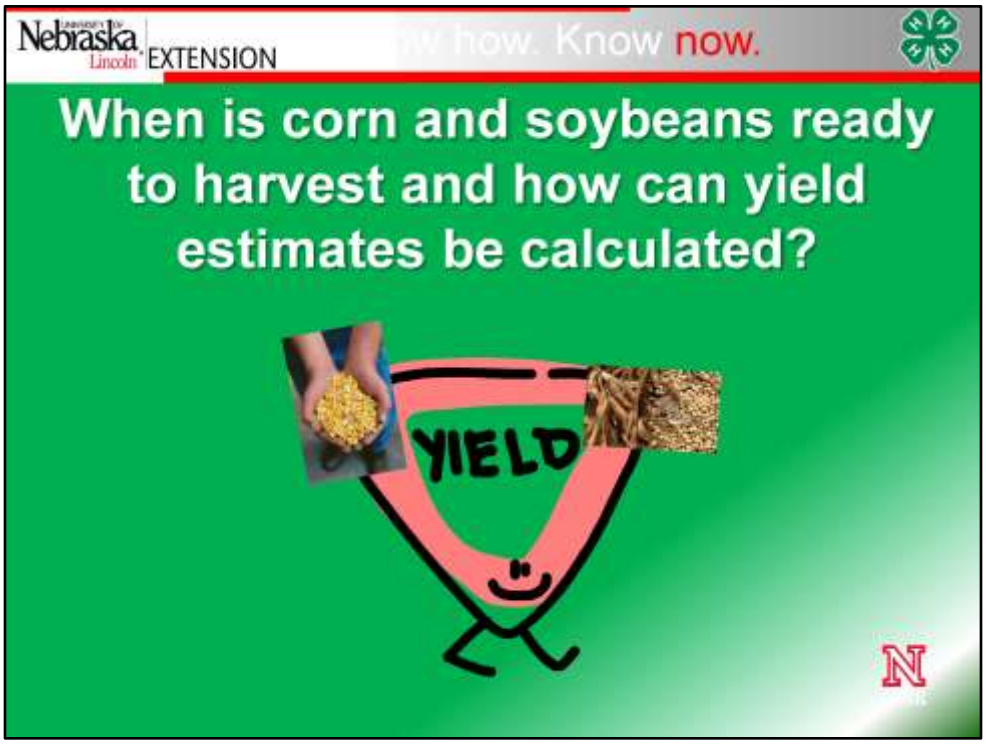
Ask youth the following:

What is the optimal time to harvest grain?
Can grain be harvested too early? Too late?
How do farmers know if their crops are ready to be harvested?
Can they estimate the yields? How and can they estimate accurately?
Why would farmers want to estimate yields?

When corn has reached black layer and is the optimal moisture for the situation (usually around 15-16% moisture) to store it or 18% to harvest. Black layer is achieved when corn is physiologically mature from cells that die, discolor and collapse into a thin layer that blocks nutrients into the kernel. When corn is just at black layer is usually around 30% moisture and will dry based on conditions present.

Full maturity (R8) of the soybean plant is defined as when 95 percent of the pods have reached their mature color which means that typically after five to 10 days of good drying weather after this stage, soybeans should have less than 15 percent moisture or harvest moisture. Soybeans will lose moisture rapidly with warm and dry weather at this point but should be harvested soon to prevent losses.



Now that we understand how to determine when to harvest our crops, let's talk about yields.

When is corn and soybeans ready to harvest and can yield estimates be calculated?

Today, we will:

Lesson Objectives:

Determine when corn and soybeans are physiologically mature.

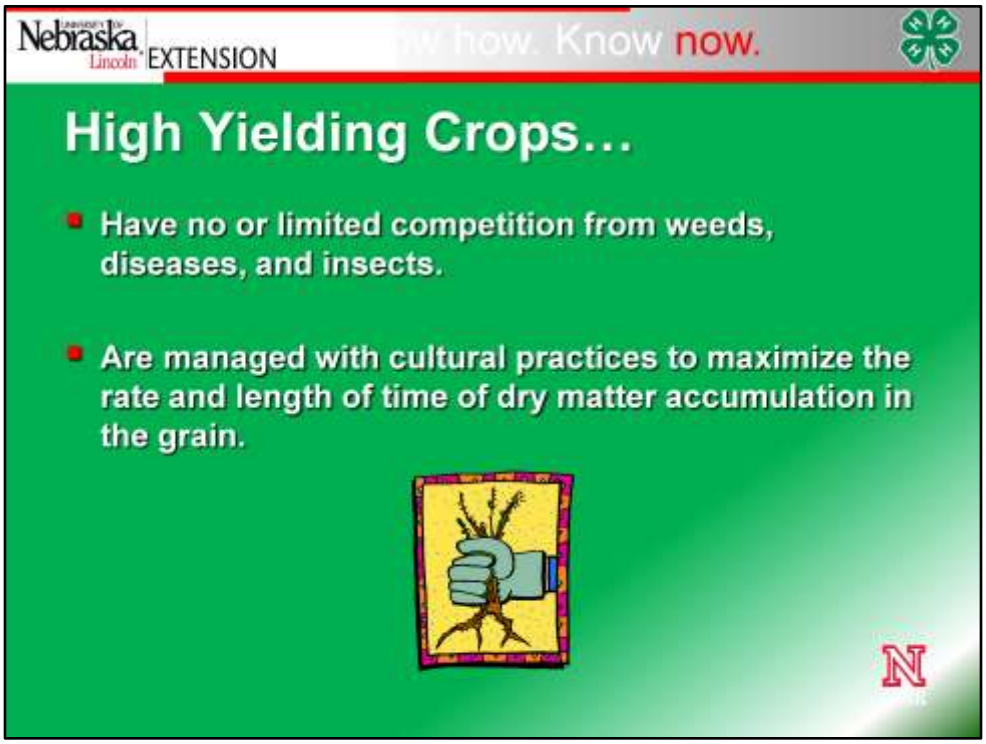
Understand limiting factors that affect yield.

Name the parts of an ear of corn and corn kernel and understand what affects the development of kernels and ears.

Calculate yield estimates on corn plants.

*(Optional) Create a display outlining how yield is determined and describe factors that affect why a yield could be outstanding or poor.

Looking at this ear of corn/soybean plant, why do you think it will do good/bad? There are many factors that contribute to an exceptional or poor yield.



Looking at this ear of corn/soybean plant, why do you think it will do good/bad? There are many factors that contribute to an exceptional or poor yield.

If any of these factors are less than desirable, there is potential for a yield loss.

So, why would it be important for a farmer to estimate yield?

It can be helpful when making crop management decisions such as when to harvest a field or in making grain marketing decisions. It it not always accurate though, so should be used with caution.

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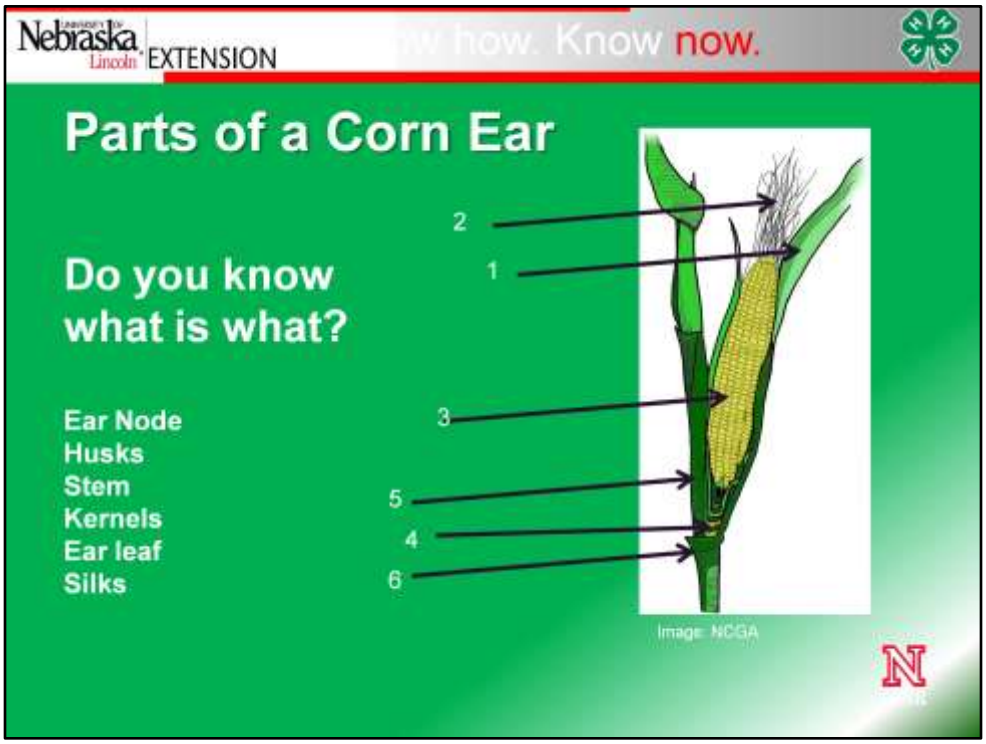
Estimating Yields for Corn

It can be helpful when making crop management decisions such as:

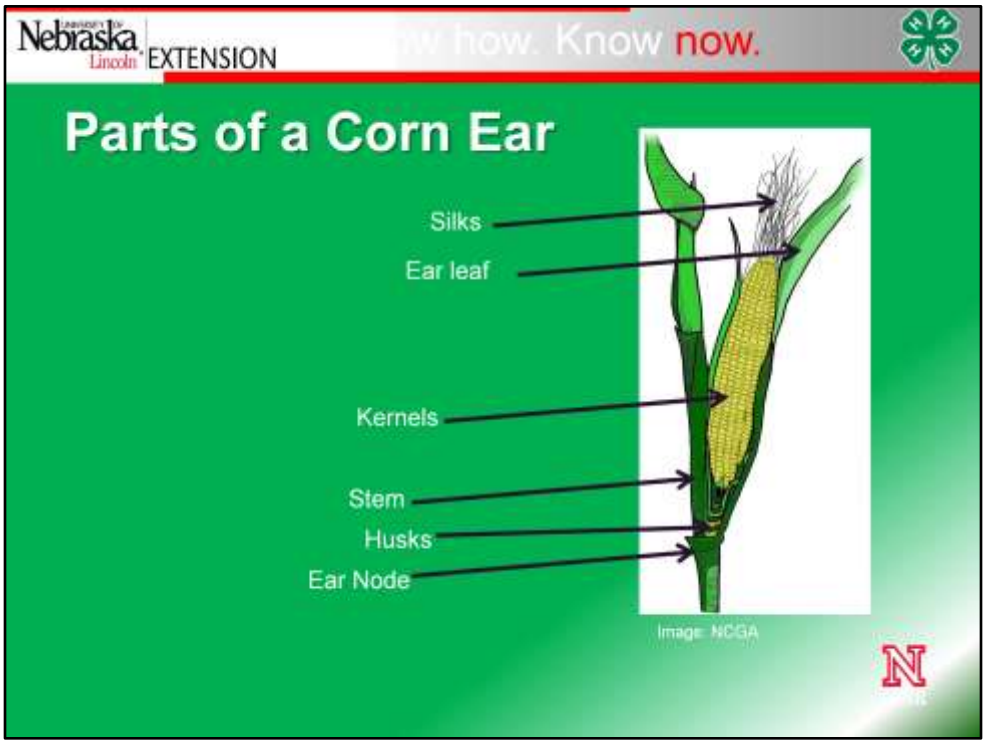
- when to harvest a field or
- in making grain marketing decisions.
- It is not always accurate though, so should be used with caution.



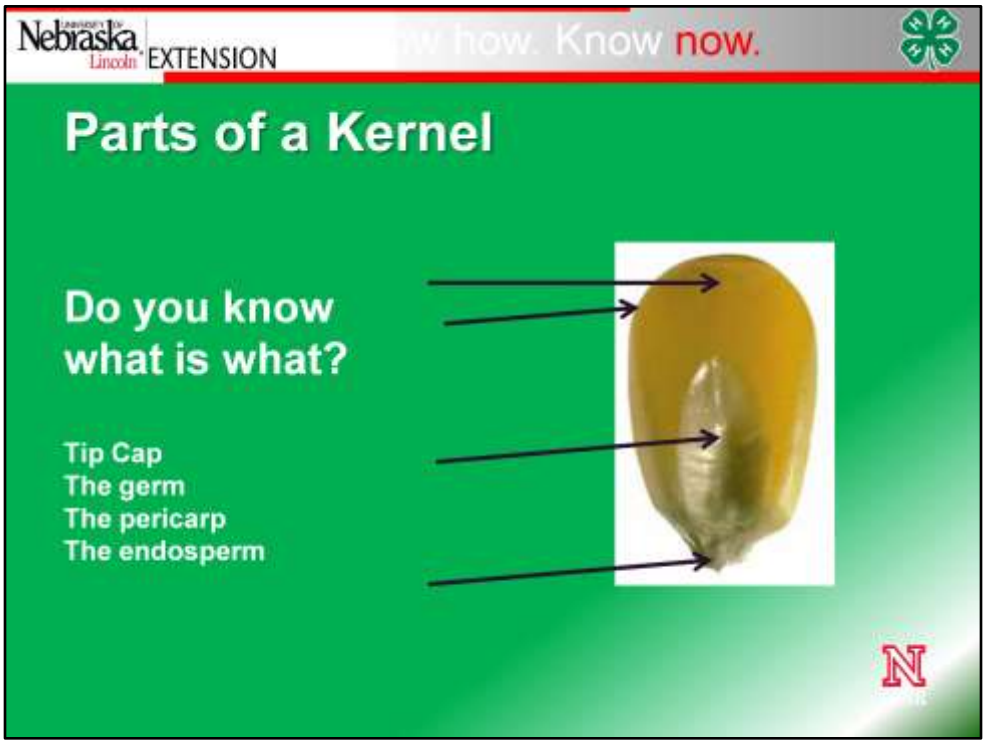
In order to successfully estimate yields for corn, we must understand the components of an ear of corn and the corn kernel.
Let's examine the parts of an ear of corn….

Show youth an ear of corn and where these are located and/or use the NCGA Unit 1, lesson 1, worksheet 3, pg. 8 handout

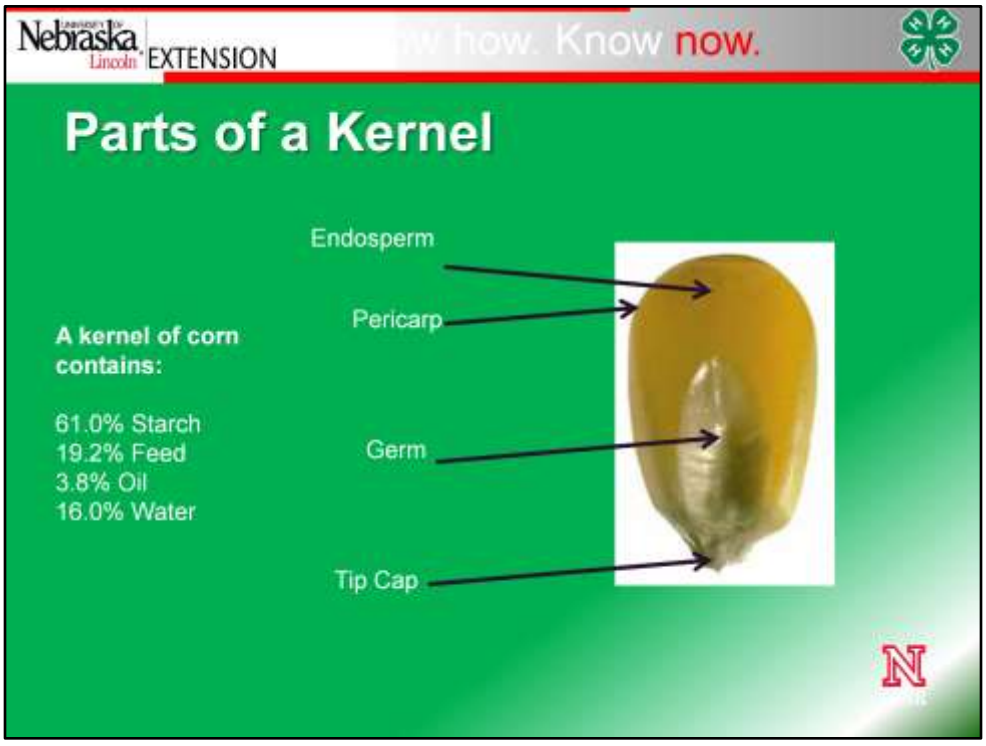
Ear leaf
Silks
Kernels
Husks
Stem
Ear Node



1. Ear leaf
2. Silks
3. Kernels
4. Husks
5. Stem
6. Ear node

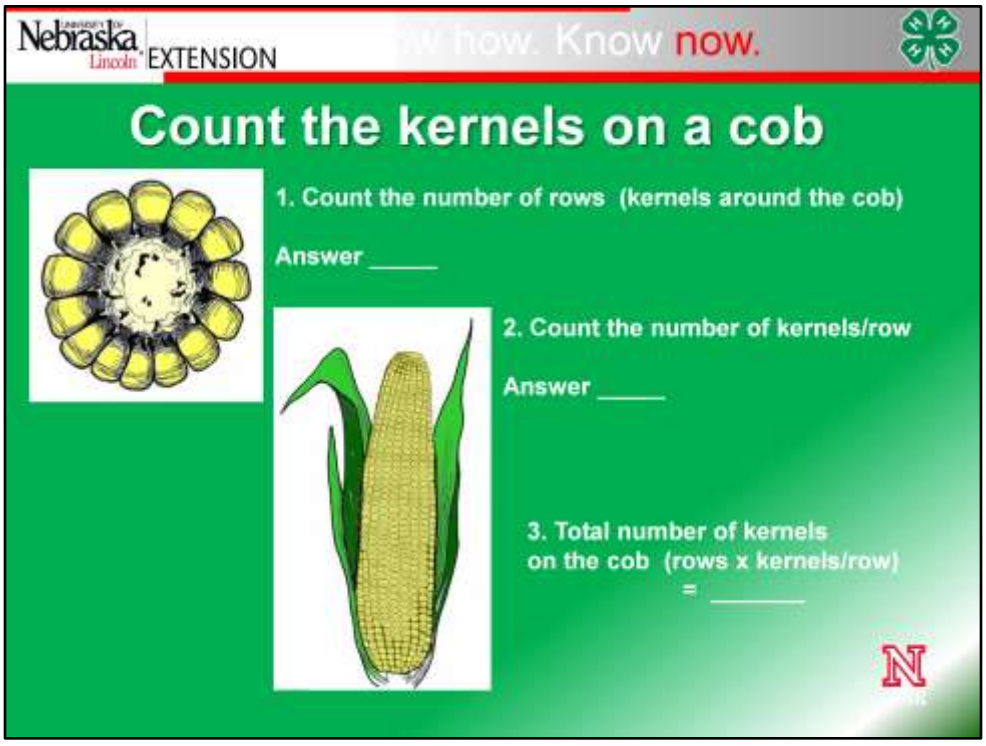


What's in a kernel?
Endosperm
Pericarp
Tip Cap
Germ



What's in a kernel?
Endosperm – 82% of kernel's dry weight & source of starch/energy and protein for the germinating seed.
Pericarp – outer covering of kernel that protects it
Tip Cap – only area of the kernel not covered by pericarp, attachment point of the kernel to the cob
Germ – only living part of the kernel; 25% of germ is corn oil

A kernel of corn contains:
61% Starch
19.2% Feed
3.8% Oil
16% Water



Use total number for kernels with the rest of the activities and use the ear counts to estimate ears per acre with a tape measure.

There are several methods for determining corn yields. Using the information sheet from University of Kentucky Extension, we will briefly describe each one and then estimate on an actual ear.

Simplest & Least Accurate Method

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

Using the table on the Kentucky fact sheet, multipliers based on ears per acre and kernel size are used to calculate expected yield. So if corn kernels are large, the multiplier is .30.
Take 600 kernels x .300 = 180 bushels/acre

In a highly productive year, kernel size will be larger. In a highly stressful year, kernel size will be smaller.

Adjusting for Population and Seed Size

Example: If you have 600 kernels per ear and you assume 25,000 ears per acre, then in an average year, 600 x .278 = 167 bushels/acre, using .278 as a multiplier on the Fact Sheet.

Using Ear Counts to Estimate Ears per Acre

Count ears per 1,000 per acre, so for 30 inch rows, count how many ears there are in 17' 5 ". If there are 26 ears in 1/1000 acre = 26,000 ears per acre.
600 kernels x (26,000 multiplier for med. kernels) .289 = 173 bushels per acre

Improving Estimate of Ears per Acre

Counting ears in 100 feet will provide the most accuracy. If you could 30 inch rows for 100 feet, a multiplier would be 174.24 for an acre so…
With 600 kernels/ear and you counted 145 ears in 100 feet of row, which has a value of 25,265 ears/acre, round to 25,000 ears/acre and on table one the multiplier is .278 x 600 kernels = 167 bushels/acre

ACTIVITY:

If time allows, try the simplest and least accurate method using the handout as a guide. (NCGA Unit 1, lesson 3, pg. 15)
Then, use that number for kernels with the rest of the activity and use the ear counts to estimate ears per acre with a tape measure.

Another group could do the improving estimate per ears per acre method.

Compare the results among all of the methods. Which one was the most accurate? Why?

Estimating Corn Yields

- Simplest & Least Accurate Method

Example 1:

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

600 x 0.300 = 180 bushels/acre

Using: 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.

Estimating Corn Yields

- Adjusting for Population and Seed Size

Example 2:

600 kernels per ear

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

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

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Estimating Corn Yields

- Using Ear Counts to Estimate Ears per 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 x 0.289 = 173 bushels/acre.

Estimating Corn Yields

- Improving Estimate of Ears per Acre

Example 4:

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 x 0.278 = 167 bushels/acre.

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Let's see how these methods compare!

- Simplest & Least Accurate Method

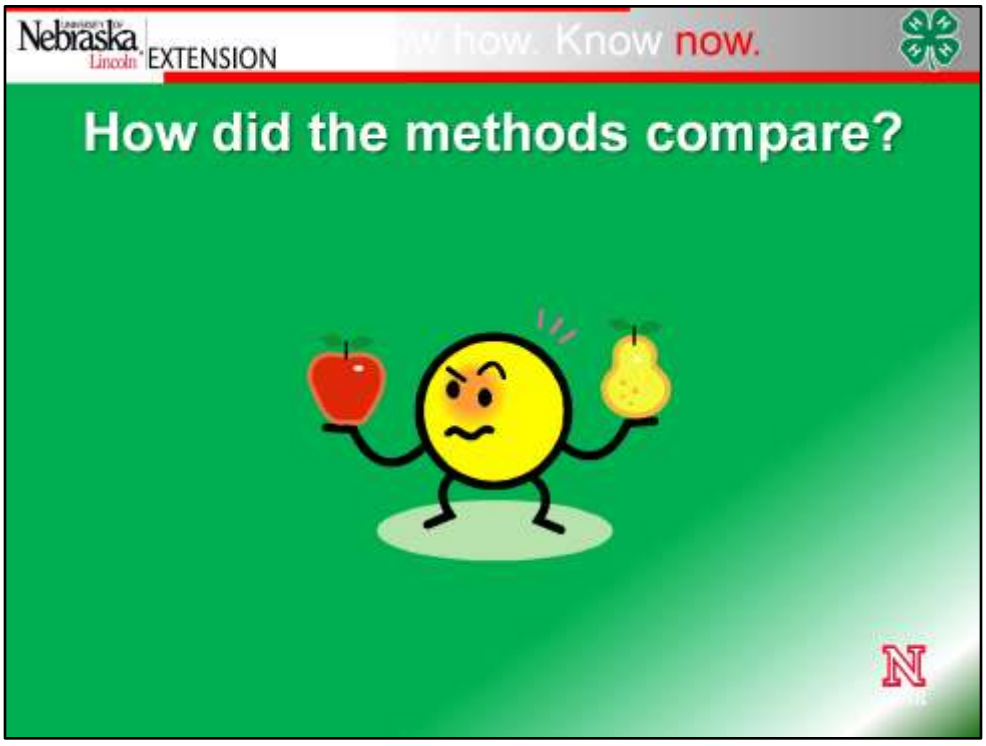
- Using Ear Counts to Estimate Ears per Acre

30 inch rows = 17.5 inches

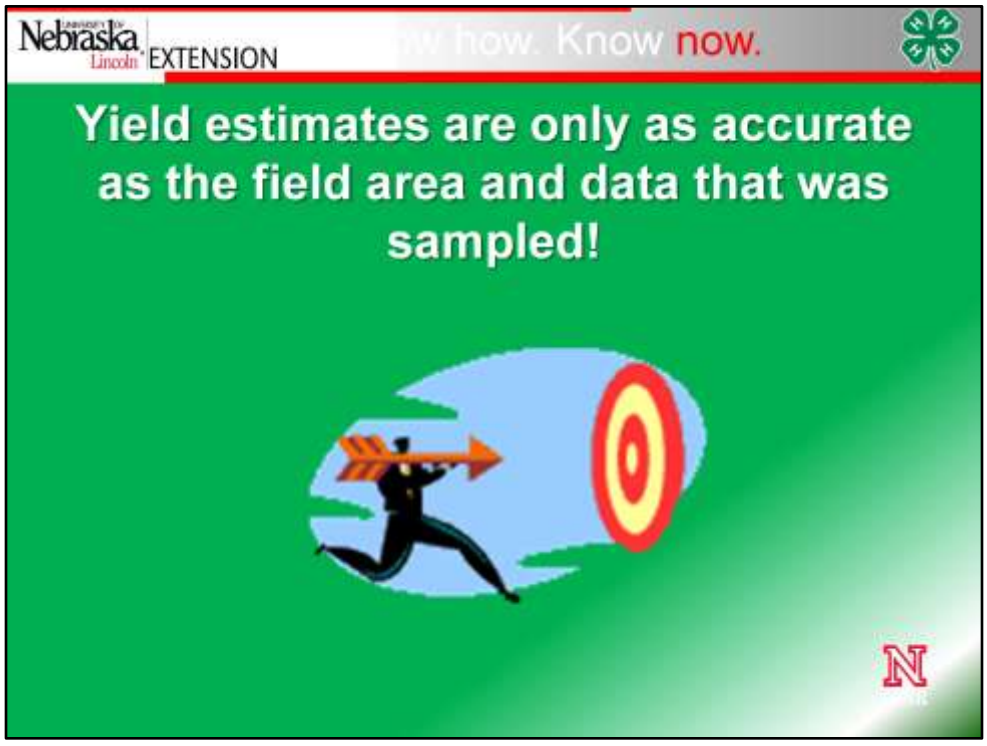
(count how many ears are in 17' 5")

- Improving Estimate of Ears per Acre

(count how many ears are in 100 feet of row)



Compare the results among all of the methods. Which one was the most accurate? Why?



Summarize yield estimates:

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.

Discuss corn harvesting & soybean harvesting losses in ISU manual Unit 3, pgs. 38 & 41

As a review, complete the It's Harvest time or is it worksheet.

Summary (Closure) – Conclusion to the Problem:
When is corn and soybeans ready to harvest and how can yield estimates be calculated?

How do you know when corn and soybeans are physiologically mature?

What are limiting factors that affect yield?

What are the parts of an ear of corn and corn kernel?

What are some ways to get yield estimates on corn?

How can you get more accurate yield estimates?

What are potential harvest losses that can occur?

*(Optional) Create a display outlining how yield is determined and describe factors that affect why a yield could be outstanding or poor.

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Know how. Know now.

What is the optimal time to harvest grain?

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