

# Taste and Teach

## June - Corn



### Five **Fun Facts** About Corn!

- Most of California's corn crop is made into silage, which is used to feed dairy cows and other ruminant animals.
- There are three types of corn that are grown for humans to eat: dent corn (for grains including cornbread and corn chips), sweet corn (to eat as a vegetable) and popcorn (to eat as a snack).
- Ethanol is an alternative fuel that is made from corn.
- A corn stalk can grow 7 to 12 feet tall!
- Corn is grown on every continent except Antarctica.

### Four **Fun Teaching Ideas**!

- Watch this video on corn from North Plains Groundwater Conservation District.  
<https://www.youtube.com/watch?v=7fkoC5oLGBY>
- Did you know many *packing* peanuts are made from nearly 100% cornstarch? Shh, don't tell your students! Ask students to use deductive reasoning to match raw commodities to their byproducts in the *Link 'Ems Ag-Bite* activity.
- Research how different cultures incorporate corn into their cuisine.
- Plant popcorn seeds in moist cotton balls! This experiment helps students learn what it takes to germinate a seed. See the lesson plan on the back of the Corn Fact and Activity Sheet.

*Explore all the great corn resources in this section!*



# Corn

Information compiled by the California Foundation for Agriculture in the Classroom

**How Produced** – The most abundant variety of corn grown in the United States is dent corn. In California, dent corn is planted each spring. Seeds are planted approximately two inches deep either into moist, flat ground that is formed into seedbeds after the seed germinates, or into pre-formed seedbeds that are irrigated until germination occurs.

The corn plant has a stalk, and “ears” of corn grow where the leaves join the stalk. An ear consists of a corn cob covered with rows of kernels (800 kernels on average). Each kernel is a seed that can grow into a new plant. Leaves, called husks, protect each ear.

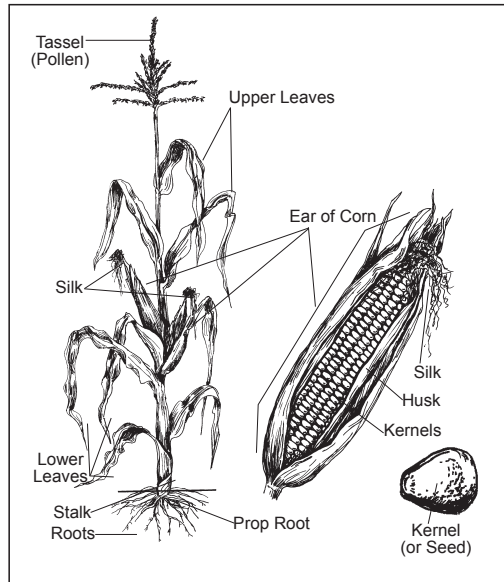
A tassel (the male plant part) at the top of a cornstalk contains hundreds of small flowers that produce pollen, which is distributed by wind and gravity to the thread-like silks of the ears. The silks are connected to the female part of the plant. Each silk will carry pollen to a spot on a developing ear and produce a kernel.

Stalks can grow from seven to 12 feet tall. Corn is harvested with a combine from August through September. The combine strips the husks and removes the kernels from each ear.

**History** – Corn, also known as maize, is a cereal grain that was domesticated in Mesoamerica as many as 10,000-12,000 years ago. Corn is a member of the grass family and grew wild in what is modern-day Mexico. Native Americans grew corn as a crop and fertilized the seed by planting it with decaying fish. The fish contained nitrogen, which corn needs for good growth. The earliest known ears of corn were tiny, but centuries of breeding—first by Native Americans, then by early settlers, and later by modern scientists—resulted in bigger, fuller ears of corn.

Today, corn is cultivated on every continent except Antarctica. The three types of corn grown for human consumption are dent corn (grain), sweet corn (vegetable), and popcorn (food snack). Dent corn is a variety that is harvested when the kernels are dry and mature (dent stage) and processed into thousands of items: starch (baby food and salad dressing); corn syrup, dextrose (bakery goods, fruit juices, antibiotics); oil (margarine and soap); and is primarily used as animal feed. Sweet corn, however, is picked when immature (milk stage) and prepared and eaten as a vegetable rather than a

grain. Today’s scientists have even developed a new source of fuel from corn products called ethanol.



**Varieties** – More than 95% of U.S. corn acreage planted is hybrid corn. Hybridization is a breeding process used to improve plant characteristics and increase yield. Hybrid varieties were developed to adapt to specific growing conditions and locations, and they are continually being improved through biotechnology and breeding efforts. Biotechnology uses living organisms (such as microbes, plants, or fungi) to produce useful products and services. Biotech corn offers in-plant protection from insects and herbicides, reduced need for plowing, and higher crop yields. In 2015, 93% of U.S. corn acreage was planted with biotech seed.

**Commodity Value** – Corn is America’s most important cash crop, with 81.5 million harvested acres generating a crop value of more than \$52.7 billion in 2019. Most of California’s corn crop is harvested to use as silage, which is fed to dairy cows and other ruminant animals.

**Top Producing Counties** – California produces 19.9% of the nation’s sweet corn, ranking number one in the U.S. According to the 2018-19 California Agricultural Statistics Review, California harvested roughly 33,000 acres of sweet corn, valued at \$170 million. The same year California harvested 65,000 acres of dent corn, valued at \$53 million. The leading counties in 2018-2019 for corn production was Imperial county for sweet corn, San Joaquin county for grain corn, and Tulare county for silage corn.

**Nutritional Value** – Corn has four major elements: starch, protein, oil, and fiber. One cup of white corn has 130 calories, two grams of fat, five grams of protein, 29 grams of carbohydrates, four grams of fiber and no cholesterol. Oil from the germ or embryo of the kernel is rich in the antioxidants lutein and zeaxanthin, which are associated with a lower risk of chronic diseases. Fructose (from cornstarch) is a sweetener that helps the body utilize protein.

**For additional information:**  
National Corn Growers Association  
(636) 733-9004  
Website: [www.ncga.com](http://www.ncga.com)

# Corn Activity Sheet

## A historical look at corn improvement

### < 5,000 B.C.

Early farmers domesticated wild plants by saving the seeds from the best plants and planting them as next year's crops. This is the earliest form of genetic modification.

### Early 1800s

When Europeans started to settle along the eastern coast of North America, two races (varieties) of corn dominated in this region—the Northern Flints and the Southern Dents. Settlers cross-pollinated these two races and created the Corn Belt Dents, the ancestor of nearly all the corn hybrids in the United States.

### 1933

Hybrid corn is commercialized by Henry Wallace in the 1920s. Growing hybrid corn eliminated the need to save seeds because the increased yields outweighed the increased costs of annual seed purchases. By 1945 hybrid corn accounted for 78% of U.S. grown corn.

### 5,000 B.C. - 1500s A.D.

Native Americans improved on corn farming by selectively sowing seeds from plants with preferred characteristics for the next year's crop. Settlers from Europe began breeding corn.

### 1870 - 1890

William James Beal produced the first experimental corn hybrid in a laboratory.

### Mid 1900s

Corn yields and quality improve through crossbreeding and hybridization. Crops are developed that contain built-in protection against insect pests, disease causing organisms and harsh environmental conditions.

### Present Day

Plant breeders can precisely select single genes that produce desired traits, such as insect resistance and herbicide tolerance.

The corn you buy in the store is different from the plant that scientists believe corn originated from thousands of years ago. The most prevalent scientific theory is that corn was first developed from a wild grass called teosinte and looked much like grass and not the golden vegetable so many people love today. Early civilizations created corn hybrids by cross-pollinating plants from different varieties.

### Lesson Ideas

- Using the data given, calculate the value of sweet corn per acre and the value of grain corn per acre. Compare your results and brainstorm reasons why there is a difference in value.
- Corn is used to produce a variety of products, including packaging peanuts, ethanol, disposable tableware and more. Choose a corn-based product and research the technology used to develop it.
- What role do the four major nutrients found in corn play in nutritional health? Write a report to summarize your findings.
- Read "Four Seasons of Corn: A Winnebago Tradition" by Sally M. Hunter.
- Research how different cultures incorporate corn into their cuisine.
- Draw a poster showing some of the past and present dangers known to threaten corn crops.

### Fantastic Facts

1. The tassel is the male part of the plant that contains hundreds of small flowers.
2. Corn was domesticated 10,000-12,000 years ago in Mesoamerica.
3. A cornstalk can grow 7-12 feet tall.
4. Hybridization is a breeding process used to improve characteristics of the plant.
5. 31% of the world's corn is produced in the United States.
6. Tulare county leads the state in the production of corn not consumed by humans.
7. Starch, protein, oil, and fiber are the four nutritional elements of corn.
8. Ethanol is an alternative fuel that is derived from corn.

## Lesson Plan: Growing Up with Corn

**Introduction:** Corn plants will move toward light when growing. Called phototropism, this occurrence is actually the result of increased cell division and growth in the area of the plant that does not receive direct light. The lopsided growth causes the plant to bend toward the light source.

**Objective:** Students will conduct an experiment to examine phototropism in corn seedlings.

**California Standards:** NGSS: 4-LS1-1, MS-LS1-4, MS-LS1-5

**Materials:** A Petri dish or sealable plastic bag with holes punched at the top (enough for one per group), popcorn kernels, absorbent cotton balls, packing tape.

### Procedure:

1. Divide students into groups and give each group four kernels of corn, one Petri dish (or plastic bag) and 3-4 cotton balls.

Put the cotton balls in the container. Plant one kernel in the moist cotton ball on each of the four sides of the dish or bag.

2. Tape the bags or Petri dishes to the wall in various places around the classroom and in varying degrees of light.
3. Observe how the plant grows, how many days it takes to germinate and how long the roots grow. Have students document which emerges first, the roots or stem, and which way the roots and stems grow.
4. As students report on their findings, help them use scientific reasoning to understand how phototropism affects the likelihood of successful reproduction.



# A-maize-ing Non-California Commodities

Corn, soybeans, and peanuts are commonly consumed crops, but are not commonly grown in California. Luckily, enough states produce these crops for Californians, and others around the world, to enjoy year-round. Let's dive into the three crops, whose by-products are in other products we use every day!

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## Corn Belt

There is a section of states known for producing large amounts of corn. These states are known as the Corn Belt. Corn is made into a variety of by-products, with a large portion going to food products, biofuel production, alternative plastic products, animal feed, and even more! Unscramble the letters above to identify the six Corn Belt states that produce the corn by-products you enjoy! **Standards: CC ELA: L.4.2.D; L.3.3**

## Surprising Soybeans

Ford Motor Company has been using soybeans in an alternative way to create **biodegradable** products for their cars since the 1940s. These "green" products are used as both interior and exterior vehicle parts. Use the QR code to watch how soybeans can be used to replace **non-renewable resources**. **Standard: CC ELA: W.3.2**

## Full of Beans

Read how soybeans play a role in great storytelling. Pick up the book, *Full of Beans*, and discuss the central role soybeans plays in Henry Ford's successes. **Standards: CC ELA: RL.3.1, RL.4.2**

**COMMODITIES**  
Corn, soybeans, and peanuts

**PRIMARY PRODUCTS**  
Biofuel, livestock feed, manufactured food products

**BY-PRODUCTS**  
Corn cobs, corn plant, soybean plant, and shells

**MADE IN CALIFORNIA**

## Nobel Prize Winner Spotlight

Barbara McClintock, 1902-1992, was known for her work with **mobile genetics** in corn. Using the Nobel Prize website, [nobelprize.org](http://nobelprize.org), research and write a summary paragraph about Barbara's life and impact on the agricultural science community. **Standard: CC ELA: W.3.2**

## Did you Know?

Dr. George Washington Carver was responsible for developing over 300 peanut products and by-products.

## Powerful Peanut Plant

When you reach for peanuts, you are grabbing the fruit of the plant, also known as a **legume**. Other parts of the plant are by-products that include the peanut meal, the hull, the skin, and the peanut vines. Other than food items, these peanut by-products can be found in dyes for clothing, cosmetic oils, medicines, biofuel, and plastics. Work with a partner to identify items in your classroom that potentially have peanut by-products in them. Create a list and share with your classmates. **Standards: CC ELA: RL.3.1, RL.4.2**

## Thinking like Henry Ford!

Henry Ford, the founder of Ford Motor Company, was known for his creative thinking in using agricultural products like soybeans, as well as other agricultural by-products, to create the soybean plastic car in 1934. In the following years, Henry inspired scientists at Ford Motor Company to continue to explore the creation of more car parts out of agricultural by-products.

**Try making your own bioplastic by following these instructions.**

**Ingredients:**

- 1 tablespoon (14 g) cornstarch
- 2 drops corn oil
- 1 tablespoon (15 mL) water
- 2 drops food coloring

**Instructions:** Combine the ingredients in a sandwich-sized resealable plastic bag. Seal the bag and mix the ingredients by rubbing the outside of the bag until the ingredients are combined. Open the bag slightly to create a vent and place it into a microwave oven on high for 20-25 seconds. Carefully remove the bag from the microwave, and let it cool for a few minutes. Congratulations, you have made bioplastic like Henry Ford! **Standard: NGSS: 5-ESS3-1**

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The Henry Ford ([thehenryford.org](http://thehenryford.org))  
The National Soybean Checkoff ([ussoy.org](http://ussoy.org))  
The National Peanut Board ([nationalpeanutboard.org](http://nationalpeanutboard.org))



## Link 'Ems

Determine how well you know your by-products. Link each raw commodity with commonly used products.

### Activity

1. Collect samples of each of the raw commodities (walnut, wood, corn, wool, soybean) and each of the by-products (sandpaper, rayon, packing peanut, lotion, crayon). Put one of each sample into a bag and mix them together.
2. Separate students into small groups and ask them to sort the raw commodities from the by-products.
3. Challenge students to use reasoning and deduction to link the raw commodities and their by-products. If teams don't agree, suggest an impromptu debate in which each team defends its conclusion. Use the information below to explain the links.
4. Challenge students to identify the chemical processes used to create the by-products. For example, how does the molecular compound for cellulose differ from that of rayon? What caused the change?

### Walnuts

Walnut meat isn't the only part of the walnut fit for human consumption. Its oils are used in cosmetics, and the shells are used in many abrasives for sand blasting roads and cleaning engines. The shells are also used in the production of sand paper, snow tires, and pet litter.

### Wood

More than 5,000 products are made from trees. Rayon, a silk-like fabric, is made from cellulose acetate, which comes from wood pulp. The cellulose is dissolved by chemicals, forced through tiny holes in a metal spinneret, and then twisted into silky yarn.

### Corn

According to the *National Corn Growers Association*, there are uses for every part of the cornstalk—husks, kernels, and even the water the kernels are processed in. Many “packing peanuts” are nearly 100% corn. They dissolve in water, making them environmentally friendly.



## Materials

- Multiple samples of the raw commodities, such as walnut, wood, corn, wool, and soybean.
- A sample of products made from each commodity, such as sandpaper, rayon, packing peanuts, lotion, and crayons.

## Tip

Have students bring in their own products and ask the class to determine from what the product originated.

### Wool

Wool from sheep contains lanolin, which helps the wool repel water. During processing, the lanolin is removed from the wool for use as a moisturizer in many soaps, facial creams, and lotions.

### Soybeans

Soybeans, used in the production of tofu, also make great crayons. *Prang Fun Pro* makes a crayon that is 85% soybean oil. One acre of soybeans can make 82,368 crayons!

## Classroom Activities

### Science

- Research the origin of the raw commodities used in this project. Present your findings to the class.
- Research products that you use daily. What are they made of? What commodity are they a by-product of?

### English Language Arts

- Identify the geographical regions that produce the raw commodities. Discuss where and why products come from these areas.

### Math

- Determine what percentage of the class linked the right products. Create a graph with the class results.

## California Standards

### Grade 6-8

ELA CC: RST.6-8.1;  
WHST.6-8.7, 9; SL.6-8.1, 4  
NGSS: MS-PS1