visible observations and one measurement they would want. Use responses to introduce the idea that yield is built from multiple components, not one visual clue.

Direct Instruction (10 Minutes)

Corn Ear Yield Components

Discussion of limitations with observations of single ear

Guided Demonstration (5 Minutes)

1. Select a representative ear rather than the largest or smallest ear in the group.
2. Count the kernel rows around the ear before cutting and record the number.
3. The instructor breaks or cuts the cob across its width to expose a clean cross section.
4. Students count the kernel positions visible around the outer edge of the cross section and compare that number with the intact-ear row count.
5. Discuss why the cross section represents kernel rows around the ear rather than total kernels on the ear.

Interactive Activity / Laboratory (20 Minutes)

Corn Cob Investigation

6. Work in teams and examine at least three teacher-selected ears from representative plants or locations.
7. For each ear, record visible condition: ear length, tip fill, missing kernels, uniformity, insect feeding, disease symptoms, or other observations.



8. Count kernel rows around the center portion of each intact ear. Use the teacher-prepared cross section to verify how kernel rows appear at the end of the cut cob.
9. Count kernels along one representative row, excluding obvious unfilled tip or base areas when the class is practicing a standard yield-component count.
10. Compare ears and calculate the average kernel-row count and average kernels-per-row count for the group.
11. Rank the ears by apparent kernel set, then explain which evidence supports the ranking and what is still unknown.

Student Observation Table

Ear	Rows Around Ear	Kernels / Row	Tip Fill	Visible Stress	Notes
1					
2					
3					
4					

Yield Connection (10 Minutes)

Explain that a true field-level pre-harvest yield estimate requires more information than the cross-section count. Students identify the four key pieces below.

Yield Component	What Students Measure or Estimate
Harvestable ears per area	Count ears in a measured, representative section of row and convert to ears per acre.
Kernel rows per ear	Average row counts from representative ears.
Kernels per row	Average the count of developed kernels along representative rows.
Kernel-weight factor	Use an instructor-provided assumption appropriate for the learning example; actual kernel weight varies. It is recommended that you use local resources to estimate a possible kernel weight for demonstration purposes.

Estimated yield is based on ears per area × kernel rows per ear × kernels per row, adjusted with an assumed kernel-weight factor.

Kernel-row count helps describe ear development and potential kernel number. Crop health requires more scouting evidence, and final yield depends on stand or ear population, kernel number, kernel weight, later-season stress, and harvest conditions.

Analysis and Discussion (8 Minutes)

- Did all ears have the same number of kernel rows? What variation did you observe?
- Which ears had the most complete kernel set from base to tip?
- What signs suggested possible stress or incomplete kernel development?



- Why would selecting only the largest ear create a biased yield estimate?
- What information from the field would be needed before turning ear measurements into a bushel-per-acre estimate?

Assessment

- Accurate kernel-row and kernels-per-row counts.
- Completion of the ear-observation table.
- Ability to distinguish ear-quality observations from a field-level health diagnosis.
- Explanation of the additional measurements required for yield estimation.

Exit Ticket

- What does counting kernels around the cut end of a cob represent?
- Name two additional pieces of information needed for a field-level corn yield estimate.
- Describe one visible ear characteristic that may suggest stress or incomplete kernel development.
- Explain why several representative ears provide better information than one ear.

Differentiation

Support

- Mark one kernel row with a washable marker so students can follow it around the ear.
- Provide a counting guide and partially completed observation table.
- Pair students as counter and verifier, then switch roles.
- Use pre-cut cross sections so students can focus on observation and math instead of tool use.

Enrichment

- Compare ears from different field zones and develop a sampling plan that reduces selection bias.
- Calculate average kernels per ear from row count $\times$ kernels per row.
- Add a measured-row ear count and complete a teacher-provided yield-component calculation.
- Graph kernel rows, kernels per row, or kernels per ear across samples and discuss variability.

Closure (5 Minutes)

Revisit the essential question. Students complete:

“The cob cross section tells me _____. To estimate field yield, I would also need _____.”

Extension Activity

- Career Exploration: Investigate how agronomists and crop advisers combine stand counts, ear sampling, crop staging, and field scouting when discussing yield potential.
- Communication Practice: Prepare a one-minute grower explanation that describes the ear observations without presenting the estimate as guaranteed harvest yield.

Facilitator Preparation Notes

- Collect several representative ears rather than selecting only unusually large or small ears.
- Prepare cross sections before class whenever possible and inspect them for clear kernel-row visibility.
- If using immature ears, explain that subsequent stress may impact kernels and that kernel weight is not yet known.



- Keep the instructional distinction clear: the cob-end count visualizes kernel rows; a yield estimate requires ear population, kernel rows, kernels per row, and an assumed kernel-weight factor.
- For a field extension, collect multiple representative samples across different field areas rather than relying on a single location.

References & Supporting Resources

- **Purdue University Extension.** Estimating Corn Grain Yield Prior to Harvest. Describes the Yield Component Method for estimating corn yield using ears per acre, kernel rows per ear, kernels per row, and kernel weight. The resource also explains the limitations associated with estimating kernel weight before maturity. Purdue University – Estimating Corn Grain Yield Prior to Harvest [agry.purdue.edu]
- **North Carolina State University Extension.** Using Kernel Counts to Estimate Corn Yield Potential. Provides guidance for assessing yield potential by sampling representative ears, counting kernel rows and kernels per row, determining productive ears per area, and using those observations in a corn-yield estimate. NC State Extension – Using Kernel Counts to Estimate Corn Yield Potential [corn.ces.ncsu.edu]

This GROWMARK lesson incorporates established agronomic methods for observing corn yield components and estimating yield potential. The instructional sequence, student activities, questions, observations, and classroom application have been developed for the GROWMARK lesson plan library.