

Commodity Fact Sheet

Apples

Information compiled by the California Foundation for Agriculture in the Classroom

How Produced – Grafting, a horticultural technique that joins two plant structures together, is the first step in apple production to ensure that rootstock and varieties will bare fruit. Once planted, it takes four to five years for the tree to produce the first fruit and will produce fruit for up to 100 years. Most apple varieties are self-sterile, meaning unable to pollinate themselves and rely upon cross-pollination. The most commonly used pollinator is crab apples (also known as wild apples) in which pollination takes place in the spring, when trees are in blossom. Once pollinated, blossoms fall to the ground and small apples begin to grow in the blossom's place.

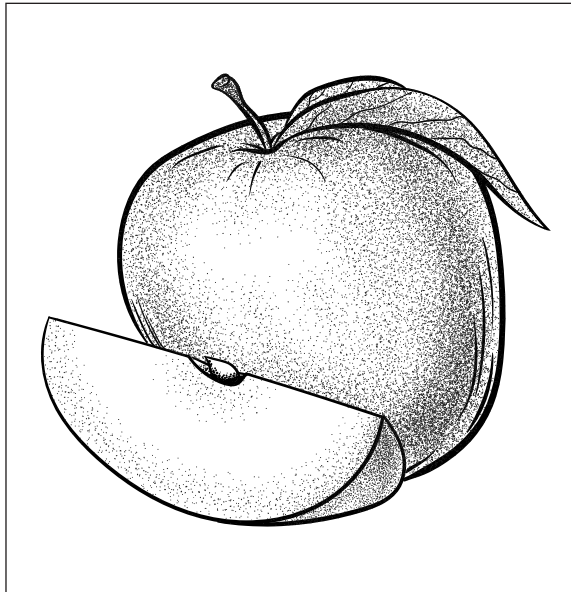
During spring and summer, apple trees require frequent watering. Apple trees can tolerate a great deal of heat if they have sufficient water. The apple crop is harvested by hand in the fall. To insure crop production for the following year, trees must be pruned yearly in the winter to promote new vegetative growth.

History – The first documented history of apples dates to 300 B.C. in the Persian Empire, where the cultivation and enjoyment of apples was an essential part of civilized life. In the 1400s apples were rediscovered and in the 1500s regained popularity again as a common commodity. During this time, European settlers of the Americas brought with them their English custom varieties, and the first apple orchard was planted in America. William Blackstone was the first pilgrim to plant apples trees grown in the United States in the Massachusetts Bay Colony in 1629.

In the early 1800s stories began circulating about John Chapman, better known as Johnny Appleseed, who traveled across the Ohio Valley carrying bags of apple seeds. Venturing westward, he planted seeds and grew apple trees wherever he roamed to ensure that settlers living in the western frontier would have nutritious apples to eat. Apples have a place in more recent history, too. In 1962, the first American to orbit the Earth carried pureed applesauce to consume during the flight.

Varieties – The apple, scientifically known as *Malus domestica*, is a member of the rose family. California has almost 14,000 acres dedicated exclusively to apple production. California grows four main varieties: Gala, Fuji, Granny Smith, and

Cripps Pink. Within the United States, roughly 2,500 varieties of apples are grown. The top 10 apple varieties grown within the United States are Red Delicious, Golden Delicious, Fuji, Granny Smith, Rome Beauty, McIntosh, Idared, Jonathan, Gala, and York Imperial.



Commodity Value – The United States' 7,500 apple producers grow approximately 240 million bushels of apples each year on 322 thousand total acres of land. The wholesale value of the United States apple crop is approximately \$4 billion annually. Worldwide, the United States ranks second to China in apple production. California ranks fourth in U.S. apple production, generating 12 percent of the national apple crop which is approximately 800 million pounds annually. Seventy-five percent of the apples produced in California will be shipped domestically and

25 percent are exported. Canada, Malaysia, Mexico, Taiwan, and Panama are five of the 27 global destinations California exports to.

Top Producing Counties – There are five major regions in which apples are grown in California. Historically, apple production was limited to the coastal mountains, the Sierra foothills, and in the Southern California mountains. Recently apple production has expanded into the Central Valley with new plantings of Granny Smith, Fuji, Gala, and other varieties. Important coastal apple producing counties are Sonoma, Santa Cruz, and San Luis Obispo. The major apple production areas are in the San Joaquin Valley with Kern, Fresno, San Joaquin, and Madera counties being the leading producers.

Nutritional Value – One medium-sized apple provides 20 percent (five grams) of the daily requirement for dietary fiber, eight percent of the daily requirement for vitamin C, and is a healthful source of potassium. One apple has approximately 80 calories and contains no fat, cholesterol, or sodium.

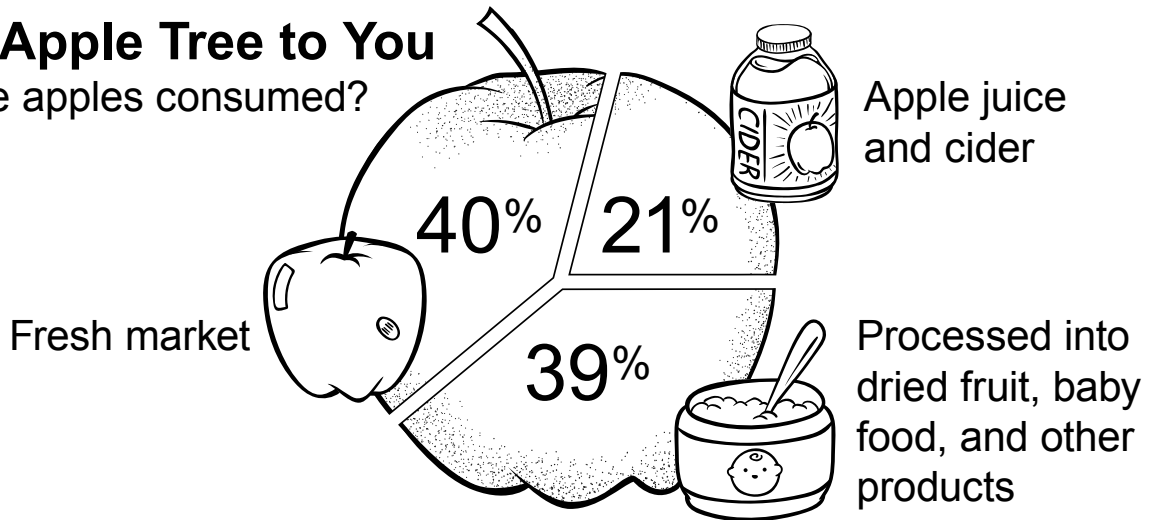
For additional information:
California Apple Commission
Phone: (559) 225-3000
Website: calapple.org



Apples Activity Sheet

From Apple Tree to You

How are apples consumed?



Lesson Ideas

- Dissect and examine the anatomical parts of an apple. Observe and identify the function of each structure.
- Research and explain the aphorism “an apple a day keeps the doctor away” using nutritional information.
- Observe and practice various grafting techniques used to grow apples.
- Compare hand and machine harvesting methods. Invent a harvesting machine for apples.
- Perform experiments that show the different methods of preserving apples.
- Research and determine what the top ten apple varieties are and why they are most popular amongst consumers.
- Calculate the percentage of water weight in apples by dehydrating the fruit.
- Sprout an apple plant from a seed.

Fantastic Facts

1. The crabapple is the only apple native to North America.
2. Apples are propagated by two methods: grafting or budding.
3. The apple variety “Red Delicious” is the most commonly grown apple variety worldwide.
4. Apples are a member of the rose family.
5. Twenty-five percent of an apple’s volume is air, which makes it naturally buoyant.
6. It takes the energy from 50 leaves to produce one apple.
7. World’s top apple producers are China, United States, Turkey, Poland, and Italy.
8. Archeologists have found evidence that humans have been enjoying apples since 6500 B.C.
9. Apples account for 50 percent of the world’s deciduous fruit tree production.
10. Two-thirds of an apple’s fiber and antioxidants are found in the peel.

Lesson Plan: Sugar or Starch

Introduction: Apples naturally contain starch also known as carbohydrates. When an apple begins its ripening process, starches are converted into sugar. This conversion process starts at the core of the apple and moves outward toward the skin. To check the ripeness of the apple an iodine test can be used to identify the amount of starch present.

Objective: Students will investigate the ripening process of apples by conducting an iodine experiment.

Standards: NGSS: 4-LS1-2, 3-5-ETS1-3; CC ELA: L.W.4-5.7

Materials: Variety of apples, iodine tincture, nitrile gloves, safety goggles, paintbrush, knife, paper plates or towels

Procedure:

1. Safety note: Iodine tincture is a hazardous material and should be handled with care. Wash hands after use and avoid contact with the eyes and skin.
2. Place individual, whole apples on labeled plates (1, 2, 3, 4,

etc.) and instruct students to observe each apple’s size, color, texture, and firmness. Have students hypothesize, based on their previous knowledge, which apples are at peak ripeness.

3. Cut apples in half, displaying both sides of the apples on each labeled plate. Have students observe each apple’s internal characteristics.
4. With the paintbrush, evenly apply iodine across the cut surface of each top apple half. Let the apple sit for two minutes. Leave the other apple half untouched as a control to compare changes in each apple.
5. Observe the surfaces of the apples. Large amount of purple indicates high starch/low sugar. Little to no purple indicates low starch/high sugar.
6. Place apples on a continuum from least to most ripe. Make concluding observations.
7. Write a conclusion paragraph on your experimental findings.

Commodity Fact Sheet

Asparagus

Information compiled by the California Asparagus Commission

How Produced – Asparagus is the growing shoot of a perennial plant raised in furrowed fields. Commercial plantings take two or more years to grow from seed to crowns. As the crowns grow, they develop buds that push up as asparagus spears every spring. The number of buds on a crown increases each year of production. A typical commercial crown is harvested for 10 to 15 years.

Individual spears with compact, tight heads, and vivid green color are harvested when they are about nine inches long. Each day, workers walk the furrows selecting choice spears and cut them by hand. An individual crown produces different sized spears. Earlier in the season, the plants produce thicker spears, which are the most tender.

While the harvest season lasts only 60 to 90 days in each production area, California's wide range of microclimates allows for fresh asparagus to be available from January through May with a small amount in September and October.

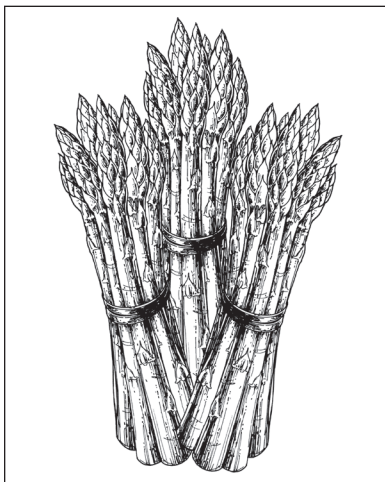
The asparagus is graded and packed in sheds located near the fields to assure maximum freshness. Spears are typically bundled into one-pound bunches, containing 10 to 12 spears, and placed into 30 pound crates specially designed for safe transport. A moist, absorbent fiber pad is placed at the bottom of the crates to prevent drying. Space is left at the top to allow for elongation of spears, which continue to grow. The boxed asparagus is rapidly cooled to a temperature of 34°F to 37°F. Careful handling at every stage of transit is the key to retaining superior flavor, texture, and nutritional content.

History – Asparagus is a member of the lily family (Liliaceae). Its name comes from the Greek language meaning "sprout" or "shoot." Cultivation began more than 2,000 years ago in the eastern Mediterranean. Ancient Greeks and Romans prized asparagus for its unique flavor, texture, and medicinal qualities. It was eaten fresh when in season and dried for winter use.

In the sixteenth century, asparagus gained popularity in France and England. From there, the early colonists brought it to America. Asparagus was first planted in California during the 1850s in the San Joaquin Delta. In addition to the Delta, today's production is centered in the Central Coast, Southern California desert, and Central Valley.

Varieties – Asparagus is available in a variety of sizes; however, size has no bearing on flavor, texture or tenderness.

Today, 98 percent of California's asparagus production is marketed as a fresh green product with the remaining two percent used for processing.



The most common variety is University of California 157 (UC157), which is adapted for warm temperatures and moist soils. Other green-colored varieties include Brock and Ida Lea. The University of California has developed a new variety, UC115, which will soon be in commercial production. It has a longer green stock and tighter tip than current, commercial varieties. Asparagus is also available in white and purple. White asparagus, which grows from the same crown as green asparagus, is shielded from the sun by straw or dirt to prevent the plant from developing chlorophyll, a photosynthetic green substance. Purple Passion produces purple spears which turn green when cooked.

Commodity Value – California produces approximately 70 percent of the nation's supply of fresh asparagus. The value of this California crop has declined because of increased foreign competition. California currently produces about 30 million pounds of asparagus yearly on 11,500 acres. Growers export nearly 20 percent of their production to countries including Canada, Japan, and Switzerland.

Top Producing Counties – Asparagus producing counties include Imperial, Monterey, Fresno, Contra Costa, Kern, Sutter, Kings, Merced, Sacramento, and San Joaquin.

Nutritional Value – Asparagus is low in calories, contains no sodium or fat, and is an excellent source of potassium, folic acid, and dietary fiber. One five-spear serving contains 20 calories and two grams of protein. Asparagus contains antioxidants which are beneficial in the prevention of certain cancers and is a significant source of vitamin C, vitamin B₆, and thiamin.

For additional information:

California Asparagus Commission
(916) 690-3911
Website: www.calasparagus.com



Asparagus Activity Sheet

History of California Asparagus Production



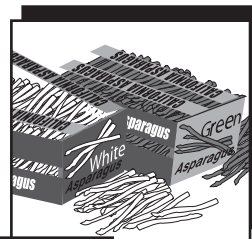
◀ #1

1850s-Migrant families started growing asparagus in the Stockton/Sacramento Delta. Harvested by hand, farmers also used horse and plow to work the fields.



◀ #2

1930s-Asparagus was taken to the docks by truck and then loaded on to ferries where they found their way to San Francisco or Sacramento—the product was then loaded on to railcars and shipped by rail all over the U.S.



◀ #3

1950s-Farmers began producing more green than white asparagus because consumers liked it more. Both were usually processed in cans.



◀ #4

1970s- Another change in consumer preferences led the industry to produce and ship fresh asparagus to grocery stores rather than a canned or frozen product. This change resulted in the need for faster transport to the marketplace. Farmers began to use semi-trucks and airplanes to get their product to market.

1980s- Asparagus was first shipped in refrigerated containers aboard airplanes to destinations all over the world.



◀ #5

Today-Fresh asparagus is still harvested and packed all by hand—just as it was 150 years ago. But, today's asparagus farmer uses tractors rather than horses and ships fresh green asparagus to consumers all over the world.

Lesson Ideas

- Asparagus is measured one inch above the bottom of the stem. Using various sizes of asparagus, determine the circumference, radius, and diameter at this point.
- Bring in a unique asparagus recipe to share. Convert the ingredient measurements in order to provide enough servings to feed the whole class.
- Place cut asparagus spears, tulips, and daffodils in a glass of water. Calculate any growth that occurs.
- Calculate the number of standard crates needed by a grocer who wants to stock 200 lbs. of asparagus.
- On a map, locate California's primary asparagus production regions.

Fantastic Facts

1. The lily, a type of flower, is related to the asparagus plant.
2. Asparagus contains protein, potassium, fiber, vitamin C, vitamin B6, and antioxidants.
3. There are 10 to 12 spears in a typical one-pound bunch of asparagus.
4. White asparagus is green asparagus that has not been exposed to the sun.
5. Asparagus is harvested by hand.
6. Labor accounts for 75 percent of the cost of growing asparagus.
7. Asparagus can continue to grow after it is cut.

Lesson Plan: Asparagus! It's All About Teamwork!

Introduction: It is important to understand that both cooperation and competition are valuable yet challenging components of the business world. This is especially true in asparagus production. More than 75 percent of asparagus production costs are associated with labor including planting, harvesting, packaging, and shipping. Additionally, in recent years the value of California asparagus production has declined due to international competition in places where labor costs are lower.

Objective: Students will plan, perform, and compare methods for harvesting asparagus in this classroom simulation.

California Standards: NGSS: 3-5-ETS1-1, 3-5-ETS1-2, MS-ETS1-1, MS-ETS1-2, HS-ETS1-3

Materials: Green construction paper, scissors, shoe boxes, rubber bands.

Procedure:

1. Divide the students into teams of five or six students.
2. Designate one area "the field" where you place 10 sheets of green construction paper and two pairs of scissors for each group.

3. Designate another area, at least 25 feet away, as "the end of the field row." Place 20 rubber bands and a shoe box at this end for each group.
4. Explain that the green construction paper represents asparagus growing in a field. They are to cut 1-inch strips of paper, get it to the end of the row, bundle it into bunches of 10 with a rubber band, and then neatly place it in a packing crate (the shoe box). The first team to do this is the winner.
5. Model the activity and then have the students perform the activity several times, making changes as needed to become more efficient. Discuss potential impacts on people and the environment that might limit possible solutions. After clean-up, discuss how cooperation and competition were involved in the activity. Was competition a useful tool? How about cooperation? How did competition and cooperation affect quality?

Commodity Fact Sheet

Beef

Information compiled by the California Beef Council

How Produced – There are approximately 600,000 beef cows on about 11,000 ranches in California. In addition, there are 1.78 million dairy cows, which also play an important role in the state's beef industry. Cattle are ruminants, which means they have a four-chambered stomach. Most beef cattle in California graze on land that cannot be used for raising other crops. There are four types of cattle operations; cow-calf, seed stock, stocker, and feedlot. Many producers have a combination of these operations.

Cow-calf producers make up the largest segment of California cattle operations. These ranchers have a herd of breeding cows, replacement heifers (young cows), and bulls. The cows are bred to calve in the spring or fall. Calves are usually sold after they are weaned, at about seven months. After weaning, cattle are sent to feedlots for approximately 120 days where they are fed a high-energy ration of grain and hay. Nineteen percent of cropland in the nation is used to raise feed grains for livestock. Cattle are good recyclers and are often fed waste by-products such as almond hulls or rice straw.

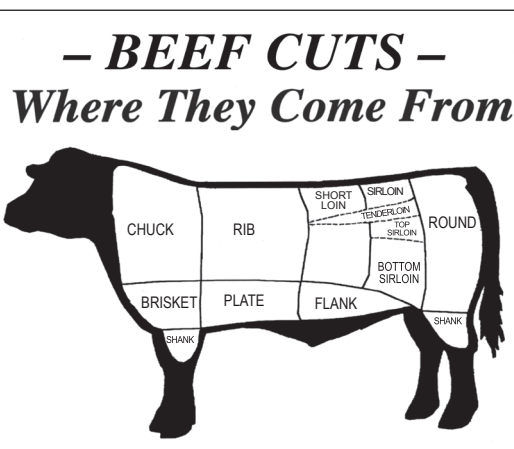
Once cattle weigh approximately 1,200 to 1,400 pounds, they are processed. Ninety-eight percent of each animal is used, but less than half is eaten as beef. Cattle provide a multitude of by-products that consumers use every day, including photographic film, soap, tires, leather, and pharmaceuticals.

Breeds – There are 275 recognized breeds of cattle throughout the world. Most breeds in California originated from Europe or have a Brahman influence. Brahman cattle from India are known for their tolerance to heat.

Cattle brought to the Western Hemisphere by the early Spanish explorers were the ancestors of the Texas Longhorns. While extremely hardy, these cattle did not produce a palatable product. As a result, nineteenth century cattle producers imported purebred cattle, including European Angus and Hereford, to improve the quality of their herds. During the twentieth century, breeds such as Charolais, Limousin, and Gelbvieh became more prevalent due to their leaner meat characteristics.

Commodity Value – The sale of cattle and calves accounted for \$3.39 billion in cash receipts in 2015 and was fourth in terms of value in the state's top 10 commodities in 2015. Nationally,

California ranks fourth in total cattle numbers behind Texas, Nebraska, and Kansas. Beef and beef products are in the top 20 of California exports, bringing in \$308 million in 2015.



Top Producing Counties – Beef cattle are raised in every county in California except San Francisco. Tulare is the leading county in California cattle production at 20.9%, followed by Fresno at 12.3%, Imperial at 10%, Merced and Kern both at 7.9%.

History – The introduction of cattle to North America mirrors the exploration and settlement of the continent by Europeans. Columbus introduced cattle to the Western Hemisphere on his second voyage to the New World

in 1493. Spanish explorer Hernando Cortez took offspring of those same cattle to Mexico in 1519. In 1773, Juan Bautista de Anza brought 200 head of cattle to California to supply the early California missions.

The hide and tallow trade sustained the California economy while it was still under Mexican rule and hides were used as currency to buy supplies from Boston trading ships. When James Marshall discovered gold in 1848, the beef business boomed, feeding the fortune seekers who came to the gold fields. Many of the miners soon realized there was more money to be made in cattle than in prospecting.

Nutritional Value – Beef is a nutritionally dense food that is an excellent or good source of 10 essential nutrients. A three-ounce serving of lean beef contributes more than 10 percent of the Daily Value for protein, zinc, vitamin B12, selenium, phosphorous, niacin, vitamin B6, iron, and riboflavin. Beef is the number one food source of protein, zinc, and vitamin B12. The U.S. Department of Agriculture's Nutrient Database shows that more than 29 cuts of beef meet government standards for lean or extra lean and that many cuts of beef are 20 percent leaner than they were 15 years ago. Half of the fatty acids found in beef are monounsaturated, the same "good fat" found in olive oil.

For additional information:
California Beef Council
(916) 925-BEEF
Website: www.calbeef.org

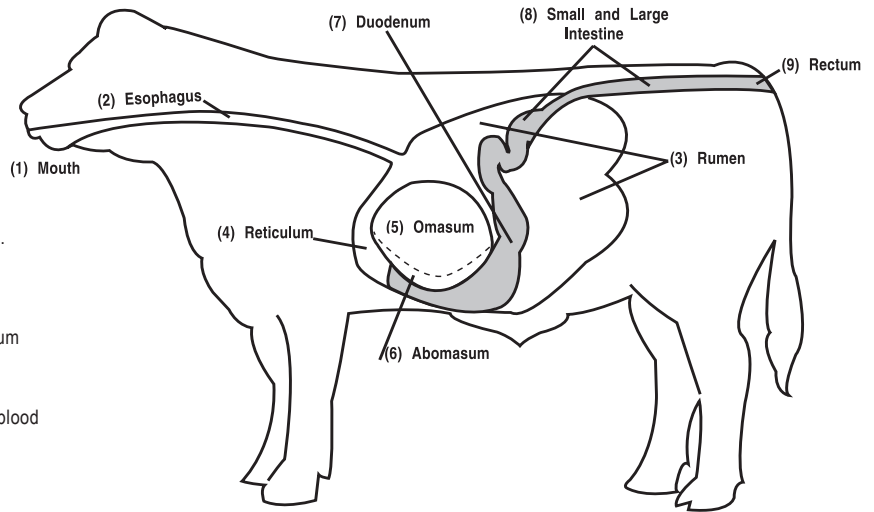


Beef Activity Sheet

Cattle are ruminants.

Ruminants are unique because they have four-chambered stomachs.

- 1) Cattle chew food in their mouths.
- 2) After the food is swallowed, it travels down the esophagus to the rumen.
- 3) In the rumen, the largest chamber of the stomach, the food mixes and softens with the aid of microorganisms.
- 4) Food travels from the rumen to the reticulum where further digestion occurs. Large food items are returned to the mouth for further chewing. This food is called cud.
- 5) When the food particles are small enough, they pass through the omasum where water is removed.
- 6) The food travels to another stomach chamber called the abomasum where stomach juices continue to digest the food.
- 7-8) From the abomasum, food moves through the duodenum and the small and large intestines where nutrients are absorbed into the blood stream and utilized by the animal.
- 9) Waste products are excreted through the rectum as manure.



Lesson Ideas

- Use a Venn diagram to compare and contrast monogastric and ruminant animals. How does their digestive system affect their nutritional needs?
- Given cattle weight at the time of processing, how many pounds of the animal is used? How many pounds are eaten as beef?
- Create a timeline depicting significant events within the beef cattle industry.
- Research the following breeds of cattle and locate their place of origin on a world map: Angus, Brahman, Charolais, Gelbvieh, Hereford, Limousin, Maine-Anjou, Nellore, Santa Gertrudis, and Shorthorn.

Fantastic Facts

1. Cattle have a four-chambered stomach.
2. 98% of beef cattle is used with less than half eaten as beef.
3. Hide, tallow, fat, and bones are examples of beef by-products that are used to make a wide variety of products.
4. People originally raised cattle for their hides and tallow.
5. The most popular form of beef served is ground beef.
6. Iron and zinc are examples of minerals in beef that are readily used by the human body.
7. The five most popular sports in the United States depend on by-products from cattle: Baseball, football, basketball, soccer, volleyball.

Lesson Plan: From Sun to Steak

Introduction: Cattle, ruminant animals, are able to digest plant cellulose—a substance indigestible by humans. This unique characteristic of ruminant animals assists in converting energy into forms that can be used by other animals including humans. Beef and dairy products result from the ruminant digestive process. In this activity the students will create a mural which depicts the energy flow from the sun to food people eat.

Objective: Students will create an energy flow mural depicting the steps from sun to decomposers.

California Standards: CCELA: SL.3-7.2, RST.6-10.7
NGSS: 4-LS1-1, 5-PS3-1, 5-LS2-1, MS-LS1-6, MS-LS2-3

Materials: Butcher paper, dictionary, glue sticks, index cards, lengths of yarn in a variety of colors, markers.

Procedure:

1. Have students find the definition for “ruminants” and list a variety of animals that fit into this category.
2. Discuss how students will create a mural showing the energy flow from the sun to the food people eat.
3. Divide students into pairs or trios. Distribute one of the listed

phrases to each group:

- cattle and sheep
 - plants get their energy from sun, water, and air
 - grazing animals live on land not suitable for crops
 - people eat fruits, vegetables, meat, dairy products, and grains
 - crops grow on fertile land
 - ruminant animals have a unique digestive tract
 - food from farms is processed, packaged, and sent to stores
 - bacteria, earthworms, and snails are types of decomposers
4. Have students draw a scenic background for their mural made of butcher paper. There should be hills, valleys, waterways, and an urban city with stores and houses.
 5. As a class, decide which phrase fits into which part of the mural. Have students create and add a scene that shows what their card indicates. Incorporate key sentences into the mural.

Commodity Fact Sheet

Bees

Information compiled by California Foundation for Agriculture in the Classroom

How Produced – Bees are raised by beekeepers but also exist in the wild. A bee hive has a seasonal cycle that repeats from year to year. During the winter a hive is dormant. The worker bees and the queen spend the winter eating stored honey. When the weather gets warmer and spring flowers start to bloom the colony becomes more active. Worker bees start to leave the hive to collect pollen and nectar. In early summer the colony is very active. Workers leave the hive daily to forage and many new worker bees emerge. By late summer, the colony has grown very large and strong. In the fall, the flowers have stopped blooming and are producing fruit. The colony works on storing food and foraging for nectar slows down.

Honey bees live in colonies that are often maintained, fed, and transported by beekeepers. The modern beehive is made up of a series of square or rectangular boxes, without tops or bottoms, placed one on top of another. Inside the boxes, bees build up the wax honeycomb to raise bees and store honey. Modern hives enable beekeepers to transport bees, moving from field to field as the crops need pollinating and allowing the beekeeper to charge for the pollination services they provide.

History – The honey bees we are familiar with today originally came to the United States from Western Europe around 1622. It wasn't until about 200 years later that they came to California. Bees were finally introduced by using a sea route along the East Coast and crossing Panama, before using the Pacific Ocean for the final part of the journey. It was in 1853 that botanist C. A. Shelton used this route to introduce the first honey bees into California. Transporting colonies of bees either by sea or land in the 1700s and 1800s was not easy. The sea voyage from England lasted six to eight weeks, and it was not easy to keep bees alive for that time while confined. Many of the attempts to transport bees were unsuccessful. But now honey bees are an important part of the American pollination process.

Varieties – There are about 4,000 species of bees. Some species live in the ground, some live in trees, while others live in bee hives. Bees often seen in California are bumblebees, honey bees, carpenter bees, and digger bees. The common honey bee is most familiar to people. This is the bee whose hives are found in hollow trees and in the white wooden

boxes managed by beekeepers for honey production and agricultural pollination. Each hive consists of the queen, drones, and thousands of female worker bees. Honey bees are the most important pollinating insect because they can be managed and transported to a pollinator dependent crop.



Commodity Value – A bee colony is worth several hundred dollars. In addition to gathering nectar to produce honey, honey bees perform a vital second function - pollination - making them a critical part of today's agricultural market. This includes products grown in backyard gardens, like apples and squash, but also products like alfalfa seed— creating food for America's meat and dairy industries. In fact, about one-third of the human diet is derived from insect-pollinated plants, and honey bees are responsible for 80 percent of this pollination. California almonds, which is a six-billion dollar industry, depend entirely on honey bees to pollinate their crops. According to a USDA report, in 2013 the annual value of direct honey

bee pollination to U.S. agriculture was estimated at over \$16 billion. Honey production in California ranked fifth in the country for 2013 at 10,890,000 pounds valued at \$22,869,000.

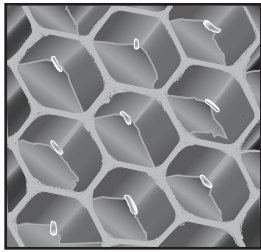
Top Producing Counties – Bees are raised by commercial operations and many small hobby beekeepers throughout California. Shasta County, Merced County, Colusa County, and Sutter County all have large operations that produce queen bees and packaged bees. Queen bee breeder operations tend to be in isolated areas. Major metropolitan areas with hobby beekeepers are in San Diego, Los Angeles, Sonoma, and the Bay Area. Bees are considered livestock!

Nutritional Value – Honey bees collect nectar and store it as honey in their hives. Nectar and honey provide energy for the bees. It also provides energy for humans. Honey is high in carbohydrates. Honey is the only sweetener that also contains B vitamins, minerals, and protein.

For additional information:

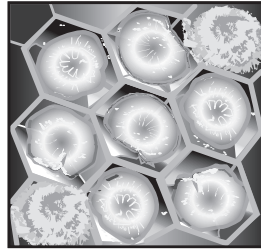
California State Beekeepers Association
(209) 545-5359
Website: californiastatebeekeepers.com

Bee Activity Sheet



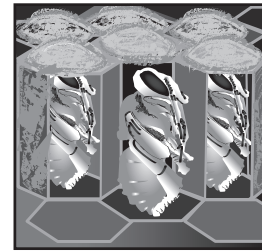
1

The queen bee lays one egg in each cell.



2

After three days, eggs hatch into larvae.



3

After about six days, the eggs are capped and each larva spins itself a cocoon and becomes a pupa.

4

Another ten days later, an adult worker bee emerges.



5

After the new adult comes out, she spends her time with jobs in the hive. This includes cleaning hive cells, feeding the developing larvae, capping the cells with wax, and guarding the front entrance.



6

After about three weeks in the hive, each worker bee leaves her job in the hive to go out and collect food for the colony.



Lesson Ideas

- Research the history of bees and honey, write a report and give an oral presentation.
- Research Colony Collapse Disorder. Create a poster that explains the problem and offers possible solutions.
- Bee hives are built and consist of many hexagons fitting together. Create an art piece using math shapes.
- Do a taste test of honey from different regions and bees that pollinated different crops.
- Research the connection between bear population and beekeepers. Report to your class.
- Come up with a recipe using honey and share with your class.
- Study insects. Create an insect book of drawings and facts.

Fantastic Facts

1. A $\frac{1}{4}$ cup of bees is about 200 bees.
2. Bees have specific jobs. Some collect pollen and others collect nectar.
3. Bees can only sting once and then they die.
4. Bees are insects with three body parts and six legs.
5. People who are allergic to bees may need to have an EpiPen injection used to assist against anaphylactic shock. It does not cure the reaction but provides time allowing the victim to get to the nearest hospital.
6. Most beekeepers in the United States manage European honey bees.
7. Bears do love honey and will raid apiaries.

Lesson Plan: Bee Hive Shapes (all about polygons)

Introduction: Each bee honeycomb is in the shape of a hexagon. Hexagons are one of the few regular polygons that can fit together perfectly without leaving any gaps. Repeating a shape to cover a surface without any gaps or overlaps is called tessellation. This activity will allow students to explore what shapes create tessellations.

Objective: Students will study geometric figures in nature and create tessellation art displays

California Standards: CC Math: 4.G.2, 5.MD.5, 5.G.4, 6.G.2, 7.G.6, 8.G.2, 3, 4, HS.G-CO.5; NGSS: 3-5-ETS1-1; Visual Arts Content: Grades 4-12, 1.0 Artistic Perception

Materials: Polygon stencils, notebooks, plain paper, pencils, colored pencils or markers

Procedure:

1. Show the class a picture of honeycomb to demonstrate how the hexagonal shapes fit together perfectly. Define the word tessellation and how honeycomb is an example of this.

2. Explain to the class that they will be looking for other geometrical shapes that can tessellate like the hexagon. Students can write a prediction in their notebooks of one or two shapes they think will fit together and why.
3. Give students time to find other polygons that can fit together without gaps or overlaps. Students will use stencils to draw one shape repeatedly to find this out. This can be done independently or in groups.
4. Discuss as a class what the students discovered. Students look back at their predictions and see if they were correct. Older students can discuss which shape is best for beehives and why, including which shape provides the most volume to store honey.
5. Conclude the lesson by allowing students to create and color their own repeating shapes. Display their tessellation art.

Commodity Fact Sheet

Bell Peppers

Information compiled by California Foundation for Agriculture in the Classroom

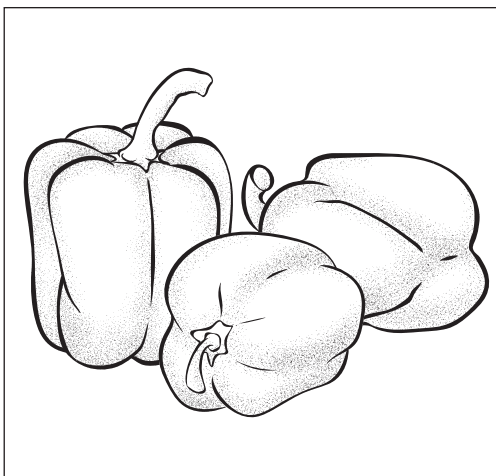
How Produced – The pepper plant is a member of the *Solanaceae* or nightshade family, which also includes tomatoes and potatoes. Pepper plants are planted in the field as seeds or as young plants, called transplants. Bell peppers are warm-season crops, sensitive to freezing temperatures at any growth stage. The ideal growing temperature is between 75° and 85°F, with night temperatures between 55° to 65°F. If planting seeds directly into the ground, the producer typically sows seeds March through May. If planting by transplant, plants are grown in greenhouses for two months before being transplanted out in the field from March through July.

Bell peppers are a slow-growing crop, with up to 180 days until the final harvest. Due to their slow-growing nature, they face greater exposure to elements such as inclement weather, pests, and weeds. Therefore, bell pepper fields require significant input costs such as water, labor, and crop protection. Bell peppers are also susceptible to sunscald, which occurs when ripening fruit is not adequately shaded by leaf cover. Adequate fertilization to increase canopy coverage helps control this problem. The color of bell peppers change as they ripen on the vine. Most bell peppers are primarily sold as green peppers, but red, yellow, orange, purple, and black colors will show as the plants ripen. Peppers are ready for harvest between early July and October. Fresh market peppers are harvested by hand, with multiple harvests occurring within a single season. Peppers intended for processing are often harvested mechanically. In this process, each plant is cut at the base and peppers are shaken from the plants. The shaken peppers are hand-sorted on the machine. Conveyor belts transfer the peppers into produce bins pulled by a tractor following alongside.

The bins are transferred onto flatbed trucks using a forklift. Trucks haul processing peppers to a facility where they are peeled, sliced, or diced into the familiar frozen, canned, or dehydrated pepper products seen on store shelves. Fresh market peppers are graded and packed in sheds located near the fields to assure maximum freshness.

History – About 9,000 years ago, the wild pepper plant originated near Bolivia and Peru. It was later cultivated for its fruits by the Olmecs, Toltecs, and Aztecs. The seeds spread throughout Central America by both nature (wind, animals) and human activity (migration, exploration).

Bell peppers were carried throughout the world by Spanish and Portuguese explorers. The misleading name “pepper” was given by Europeans when Christopher Columbus brought the plant back to Europe. Due to the versatility of the bell pepper, it quickly became a staple in diets throughout the world including Central Europe where they were dried and ground to make paprika. Commercial bell peppers were first grown in the United States in the early 1920s.



Varieties – Varieties are selected on the basis of yield potential, quality, market acceptability, and disease resistance or tolerance. There are nearly 200 different varieties of bell peppers grown throughout California for both fresh market and processing. These include varieties with the traditional multi-lobe shape as well as longer more pointed

varieties. Common bell pepper varieties used for commercial production include: Huntington, Classic, and Baron.

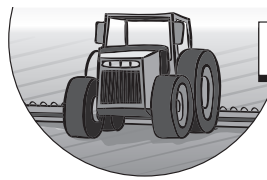
Commodity Value – California is the nation's leading producer of bell peppers. Last year, California's pepper growers harvested more than 410,000 tons on 19,800 acres throughout the state. The state's crop value reached \$400 million in 2017. Most of California's peppers are consumed within the US. Canada is the top export market, valued at \$26 million.

Top Producing Counties – Riverside is the top producing county in California generating nearly \$78 million. The second highest producing county is Ventura generating \$61 million, followed by San Benito at \$32 million, and Santa Clara at \$19 million.

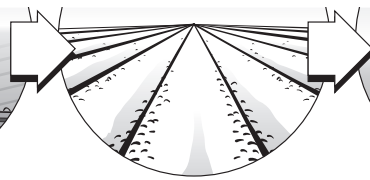
Nutritional Value – One serving of red bell peppers is an excellent source of vitamin A and vitamin C and a good source of vitamin B6. Vitamin B6 helps the body break down or metabolize protein, aids in the formation of red blood cells, and helps maintain normal brain function. Bell peppers are also an excellent source of dietary fiber and provide small amounts of several other vitamins and minerals.

For additional information:
California Pepper Commission
(559) 591-3925
Website: calpeppers.com

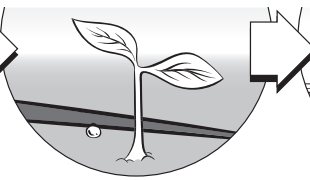
Bell Peppers Activity Sheet



Prepare Fields
Tractors prepare the soil and beds for planting.



Install Drip Irrigation
Pepper plants are irrigated frequently during the growing season.



Plant Seeds or Seedlings
Proper moisture is essential for early growth.

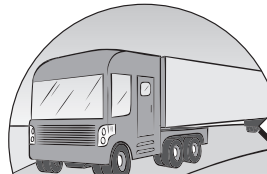


Control Weeds
A combination of hand labor and chemical control is often employed.

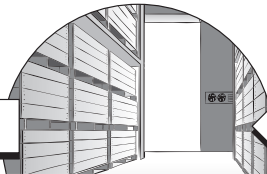
Thin Peppers in the Field
If seeded, manually remove unwanted seedlings.



Fertilize and Water Regularly
Proper nutrition and moisture are critical for plant development.



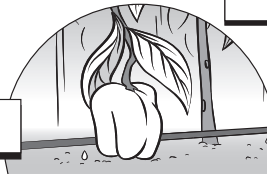
Transportation and Marketing
Products are distributed to stores and restaurants.



Processing
Peppers are transported to cold storage to undergo further processing.



Harvest
Fresh market peppers are harvested by hand; processing peppers are often harvested mechanically.



Lesson Ideas

- Research preserved peppers throughout history and plot significant dates on a timeline.
- Study the anatomy of the bell pepper. Label the different parts.
- Examine the capsicum genus and compare the different species of peppers.
- Create an alliterative phrase about peppers. Try to say it three times fast.
- Compare the edible mass of a traditional bell pepper and a sweet mini pepper.
- Explore different types of preserved peppers and compare price per ounce.
- Identify cultures that use peppers in cooking and locate them on a map.
- Research the Scoville rating for a variety of peppers, make a bar graph to illustrate.

Fantastic Facts

1. Peppers are fruits because they are produced from a flowering plant and contain seeds.
2. Columbus and Spanish explorers named bell peppers while searching for peppercorn plants to make black pepper.
3. Bell peppers are called by different names throughout the world (US: bell pepper; England: pepper; Japanese: papurika; Australia: capsicum)
4. Red bell peppers have twice the vitamin C content as green bell peppers.
5. Bell peppers are the only member of the pepper family to not contain capsaicin, the main compound that gives chili peppers their heat.
6. Green bell peppers are less sweet and almost bitter since they have not been able to fully ripen.

Lesson Plan: Sort Your Salsa

Introduction: Peppers add color, flavor, and texture to salads, pizza, pasta, and ethnic foods. In recent years, salsa has become one of America's favorite condiments. For every bottle of ketchup purchased, Americans are purchasing two jars of salsa. Along with fresh tomatoes, salsa often contains bell and chili peppers.

Objective: Students will analyze, determine ingredient ratios, and explore the essential role of peppers in salsa.

California Standards: CC Math: 3-4.MD.2, 6-7.RP.3

Materials: Fresh salsa that contains peppers, paper plates, toothpicks, cheesecloth, magnifying lenses

Procedure:

1. Before the lesson, use the cheesecloth to drain as much liquid as possible from the salsa.
2. Ask students to raise their hand if they have salsa in their home right now. Discuss the different styles of salsa. Have students raise their hands to vote for their favorite style.

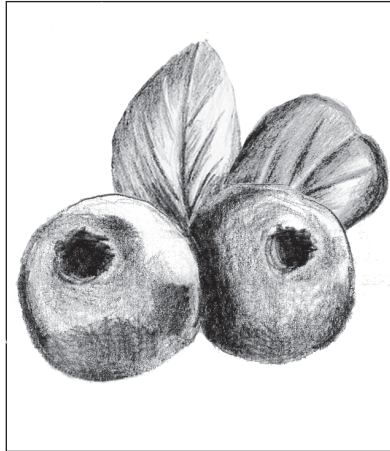
3. Brainstorm ingredients of salsa and record them.
4. Predict the ratios of each ingredient in a salsa recipe.
5. Distribute toothpicks, a paper plate, and two tablespoons salsa to each group. Instruct groups to weigh and record the mass of their salsa.
6. Using toothpicks and magnifying lenses, instruct students to separate their salsa by ingredient. Find the mass of each ingredient. Record data.
7. Use proportional reasoning to convert weights to percentages (or degrees) and create a pie chart.
8. Compare results and discuss how peppers change the color, flavor, and texture of salsa.

Blueberries

Information compiled by California Blueberry Commission

How Produced – Blueberries are part of the Ericaceae plant family, which includes the flowering azalea and heather plants. They grow best in acidic soil with plenty of water and good drainage. Highbush blueberries—the ones you find in grocery stores—grow on bushes planted in long rows. The bushes can grow up to 12 feet tall, but most peak at about 6 feet. In the spring, clusters of white blossoms pop up all over the bushes and are pollinated by bees. Each blossom eventually becomes a berry—first hard and green, then reddish purple, and finally blue.

California blueberries are harvested from May through July. For the fresh market, blueberries are mainly picked by hand. For other markets, blueberries are gathered with large machines that gently shake each bush so ripe berries fall into a catching frame.



Berries are gathered in large bins and transported by truck or tractor from the field to a packing plant, where they are sorted, cleaned, and packaged in clear clamshell containers. These containers are stored in large refrigerated rooms until they're taken to market.

History – When Europeans arrived on the continent, Native Americans were already using wild blueberries year-round. They dried blueberries in the sun and added them whole to soups, stews and meat, or crushed them into a powder which was rubbed into meat as a preservative. The Native Americans also used blueberries for medicinal purposes. They called blueberries “star berries” because the blossom end of each berry, the calyx, forms a perfect five-pointed star.

Native Americans developed one of the first blueberry baked goods, a simple pudding made with blueberries, cracked corn, and water. Many historians believe it was part of the first Thanksgiving feast.

During the 20th century, people didn't think wild blueberries could be domesticated. In 1908, Frederick Coville, a USDA botanist, began breeding wild blueberry plants with superior genetic traits. In 1912, with the help of Elizabeth White, the daughter of a New Jersey farmer, Coville successfully harvested a crop of plump and flavorful berries like those we enjoy today. The team sold the first commercial crop of blueberries in 1916.

Today, blueberries are found in nearly 4,000 products including pet food and cosmetics.

Varieties – With California's numerous micro-climates, many different blueberry varieties can thrive in the state. There are hundreds of varieties, but only about a dozen are sold commercially. Farmers usually grow several varieties at a time. When blueberries are harvested, varieties are combined which gives a batch of blueberries its varied colors, textures, and levels of sweetness. Each variety is unique in its size, shape, color, and taste.

Commodity Value – Over the past five years, blueberry production and consumption has almost tripled. California is one of the top six blueberry producing states in North America. In 2015-2016, blueberry growers received an average of \$5.08/pound. California moved 44 million pounds of blueberries into domestic and export markets. Most of the state's crop stays in California, with some transported to other states. About 12 to 15 percent is exported, with Canada, Japan, and Southeast Asia being the top international markets.

Top Producing Counties – With 80 individual producers, blueberries are grown throughout California. In the most recent season, California farmers produced blueberries in 28 counties on approximately 7,000 acres. The greatest blueberry acreage can be found in Tulare County, where blueberries are grown on 1,410 acres. San Joaquin, Kern, and Monterey counties follow Tulare County in total acreage for blueberry production.

Nutritional Value – Blueberries are low in fat, a good source of fiber, and an excellent source of manganese. A one-cup serving of blueberries contains 80 calories and virtually no fat. One serving helps satisfy recommended daily fiber intake. Dietary fiber is important in maintaining digestive health and reducing the risk of heart disease. A single serving of blueberries delivers almost 25 percent of one's requirement of vitamin C, which helps the body maintain a healthy immune system. Blueberries are high in manganese. Manganese plays an important role in bone development and converting proteins, carbohydrates, and fats into energy.

For additional information:

California Blueberry Commission
(559) 221-1800
Website: www.calblueberry.org



U.S. Highbush Blueberry Council
www.blueberry.org

Blueberry Activity Sheet

Where are California's top 5 blueberry destinations?



Lesson Ideas

- Make a family tree showing several subfamilies, genera, and species related to the Ericaceae plant family.
- Write an expository paragraph highlighting different ways Native Americans used blueberries for medicinal purposes.
- Investigate the history of fruit crate labels. Create a vintage-looking fruit crate label for California grown blueberries.
- Visit www.calblueberry.org and rewrite one of the recipes to serve your entire class.
- Create a bar graph comparing the vitamin C content of a variety of fruits and vegetables, including blueberries.
- Early American colonists made blue paint by boiling blueberries in milk. Experiment with making different shades of blue before painting a masterpiece.
- Compare the cost per pound of fresh, frozen, and canned blueberries. Make a bar graph highlighting your findings. Track the cost over time and create a line graph.

Fantastic Facts

1. Blueberry bushes can grow up to 12 feet tall.
2. Blueberries are stored in large refrigerated rooms until they're taken to market.
3. The first commercial crop of blueberries was harvested in 1916.
4. Canada imports more California blueberries than any other country.
5. Tulare County has the greatest blueberry acreage.
6. One serving of blueberries provides the recommended amount of daily fiber.
7. Native Americans used wild blueberries for food and medicinal purposes.
8. Blueberry bushes grow best in acidic soil.
9. Fresh market blueberries are harvested by hand, while other markets (frozen, dried, canned) use machines.

Lesson Plan: Testing Soil pH

Introduction: Blueberries require acidic soils. UC Cooperative Extension recommends a soil pH between 4.8 and 5.5. If you plant blueberries in neutral or alkaline soils (soil pH 7 or higher) the plants will yellow and grow poorly, if at all.

Objective: Students will test soil pH and determine if it is adequate for growing blueberries. Students may amend the soil to attain the proper pH requirements.

California Standards: ELA CC: RST.6-10.3, 7; NGSS: MS-LS1-5

Materials: pH test strips (available at most garden centers), hand trowel, distilled water

1. Brainstorm with the class what plants need to grow. Record ideas. Be sure to include space, water, air, soil, light, and nutrients. Explain that when we talk about soil, there are minimum requirements the soil must meet. One of these requirements is the pH, or acidity, of the soil.
2. Collect a soil sample from a potential planting site. The soil should be collected from approximately 5-10 centimeters below the soil's surface.

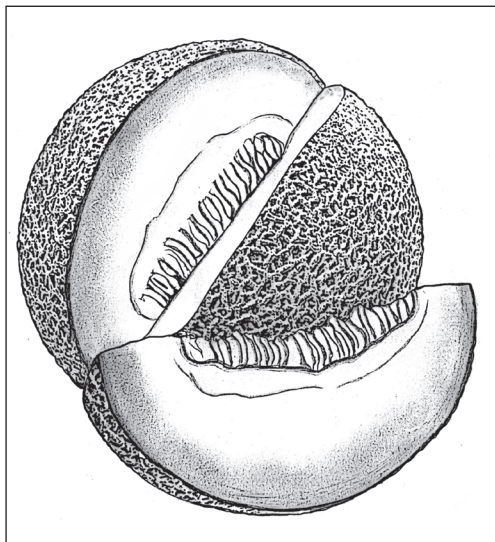
3. Place the soil in a bowl. Pour distilled water into the bowl until the soil has the consistency of a milkshake. Stir the mixture to ensure the water is fully incorporated.
4. Hold a pH test strip at the non-reading end and dip the strip into the dirt mixture for 20-30 seconds. Lift the pH strip from the water and dip it briefly in distilled water to clean off the dirt.
5. Use the color-coded key included in your pH test kit to read the pH of your soil.
6. Test the soil pH of several different sites around your home or school. Plot your data on a map. Provide a site recommendation based on evidence for planting blueberry bushes.
7. If your sites tested above pH 7, add acidifying material such as sulfur and ammonium-based fertilizers. Retest the soil. Add additional acidifying material, testing as necessary, until you reach the desired level. Continue to add material periodically to maintain a low pH.

Commodity Fact Sheet

Cantaloupe

Information compiled by the California Cantaloupe Advisory Board

How Produced – California cantaloupes are grown in two main regions—the Southern Desert Area, and on a 200-mile long stretch on the west side of the San Joaquin Valley from Bakersfield to Tracy. The latter area is where 70 percent of California's crop is harvested each year between June and October. Because of climatic conditions, planting times vary depending on the region in which they are produced. In the San Joaquin Valley, "Westside" cantaloupes are planted in early to mid-April and through mid-summer. These cantaloupes prefer loam or clay-loam soils and are planted on beds that are raised so when irrigation water is applied, only the plant roots get the water and the surface of the bed remains dry. This keeps the cantaloupes from contact with moist soil, which can result in cosmetic blemishes. It also protects against molds and other microorganisms.



Cantaloupes can be identified by the characteristic system of ridges that encompass the outside of the rind and look almost as if the fruit is covered in a net. Look for cantaloupes with prominent, cream-colored ridges. It is perfectly normal for one side where the cantaloupe has touched the ground as it grows in the field to be lighter in color or to have smoother ridges. The stem end of the cantaloupe should be smooth and well rounded. A sure sign of a tasty, ripe melon is its sweet, musky aroma.

Cantaloupes are generally harvested, packed, inspected, and graded in the field and then transported to a cold storage facility, where they are cooled to 36°F to 40°F prior to shipment. Some melons are harvested into field bins and brought directly to packing houses where they are placed into shipping boxes.

All cantaloupes packed in central California are subject to continuous government inspection, and only cantaloupes that meet the inspection criteria receive a stamped certification and may be shipped. Like all fresh fruits and vegetables, melons should be washed under running tap water before cutting. Store sliced melon with seeds still intact in the refrigerator until it is ready to be eaten.

History – Egyptians wrote about cantaloupes as far back as 2400 B.C. In later times, the Romans described the cultivation of cantaloupes. Gradually their popularity moved west, reaching France in the 1490s, and continued to spread into central and northern Europe. Columbus brought seeds

to the New World on his second voyage and reported their cultivation there upon his return. Since the eastern soils and climate of North America weren't well suited for cantaloupes, commercial production eventually moved into the western states. Today, most of the cantaloupes produced in the U.S. are grown in Arizona and California.

Varieties – There are many types of cantaloupes. The type generally grown in California is called the "western shipping type," of which there are many varieties. Seed companies supply the variety best suited to a region's particular soil type and weather conditions. The average consumer cannot tell the difference between the varieties since they are all nearly round, have a prominent "netting" on their skin, and differ only slightly from each other in general appearance.

Commodity Value – California typically produces about 75 percent of the nation's domestic supply of cantaloupes. Cantaloupes are generally packed in 40-pound cartons. Production varies greatly, ranging from 500 to 900 cartons per acre. This is equivalent to 20,000 to 36,000 pounds per acre. Over the past five years, the average cantaloupe crop was valued at \$194 million annually.

Top Producing Counties – Fresno County grows more cantaloupes than any other California county, but cantaloupes are a major crop in several other San Joaquin Valley counties including Merced, Kern, Stanislaus, and Kings. In addition, cantaloupes are grown in Riverside, Imperial, Yuba, and Sutter counties.

Nutritional Value – Cantaloupes are an excellent source of both vitamin A and vitamin C. A six-ounce serving, or roughly a quarter of a melon, provides 100 percent of the U.S. recommended daily allowance of each vitamin. Cantaloupes are also high in dietary fiber as well as folacin, a nutrient needed for growth and the development of hemoglobin. All of the nutrition in cantaloupes comes with minimal calories. There are 50 calories in a six-ounce serving of cantaloupe. Cantaloupes contain no fat or cholesterol.

For Additional Information:
California Cantaloupe Advisory Board
(559) 591-5715

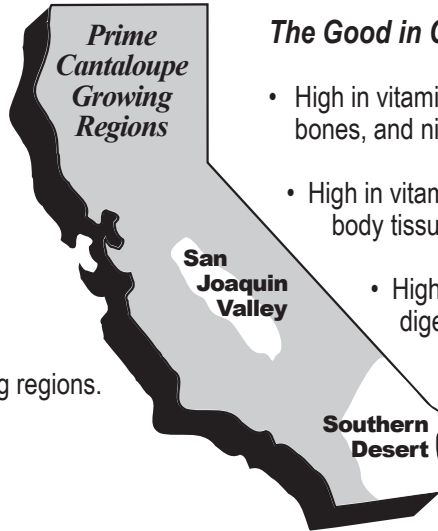


Cantaloupe Activity Sheet

Cantaloupes for Californians and the World

What it Takes to Grow a Cantaloupe

- Loam or clay-loam soils.
- Raised beds so roots get the water but the melons do not.
- Plentiful water.
- Sunny, hot days.
- Seed variety selection for specific growing regions.
- Minimal rain and low humidity.
- Control of white flies and other pests.



The Good in Cantaloupe

- High in vitamin A essential for healthy body tissue, growing bones, and night vision.
- High in vitamin C essential for strong gums and healthy body tissues.
- High in dietary fiber essential for maintaining a healthy digestive tract.
- High in folacin essential for cell growth and reproduction.
- Low in calories.

Lesson Ideas

- Cantaloupes were named after the Roman town of Cantalupo where they were grown in abundance. Research the history and culture of Cantalupo, Italy.
- Create a poster illustrating the nutritional benefits of cantaloupe. Ask the produce manager at a grocery store to display the informative posters.
- Cantaloupes are members of the gourd family. Find criteria that define the gourd family and make a list of other commodities classified as gourds.
- Create a limerick about cantaloupes. Include facts found on this fact sheet.
- Collect a variety of soil samples. Have students determine which sample would be best for growing cantaloupes and why.
- Estimate the circumference, surface area, and volume of various melons. Verify your results.

Fantastic Facts

1. California leads the nation in cantaloupe production.
2. Fresno county is the greatest cantaloupe producing county in the nation.
3. 10-15 bee visits are necessary, on average, for proper pollination and large melons.
4. Another name for cantaloupe is muskmelon.
5. The fleshy portion of a cantaloupe is usually orange.
6. Cantaloupes grow on a vine.
7. There is evidence that ancient Egyptians and Romans grew cantaloupes.

Lesson Plan: Melodious Melon Poetry

Introduction: Poetry is often used to express feelings and experiences. A didactic cinquain is a five line verse that uses structure and different parts of speech about a subject.

Objective: Students will experience the sights and tastes of cantaloupes and will then write about them poetically.

California Standards: CC ELA: L.6-12.2; L.3-12.3; L.4-5.5

Materials: One cantaloupe for every six people, knife, paper towels, writing paper, pencils.

Procedure:

1. Give each group of students a cantaloupe. Have them write down single words that describe its external appearance.
2. Next, cut the cantaloupe in half. Have students brainstorm a list of adjectives that describe its internal structure.
3. Continue cutting the melons, providing each student with a slice. Have them smell, touch, and taste the melon and then

write down words that describe their experience.

4. Have your students write a cinquain describing their melon-tasting experience.

A one word title, a noun that tells what your poem is about

Two adjectives that describe the title

Three action verbs that describe the title

Four-word phrase that tells more about the title

A synonym for the title

Fresh Carrots

Information compiled by the California Fresh Carrot Advisory Board

How Produced – Carrots, an annual root crop, must be planted in soil that is free of disease and organisms that might affect their color, shape, or texture. This sometimes requires fumigation of the soil. The tiny carrot seeds, 2-3 millimeters in length, are planted in raised beds so the carrots are in position for mechanized harvesting. The growing season ranges from 110 to 180 days, depending upon the time of year, growing conditions, and desired size.

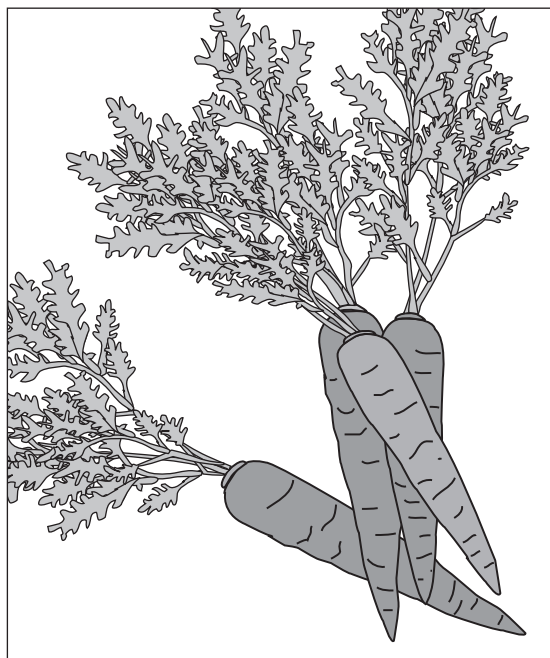
After loosening the earth under the mature carrots, large, self-propelled harvesters lift the carrots by their tops, remove the tops, and load the carrots into a truck and trailer which travel alongside the harvester. The carrots are rushed to packing plants, cooled to 34°F, sorted, cleaned, and packaged within 24 hours of harvest.

History – Carrots, originally cultivated in Central Asia and the Near East, were introduced to the American colonies in the seventeenth century. They were not originally yellow-orange, but a range of purple colors. It is thought that the yellow root evolved from a mutant variety which lacked the purple pigment. Ancient Greeks and Romans used both the purple and yellow varieties for medicinal purposes.

Carrots were first used for food by Europeans during the Middle Ages. In the nineteenth century, carrots were identified as a rich source of beta-carotene. During World War II, British aviators were fed a specially developed English carrot, high in beta-carotene, to overcome night blindness. Plant geneticists continue to develop carrots with higher beta-carotene content, as well as strains that are sweeter and more tender.

Varieties – While there are many varieties of carrots, most consumers are unable to tell one from another since there are only slight differences in taste, shape, or size. Varieties are bred for particular growing regions or specific uses. Normally, carrots grown for the supermarket produce shelf are found in cello bags and are purposely cultivated to be larger than carrots for the baby-cut market. Baby-cut carrots are not necessarily small carrots, but are made from full-grown, small diameter carrots by peeling and cutting them to the desired length. Farmers plant carrots intended for the baby-cut market closer together so the roots stay slim and there is less waste

when the carrots are cut to size. Conveniently packaged to be ready-to-eat, baby-cut carrots keep in the refrigerator in their original bag for up to three weeks.



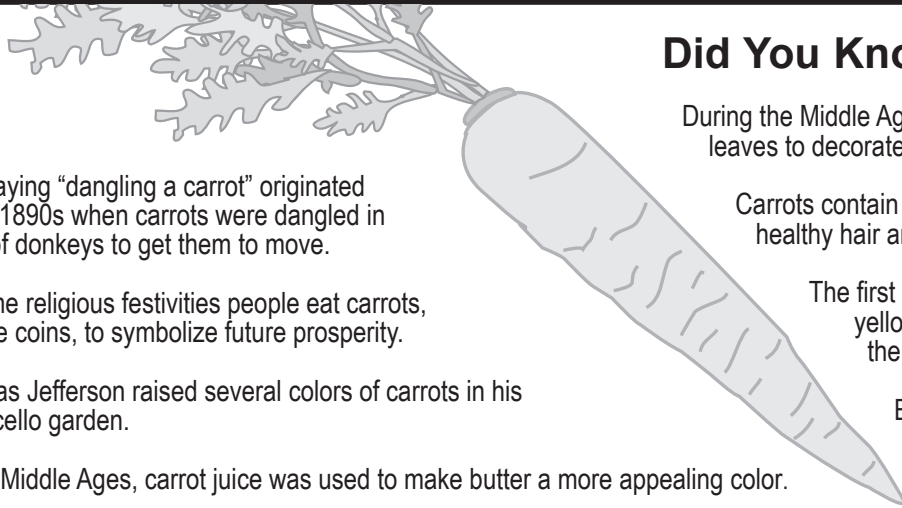
Commodity Value – There were production increases of approximately 30 percent during the late 1990s because of the rather sudden popularity of baby-cut carrots. The market for fresh carrots has leveled off since the turn of the century. In 2015, California harvested 63,000 acres of carrots, bringing in a crop of 976,000,000 pounds valued at \$639 million dollars. Baby-cut carrots account for 70 percent of the acreage. Besides fresh carrots still being available in the familiar cello package as well as the very popular baby-cut carrots, consumers are now also able to find fresh carrots in other convenient shapes such as sticks, coins and chips, as well as shredded carrots for salads.

Top Producing Counties – Approximately 80 percent of the nation's fresh carrots are grown year-round in California. Most are grown in and shipped from Kern County. Other growing regions include Imperial County, Riverside County, Monterey County, and Madera County.

Nutritional Value – Carrots are an excellent source of beta-carotene and a good source of fiber. Beta-carotene, the plant pigment that gives carrots their vivid orange color, is converted by the human body to vitamin A. Surplus amounts of beta-carotene are stored in the body's fat cells. One medium carrot provides four times the Daily Value of vitamin A which helps maintain the health of eyes and skin and reduces the risk of certain cancers. Carrots are fat-free and contain other essential elements in low amounts including vitamin C, potassium, calcium, phosphorus, and magnesium.

For additional information:
California Fresh Carrot Advisory Board
(559) 591-5675

Fresh Carrot Activity Sheet



Did You Know?

During the Middle Ages, French women used carrot leaves to decorate hair and hats.

Carrots contain beta-carotene, which helps build healthy hair and nails and keeps eyes healthy.

The first carrots were white, purple, and yellow. In the 1600s, the Dutch developed the orange carrot we eat today.

Early American colonists grew carrots between rows of tobacco to repel beetles.

The saying “dangling a carrot” originated in the 1890s when carrots were dangled in front of donkeys to get them to move.

In some religious festivities people eat carrots, cut like coins, to symbolize future prosperity.

Thomas Jefferson raised several colors of carrots in his Monticello garden.

In the Middle Ages, carrot juice was used to make butter a more appealing color.

Lesson Ideas

- Read “The Carrot Seed” by Ruth Kraus.
- Make a list of edible roots.
- Research taproots and fibrous roots and find examples in your garden.
- Make a carrot-shaped book showing the history of the carrot and interesting carrot facts.
- Visit the cafeteria to see ways carrots are prepared.
- Ask a professional chef to discuss and demonstrate the many uses of fresh carrots.
- Place a freshly cut carrot top in a shallow dish of water and watch it grow.
- Estimate, then count, the number of baby carrots in a bag.
- Visit a grocery store and make a list of the ways fresh carrots are available to consumers.
- Inside a large drawing of a carrot, write the many nutrients provided by carrots.
- Research and discuss how scientists determine the amount of beta-carotene in a carrot.

Fantastic Facts

1. Most of the nation’s fresh carrots are grown in Kern County.
2. Beta-carotene is know to assist with night vision.
3. The main reason for the recent increase in carrot production is ready-to-eat, convenient packaging of baby carrots.
4. Carrots come in many colors including orange, white, yellow, and purple.
5. Commercial carrots are mechanically harvested by first loosening the soil underneath the root, then lifting the carrots by their tops.
6. Baby carrots are long, small-diameter carrots peeled and cut into pieces.
7. Ancient Greeks and Romans used carrots for medicinal purposes.

Lesson Plan: Growing Carrots on the Mayflower

Introduction: Grow boxes are used where the soil is in poor condition or where weather is such that it is difficult to grow crops. Pilgrims used grow boxes on the Mayflower.

Objective: Students will grow carrots in grow boxes and record growth and other observations in a journal.

California Standards: CC ELA: W.3-8.7, SL.3-8.1, RST.6-8.3, WHST.6-8.2, 7; CC Math: 3.MD.4, 4.MD.4, 5.MD.2; NGSS: 3-LS1-1, 4-LS1-1, 5-LS1-1

Materials: 12-inch wide redwood boards, an area to build and place a garden box, nails, hammer, saw, soil mixed with nitrogen-based fertilizer, carrot seeds, water, journals for each student, resource materials about the Mayflower, Pilgrims and early colonists.

Procedure:

Explain what a garden box is and brainstorm why and where people use them. Discuss the food conditions and challenges

Pilgrims encountered during their voyage to America and the building of their settlement. Why did they use grow boxes?

1. As a class or group, build a grow box that is at least 12 inches deep. Fill the box with soil and moisten.
2. Make rows 4 to 5 inches apart. Make a shallow furrow in each row and sprinkle seeds in the furrow. Cover the seeds with a dusting of soil.
3. As the carrots grow, thin the crop when the carrots are as thick around as an index finger, allowing four inches between plants.
4. Keep garden well watered and weeded. Harvest in 70-80 days.

NOTE: Throughout the growth of the carrots, have the students perform various assignments in their journals—observations, poems, find or create recipes, make invitations to a Carrot Fest, measure and graph root length and stem length, find out what to do with the carrot tops and peelings, etc.

Commodity Fact Sheet

Cherries

Information compiled by the California Cherry Board

How Produced – Cherry trees are grafted to rootstock and planted 20-25 feet apart in straight rows. Farmers can typically grow 100 trees per acre. Trees grow best in deep, well-drained, gravelly to sandy loam soils. Pollination is absolutely essential for production. Because the trees are not self-pollinating, at least two varieties of cherry trees are planted every third tree in every third row, or a ratio of approximately 9 to 1. Honey bees are the main pollinator.

After an orchard is planted, it takes approximately six years until it produces its first major crop. Constant attention is given to each tree every step of the way to ensure a healthy orchard. California cherry harvest lasts May through June.

Traditionally, color change is used to signal maturity. However, “fruit removal force” has been used more recently, and is more reliable. This is based on the progressive ease of removing the fruit from the pedicel, or stem, starting about two weeks before maturity. Growers use a special pull gauge, which pulls the fruit from the pedicel and registers the force required to remove the fruit.

Sweet cherries for fresh consumption are harvested by hand, usually leaving the pedicels intact. They are harvested at firm-mature stage to reduce bruising. Sweet cherries intended for processing are hand harvested also, but without pedicels.

Sweet cherries have extremely short shelf lives, and must be handled gently to reduce bruising and oxidation. Cherries are cooled directly using chilled water—a process called hydrocooling—then sorted based on color and size, and packed in shallow flats. The shelf life of fresh cherries is only a few days at room temperature and about 2 weeks when refrigerated.

History – The sweet cherry originated in Asia Minor, in the fertile area between the Black and Caspian Seas, and was probably carried to Europe by birds. Cultivation began with Greeks, and was increased and expanded by Romans. Trees were planted along roadsides and were valued for their timber as well as their fruit.

Sweet cherries came to the U.S. with English colonists in 1629, and later were introduced to California by Spanish missionaries. In the 1800s, sweet cherries were moved west by pioneers and fur traders to their major sites of production in Washington, Oregon, and California. Cultivars selected at

that time still form the base of the industry today.

Varieties – Cherries are members of the Rosaceae family, subfamily Prunoideae, and are distant cousins to peaches, plums, apricots, and almonds. There are a number of sweet cherry varieties grown in California. The most prominent are Bing, Coral, Brooks, Tulare, Sequoia, Rainier, Chelan, Garnet, and Royal. The Bing variety continues to be the favorite of consumers, with its mahogany-colored skin and sweet, rich flavor. The coral variety has risen in popularity in recent years due to its large size, firm texture, and sweet flavor.



Commodity Value – The U.S. is the second-largest producer of cherries in the world, accounting for more than 10 percent of world production. Turkey

is the leading cherry producer. Washington leads the nation in sweet cherry production followed by California. Sweet cherries rank 27th among all California commodities. With approximately 600 growers farming more than 40,000 acres, California's sweet cherry crop was valued at \$351 million in 2015.

Top Producing Counties – Cherry orchards in the San Joaquin Valley receive the perfect combination of nutrient-rich soil, abundant sunshine, and mild temperatures needed to produce high-quality fruit. In 2015, San Joaquin County produced nearly 52 percent of the state's total production. Other top-producing counties include Kern, Fresno, Kings, and Stanislaus.

Nutritional Value – In addition to being a good source of vitamin C, cherries are also high in iron, potassium, dietary fiber, and antioxidants. Anthocyanins found in cherries block inflammatory enzymes, reducing pain. In fact, 20 cherries are 10 times as potent as aspirin and have positive effects on gout and arthritis pain. All in a small package that's low in calories and contains no fat or sodium. Sweet cherries are also considered to be excellent sources of boron. Boron consumption, coupled with calcium and magnesium, has been linked to increased bone health.

For additional information:
California Cherry Board
(916) 441-1063
Website: calcherry.com



Cherry Activity Sheet

Sweet Cherry Pie Recipe

Pastry for a 9" Two Crust Pie

2 cups flour
1/3 cup plus 1 tablespoon butter
1/3 cup plus 1 tablespoon shortening
1 teaspoon salt
4-5 tablespoons cold water

Preheat oven to 425 degrees. Place flour and salt into a medium mixing bowl or into the food processor. Cut in shortening and butter and work with a fork or pastry cutter until mixture is like coarse corn meal. If using a food processor, use the "S" blade, sprinkle in cold water, one tablespoon at a time, mixing until all flour is moistened and forms a ball. Chill until ready to roll out for pie crust.

Filling

1/4 to 1 1/4 cups sugar, to taste
1/4 teaspoon almond extract
8 cups pitted Bing cherries (about 3 1/2 pounds)
1/3 cup flour
2 tablespoons butter



In a large mixing bowl, stir together sugar and flour. Mix well with cherries. Roll pastry out on lightly floured board. Place bottom crust in 9" pie plate. Add cherry mixture. Sprinkle with almond extract and dot with butter. Cover pie with top crust, crimping edges, and adding slits to allow for steam to escape. Cut a piece of aluminum foil about three inches wide and cover the edge of the pie to prevent excessive browning. (Remove foil during the last 15 minutes of baking.) Bake 35-45 minutes or until crust is brown and juices are bubbling.

Lesson Ideas

- Investigate health benefits of cherries. How do cherries help prevent heart disease?
- Design an informative and attractive cherry display for consumers. Include information about shelf life, handling tips, and recipes. Share your display with a local grocery store.
- Calculate how many cherry trees can be planted on one acre if each tree is spaced 20-25 feet apart.
- Compare and contrast the harvesting techniques for sweet and tart cherries intended for processing or fresh consumption.
- Using a map of California, locate the geographical areas where cherries are grown. Study the climate, seasons, and weather patterns of these areas for similarities.
- Determine the chemistry involved in processing maraschino cherries.

Fantastic Facts

1. Cherries are a good source of vitamin C.
2. San Joaquin county leads the state in cherry production.
3. 52 percent of the nation's cherries are grown in San Joaquin county.
4. Bing, Coral, Brooks, Tulare, Sequoia, Rainier, Chelan, Garnet, and Royal are cherry varieties grown in California.
5. Sweet cherries are ranked 27th of all California commodities.
6. California is home to approximately 600 Bing cherry producers.
7. Honey bees are essential for cherry blossom pollination.
8. Spanish missionaries introduced cherries to California.

Lesson Plan: An American Legend

Introduction: Cherries have an interesting place in our nation's folklore. One of the most enduring legends about George Washington involves him chopping down his father's cherry tree and, when asked about it, using the famous line "I cannot tell a lie, I did it with my little hatchet." Mason Locke Weems has been identified as the storyteller responsible for this legend.

Objective: Students will investigate the origin of legends, read common American legends, and write their own legend about cherries.

California Standards: CC ELA: RL.3-12.2, W.3-12.3, W.3-8.7, SL.3-12.4

Materials: Internet access, encyclopedia, reference books, paper, pencil.

Procedure:

1. The Brothers Grimm defined legend as "folktale historically grounded." In cooperative learning groups, students may use previous knowledge and experiences to brainstorm characteristics common to legends.

2. As a class, have students share and compare their brainstormed ideas, and research the actual etymology and origin of legends
3. Assign each group an American legend to read and examine. Examples of American legends include the story of Johnny Appleseed, Davy Crockett, and Paul Bunyan.
4. Once students read the legend, challenge them to decipher fact from fiction. Each group may report their findings by providing an objective summary for the class.
5. Instruct groups to write their own legend featuring a historical figure, a character trait, and cherries. Students will need to research their historical figure and determine which traits they are renowned for. Encourage students to use creative writing skills to develop this information into a legend.
6. Have writers share their legend in front of the class. As a group, provide feedback for each story and determine how it exemplifies the traits of a great legend.

Commodity Fact Sheet

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 and is often double cropped—with a second planting occurring in the summer. 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 corncob 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.

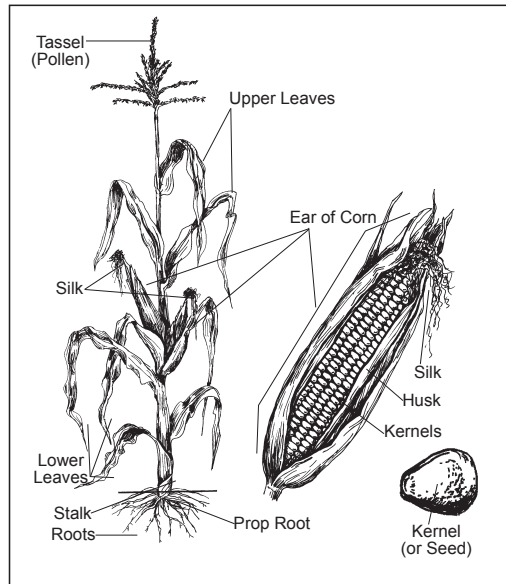
A tassel (the male plant part) at the top of a cornstalk contains hundreds of small flowers that produce pollen, which is distributed by wind and gravity to the thread-like silks of the ears. The silks are connected to the female part of the plant. Each silk will carry pollen to a spot on a developing 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 primarily used as feed for animals, but is also processed into thousands of items: starch (baby food, salad dressing, glue); corn syrup (soda, fireworks, adhesives); dextrose (bakery goods, fruit juices, antibiotics); and oil (margarine, soap, paint). Today’s scientists have even

developed a new source of fuel from corn products called ethanol.



Varieties – More than 95 percent 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 percent of U.S. corn acreage was planted with biotech seed.

Commodity Value – Corn is America’s most important cash crop, with 80.7 million harvested acres generating a crop value of more than \$49 billion in 2015. 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 percent of the nation’s sweet corn, ranking number two in the U.S. In 2015, California harvested 60,000 acres of corn for grain, valued at \$33 million. The same year, the state harvested 365,000 acres of corn for silage. The leading counties in 2015 for corn production were Fresno for sweet corn, Sacramento for grain corn, and Tulare 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

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 percent 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. 40 percent 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.

Pickling Cucumbers

Information compiled by Kruger Foods

How Produced – Cucumbers are an annual plant typically planted in mid-March up until August. The time from seedling to harvest is roughly 55 to 70 days depending on the seed variety. Due to the short season, many growers (farmers) plant two crops of cucumbers yearly, while others use cucumbers as a crop rotation – meaning they plant it after a different crop has been planted and harvested. Cucumber harvest runs from May through November. Cucumbers are grown for fresh market (slicing cucumbers) and processing (pickling). Pickling cucumbers are typically harvested by machine. The perfect cucumber for pickling is the right color and size, and doesn't have a lot of seeds. After harvest, pickling cucumbers are transported to a briner where they will be washed, graded, sized, and placed in a tank of brine (a mixture of vinegar, salt, garlic, and spices) to be fermented and turned into pickles.



cucumbers are generally longer, with thicker, waxed skin. They are good for eating fresh. Pickling cucumbers are generally shorter, firmer, and crisper. Varieties planted in California include Eureka and Valaspik. Burpless cucumbers are generally longer and thinner, easy to digest, mild-tasting, and contain fewer seeds. Specialty cucumbers are unique in shape, color, and taste. An example is the lemon cucumber.

Dill weed is added to the tanked cucumbers during the last stage of fermentation to create dill pickles. Kosher dill pickles have been manufactured and certified in accordance with Jewish dietary laws. They are made with dill and garlic added to the brine, and are more robust than typical dill pickles. To make

sour or half-sour pickles, cucumbers are placed into a brine mixture that doesn't include vinegar and then refrigerated. The longer they remain in the mixture, the more sour they will become. Sweet pickles are placed into a sweet mixture of vinegar, sugar, and spices. Some variations include Bread and Butter, Candied, and Hot.

Approximately 100,000 to 125,000 acres are devoted to growing pickling cucumbers in the United States. They are grown in more than 30 states, with the biggest producers being California, Colorado, Florida, Indiana, Michigan, Ohio, North and South Carolina, Texas, and Wisconsin. California ranks fifth in the nation for pickling cucumber production. They are mainly grown in the agriculture-rich Central Valley.

Commodity Value – California produces about 6% of the nation's cucumber crop. Michigan tops the list for pickling cucumbers, followed by Florida. Approximately 35,000 tons of pickling cucumbers are grown in California every year. The national average price per ton is \$324. Exports are mainly to Canada and Mexico. China produces nearly 80% of the world's output.

History – Cucumbers are one of the earliest known cultivated vegetables and originated in India. They were used not only as food but also for medicine. Ancient Mesopotamians pickled cucumbers about 4500 years ago. Cleopatra thought that pickles enhanced her good looks. Julius Caesar and Napoleon both fed pickles to their troops for physical and spiritual strength. Christopher Columbus brought cucumbers to the New World - he even grew cucumbers to pickle in Haiti. Columbus's ship stocker, Amerigo Vespucci, stocked the ships with plenty of pickles to prevent scurvy outbreaks. The name "America" actually came from Amerigo Vespucci, the pickle merchant!

Top Producing Counties – Pickling cucumbers are mainly grown in the Central Valley. The top producing counties for pickling cucumbers include: San Joaquin, Stanislaus, Solano, Yolo, San Benito, and Imperial counties. Cucumbers grow well in the Central Valley because of the moderate Mediterranean climate, low humidity, and heavy, dry ground.

In 1659, New York Dutch farmers grew cucumbers in what is now known as Brooklyn. They were cured in barrels and sold at market stalls as Kosher Dills. In 1900, Henry J. Heinz of catsup fame, set up one of New York's first large electric signs on the corner of Fifth Avenue and 23rd Street. It featured a 40-foot long pickle and 1,200 light bulbs.

Nutritional Value – Cucumbers are 96% water and are low in fat, sodium, and calories. A one-half cup serving has 8 calories. Pickles are also low in fat. One large dill pickle, approximately 4 inches long, contains 16 calories, 0.19 grams of total fat, and 0.05 grams of saturated fat. It also has 0.81 grams of protein, 3.5 grams of total carbohydrates, 1.5 grams of dietary fiber, 124 mg of potassium and 57 mg of calcium. Pickles have 1,181 mg of sodium.

Varieties – Cucumbers are part of the Cucurbitaceae family which includes gourds, pumpkins, watermelon, and squash. There are hundreds of varieties, but there are basically four types: slicing, pickling, burpless, and specialty. Slicing

For additional information:

Pickle Packers Intl. Inc.

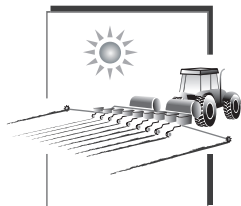
(202) 331-2456

Website: www.ilovepickles.org

Pickling Cucumber Activity Sheet

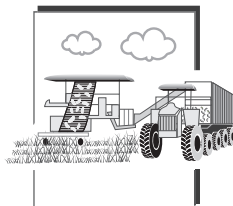
From Plant to Pickle

1



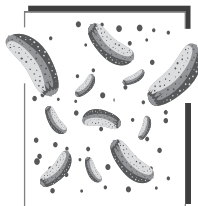
Cucumber planting takes place from March to August.

2



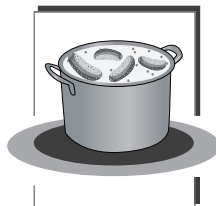
Mechanical harvesting takes place from May to November.

3



Perfect cucumbers are selected for pickling based on size, shape, and color.

4



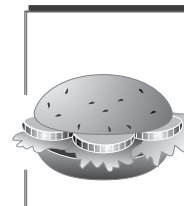
Cucumbers are processed in a brine bath of vinegar, salt, garlic, and spices for 6 to 8 weeks.

5



Additional seasoning is added and pickles are packaged and ready to be shipped to stores and restaurants.

6



Ready to eat! Enjoy pickles on your sandwiches or hamburgers!

Lesson Ideas

- Illustrate and label postcards with the scientific names of various fruits and vegetables.
- Grow cucumbers in your classroom. Observe and plant outdoors when ready.
- Study bees and pollination and their importance to cucumbers and other fruits and vegetables.
- Research canning and food preservation; invite a master preserver to your class.
- Illustrate the steps from farm to fork of different commodities that are preserved.
- Create a timeline of the history of cucumbers or other vegetables.
- Create classroom recipes using cucumbers such as infused water, salads, or sandwiches.

Fantastic Facts

1. Pickle fans include: Queen Elizabeth, George Washington, Thomas Jefferson, John Adams, and Selena Gomez.
2. Although most people consider cucumbers a vegetable, it is in fact a fruit.
3. Miniature sweet or kosher dill pickles are called gherkins.
4. People have been pickling food for nearly 5,000 years.
5. Pickled cabbage is called sauerkraut.
6. Fifty percent of cucumbers grown in the US are made into pickles each year.
7. During WWII, pickles were rationed and 40 percent went to the armed forces.
8. Pickle juice can be made into pickle popsicles!

Lesson Plan: Refrigerator Pickles

Introduction: Pickling is one way to preserve food. By adding vegetables to a brine bath (vinegar, salt, and seasoning) and allowing time, vegetables can last longer. Discuss why food is preserved, different methods of food preservation (examples: canning, freezing, drying, pickling, dehydrating) and different types of foods that are preserved.

Objective: Students will learn and report on the process of food preservation by pickling.

California Standards: CC ELA: SL.3-12.4, RST.6-12.3
NGSS: MS-LS1-5, HS-LS1

Materials: recipe, cutting board, paper towels, bowl, knife, 3-4 pint jars, lids, labels, marker, measuring cup and teaspoon, vinegar, water, mustard seed, peppercorns, kosher salt, fresh or dried dill, cucumbers.

Procedure:

1. Prepare a sample ahead of time to show your students. Ask students to bring in supplies. Students will work in groups of three to four.
2. Discuss food safety – washing hands, vegetables, and tools. Discuss how to handle kitchen tools safely.

3. Gather materials for a demonstration on how to prepare the pickles.
4. Wash and dry cucumbers and dill. Slice cucumbers into wedges. Place the cucumbers in a bowl with the dill and salt, mix by hand.
5. Using 3-4 pint-size jars, divide the remaining ingredients (vinegar, water, mustard seed, peppercorns) evenly into each.
6. Equally distribute the dill/salt/cucumber mixture to each jar.
7. Seal the lids, mix the pickles, and refrigerate at least a week before you eat them! Have a pickle tasting!
8. Have student groups report to the class on their experience making and tasting pickles.
9. Extension idea - research the role of bacteria in preserving food.

Recipe: ½ cup vinegar, 2 cups water, 6 black peppercorns, ½ tsp of mustard seed, 8 tsp kosher salt, 1 cup fresh dill (or 1/3 cup dried), 6 medium cucumbers

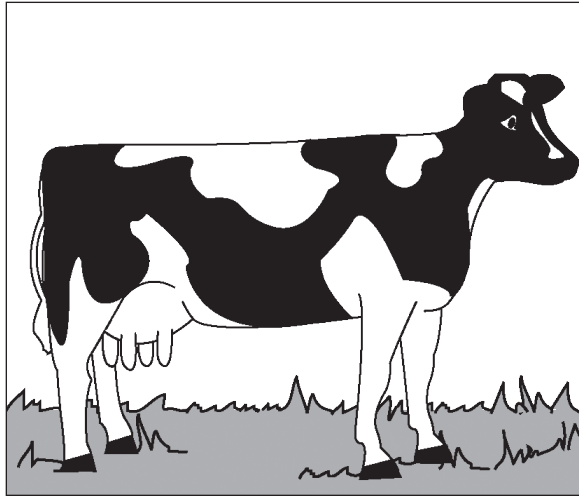
Commodity Fact Sheet

Dairy

Information compiled by the Dairy Council of California

How Produced – California produced 40.9 billion pounds of milk in 2015. Approximately 1.75 million dairy cows produce milk on approximately 1,438 dairies located throughout the state. California's available land, mild climate, and plentiful feed supply make it a desirable and productive location for dairies.

A dairy cow must give birth to a calf to produce milk. A female calf is called a heifer and a male is called a bull. After nine months gestation, a mature two-year old heifer gives birth and is called a "fresh cow." She produces milk (lactation) for 10 months during which time she is bred again. Her milk production then decreases until she produces no milk (dry) for two months. She will produce milk again after she has her next calf. Cows have a production cycle of four to seven years.



Dairy cows are milked two (sometimes three) times each day. A cow will produce six to seven gallons of milk each day which is more than 2,000 gallons of milk each year.

Cows are ruminant animals, which have four stomach compartments, and efficiently digest many different commodities such as hay, silage (fermented corn, wheat or hay including the stalks and leaves), and grain (corn, oats and barley). Cows also consume many different agricultural by-products including cottonseed, almond hulls, sugar beet pulp, and blemished vegetables. Cows drink approximately 35 gallons of water each day.

History – Anthropologists suggest that Ancient Egyptians, Romans, and Greeks made cheese and yogurt as early as 600 B.C. Missionaries brought the first dairy cows to California in 1770. During the Gold Rush, immigrants brought cows, cheese presses, and churns to California along with their own recipes for making dairy products.

In 1882, David Jacks, a Scotsman from Monterey, named his cheese Monterey Jack. He was the first person to sell cheese commercially in California. The early 1900s brought changes to the dairy industry including centralized manufacturing and distribution. As California's population increased, the dairy industry focused on improving sanitation, increasing production, and mechanization.

Today, California's dairy industry utilizes technology and

advanced food processing systems to provide safe, quality products for California, the United States, and the world.

Breeds – There are five dairy breeds in California. The black and white Holstein is the most common. The Jersey is a smaller cow whose milk is often used for cheese production. The Brown Swiss, Guernsey, and Ayrshire are other breeds used for milk production.

Commodity Value – California has been the nation's leading dairy state since 1993 when it surpassed Wisconsin in milk production. Sales of milk and cream contributed \$6.9 billion in 2015 to California's economy. California produces more than 20 percent of the nation's cheese and a fifth of its milk supply. California's cheese production

ranks second in the nation, with approximately 46.3 percent of all the Golden State's milk used to make cheese.

Top Producing Counties – Although during 2015, 31 counties contributed to the state's total milk production, a handful of counties continued to be responsible for the bulk of the production. Tulare, Merced, Kings, Stanislaus, and Kern counties accounted for 71.5 percent of the state's market milk production.

Nutritional Value – Dairy products such as milk, yogurt, and cheese contain numerous essential nutrients including calcium, potassium, phosphorus, magnesium, and protein. This "package of nutrients" is critical for the development of strong bones and teeth, maintaining a healthy weight, and reducing the risk of high blood pressure, osteoporosis, and certain cancers. Whether it's protein to help build and repair muscle tissue or vitamin A to help maintain healthy skin, dairy products are a natural nutrient powerhouse.

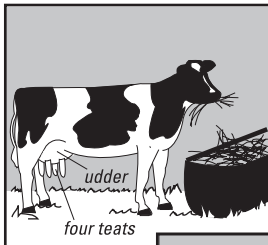
For additional information:

Dairy Council of California
(877) 324-7901
Website: www.HealthyEating.org

California Milk Advisory Board
Website: www.realcaliforniacheese.com

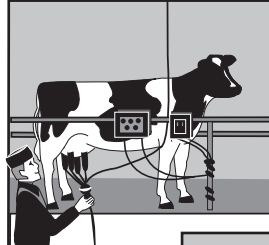


Dairy Activity Sheet



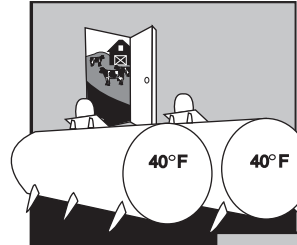
◀ #1

Dairy cattle convert feed energy to milk production. A cow produces milk in her udder. Milk is released through the udder's four teats.



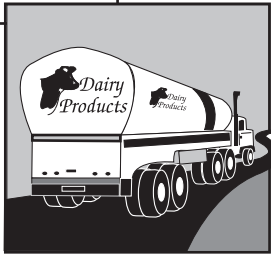
◀ #2

Cows are milked in a milking parlor where the teats are cleaned and attached to a milking machine.



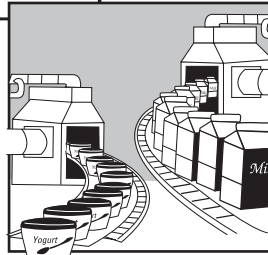
◀ #3

The milk is piped immediately to refrigerated storage tanks.



#4 ▶

The milk is transported daily, in large stainless steel tanker trucks, to processing facilities.



#5 ▶

The milk is pasteurized, homogenized, and processed into many products such as milk, yogurt, cheese, and ice cream.



#6 ▶

A variety of dairy products are available to meet the tastes and nutritional needs of consumers.

Lesson Ideas

- Explore different dairy breeds including their characteristics, history, and origin.
- Compare a cow's diet and digestive process to a human's diet and digestive process. Diagram ruminant and monogastric digestive systems.
- Make butter by shaking heavy whipping cream in baby food jars.
- Create a picture collage of products made from milk.
- Visit a dairy or milk processing facility.
- Taste test different cheese and dairy products.
- Make homemade ice cream.
- Research the nutrients found in dairy products.

Fantastic Facts

1. Cows have four stomach compartments.
2. Cottonseed, almond hulls, sugar beet pulp, and blemished vegetables are all agricultural by-products eaten by cows.
3. Monterey Jack cheese was developed by the Jacks family in Monterey, California.
4. Silage is partially fermented grains and grain by-products.
5. On average, a cow produces milk for four to seven years.
6. The most common dairy breed in California is the black and white Holstein.
7. Yogurt, ice cream, cheese, and butter are all dairy products.
8. Calcium is an essential nutrient found in milk.

Lesson Plan: Milk-From the Farm to the Family Class Book

Introduction: Dairy products have been around since 600 B.C. However, today's milk production and the production of dairy products is very scientific and technical.

Objective: Students will perform independent research on one aspect of milk and dairy product production. The class will produce a book that depicts the process.

California Standards: CC ELA: W.3-12.2, 4, 7
SL.3-12.4, 5

Materials: Index cards, resources including Internet access, books and encyclopedias, 12" x 18" paper, markers.

Procedure:

1. Write key words or phrases on index cards. These should be one card per student or pair of students. Example words include ruminant, lactation, cow diet, pasteurization, homogenization, etc.

2. Distribute one card to each student or partnership.
3. Have the students research, on the Internet and in libraries, the meaning of their word or phrase and learn how it relates to milk production.
4. Have the students write and roughly illustrate their findings using a standard format.
5. Have the students each read their page to the class. As a class, sequence the information and have the students use technology to create a professional looking page about their findings so that it blends with the work of other classmates.
6. Title the book "Milk: From the Farm to the Family." Bind the book and share it with other classes or at Open House.

Commodity Fact Sheet

Eggs

Information compiled by the California Egg Industry Association

How Produced – There are many methods of commercial egg production, including caged, cage-free, organic, free-range, and specialty eggs. California is the seventh largest egg production state, behind Iowa, Ohio, Pennsylvania, Indiana, Texas and Michigan. Annual egg production in California is about five billion eggs per year with approximately 14.5 million laying hens. Hens start laying eggs at 19 weeks of age. To produce one egg it takes a hen 24-26 hours. Each laying hen produces approximately 250 eggs each year. The majority of eggs are laid between the hours of 7:00 - 11:00 a.m. Eggs move quickly from the hen house to the egg processing area where they are washed, graded, and sized, then packaged and shipped to the retail outlets.

Most of the eggs produced today will be in the supermarket within 72 hours. In 1994, there were 350 egg companies in the United States and currently there are 198 (with flocks of 75,000 or more). Per capita egg consumption nationwide is estimated at 265.8 eggs per person.

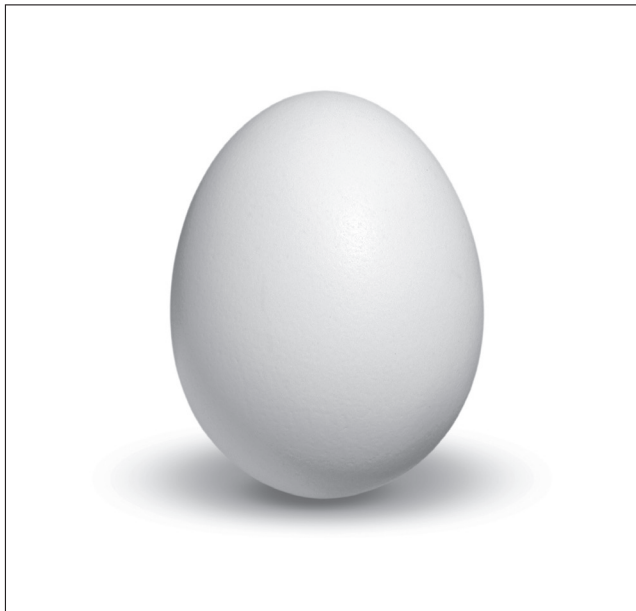
Breeds – The Single Comb White Leghorn is the principle breed used for production of white shell table eggs. There are various breeds that lay brown eggs. The only difference between brown and white shelled eggs is the color of the shell, there is no nutritional difference.

Commodity Value – Farm gate value of California egg production is estimated at 800 million. Approximately 81,000,000 shell eggs were inspected in California in 2014-2015. Total egg sales are reported at \$1 billion annually.

Top Producing Counties – One half of California's egg production is in the southern part of the state including San Bernardino, Riverside, and San Diego counties. One half of the state's production is in northern California. The majority of egg farms in northern California are in the San Joaquin Valley with considerable egg production in San Joaquin, Stanislaus, Merced, and Kern counties. Petaluma in Sonoma county was once known as the "egg basket of the world."

History – Egyptian and Chinese records show that fowl have been laying eggs for man since 1400 B.C. Europe has had

domesticated hens since 600 B.C. Chickens came to the New World with Columbus on his second trip in 1493. While it is customary to throw rice at weddings in many countries, French brides break an egg on the threshold of their new home before stepping in, for luck and healthy babies. At the time of the French Revolution, the French already knew 685 different ways of preparing eggs.



Nutritional Value – Table eggs are nutrient dense and one of nature's most perfect foods. Foods that supply significant amounts of one or more nutrients compared to the number of calories they supply are called nutrient dense. Nutrient dense foods help you get needed nutrients without excess calories. Each egg contains 13 essential vitamins and minerals, 6 grams of high quality protein, and the antioxidants lutein

and zeaxanthin. A large egg contains 70 calories and 185 milligrams of cholesterol. Eggs contain the highest quality protein of any food. Studies show that students perform better in school after eating a high protein breakfast. Eggs are also a source of choline, an essential nutrient that contributes to fetal brain development and helps prevent birth defects.

For additional information:
California Egg Industry Association
(916) 441-0801

American Egg Board
(847) 296-7043

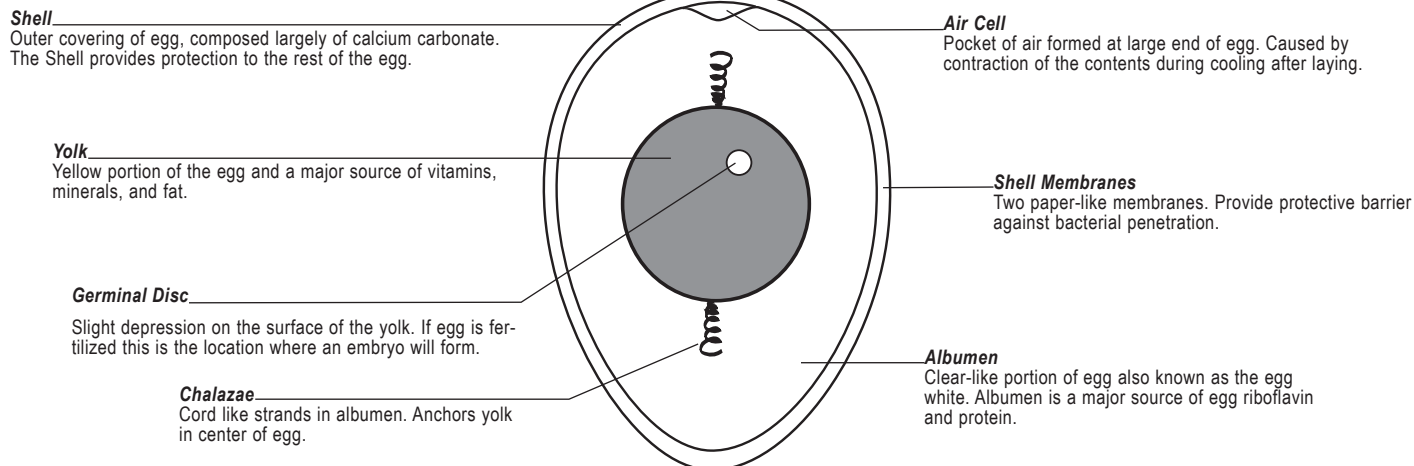
Websites:
www.aeb.org
www.incredibleegg.org



California Egg Farmers

Egg Activity Sheet

What's Inside an Egg?



Lesson Ideas

- Create an "Egg Yolk Joke Book."
- Calculate the number of eggs produced by commercial laying hens each year. Convert this number to dozens.
- Study the science of egg development in birds.
- Research how eggs were used in the development of vaccines.
- Learn how various chicken feeds affect the color of the egg yolk.
- Research how technology has improved egg production.
- Make Ukrainian eggs and study their history.
- Make a variety of egg dishes such as quiches, omelets and frittatas, and research their history.
- Create the perfect egg package, which prevents egg shells from cracking.
- Dissect a hard-cooked egg and label its parts.

Fantastic Facts

1. On the average, one laying hen produces 250 eggs in a year.
2. An average person today eats about 247 eggs each year.
3. The Single Comb White Leghorn chicken breed is the most common egg layer in California.
4. Egg proteins are used by nutritionists as a standard for all other nutrients. They are used to grade all other proteins
5. There are 192 egg farmers in the United States who, combined, have over 280,000,000 laying hens.
6. Petaluma was once known as the "egg basket of the world."
7. Most eggs arrive at supermarkets within 72 hours after laying.
8. There are approximately 20 million laying hens in California.

Lesson Plan: The Bouncing Egg

Introduction: Eggs have a variety of unique characteristics and can be used for a variety of scientific experiments.

Objective: Students will observe changes in an egg shell when placed in vinegar.

California Standards: CC ELA: W.3-5.7, W.6-8.2, 7
NGSS: 4-PS3-3, 5-PS1-4, 5-PS2-1, MS-PS1-2, 5 MS-PS2-1, 2, 4;
HS-PS1-4, HS-PS2-1

Materials: One hard-cooked egg per team, white vinegar, plastic container with lid.

Procedure:

1. Without breaking the shell, examine the hard-cooked egg carefully. Record visual observations.

2. Place egg in plastic container. Cover completely with white vinegar and seal with lid. Predict what will happen in one hour, one day, and one week. Record predictions.
3. Observe the egg at the indicated times and record observations. The egg shell should have dissolved and the egg white and yolk should have become rubbery. After rinsing and drying the egg, record what happens when it is dropped. It should bounce.

Note: After each observation, have your students wash their hands. Also, do not eat the eggs.

Commodity Fact Sheet

Cut Flowers

Information compiled by the California Cut Flower Commission

How Produced – California dominates the domestic cut flower industry because of its favorable Mediterranean climate, which allows for year-round production of an enormous variety of flowers.

Cut flowers are grown in covered greenhouses and outside in open fields. The floriculture industry, which includes the production of bedding and potted plants, shrubbery and fruit stock, as well as cut flowers, and foliage, is extremely labor intensive, requiring as many as 12 workers per acre. Flowers are harvested by hand and then pre-cooled and boxed to prevent heat buildup and premature decay. United States cut flower growers ship approximately two-thirds of their product by truck and the other one-third by air. Transit time from the grower/shipper to retail outlets varies widely, but can take as little as 24 hours—even to the East Coast. Most flowers are purchased during four key holiday months: February, April, May, and December. Besides holiday sales, flowers are typically purchased for two reasons: to express an emotion or to send “get well” wishes.

Varieties – Color and scent are distinguishing features of cut flowers, however they are generally categorized as one of four types used in floral design; line flowers, mass flowers, filler flowers, and foliage. Line flowers are tall, and give the bouquet height, width, and a balanced look. Examples of line flowers are gladiolus, snapdragons and curly willows. Mass or “face” flowers give bouquets weight, or mass, and are generally round and full faced. They are usually the focal point of color and interest in a bouquet. Most mass flowers come with only one flower on the end of the stem. Examples include roses, carnations, gerberas, sunflowers, lilies, daffodils, tulips, iris, freesia, zinnias, alstroemeria, protea, and chrysanthemums. Filler flowers, stems with a lot of little flowers and foliage, round out the bouquet and give it a soft, full look. Casual, fresh-from-the garden, bouquets use an abundance of filler flowers to visually connect mass and line flowers. Examples of filler flowers are baby’s breath, Queen Anne’s lace, heather, and aster. The last type of plant used in floral design is foliage. Foliage refers to the leaves and greenery used to complement floral arrangements. Foliage can also conceal the “mechanics” of an arrangement, such as floral foam. Fern, eucalyptus, salal, and myrtle are all examples of foliage.

Like most California crops, some flower varieties are available year-round while others are not. Many flowers are only available during certain times of the year based on seasonality. For the highest quality and most inexpensive California flowers, consumers can select flower varieties that are “in season.”

Commodity Value – California leads the nation in cut flower value of production, accounting for 77 percent of the nation’s total production. California producers market cut flowers and foliage, valued at more than \$278 million (wholesale value) annually, to the nation’s 40,000 florists and 24,000 supermarket floral departments, as well as to numerous kiosks and outlets. California retail florists alone employ approximately 11,000 people.



Top Producing Counties – The leading county is Santa Barbara. Other major producing counties include San Diego, Monterey, San Luis Obispo, Santa Cruz, Humboldt, and Ventura.

History – California is considered the originator of America’s commercial cut flower industry. It began in the late 1870s when a Ventura housewife, Theodosia Shepard, was inspired to sell the flowers she raised in her garden. Soon, other women were following suit and bringing their backyard beauty to the local market, and the retail florist profession was born. This period marked a time when French Impressionists began depicting flowers in their paintings and women’s magazines began counseling homemakers on flower care and display.

At the turn of the century the state’s cut flower industry expanded even further as many immigrant families turned their love of beauty and their botanical talents to flower production. The Chinese, Japanese, Italians, and Dutch revolutionized the floriculture industry in California and make up much of the industry to this day.

For additional information:
California Cut Flower Commission
(916) 441-1701
Website: www.cffc.org

Cut Flower Activity Sheet

Line Flowers

gladiolus, liatris, snapdragon, delphinium, veronica, curly willow

Filler Flowers

baby's breath, Queen Anne's lace, statice, aster

Mass Flowers

rose, carnation, sunflower, lily, iris, zinnia

Foliage

ferns, eucalyptus, salal, myrtle, ruscus



Beautiful Bouquet

Lesson Ideas

- Invite a floral designer to visit your classroom to teach about floral arranging and discuss the wide variety of career opportunities in the floral industry.
- Press flowers in waxed paper. Use the flowers to create a botany book, labeling each flower with its common and scientific name.
- Create a manual illustrating the steps of cut flower pollination, fertilization, and reproduction.
- Research the Fibonacci sequence and determine how the sequence relates to cut flowers.
- Look at a variety of flowers. Categorize them as line, mass, or filler flowers. Sort by color, smell, and shape.
- Grow flowers from bulbs or seeds.
- Color a white carnation using food color in water to learn about capillary action.
- Dissect a flower and identify its parts.
- Experiment with different liquids to determine their effect on flower freshness.
- Visit a commercial greenhouse or nursery to learn how cut flowers are produced.

Fantastic Facts

1. Mass, line, foliage, and filler flowers are the four categories of flowers used in a bouquet.
2. February, April, May, and December have the greatest number of cut flower sales because Valentine's Day, Easter, Mother's Day, and Christmas fall in these months.
3. One-third of flowers are shipped to floral retailers and wholesalers by air and two-thirds by truck.
4. Besides holidays, flowers are purchased to express emotion or send "get well" wishes.
5. The main expense in cut flower production is labor costs. It requires up to 12 workers per acre.
6. Cut flower production is just one part of the floriculture industry.
7. Theodosia Shepard, a Ventura housewife, is considered the founder of the cut flower industry.

Lesson Plan: Make Your Own Potpourri

Introduction: Potpourri is a mixture of dried, naturally fragrant plant material, used to provide a subtle, natural scent in homes.

Objective: Students will compare flowers based on texture, color, and scent. They will use ratios to mix a potpourri recipe.

California Standards: CC Math: 6.RP.1, 7.RP.2; Visual Arts: 3-4, Artistic Perception 1.5

Materials: Fresh flower petals and herbs, citrus peels, large cardboard sheet, paper towels, large bowl, large jar with lid, cinnamon (sticks or powder), a variety of scented oils.

Procedure:

1. Students will sort plant material into groups based on a chosen trait: color, texture, or shape.

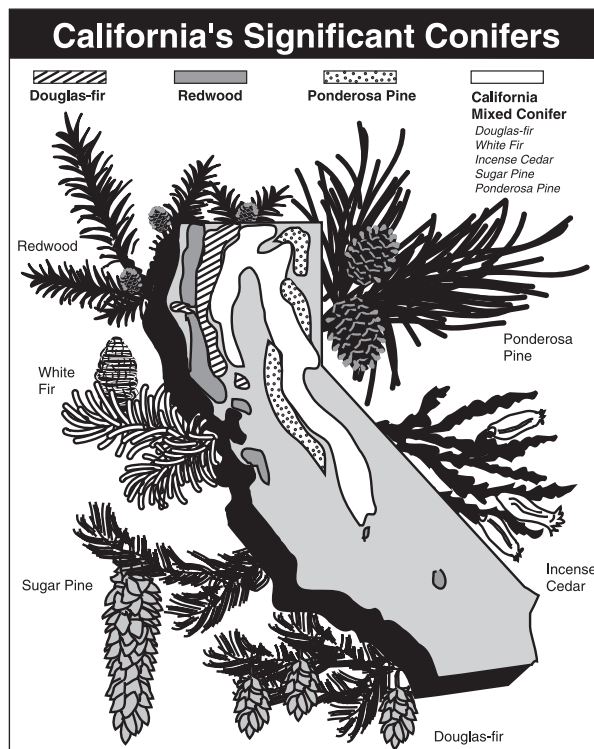
2. Using a mathematical ratio, students choose a specific number of items from each of their sorted groups. Have them create a table to show the ratio relationship they used.
3. Cover a piece of cardboard with paper towels. Spread the plant material on the cardboard and let dry for 2-3 weeks, fluffing the mixture occasionally. Cover cardboard with paper towels.
4. In large bowl, mix dried petals with all other ingredients except scented oil. Put a layer of mixture in the jar. Add 3-4 drops of scented oil. Continue to layer the mixture with the oil until the jar is full.
5. Put lid on the jar and leave 1-2 weeks, shaking daily to mix.
6. Finished potpourri can be used in gift baskets or to make sachets.

Forest Resources

Information compiled by the Forest Foundation

Sources – Approximately one-third of California’s 100 million acres is forests. More than half of California’s Forestland is under public ownership by the federal or state government.

Approximately 11 percent of California’s forestland is privately owned and managed for timber production. California is home to 52 native species of conifer trees. Conifer trees produce cones, have leaves that are needle-like and are evergreen. Needles are like solar panels for the tree, capturing energy from the sun through photosynthesis and converting carbon dioxide and water into sugars used for growth and reproduction. The roots absorb water and nutrients from the soil, transporting them through the trunk to the rest of the tree. The trunk protects the tree and provides support. In spring, a tree grows wood in a ring of large, light cells. In summer, it grows more slowly, forming a ring of darker, smaller cells. Dark rings are counted to tell the age of the tree.



Coastal redwood, Douglas-fir, white fir, sugar pine, ponderosa pine and incense-cedar form the mainstay of California’s forest products industry. California utilizes the equivalent of one 100 foot tall tree per person per year in forest products. Trees are a renewable resource. In addition to natural regeneration, foresters replant an average of 30 million seedlings annually—about one for each person in the state.

Uses – California’s forests provide more than just forest products. They provide beauty, sources of recreation, and homes to many Californians and to nearly 650 species of fish and wildlife. Forests protect against erosion, purify the air through photosynthesis, and filter water. Nearly 100 percent of each tree is used to produce more than 5,000 products. Lumber, furniture, and paper are easily identified wood products. Other items are less obvious. Rayon is cellulose acetate, a by-product of tree fibers. Lignin, which holds tree cells together, is often used as a thickener in baby foods, pet foods, and cosmetics. Baked goods sometimes contain torula yeast, derived from sugars in wood pulp. Flavorings and fragrances from tree oils are often used in foods, beverages, cosmetics, and medicines. Wood is 50 percent carbon. When trees are made into wood products, the carbon is

stored for the life of the product. Wood waste from the milling process is often used to produce electricity. This provides a renewable source of power, which is an environmentally friendly alternative to burning fossil fuels.

History – Long before the arrival of Europeans, Native Americans lived in and around forests. They burned and opened up parts of the forest to provide wood for daily needs, build villages, plant crops, make hunting easier, and to protect against enemies. The process helped maintain forest health. Arriving in the 1600s, European settlers respected the forests which gave them building materials and plenty of game. In colonial days, towns often had a liberty tree, under which important decisions were made. A tree was stamped on America’s first coins and trees were sewn on the flags of the first colonies. During the settlement of the West in the mid-1800s, wood was used without much thought of the future. The Gold Rush town of San

Francisco was built almost entirely of redwood—even its curbs. Today, California foresters practice sustainable forestry—more trees are grown than harvested. The amount of U.S. forestland has increased in the last 20 years.

Economic Value – California has more forestland than any state, except Alaska. Our state is among the top five producers of wood products in the nation. California’s lumber, wood products, paper, and allied industries provide an annual payroll of more than \$4 billion to employees. Approximately three percent of California’s lumber is exported outside the U.S.

For additional information:

The Forest Foundation
(866) 241-TREE
Website: www.calforestfoundation.org



The Forest Foundation

Forest Resource Activity Sheet



#1

Seedlings are often damaged or destroyed by animals, insects, drought, and plant competition. Modern forestry techniques allow 80 percent of seedlings to reach cone-bearing age.



#2

Saplings grow vigorously, cleaning the air of greenhouse gases and releasing oxygen.



#3

Light filtering through adolescent forests stimulates growth of understory plants, providing ideal foraging for animals, who then become prey to others.



#4

In established forests, foresters control disease and insects. They build trails and roads to provide access to firefighters.



#5

The mature forest provides recreation, watershed for urban and rural communities, animal habitats, and a host of wood products for our everyday lives.

Lesson Ideas

- List the variety of products in your kitchen that come from trees.
- Visit a lumber mill or a paper processing plant.
- Make a collage of everyday items made from trees that do not look like wood.
- Make a sand table forest scene. Show how Native Americans made openings in the forest through fire and harvesting to provide for their needs.
- Contact a forester to learn about the kinds of tools used to measure and work with trees.
- Visit a cogeneration plant to find out how electrical energy is produced from forest by-products.
- Find the height of a tree at your school using a clinometer and triangulation, a method of geometry.
- Count the dark rings of a cross section of wood to determine its age.

Fantastic Facts

- One-third of California is covered in forests.
- California is ranked among the top five producers of lumber.
- Three percent of California's lumber is exported outside the United States.
- Rayon is a fabric made from tree fibers.
- Native Americans used controlled burns when building villages, planting crops, hunting, and protecting themselves from attack.
- Approximately 650 species of fish and wildlife inhabit California's forests.
- The six main types of conifers used for California wood products include coastal redwood, Douglas fir, white fir, sugar pine, ponderosa pine, and incense cedar.
- Approximately 5,000 different products come from trees.

Lesson Plan: Making Recycled Paper

Introduction: Almost all paper is made from cellulose. The most abundant form of cellulose is wood, and processes for extracting cellulose from wood is the objective of paper mills and pulping.

Objective: Students will create recycled paper and determine how much water evaporated during the paper-making process.

California Standards: CC Math: 3.MD.2; 4.MD.1,2,4; 5.MD.1,2; HS.S-ID.1

Materials: Large square pan about three inches deep, large bowl, 3 cups of water, a large section of newspaper, rolling pin, pan balance or digital scale.

Procedure:

- Tear one or two pages of newspaper into small pieces of one inch or less.
- Put the paper chips into a large bowl and add three cups water to it. Keep adding paper, tearing it and squeezing it, until the mixture looks like thick oatmeal.
- With the pan turned upside down, place about 1 cup of the

blended pulp over the bottom of the pan. Spread it with your fingers evenly across the entire area.

- Lay several sheets of newspaper over the pulp, then carefully turn the pan over. Remove the pan. Your pulp "square" is now sitting on the newspaper.
- Close the newspaper over the pulp. Using the rolling pin, roll over the newspaper to blot out the extra water. Weigh the paper, recording measurement in kilograms, grams, and milligrams.
- Uncover and let the new "paper" dry completely. When it is thoroughly dry, weigh the paper again. Determine the difference between the two weights and record the amount of water that has evaporated. Together, make a line plot to illustrate results.
- Peel the new recycled paper away from the newspaper. Have students make a greeting card out of their recycled paper. They can draw designs or use glitter and glue to write a message.

Table Grapes

Information compiled by the California Table Grape Commission

How Produced – Growing fresh market grapes is a year round job. Growers vigorously prune the vines in the winter. In the spring, buds appear, shoots emerge and grow, cluster florets develop and flowers begin to bloom when daytime temperatures reach about 68°F. As the flowers die, fruit set follicles and tiny green berries appear. These will eventually grow and ripen into mature clusters of grapes. In late spring, the farmers girdle the vines of many varieties, stripping a small ring of bark from the shoots, canes, or trunks. This forces nutrients from the vines and roots into the fruit, resulting in larger berries.

When grape berries achieve the correct size, sugar content, and color, clusters are harvested by hand with special clippers. Harvest usually occurs in late spring to mid-July in the warm desert area of the Coachella Valley. In the San Joaquin Valley, harvest begins in late June continues through late fall.

At harvest, the clusters are trimmed and inspected, packed into shipping boxes, palletized, and transported to a cold storage facility to quickly cool the grapes. Grapes that are not immediately shipped to market are maintained in a controlled climate storage facility between 30°F to 32°F with 90 to 95 percent relative humidity. This storage process allows consumers to enjoy California table grapes through January.

History – Viticulture, or the science, production and study of grapes, first began in California in the late 1700s when Spanish friars arrived to establish Catholic missions. Because the native grapes were sour and made poor wine, the friars brought over grapes from Europe and planted their own vineyards to make sacramental wine.

In the mid-1800s, prospectors poured into California. They came looking for gold until some discovered that there might be more money in grapes. Shortly after the Gold Rush, California's fledgling agricultural society declared, "Capital put into vineyards would bring greater rewards than... fluming rivers for golden treasures." Their instincts were good. California's warm, dry climate turned out to be ideal for growing grapes. Today, more than 700,000 acres across California are planted with fresh grape, wine and raisin vineyards.

Varieties – California produces more than 2 billion pounds of table grapes each year. To give an idea of the total annual

crop size, one season of California table grapes amounts to 7.4 billion servings, enough for each person on the planet to have one serving.



There are over 85 varieties of table grapes grouped into three color classifications: green, black, and red. The numerous varieties enable consumers to have fresh California table grapes from May through January.

Commodity Value – The total annual crop value of fresh grapes from California is more than 1.5 billion dollars. Typically, 40 percent of California's table grapes are exported to countries around the world. The top five export markets by volume include Canada, Mexico, China, the Philippines and Taiwan.

Top Producing Counties – California produces 99 percent of the nation's commercially grown table grapes.

California's table grapes are produced in the Coachella and San Joaquin Valleys, which include Fresno, Kern, Kings, Madera, Riverside, and Tulare counties.

Nutritional Value – Grapes of all colors make a healthy snack. A serving of grapes ($\frac{3}{4}$ cup) is just 90 calories, has no fat or cholesterol and virtually no sodium. Grapes are an excellent source of vitamin K, and contain 7% of the recommended daily intake for potassium. Fresh grapes are also a natural source of beneficial antioxidants and other polyphenols. Research shows that grape polyphenols may help maintain a healthy heart. It is recommended that people consume a "rainbow" of naturally colorful, whole fruits and vegetables; eating a variety of fresh grapes helps achieve this goal and is a great start to a healthy lifestyle. Eat them fresh by the bunch, tossed into salads, yogurt, and more. Frozen grapes also make a refreshing snack on a hot day.

For additional information:

California Table Grape Commission
(559) 447-8350

Website: www.grapesfromcalifornia.com

Facebook: www.facebook.com/GrapesFromCalifornia

Twitter: www.twitter.com/GrapesFromCA

Pinterest: www.pinterest.com/GrapesFromCA

Table Grape Activity Sheet

A Little Bit of History

William Wolfskill, a former trapper from Kentucky, planted the first table grape vineyard in 1839. It was located in a Mexican colonial pueblo now known as Los Angeles.



In the 1860s, William Thompson, an English settler, first planted a popular Eastern Mediterranean grape in Yuba City. It is now known as the Thompson Seedless grape.

In the mid-1800s, Colonel Agoston Haraszthy personally brought 100,000 table grape cuttings to California and planted them to provide fruit to the miners of the California Gold Rush.

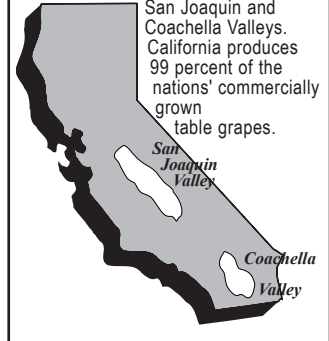


In 1869, R.B. Blowers pioneered the transport of fresh table grapes to eastern markets.

The first load was shipped by freight train to Chicago. Each grape cluster was wrapped in paper bags, in 22-pound boxes.



Today, the major California table grape growing regions are the San Joaquin and Coachella Valleys. California produces 99 percent of the nation's commercially grown table grapes.



Lesson Ideas

- Make a mural depicting the lifecycle of a grapevine.
- Research the role of phloem, xylem, and cambium in plants and relate it to the girdling process done on grapevines.
- Use a world map to trace the distribution of grapes over time.
- Compare the latitudes and longitudes of major grape-growing countries and grape-importing countries.
- Compare and sort various grape varieties by color, shape, or size.
- Research the Phoenicians and their importance in the ancient world.
- Use frozen grapes as ice cubes in a favorite drink.
- Compare the etymology of the French word "grape" and the English word "grapple."

Fantastic Facts

1. Growers harvest grapes when they are fully ripe.
2. The two valleys in California that produce the most fresh market grapes are Coachella and San Joaquin.
3. California produces 99 percent of the nation's commercially grown table grapes.
4. There are over 85 varieties of table grapes grown in California.
5. Fresh California table grapes are available from May through January.
6. The three colors of table grapes are green, black, and red.
7. A serving size of grapes is 3/4 cup.

Lesson Plan: To Market! To Market!

Introduction: Since 1970, the United States per capita consumption of table grapes has grown from two pounds to close to 9 pounds per year. Many factors contributed to this rise, including improved marketing techniques. Developing new marketing techniques relies heavily on research such as surveys and taste tests. In this activity, your students will conduct a survey, analyze the results, and produce a magazine advertisement to sell table grapes.

Objective: Students will conduct a survey, analyze the results, and create an advertisement.

California Standards: CC ELA: W.3-12.4, 7; WHST.6-12.4, 7; SL.3-12.1, 3-12 Visual Arts Content 5.0

Materials: *Table Grape Fact Sheet*, supermarket advertisements for grapes, magazine food advertisements, and red, green and black grapes.

Procedure:

1. Discuss how advertising and product presentation affect the sale of foods. Have students bring in samples of food advertisements from magazine and grocery ads.

2. Discuss the various marketing strategies used to persuade a consumer to purchase a product. Examples may include low prices, convenience, healthy eating, or appealing to the senses. Have the students analyze what strategies are used in the ads brought to class.
3. Have students gather information on grapes by examining and tasting fresh grapes, writing down words that describe the grapes, looking at the cash register receipt from the grape purchase, and reading the *Table Grape Fact Sheet* and other literature you have on grapes.
4. Have the students develop and administer a survey designed to find out what consumers are looking for when buying fresh fruit, in particular, fresh grapes. Possible questions may include: "Who eats grapes in your home?," "Does price matter in your fruit choice?" and "What color of grapes do you prefer?"
5. After conducting their survey and analyzing results, have students write magazine or grocery ads to promote their products.

Commodity Fact Sheet

Herbs

Information compiled by California Foundation for Agriculture in the Classroom

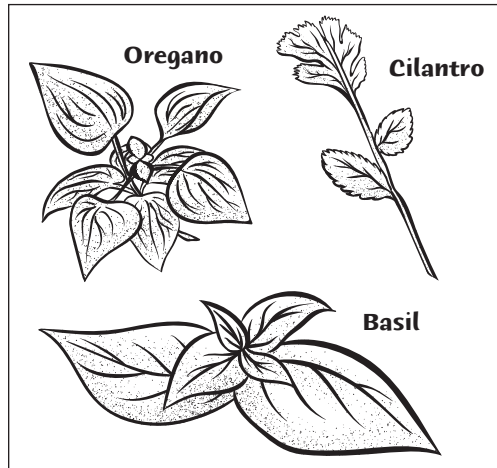
How Produced – Herbs are plants useful for culinary, cosmetic, industrial, medicinal, landscaping, decorative, and fragrance purposes. Both fresh and dried herbs may be used for culinary purposes. Additional purposes for processed herbs include décor, essential oils, teas, dyes, and cosmetics. Herbs are among some of the easiest plants to grow. They require plenty of sunlight and typically grow well in most soils.

Oregano – Oregano has purple flowers and spade-shaped, olive-green leaves. Oregano seeds are planted in greenhouses for 6-8 weeks before being transplanted to the field in spring. A perennial herb, with creeping roots, oregano requires some irrigation, but once established it requires very little water. Well drained soil is ideal, but it does not require especially fertile soil. Oregano is ready for harvest 45 days after planting, before full flower. Oregano is harvested by hand 4-6 times per year. If oregano is harvested early in the morning, the need for cooling is minimized. Oregano intended for the fresh market is kept in cold storage, while oregano intended for the dry market is transported to a dehydrator.

Cilantro – Cilantro leaves are light green, feathery, and flat. While the leaves are used as an herb, the dried seeds, called “coriander,” are used as a spice. Cilantro seed is grown year-round—in the winter in the desert and in the summer along the coast. Extremely hot weather may cause plants to “bolt,” or produce flowers prematurely. Cilantro matures in 40 to 45 days. It is often used as a rotation crop; however, some growers may double-crop each year. Cilantro has a relatively shallow root system and thrives on frequent, short irrigations. It is commonly grown in high-density planting on 80-inch wide beds that are sprinkler irrigated. Cilantro can be harvested by hand and sold in bunches to be used as a fresh herb or mechanically harvested and loosely packed into totes. Once cut, cilantro is immediately cooled and kept in cool storage.

Basil – Basil leaves are glossy and oval-shaped, with smooth or slightly toothed edges. Basil is directly seeded or transplanted to the field in late spring. Most growers use drip irrigation to water basil plants regularly. Basil is a warm season herb, and is harvested from March through mid-November. The timing and method of harvest depends on the use of the herb. For dried basil leaves, the plant is cut just prior to appearance of flowers. To produce essential basil oil, the plant is harvested when the flowers are in full bloom. Fresh

basil is typically harvested several times during the growing season. For the fresh market, leaves are washed and stems are packed in bulk boxes in the field and transferred to cold storage rooms. Once transported to the packinghouse, the herb is hand-sorted into plastic clamshells for retail sales. For the dried herb, low temperature drying of the leaves under forced air is used to retain maximum color.



History – The use of plants as herbs has been important to all cultures since before history was recorded. For thousands of years, tribal cultures have used wild and cultivated herbs for medicinal and food purposes. Historians have found documentation that suggests that hunters and gatherers wrapped meat in the leaves of bushes, accidentally discovering that this process enhanced the taste of meat,

as did certain nuts, seeds, berries, and bark.

Evidence of early herb gardens dates to Europe in the Middle Ages. Egyptian schools of herbalists have existed since 3000 B.C. Some herbal benefits are symbolic. For example, basil was given to those who needed strength to endure fasting, while rosemary was given to others for remembrance.

Commodity Value – California leads the nation in herb production. In 2016, the value of fresh market organic herbs was approximately \$9.4 million, while the value of organic dry herbs was approximately \$250,000. California is the largest cilantro producing state with annual production exceeding 56 million pounds. The United States produces approximately 200 billion pounds of herbs and spices per year.

Top Producing Counties – Ventura, Imperial, and Monterey counties lead the state in cilantro production. Individual county data is not available for oregano and basil.

Nutritional Value – Most herbs are highly nutritious, but the benefits are not particularly relevant since they are consumed in limited quantities. Oregano, cilantro, and basil are all good sources of dietary fiber, zinc, and calcium. The essential oils produced from these herbs may be applied topically or used aromatically for a variety of medicinal benefits.

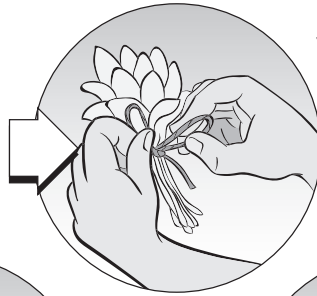
For additional information:
UC Master Gardener Program
Website: mg.ucanr.edu

Herbs Activity Sheet



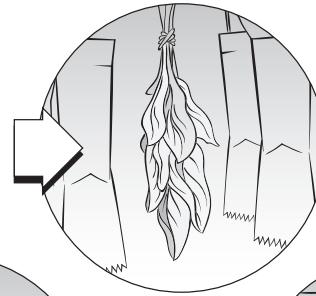
Procure

Cut fresh herbs from your garden or purchase from the grocery store.



Tie

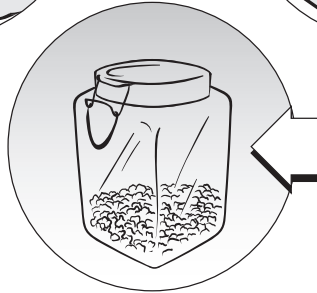
Bundle small bunches of herbs with string. Large bundles may develop mold.



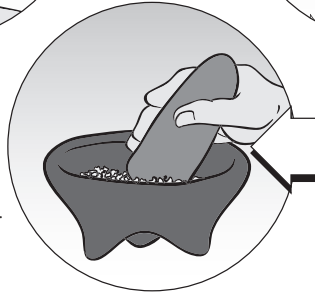
Hang

Hang the bunches up to dry, leaves downward, covered loosely with thin paper bags.

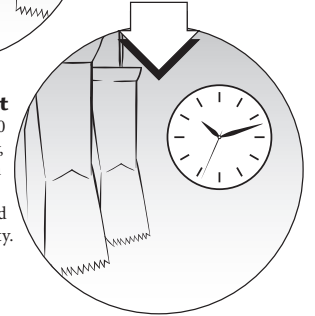
Store
Place in an airtight glass container for up to one year.



Crush
Harvest dry leaves, discarding the stems. Gently break leaves into smaller pieces.



Wait
Allow 7 to 10 days to dry, depending on the size of the bunches and humidity.



Lesson Ideas

- Dry herbs to make a loose-leaf tea.
- Research the medicinal properties of different herbs.
- Create nature prints by using herbs and sun-sensitive fabric or paper.
- Harvest and crush seeds from a cilantro plant to make the spice coriander.
- Make a woven lavender wand.
- Taste and describe different varieties of the same herb.
- Use herbs to make your own potpourri.
- Compare storage methods of fresh herbs.
- Plant your own mini-herb garden in a container.
- Classify herbs by leaf shape, color, and texture.

Fantastic Facts

1. The word oregano comes from the Greek, meaning “joy of the mountain.” It was believed Aphrodite, the goddess of love, grew it on Mount Olympus.
2. Cilantro was brought to North America by the English in 1670.
3. Heat diminishes the flavor of fresh herbs, which is why dry herbs are often used in cooking.
4. Oregano was introduced to the United States by soldiers returning from Italy after World War II.
5. Some people may be genetically predisposed to dislike the taste of cilantro.
6. In ancient history, basil was used to embalm mummies.
7. Cilantro seeds are called coriander, which is a spice that has its own unique flavor.

Lesson Plan: Making Herb Butter

Introduction: Butter has long been used as a spread and as a cooking fat. In fact, approximately a third of the world’s milk production is devoted to making butter. To make butter, the cream is agitated (stirred up) so that the fat molecules get shaken out of position and clump together. Eventually, after enough agitation, the fat molecules clump so much that butter forms. In this lesson, students will make their own herb butter.

Objective: Students will understand how churning separates the butterfat (the solids) from the buttermilk (the liquid).

California Standards: NGSS: MS-PS1-1, MS-PS1-4; ELA CC: RST.6-8.3

Materials: Heavy whipping cream, finely chopped herbs of your choice, small liquid-tight container with lid, plastic knives, crackers

Procedure:

1. Fill the container halfway with heavy whipping cream and add $\frac{1}{4}$ teaspoon of herbs.

2. Close the container and begin shaking. The faster you shake it, the faster you make it.
3. As you shake, you will see the cream begin to thicken.
4. Keep vigorously shaking until you see the liquid has separated from the solid.
5. Once you have butter, STOP SHAKING (if you keep shaking the butter will melt). Drain and discard the remaining liquid.
6. Spread butter over crackers and enjoy.
7. While enjoying your butter, discuss how long it took for the butter to form.
 - What variables cause the butter to form more quickly?
 - What is happening at a molecular level?
 - What would be the quickest or most efficient way to turn cream into butter?

Commodity Fact Sheet

Lettuce

Information compiled by California Foundation for Agriculture in the Classroom

How Produced – Cool weather is important in lettuce production. Lettuce is a cool-season, annual crop. It grows best in moderate daytime temperatures (73° F) and cool nighttime temperatures (45° F). Lettuce grows well in loose, fertile, sandy-loam soils that are well-supplied with organic matter. Soil should be well-drained and moist, and have a slightly acidic pH of 6.0 to 6.5. Since lettuce seeds are so small, a well-tilled seedbed is essential - large clods will reduce germination. Lettuce is hand-harvested and takes place year-round, from April to October in the Salinas Valley, California and from November to March in Yuma, Arizona. Lettuce is one of the top three vegetables produced in the US, along with tomatoes and potatoes. Iceberg lettuce accounts for about 1/2 of the lettuce produced in the US, with the other 1/2 including romaine, butterhead and leaf lettuces. Growing, harvesting, and marketing of lettuce is mainly from large-scale growers with organic production gaining in popularity. World-wide, the US is the second largest lettuce producer (behind China), with most of the lettuce coming from California and Arizona.



History – Lettuce is one of the oldest known vegetables. There are Ancient Egyptian tomb drawings depicting lettuce dating back to about 2500 BC. The Egyptians believed it aided in sleep. Originally used for its seeds to produce oil, it then began to be grown for its leaves. Lettuce spread to the Greeks and Romans who gave it its name lactuca. In Rome, Emperor Caesar Augustus built a statue praising lettuce because he believed eating lettuce had cured him of an illness. It was introduced to North America by Christopher Columbus during his second voyage in 1494. Many varieties developed during the 16th through 18th centuries in Europe. Different forms became popular in different regions. Stem lettuce was most popular in the Mediterranean, Egypt, the Middle East, and China. In Northern Europe, butterhead was most popular. Lettuce varieties have changed over the years. The long, thick-stemmed variety of the past, has evolved into leafier, greener types. In recent times, salad bars have become popular (1970s), and salad mixes of pre-washed and packaged greens have become available (1990s).

Varieties – There are several types of lettuce, but the three most common are head, leaf, and romaine. Iceberg lettuce has been the most popular variety, indicated by the largest area harvested, most tonnage produced, and most revenue generated. A shift from iceberg to leaf lettuce being the most popular has occurred in the last ten years. Varieties differ in color, texture, and amount of nutrients.

Commodity Value – In 2014, lettuce was number six in California commodity values, generating sales of 2 billion dollars. Lettuce is in the top 20 of California exports, coming in at number 14 with \$337 million in sales. Canada takes in the highest amount of California grown lettuce exports at 88%. Imports of lettuce to California are limited to less than 5%, and come from Mexico and Canada.

Top Producing Counties – Monterey County is the top lettuce producing county, producing more than 70 percent of the crop and generating 1.48 billion dollars. The second highest producing county is Imperial at \$158 million, and third highest is Santa Barbara at \$107 million. Lettuce is easy to grow and yet sensitive to temperature – frost damages it, and heat causes the stem to grow quickly and

the plant to go to seed. Ideal conditions are mild weather, and moist, fertile soil explaining why the coastal counties do well in spring and summer months and Imperial County and Arizona do well in winter months.

Nutritional Value – Lettuce is low in calories, fat-free, cholesterol-free, and low in sodium. It has 11 calories per one cup. Lettuce contains dietary fiber along with omega fatty acids that promote good health. Lettuce also provides immune capability with the help of mineral contents like manganese, magnesium, potassium, iron, phosphorus, and calcium. Presence of these mineral compounds decreases harmful free radicals in the body and improves the body's immune system as well as protects from viral infections and related diseases. The iron content in lettuce contributes many beneficial properties for health. Iron is required for the formation of red blood cells and the transportation of oxygen to different parts of the body. These nutritional benefits of lettuce can help prevent anemia and aid in protecting the body from indigestive agents. Lettuce also breaks down heavy protein and carbohydrates helping the stomach function properly. Lettuce contains vitamin A (which helps protect the eye), vitamin C, thiamine and vitamin B6.

For additional information:

California Leafy Green Products
(916) 441-1240
Website: www.safeleafygreens.org
YouTube: [youtube.com/user/CALeafyGreens](https://www.youtube.com/user/CALeafyGreens)

Leafy Greens Council
(716) 517-0248
Website: www.leafy-greens.org



Lettuce Activity Sheet

ANCIENT EGYPT



- Tomb paintings depict lettuce
- Stems used instead of leaves
- Grown for seed and oil

2500 B.C.

CHINA



- Consumed as a cooked vegetable
- Lettuce traveled to Persia, Greece, Rome
- Stem lettuce variety native to the area

5TH CENTURY

WESTERN EUROPE



- Shorter-stemmed varieties developed
- Christopher Columbus brought lettuce to the New World

15TH CENTURY

AMERICA Modern Varieties Developed



Butterhead



Romaine



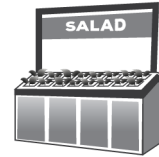
Crisphead



Loose Leaf

EARLY 1900s

WORLD



- Salad bar popularity
- Plant breeding for disease-resistance and more varieties

1970s

CALIFORNIA

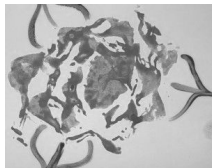


- 1/3 of California-grown lettuce is sold in ready-to-eat packaging
- Contributes 70% of total lettuce exports

TODAY

Lesson Ideas

- Research Ready-to-Eat bagged lettuce. Include when it started and its success. Compare its popularity to head lettuce.
- Make an artistic salad using leafy greens and other vegetables.
- Identify and illustrate different lettuce varieties.
- Research Lettuce Mosaic Virus and/or the Soil-Dwelling Springtail.
- Create a green smoothie recipe.
- Using the art principle of perspective, research and draw a lettuce or other agricultural field.
- Create artwork using lettuce head stamping (art, see below).



Fantastic Facts

1. Lettuce is a member of the sunflower family.
2. Over 90% of lettuce sold in the US is grown in California and Arizona.
3. California is the "salad bowl" of America, producing a year-round supply of lettuce, celery, broccoli, and cauliflower.
4. Americans consume 30 pounds of lettuce per person each year.
5. The first modern iceberg variety was created by TW Whitaker of the USDA and was named Great Lakes, although it was developed in California.
6. *Lactuca sativa* is the botanical name for common garden lettuce.
7. Drawings of lettuce are found on ancient Egyptian tombs.
8. Lettuce was recently grown, harvested, and eaten on board the International Space Station.

Lesson Plan: Growing Lettuce From a Stem

Introduction: Lettuce and other leafy greens can be grown from a cutting. Have your students design a science experiment to observe the phenomenon. Research and find out why it works.

Objective: Students will investigate what plants needs to grow.

California Standards: CC ELA: SL.3-12.4, WHST.6-12.7
NGSS:4-LS1-1, 5-LS1-1, MS-LS1, HS-LS1

Materials: Stems or cuttings from heads of lettuce, bowls, water, observation tools – notebook, pencil, thermometer, ruler.

Procedure:

1. Brainstorm what plants need to grow. Ask what would happen if we cut the stem of the lettuce off and put it in water? Have students make predictions. Students will work in groups of 3-4.
2. Bring in heads of lettuce for each group. Cut the stem off about 1 inch from the bottom. Save for the experiment. Use the lettuce for a class salad.

3. Place the cut stem in a bowl of water. Add about ½ to 1 inch of water.
4. Place the bowl in the window or under lights.
5. Draw a picture and record other measurements such as date, time, temp, size, lettuce type, etc.
6. Change the water in the bowl every other day and observe the cutting every day. Watch for new leaves and roots. Make observation notes.
7. After two weeks, you may plant your lettuce in a pot or outside. Continue to make observations.
8. Research why the plants were able to grow after being cut and only with sun and water. Consider other experiments you can conduct to improve lettuce growth.
9. Have groups present their results using evidence, data, and a model to support their findings.

Commodity Fact Sheet

Mushrooms

Information compiled by the Mushroom Council

How Produced – The life of mushrooms begins in a laboratory as tiny grains, but they will eventually grow into flavorful mushrooms in just five steps.

Step 1 – Composting: At the farm, the grower prepares a growing medium called compost. The compost is often made from wetted straw, hay and/or crushed corncobs. The grower mixes the ingredients and waits for them to decompose. Once the material is broken down, they bring the compost inside to pasteurize it. Pasteurizing kills any insects or pests and removes ammonia, which formed during decomposition. This step is important because the compost provides nutrients for the mushrooms.

Step 2 – Spawning: The mushroom compost must be inoculated with mushroom spawn for mushrooms to grow. Growers start the process by sterilizing a mixture often composed of rye grain, water, and chalk. The grower spreads this mixture across the compost and the spawn will begin to appear as a white to blue-white mass throughout the compost. The compost will fully grow with spawn in 14 to 21 days.

Step 3 – Casing: The pasteurized compost is placed in stacked, wooden trays. A top-dressing, called casing, is layered onto the compost. This is where the mushrooms will eventually form.

Step 4 – Pinning: This is the growth stage where the shape of the mushroom forms, appearing like pins. From this point, it takes about a month to produce the first mushrooms for harvest.

Step 5 – Cropping: Mushrooms develop at varying rates, so harvest can take six to 10 weeks. Once all of the mushrooms are picked, the trays are emptied and the growing area is pasteurized with steam before a new crop is started. Mushroom farms today are highly technical operations with computerized systems to monitor each point in production.

History – Ancient Egyptians believed mushrooms were the plant of immortality, according to the hieroglyphics of 4,600 years ago. The delicious flavor of mushrooms intrigued the pharaohs so much that they thought mushrooms were food for royalty and no commoner could touch them. In other civilizations throughout the world, including Russia, China, Greece, Mexico and Latin America, communities practiced mushroom rituals. Many believed that mushrooms had properties that could produce super-human strength, help find lost objects, and lead the soul to the gods.

France was the leader in the formal cultivation of mushrooms and some say that Louis XIV was the first mushroom grower. In the seventeenth century, mushrooms were grown in special caves near Paris set aside for this unique form of agriculture.



Varieties – The most popular mushroom is the white button, representing approximately 90 percent of mushrooms consumed in the United States. Crimini mushrooms, also known as baby bellas or browns, are similar in appearance to the white button, but have a light-tan to rich-brown cap and a firmer texture. Portabella mushrooms are another popular variety. Known as the “vegetarian meat,” they have a meat-like texture and flavor. Specialty mushroom varieties include shiitake,

maitake, enoki, oyster, beech, and blue trumpet.

Commodity Value – Today, mushrooms are commercially produced in almost every state. As the top mushroom producing state, Pennsylvania accounts for approximately 60 percent of the total U.S. production. California is the second largest mushroom producing state, accounting for 20 percent of total U.S. mushroom production.

Top Producing Counties – In California, mushrooms are primarily grown on the coastal strip between San Mateo and San Diego. The leading mushroom growing counties include Monterey, Santa Clara, Ventura, San Diego, and San Mateo. As the top producing county, Monterey County alone accounts for nearly 40 percent of California’s total production.

Nutritional Value – Mushrooms are a produce powerhouse of nutrients. Few foods naturally contain vitamin D, but mushrooms are unique for being the only source in the produce aisle and one of the few non-fortified food sources. Mushrooms are low in calories, fat-free, cholesterol-free, and low in sodium. Mushrooms provide selenium, potassium, B vitamins, and ergothioneine, a naturally occurring antioxidant that helps protect the body’s cells.

For additional information:

The Mushroom Council

(408) 432-7210

Website: www.mushroominfo.com

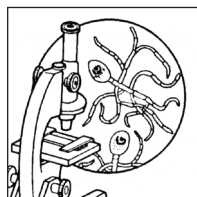


Mushroom Activity Sheet

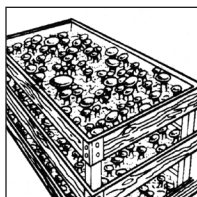
Mushrooms to Market



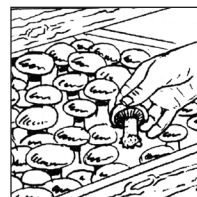
1. Compost production



2. Spawn production



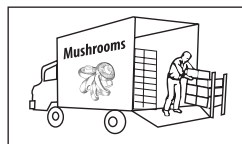
3. Mushroom growing



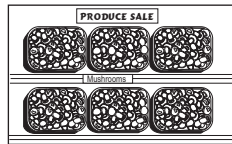
4. Mushroom harvesting



5. Mushroom packaging



6. Mushroom transporting



7. Mushroom sales



8. Mushroom cooking



9. Enjoyment

Lesson Ideas

- Persuade the class that your chosen mushroom variety is the best. Create a convincing, fact-based advertisement and develop a supporting sales presentation.
- Determine the current market price (per pound) for different mushroom varieties. Weigh the mushrooms, convert data from dollars per pound to dollars per gram and compare the price.
- Egyptians believed mushrooms were the plant of immortality. Research specific mushroom rituals for ancient civilizations.
- Compare the energy flow of autotrophic plants and heterotrophic fungi. Create a Venn diagram showing the similarities and differences.
- Identify nutrients found in mushrooms and their effects on human health. Develop a tri-fold brochure to illustrate the health benefits.
- Research each mushroom variety. Create a fictional, multi-paragraph story that features one of the mushroom varieties as the main character. Follow the mushroom's experience from spawn to supper.

Fantastic Facts

1. Monterey County produces the most mushrooms in California.
2. The white button variety is the most popular variety of mushroom.
3. The portabella mushroom variety is known as the "Vegetarian Meat."
4. Ancient Egyptians believed mushrooms were the plant of immortality.
5. Potassium, copper, vitamin D, phosphorus, and ergothioneine are all nutrients found in mushrooms.
6. A typical mushroom harvest lasts six to 10 weeks.
7. Light is not required for mushroom growth.
8. Pasteurization is a process that kills insects and pests while removing ammonia from the compost.
9. It is not safe to eat mushrooms found outdoors. Only eat mushrooms bought at a market.

Lesson Plan: Mushroom Dissection

Introduction: Mushrooms are natural wonders. Very different from plants, these fungi have cell walls made of chitin and do not go through the process of photosynthesis.

Objective: Students will identify and dissect several different varieties of mushrooms.

California Standards: CC ELA: W.3-12.7; NGSS: 4-LS-1, MS-LS-1

Materials: Scalpels, tweezers, microscopes, microscope slides and cover slips, magnifying glasses, paper, tape.

Procedure:

1. Review mushroom anatomy with the class. Discuss varieties of mushrooms and make observations about visual differences and structural similarities. Discuss the important role mushrooms and all fungi serve in the ecosystem.
2. Distribute three different varieties of store-bought mushrooms to the class. Each student/group should have one mushroom.

3. Instruct students to identify and record their given mushroom variety. Have students carefully bisect the mushroom to reveal the internal components. Students may either draw their mushroom specimen or tape their specimen to a piece of paper. Guide students in labeling the following parts: hyphae, fruiting body, mycelium, cap, gills, stipe (stalk), ring, pores, and scales.
4. Demonstrate use of the scalpel to take a small sample of mushroom tissue for microscopic observation. Students place their mushroom sample on a slide, view and record observations. Challenge students to also draw their magnified tissue sample and label cell wall, cross wall, nuclei, and cytoplasm.
5. Students compare findings and submit completed lab reports.
6. Conclude the experiment by reviewing the unique qualities of mushrooms and their exceptional nutritional value.

Commodity Fact Sheet

Pears

Information compiled by the California Pear Advisory Board

How Produced – Rich soil, plenty of water, warm days and cool nights are the best conditions for pear growth. Pear trees are in production for an average of 50 to 75 years, although some pear trees still produce after 100 years.

In winter, trees are pruned and replacement trees are planted. It takes five to seven years for a tree to produce fruit. Pear trees are unique since they are self-pollinating. They do not need bees for this process. The California pear harvest begins in late June and continues through September. The pear is one of the few fruits that does not ripen on the tree, so growers pick the fruit when it is mature, but green, and not yet ripe. Pears are harvested by hand, placed into bins and transported to a packing house. The pears are graded for quality, sorted by size, and packed for the fresh market or sent to a processing facility. Next, pears are cooled to slow down the ripening process. To initiate ripening, pears are brought to room temperature.

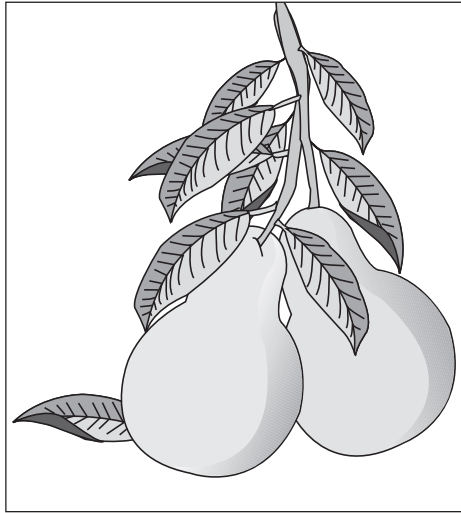
Pears are processed into canned pears, fruit cocktail, juice concentrate, and baby food products, and are often dried. They can be found in such items as fruit juices, baked goods, and snack foods like fruit roll-ups.

History – In eighth century B.C., pears captured the praise of the Greek poet Homer, who referred to them as a “gift of the gods.” The Romans proceeded to use grafting techniques to develop more than 50 varieties and introduced cultivated pears into other parts of Europe.

The Bartlett pear was developed in England in the seventeenth century by a schoolmaster named John Stair. He sold some cuttings to a horticulturist named Williams, who further developed the variety and renamed it after himself. Early Americans brought pear seedlings across the Atlantic to the Massachusetts Bay Colony. In 1812, nurseryman Enoch Bartlett discovered the pear variety and, unaware of the pear’s true name, distributed it as a “Bartlett.” However, it is still known as the “Williams” pear around the world. Bartlett cuttings eventually came west when the forty-niners headed for the great California Gold Rush and continue to grow in California today.

Varieties – The pear, scientifically known as *Pyrus communis*, is a member of the rose family. The Bartlett comprises 75 percent of California’s pear acreage and 90 percent of its

tonnage. The Bartlett has a teardrop shape with thin skin that turns from green to yellow when it ripens. When California Bartletts are golden yellow, they are ready to eat. Remember to handle gently to avoid bruising.



Other California varieties include Bosc, Seckel, Comice, Red Pear, French Butter, Golden Russet, and Forelle. Each has its own distinct shape, color and flavor. The Red Sensation variety was discovered as a “bud sport” on a Bartlett tree. A bud sport is a tree limb that naturally transforms and develops a different fruit variety from that of the original.

Commodity Value – California produces 25 percent of all pears grown in the United States, ranking number two in the nation. California produces approximately 160,000 tons each year and adds \$80 million to its economy. California exports more than 20 percent of its fresh crop. Canada and Mexico receive more than 80 percent of California’s exports.

Top Producing Counties – Pears are grown in two primary growing regions of Northern California on approximately 9,000 acres. The regions are divided into “early” and “late” districts based on the timing of the harvest. The early district, called “River Pears,” spans the Upper Sacramento Valley of Sutter and Yuba counties and along the Sacramento River Delta in the counties of Sacramento, San Joaquin, Yolo, Solano, and Contra Costa. The early district produces about two-thirds of California’s annual pear crop. The late district, called “Mountain Pears,” spans Mendocino, Lake, and El Dorado counties. This area produces approximately one-third of California’s pears annually.

Nutritional Value – One medium pear provides 16 percent (four grams) of the daily requirement for dietary fiber, 10 percent of the daily requirement of vitamin C, and a healthful source of potassium. One pear has approximately 100 calories and contains no cholesterol, sodium, or saturated fat.

For additional information:
California Pear Advisory Board
(916) 441-0432
Website: www.calpear.com



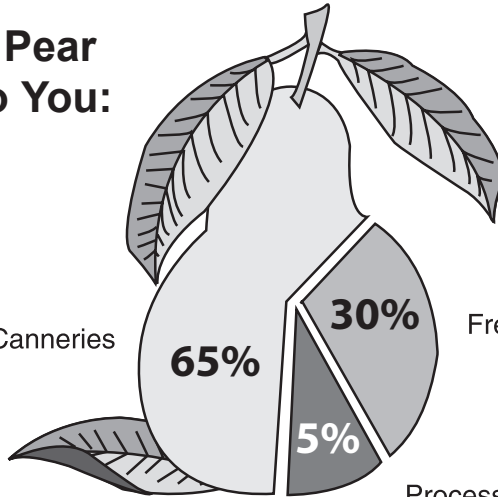
CALIFORNIA
PEARS

Pear Activity Sheet

From Pear Tree to You:



Canneries



Fresh market



Processed into dried fruit, baby food, and juice products.

Lesson Ideas

- Slice a pear in half. Find the stem, core, shoulder, flesh, seeds, skin and calyx.
- On a map of California, identify the River Pear and Mountain Pear districts.
- Dehydrate pears and calculate the percent water loss.
- Compare the color, taste, and texture of various pear varieties. Graph or chart your results.
- Examine pear fruit cells under a microscope. Observe the sclerenchyma cells, which give pears their unique texture.
- Dip the tips of your thumb and little finger on an inkpad and make pear prints.
- Write a song or poem about pears highlighting their unique characteristics.
- Create a collage of food products that contain pears.

Fantastic Facts

1. It takes five to seven years for a pear tree to produce fruit.
2. The pear is one of the few fruits that does not ripen on the tree, so growers pick the fruit when it is mature, but green, and not yet ripe.
3. Consumers can initiate ripening in pears by storing them at room temperature.
4. The Greek poet, Homer, referred to pears as a "gift from the gods."
5. The Bartlett pear is sometimes called the Williams pear because a horticulturalist named Williams originally developed the variety.
6. A bud sport is a tree limb that naturally transforms and develops a different fruit variety than the rest of the tree.
7. A medium pear provides 16 percent of the daily requirement for dietary fiber.

Lesson Plan: Ripe for the Taking

Introduction: Since pears do not ripen properly on trees, growers pick pears while they are still green, but mature. Most consumers want to buy Bartletts that are just starting to "break color" from green to yellow, yet only half of grocery chains ripen Bartletts in the backroom. A considerable amount of time and money has gone into informing grocers how to properly ripen pears as well as increase their shelf life. Pears are considered ripe when they are slightly soft when gently pressed on the stem end of the fruit.

Objective: Students will compare the ripening rates of pears under various conditions.

California Standards: CC ELA: W.3-5.4, WHST.6-12.2; NGSS: 3-5-ETS1-1, MS-ETS1-1, MS-PS3-4, HS-ETS1-3

Materials: Unripe pears for each variety you are testing, thermometers, resealable plastic bags, supplies determined by students.

Procedure:

1. Explain to the students that pears ripen best after they have

been picked. Have the students think of variables that may affect the ripening rate of pears and brainstorm a list of variables that can be explored in a classroom setting.

2. Have the students create and perform an experiment that will test one aspect of fruit ripening. One such experiment is described in step 3 below.
3. Make two sets of three pears each in a resealable plastic bag. Place one bag in the refrigerator and one on a counter top. Record temperatures. Over the next few days, record temperatures, and changes in fruit color and firmness. Compare the ripeness of the two sets of fruit.
4. Have the students discuss the results of each of the performed experiments.
5. Individually or as a class, have the students write a memo or cardboard box cover that explains to the grocer how to store and ripen pears. Or, have students design an ad that explains to consumers how to ripen pears at home.

Commodity Fact Sheet

Pork

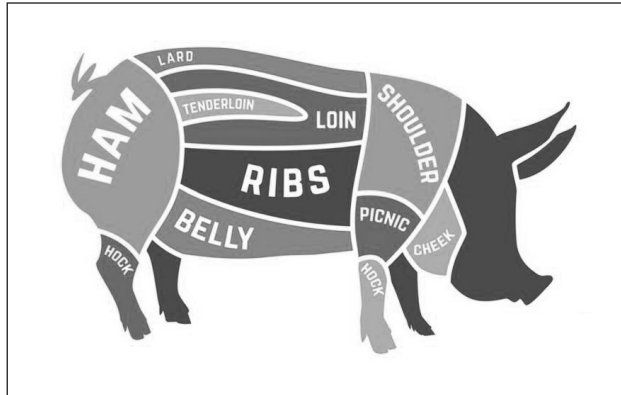
Information compiled by California Pork Producers Association

How Produced – While a majority of California farms use modern farming practices, some farms are specific niche markets. Today's farming combines the best of traditional farming practices with the benefits of modern technology. Many California farmers believe that raising pigs in barns helps them to better care for their animals by controlling their environment. Many California pigs are raised in barns that use technology like fans and heaters to keep them comfortable all year long. Pigs are kept in clean living conditions and provided fresh feed and water. Most pigs eat a diet that consists of corn and soybeans and is called a ration. Nutritionists carefully develop pig rations based on the age, size, and nutrient requirements that changes throughout their lifetime. Pigs have stages of growth from birth to market; farrowing – weaning –growing –finishing. Baby pigs are raised by their mother or sows, for the first month, then they are weaned. Weighing between 12-15 pounds, they go to a nursery where they are fed solid food, provided fresh water, and kept warm. They stay there for 4-6 weeks and are fed a grower ration. They will complete their growth cycle at an average market weight of 270 pounds around six months of age.

History – There are fossils indicating wild pig-like animals roamed the earth 40 million years ago! Pigs were domesticated in China around 4900 BC and were raised in Europe by 1500 BC. Columbus took pigs on his trip to Cuba in 1493. Spanish explorer Hernando de Soto, the “father of the American pork industry” was the first person to bring pigs to America in 1539. With just 13 pigs he settled in Florida. Once in America, de Soto's pig herd grew to 700. Explorers used the pigs not only for eating as fresh meat but for salt pork and preserved pork. When de Soto died, some pigs ran off and became ancestors to today's feral or razorback pigs and some were given to the Native Americans to keep the peace. The pork industry in America had begun. Pig production spread quickly through the colonies. Hernán Cortés brought hogs to New Mexico in 1600 and Sir Walter Raleigh brought sows to Jamestown Colony in 1607. As pioneers moved west, they took their pigs with them in crates that hung from covered wagons. Pork processing facilities started popping up in major cities. Pigs were first processed in Cincinnati, which became known as “Porkopolis.”

Varieties – There are two major forms of domestic pigs, European (*Sus scrofa*) and Asian (*Sus indicus*). Chinese

pigs were bred for superior meat quality and adaptability. In European pigs, fatness was selected for. The genetic crossbreeding of these two varieties in the 18th and 19th centuries formed a broad genetic basis for today's domestic pig. There are over 180 species found in every continent of the world except Antarctica. The top eight breeds are Yorkshire, Hampshire, Berkshire, Landrace, Duroc, Chester White, Poland China and Spot. In California, crossbreeds are the most desirable animal in weight, conditioning, and carcass quality.



Commodity Value – California ranks 28th in the United States in pork production with an inventory of 244,000 pigs valued at over \$2 million dollars and cash receipts over \$4 million annually. Pork production and pig prices vary in a predictable manner during the calendar year. Such variation is called seasonality or seasonal variation. The US exports 5.5 billion pounds of pork annually, up 23% since 2011 and a 200% increase since the North American Free Trade Agreement (NAFTA) of 1994, a treaty entered into by the US, Canada, and Mexico. More US pork has been available for export to China since Beijing lifted restrictions in October of 2015.

Top Producing Counties – There are 4 top processing plants that are located in the counties of Los Angeles, Stanislaus, Glenn and Merced providing more than 11,000 animals per day. Many swine operations provide breeding pigs, project pigs, roaster pigs, and/or products and services for sale. Pigs are raised in the Central Valley, along the coastal regions and in Northern and Southern California encompassing every county in the state. Many agriculture colleges like CSU Fresno, CSU Chico, UC Davis, Modesto Junior College, and Reedley College breed, raise and sell pigs.

Nutritional Value – A 3-ounce portion is an excellent source of protein, thiamin, B6, phosphorus and niacin, and a good source of potassium, riboflavin, and zinc. It contributes 6% of the calories in a 2,000 calorie diet. Pork is 16% leaner and has 27% less saturated fat than 20 years ago due to improved breeding and feeding methods, as well as better meat trimming.

For additional information:
California Pork Producers
(916) 447-8950
Website: www.calpork.com



Pork Activity Sheet

PORK BY-PRODUCTS

FATTY ACIDS AND GLYCERINE

- Weed killers
- Crayons and chalk
- Make-up
- Fabric softener

HAIR

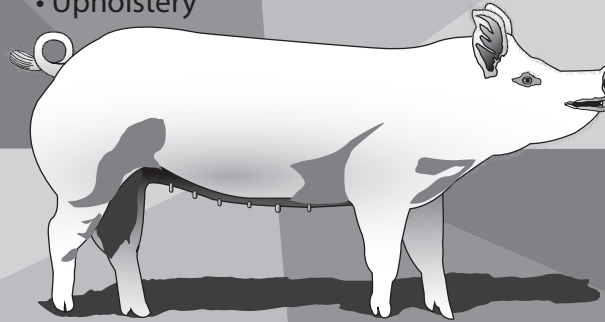
- Artist's brushes
- Upholstery

BRAIN

- Cholesterol

SKIN

- Gelatin
- Footballs
- Luggage, purses, gloves and shoes
- Drumheads



BONES

- Glue
- Buttons
- Fertilizer
- Water filters

BLOOD

- Plywood adhesive
- Fabric printing and dyeing

MEAT SCRAPS

- Commercial feeds
- Pet food

INTERNAL ORGANS

- Insulin
- Heart valves

Lesson Ideas

- Research the changes in pig production in the last 50 years and explore why pigs have larger litters, use less water, and produce less waste.
- Compare pig operations in the Midwest with California. Why are there more? Are they bigger?
- Identify and illustrate the top 8 breeds of pigs.
- Research heritage breeds of pigs and the history of their domestication. Create a timeline.
- Research marinades. Do an experimental taste test on meat that has been marinated and meat that has not been.
- Create a recipe using pork and a nutritional brochure. Share with the class.
- Study the process of ear notching and identify how to read a pig's number.
- Research the history of using pig by-products to create insulin. Research other animal/medicine connections.
- Create a cartoon panel that follows a pig's journey through their four phases of life from birth to market.

Fantastic Facts

1. A gilt is a female pig that has not given birth; a sow is a female pig that has given birth.
2. Farrowing is the act of giving birth to baby pigs.
3. Sows generally have litters of 12 and can have two litters per year.
4. Pork is the world's most widely eaten meat followed by chicken and beef.
5. Pig heart valves can be surgically implanted in humans to replace weakened heart valves.
6. When hot dogs were first sold, street vendors called them 'red hots,' and they didn't come on a bun. Instead, a pair of white cotton gloves came with each to keep fingers cool while eating.
7. Like humans, pigs are omnivores, meaning they eat both plants and animals.
8. Pigs don't have sweat glands. That is why they like to roll around in the cool, wet mud.
9. Wall Street was once a long solid wall constructed on Manhattan island to control roaming herds of wild pigs.

Lesson Plan: "Living High on the Hog" and other idioms

Introduction: Idioms are "sayings" that offer advice. They mean something different than what they "literally" mean. For example, Living High on the Hog means to be wealthy or When Pigs Fly, means never or unlikely to happen.

Objective: Students will create and illustrate an idiom book.

California Standards: CC ELA: L.4-12.5

Materials: Idiom examples, paper, pencils, crayons, blank paper.

Procedure:

1. Read and discuss different idioms and their origin.

2. The following examples are a good place to start the class discussion:
 - It's raining cats and dogs.
 - A penny for your thoughts.
 - Barking up the wrong tree.
3. Have students brainstorm in small groups to share common idioms they have heard or used.
4. Research the history and meaning of each idiom.
5. Choose the idioms discovered by the students and create a classroom book that includes the idioms, illustrations, real meanings, and history.

Commodity Fact Sheet

Poultry

Information compiled by the California Poultry Federation

How Produced – Turkeys and chickens are raised on ranches throughout the state. Turkeys are the result of 18 months of careful effort. First, eggs are purchased from a “primary breeder” who specializes in producing superior genetic stock. In 28 days, they hatch into potential breeders. Those that pass a rigorous selection process are placed in a breeding program that produces market turkeys. After hatching, the turkeys are ready for market in four to five months.

Raising chickens for market is much faster. Incubation takes only 21 days. Eggs are placed in an incubator, located in a chick hatchery. After hatching, they are counted and graded before delivery to the customer’s farm. There are two types of egg laying chickens - the meat-type breeder and the egg-type breeder. Chicks raised for meat are ready in 40-45 days. Hens kept for egg laying are kept in production for 44 to 60 weeks before being sold to market.

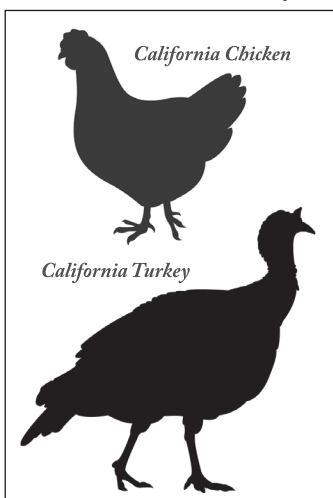
History – The first known domesticated poultry are believed to be the red jungle fowl, a member of the pheasant family, which lives in the forests and bamboo jungles of India and Southeast Asia. Jungle fowl were captured and kept for their eggs and for meat by about 2000 B.C. in Asia. It is thought that all domestic poultry in the world today are descended from this one species.

Over the past 100 years, poultry production has grown from backyard flocks and small, local businesses into highly efficient businesses. In the 1800s and early 1900s many families had backyard flocks for eggs and for meat. By the 20s and 30s, the broiler chicken evolved, and was raised specifically for its meat. In the 40s, 50s and 60s, feed mills, hatcheries, farms and processors were still all separately run businesses. Vertical integration began in the mid-1960s, meaning poultry businesses operated all aspects from growing chicks to transporting the finished product. In the late 60s and early 70s, television and media began to market chicken under brand names. Today, most California poultry is sold under a few family-owned farms.

Varieties/Breeds – More than 300 breeds of chickens exist but only a few are appropriate for meat-type commercial production. Meat producers are frequently New Hampshire, White Plymouth Rock, Cornish or hybrid strains developed by combining breeds to meet producers’ needs.

Turkeys have roamed North and South America for 10 million years. Wild turkeys still exist but they are not very similar to

the tender, broad-breasted bird seen in the market. These birds weigh three and a half times as much as the wild turkeys eaten by the Pilgrims. Today’s turkey consumes 30% less feed and requires one month less growing time to reach market weight than turkeys did 40 years ago. The most common commercial turkey comes from strains developed over the years to produce a white, broad-breasted turkey.



Commodity Value – The U.S. poultry industry produced broilers, eggs, and turkeys for a combined value worth \$48.3 billion in 2014. In California, broiler chickens alone ranked 13th out of the top 20 commodities valued at more than 1 billion dollars! In 2015, California chicken producers raised more than 250 million birds, which ranks California among the top 9 chicken producing states. In 2015, California turkey producers raised 15 million

birds which is about 435 million pounds of meat. California ranks among the top 8 turkey producing states. California poultry companies process more than 700,000 broilers per day and more than 750 different California chicken products are sold in supermarkets and grocery stores throughout the West. California companies are producing new products every year, from fresh chicken to deli lunch meats, prepared entrees and corn dogs.

Top Producing Counties – The Central Valley is the primary poultry producing area. Fresno, Merced, Stanislaus, San Joaquin, and Sonoma are top producing counties for chicken. Fresno, Merced, Kings, Stanislaus, and San Joaquin are top producing counties for turkey. Fresno and Merced counties are the top chicken production counties in the state. Stanislaus and Fresno counties are top producers of turkey. These rural areas allow room for ranches while allowing access to quick and economical transportation to market.

Nutritional Value – Poultry is in the protein food group and provides nutrients that are important for your body. Nutrients include B-vitamins (niacin, thiamin, riboflavin, and B-6), vitamin E, iron, zinc, and magnesium. Turkey and chicken are low in fat and calories while providing a high-protein meat source. For more information on chicken and turkey nutrition, please visit www.nationalchickencouncil.org and www.eatturkey.com.

For Additional Information:
California Poultry Federation
(209) 576-6355
cpif.org



Poultry Activity Sheet



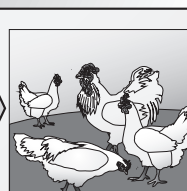
Primary Breeders
Develop strains of poultry for best meat and efficient feed conversion.

1



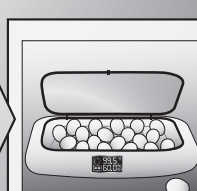
Feed Mills
Create formulas for different stages of growth in poultry.

2



Breeders
Raise chicks to adults. Produce fertile hatching eggs.

3



Hatchery
Hatches eggs in incubators that maintain temperature and humidity.

4

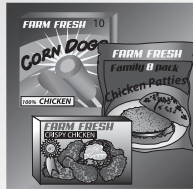
POULTRY PRODUCTION

Transportation & Marketing
Products are transported in refrigerated trucks to stores and restaurants.



8

Further Processing
Whole chicken is further processed by breading, marinating, or cooking.



7

Processing Plants
Birds are harvested and USDA inspected.



6

Grow Out Ranches
Raise newly hatched chicks to market weight.



5

Lesson Ideas

- Compare market chickens with market turkeys. Have a debate.
- Create a timeline and give a presentation on poultry history.
- Create a Jeopardy poultry game.
- Research and compare the nutritional value of poultry with other meats.
- Research and identify different breeds. Compare their qualities and create a card set.
- Create a Thanksgiving or poultry dinner meal, identify where all of the foods came from (adapted from NAITC matrix).
- Research and compare other vertically integrated businesses.
- Graph the production of broilers or turkeys for a year and compare.

Fantastic Facts

1. About 15,000 people work for California's poultry companies.
2. It takes about 10 pounds of feed to produce a 5-pound market-ready chicken.
3. California's poultry companies are all family-owned.
4. Foster Farms produces 1.3 million corn dogs per day.
5. Most corn dogs are made from chicken.
6. California consumers eat more chicken than any other state, more than 3 billion pounds per year. That's about 30 chickens per person!
7. The majority of chickens and turkeys you eat are produced in California's Central Valley.
8. The chicken and turkey you eat today is thought to be descended from India and Southeast Asia.

Lesson Plan: Taco Tuesday Taste Test

Introduction: Tacos can be a fun way for students to discuss the flavors of chicken and turkey. This lesson will allow students to have a taco party and learn along the way!

Objective: Students will work in groups to create an advertisement, calculate the cost of each taco, and conduct a taste test to determine the best ingredient combinations.

California Standards: CC ELA: SL.4.1, SL.5.1, 4, 5, SL.6-8.1, 4, 5, SL.9-12.1, 4; CC Math: 4.NBT.4, 5, 6; 5.NBT.5, 6, 7; 6.NS.2, 3; 7.NS.1, 3

Materials: Taco ingredients - flour or corn tortillas, shredded or ground cooked turkey and chicken, grated cheese, sour cream, salsa, lettuce, tomatoes, and other selected ingredients. Serving utensils, plates, napkins, large construction paper for advertisement posters, colored paper, markers, and scissors.

Procedure:

1. Introduce the Taco Tuesday Taste Test with your class. Brainstorm popular ingredients to include in a taco. Students

sign up to bring different ingredients. Have students save all receipts and record costs on a classroom chart for all groups to use.



2. In groups, students compete to create the best taco, and calculate how much it costs per taco.
3. Have each group create and present a commercial for their taco.
4. Finish with a taste test competition to select the class favorite.
5. Additional ideas - have students learn what food group each ingredient comes from, the serving size, and the nutritional value.

Suggestions:

- Fill a corn tortilla with cooked ground turkey, shredded lettuce, diced tomatoes, shredded cheddar cheese and sliced olives. Drizzle with favorite red or green salsa.
- Layer a flour tortilla with mashed black beans, shredded cooked chicken, shredded cheese, dollop of greek yogurt and favorite red or green salsa. Gently fold in half and enjoy!

Green (Snap) Beans

Information compiled by the California Foundation for Agriculture in the Classroom

How Produced – Snap beans, also referred to as green beans or string beans, are edible pod beans that can be grown as bush beans or pole (climbing) beans. California farmers primarily plant bush beans.

Snap beans are a warm season crop, with an ideal growing temperature that ranges from 65° to 85°F. The seed is planted as early as March and as late as August, depending on first and last frost. Seed is planted mechanically by a tractor pulling a planter. The beans are typically planted at 80 pounds per acre, depending on seed size, with two rows on each bed.

Most varieties mature in 50 to 60 days. High temperatures (above 90°F) and late season rains can cause blossoms to drop without the opportunity for fruit to set, greatly reducing yield. Since excess water at any time during growth can increase the plant's susceptibility to root rot infection, many growers use drip irrigation.

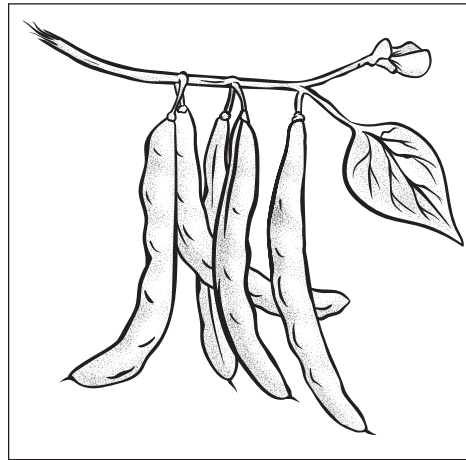
Snap bean pods are harvested two to three weeks after blooming. Marketable pods are fleshy, tender, and green for only a short period; they will quickly become tough, fibrous, and overmature if not harvested on time. Pods of desirable length, shape and width are selected, harvested, and graded. Harvesting can be done by hand or by machine. Hand-harvesting allows for multiple harvests of a field, while machine-harvesting is a one-time operation because the plants are destroyed in the process.

Snap beans are highly perishable and should be cooled quickly after harvest. Some growers practice field packing so snap beans are quickly moved from field to cooler with minimum handling. Snap beans destined for further processing are transported to a facility where they are sorted, washed, and trimmed prior to freezing or canning.

History – The common bean was cultivated in ancient Mesoamerica approximately 8,000 years ago. Beans were even found in the mummy covering of a woman in a Peruvian cemetery dating back to pre-Inca civilization. Snap beans originated in the tropical southern part of Mexico, Guatemala, Honduras, and Costa Rica. They spread from this center of origin to North and South America long before European explorers ever arrived.

When early explorers first returned home with these, natives of Central and South America and Europeans used them

not as food crops but as ornamentals. They appreciated the butterfly-like blossoms in shades of red, pink, or white, but did not appreciate the tough texture of the pod.



Snap beans, by nature, had a fibrous strip that ran down the length of the bean. This portion had to be removed before it could be enjoyed. This led to the nickname "string beans." Botanists, however, found a way to remove the string through breeding and in 1894 the first "stringless" bean plant was cultivated. Today, commercial varieties of edible pod beans are grown without the strings.

Varieties – Snap bean varieties can be flat or round. The flat types, called Kentucky Wonder, include varieties such as Magnum, Greencrop, and Calgreen.

The round types, called Blue Lake, include Benchmark, Strike, and Landmark. Yellow-podded varieties are Goldrush and Slenderwax. A popular Italian flat bean variety is Romano. Snap beans also come in purple-podded varieties. The purple pods are flavorful, and turn green when cooked.

Commodity Value – California is ranked second in the nation for production of fresh market snap beans, while Florida is the top producer. Approximately 95 percent of the snap bean crop in California is marketed as fresh, with the remainder marketed for processing. Last year, California's snap bean growers harvested more than 41,200 tons on 7,000 acres throughout the state. The state's crop value reached \$55 million in 2017.

Top Producing Counties – Snap beans are produced in many areas of California. Primary production areas include Tulare County, Riverside County, and Orange County.

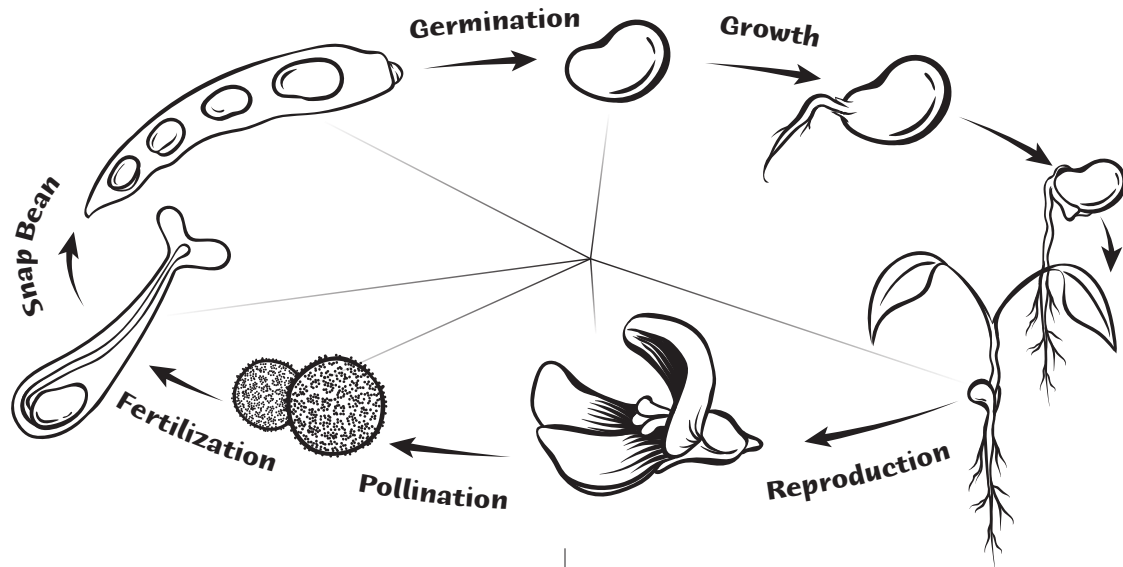
Nutritional Value – A 1/2 cup serving of snap beans is a good source of fiber, folate, and beta-carotene. Our bodies use beta-carotene to make vitamin A, a nutrient important for vision, immune function, and skin and bone health. Snap beans also contain small amounts of calcium and vitamin C. Green, yellow, and purple snap beans are similar in taste, texture, and nutrition.

For additional information:

Orange County Produce

Website: ocproduce.com

Green (Snap) Beans Activity Sheet



Lesson Ideas

- Dissect a bean and record observations in a science journal. Include labeled diagrams.
- Germinate beans in a damp paper towel inside of a plastic sandwich bag. Tape the bag to a window and make daily observations of bean growth.
- Compare different varieties of snap beans. Make a table to organize data such as color, shape, number of beans, length, and taste.
- Measure the length, mass, and volume of snap bean pods. Create a class average and discuss how common traits have been established through science.
- Design an experiment that identifies the best practices for fresh snap bean storage. Share your findings with your school's food service workers.
- Taste frozen, fresh, and canned snap beans. Record similarities and differences.

Fantastic Facts

1. Snap beans were named for the snapping sound produced when breaking off the end of the pod.
2. The pod color of snap beans can be green, golden, purple/red, or streaked, but the beans inside the pod are always green.
3. Snap beans are nitrogen fixers, which means they draw nitrogen from the air and return it to the soil. Farmers often plant beans to replenish the soil.
4. The Asian Yardlong variety of snap beans have pods that measure up to 18 inches long.
5. The Spaniards initially used snap beans as ornamental plants because they found the bean pods tough, but very much liked the flowers.
6. Snap beans are the third most commonly grown home garden vegetable in the United States, outranked only by tomatoes and peppers.

Lesson Plan: Oh Snap! Finding the Right Soil for Snap Beans

Introduction: Snap beans are grown on many soil types in a pH range of 5.5 to 7.5. Well-drained soils are preferred. Excessively wet soils encourage root diseases and nutrient problems. Snap beans have a semi-shallow root system, and the crop requires frequent irrigation.

Objective: Students will investigate how snap beans grow in different soil types.

California Standards: CC Math: 7.SPC.8; NGSS: MS-LS1-5

Materials: Four identical containers (per group), potting soil, sandy soil, clay soil, snap bean seeds, tray for pots

Procedure:

1. Divide students into groups. Distribute snap bean seeds and containers.
2. Instruct students to fill each container with the same volume of soil, using each of three available soil types. Students must label each container properly.

3. The fourth container will have a student-designed mixture of the three soil types. Have students record the ratios and label the container.
4. Plant the snap beans in each container, at a depth of one inch.
5. Ask students to identify techniques for measuring plant growth. As a class, determine which techniques will be used to measure plant growth in this experiment. These techniques may include: measuring plant height, counting leaves, determining surface area of leaves, observing plant color, or identifying number of days to flower.
6. Apply the same volume of water to the plants at consistent intervals.
7. Routinely employ techniques to measure plant growth, and record measurements in science journals.
8. Use data to graph results and summarize findings.

Commodity Fact Sheet

Spinach

Information compiled by Fresh Express

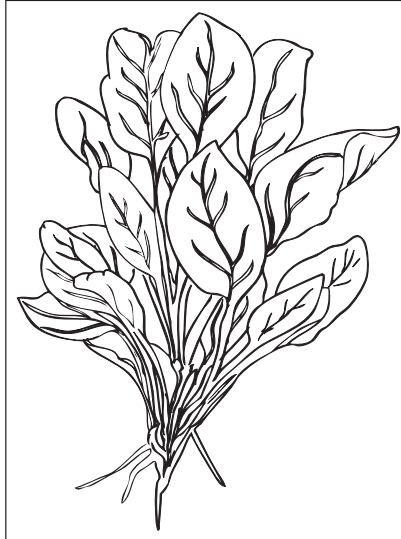
How Produced – Before planting, the farmer will till and prepare the soil. Spinach can be grown on a variety of soil types but the best crops come from sandy loam soil, which is usually found along rivers. The sandy ground makes harvesting easier after rainfall because of good drainage. Drainage quality also affects the irrigation cycle. Since spinach is not a deep-rooted crop, it relies on frequent irrigations to maintain the proper soil moisture levels for ideal growth.

Approximately 90 percent of U.S. spinach is grown in California and Arizona. Spinach grows best during cool periods of the year. Almost 50 percent of spinach produced in California is grown in the Salinas Valley in Monterey County, where spinach is produced from February through November. Spinach is a quick-growing, cool-season vegetable that grows best at temperatures from 45°F to 75°F. The foggy and cool summers of the California central coast and the clear and cool winters of the Arizona desert provide ideal growing conditions for spinach.

Spinach is planted relatively shallow at about ½ to ¾ inch depth and at high seed densities of 21 to 48 seed lines per 80-inch beds. These high seed densities result in about 3.5 million plants per acre. Spinach can be harvested in the Salinas Valley 21 to 50 days after planting. Spinach is grown for fresh market (bunched or packaged) and for the processing (frozen) industry. Most of the spinach is mechanically harvested using a machine with a front cutter bar. After harvesting, spinach is typically cooled to 34°F at centralized cooling facilities before being transported to the processing plant. Spinach has a very high respiration rate and is therefore quite perishable. If kept at low temperatures, spinach can be stored for 14 to 18 days.

History – Spinach has been consumed for thousands of years. It is believed that spinach made its way into Indian and Asian cooking through Arab traders who carried it to Asia from the Middle East. In the 11th and 12th centuries, spinach became a popular vegetable in Spain, and from there it diffused to Germany, Italy, England, and France. It has been used in salads, soups, in baked dishes with cheese, yogurt, and in tortellini. In the early 19th century, American colonists introduced spinach to North America. At least three varieties were grown by 1806. With the development of canning and freezing, the popularity of spinach increased world-wide. The increase in spinach consumption in the U.S. has been due to the sale of freshly packaged teen and baby spinach.

Varieties – Types of spinach are classified as smooth leaf, savoy, and red veined. California grows all three. Smooth leaf varieties have a mature leaf length of about six inches. Savoy spinach is very crinkly and has the same sized leaf as the smooth leaf variety. Red veined spinach has a smaller leaf, similar to the all-green baby leaf types, but adding attractive color and nutrients associated with the red color in the leaf veins. There are many varieties in each type of spinach. Popular varieties in California include Avenger, Bolero, Bossanova, Dolphin, Emilia, Falcon, Lazio, Palco, Unipak, and Whale. Varieties are constantly being developed and may replace these currently popular ones.



Commodity Value – The acreage of fresh market spinach in California has continuously increased by 30 percent over the last decade from 15,000 acres in 2001

to 19,600 acres in 2011, while the acreage of processing spinach remained constant at 7,300 acres. In 2011, the total crop volume for spinach (fresh market and processed) was 606 million pounds, showing an increase of 59 percent from 2001. California accounts for 58 percent of the nation's total spinach production. Spinach ranks number 41 among all commodities grown in California.

Top Producing Counties – The top counties for spinach production in California are Monterey (66 percent), San Benito (9 percent), Imperial (8 percent), Ventura (6 percent), and Santa Barbara (4 percent).

Nutritional Value – Fresh spinach is a good source of antioxidant vitamins like A and C and phenolic antioxidants like lutein, zeaxanthin, and beta-carotene. These compounds are scavengers against free radicals and play a healing role in aging and different diseases, including cancer, and promote normal eye-sight. Spinach is an excellent source of vitamin K, which is important for strengthening the bone mass. It also contains vitamin B6 and folates.

For additional information:

Chiquita Brands/Fresh Express
(831) 772-6057

Website: www.freshexpress.com

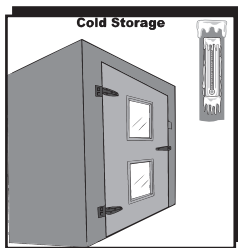


Spinach Activity Sheet



#1

Food safety specialists carefully examine field conditions, monitoring crop quality and food safety compliance prior to planting, and during production and harvest.



#2

Cold temperatures are critical to freshness. Growers cool down spinach within hours of harvesting and keep it chilled from the field to the store.

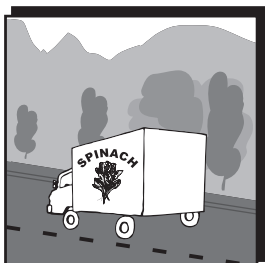


#3

From the field, spinach is transported to packaging facilities where it is thoroughly washed, rinsed, and gently dried. Often spinach is packaged in a breathable bag for long-lasting freshness.

#4

After packaging, spinach is transported swiftly and safely to retail locations across the country. Maintaining consistent cold temperatures is important so every refrigerated truck is monitored throughout its journey to ensure spinach stays cool, fresh, and delicious.



#5

Consumers enjoy eating spinach. Everyone knows that fresh spinach makes a delicious side dish, but it also makes a nutritious meal on its own.



Lesson Ideas

- Traceability systems inform consumers about where their food comes from and plays a significant role in minimizing food safety risks. Visit www.freshexpress.com/yoursaladstory to track the origins of fresh, packaged spinach.
- Locate on a Western U.S. map where spinach is predominantly grown. What are the climatic differences or similarities?
- Based on the total pounds of spinach produced in California in 2011, how many pounds would have been grown in Monterey County? How many tons is this?
- Illustrate the process of photosynthesis and explain the role chlorophyll plays in spinach growth.
- Compare and contrast the nutritional value of spinach to other leafy greens such as mizuna, iceberg lettuce, and arugula.
- Create a delicious recipe using spinach and provide a cooking demonstration for the class. Explain safe food preparation and give everyone in the audience a sample.

Fantastic Facts

- The three main spinach varieties are Smooth Leaf, Savoy, and Red Veined.
- It takes 21 to 50 days for a spinach plant to mature.
- After harvest, spinach is cooled to a temperature of 34 degrees F.
- Spinach is a significant source of vitamin A, vitamin C, vitamin B6, vitamin K, folate, beta-carotene, lutein, and zeaxanthin.
- The best spinach crops come from sandy loam soil, which has good drainage and makes harvesting easier.
- The Salinas Valley produces the most spinach in California.
- California grows 58 percent of the nation's total spinach.
- Spinach originated as a food crop in the Middle East.

Lesson Plan: Steamed or Raw?

Introduction: Spinach is packed with nutrients, easy to prepare and tasty too! In fact, spinach can be prepared many different ways. This activity will encourage students to add spinach to their diets.

Objective: Students will compare the visual appearance, taste, texture, and smell of fresh and steamed spinach.

California Standards: CC ELA: W.3-12.7; WHST.6-12.2, 7
NGSS: 5-PS1-2; MS-PS1-2

Materials: Raw and steamed spinach (prepared before or during class), paper plates, forks, napkins, observation journals, pencils.

Procedures:

- After students wash their hands, instruct them to use all their senses to observe the raw spinach. Keep in mind color, texture, smell, sound, and taste. Students may record observations in their journals.

- Repeat the observation activity above with steamed spinach.
- Research and compare the nutritional value of raw and steamed spinach. Discuss why the nutritional values differ and investigate the chemical processes involved in cooking spinach.
- Determine the differences in serving size for raw and steamed spinach.
one cup raw = __ cup steamed
- Ask students to explain which type of spinach they liked best and why. Discuss the balance between choosing the most nutritious product and personal taste preference.
- Optional: Give students the opportunity to compare the qualities and nutritional value of canned and frozen spinach too.

Commodity Fact Sheet

Strawberries

Information compiled by the California Strawberry Commission

How Produced – Strawberries thrive along California's coast because western ocean exposure and Pacific winds insulate the fields from extreme temperatures and weather, providing the ideal conditions for growing strawberries almost year-round. Strawberry plants are grown in stock nurseries and then transplanted into fields where they grow for another three months before they begin producing fruit. Strawberries are grown all year long in California, with the peak strawberry season occurring in April, May, and June when volume rises from about a million trays per week to seven million trays. That is about 60 million pounds per week.

All strawberries are picked, sorted, and packed in the field by hand. Trays of strawberries are then rushed to shipping facilities where they are cooled to 32oF. Within 24 hours of harvest, fresh market strawberries are loaded on refrigerated trucks for delivery across the country. This unique and sophisticated distribution system ensures this highly perishable fruit reaches consumers in fresh-from-the-field condition.

History – This luscious fruit can be traced back as far as the Romans, and perhaps even the Greeks. Medieval stonemasons carved strawberry designs on alters and around the tops of pillars in churches and cathedrals, symbolizing perfection and righteousness. During the same time period, strawberries were served at important state occasions and festivals to ensure peace and prosperity.

The most common explanation for how the strawberry got its name is that children in the nineteenth century threaded the berries onto straw and offered them for sale. Fresh strawberries began to flourish in California in the 1950s due to improved cultural technologies.

California strawberry growers are leading research in ways to conserve water, protect the soil, and reduce fertilizer and pesticide use. One of the first agricultural groups to adopt drip irrigation technology to conserve water, they continue to invest millions of dollars in non-chemical farming methods. Progressive and sustainable farming practices include innovative integrated pest management (IPM) strategies that work with nature to control pests, advance irrigation management practices, and develop new strawberry varieties.

Varieties – Different varieties are suited to particular climates and growing regions. Southern California varieties are adapted for warmer temperatures and shorter daylight hours for early fruit production. Northern varieties have been selected for a longer production cycle, which extends through the fall. For more than 50 years, commercial varieties have been developed by pomologists at the University of California. Successes include the development of new commercial strawberry varieties now grown throughout the world and precedent-setting solutions to disease and pest control.

Commodity Value – Strawberries are among the top five most frequently consumed fruits, and consumption is steadily increasing. One in five families

reported eating more strawberries in the past year than previous years. In 2015, strawberries produced in California accounted for 88 percent of the U.S. strawberry production. Nearly 32,000 acres are devoted to strawberry production in California. Canada, Mexico, and Japan are primary export markets for fresh and frozen California strawberries. Today, strawberries represent a \$2.3 billion industry in California.

Top Producing Counties – California harvests more than two billion pounds of fruit annually. The leading counties in strawberry production include Santa Barbara, Orange, Ventura, San Diego, Monterey, Santa Cruz, Fresno, and San Luis Obispo.

Nutritional Value – California strawberries are an excellent source of vitamin C, providing 140 percent of the recommended daily value, and are a source of potassium, folate, and fiber. Naturally low in sugar, a one cup serving of strawberries has only 45 calories. Research shows eating eight strawberries a day may improve memory, and reduce the risk of heart disease and some cancers.

For additional information:

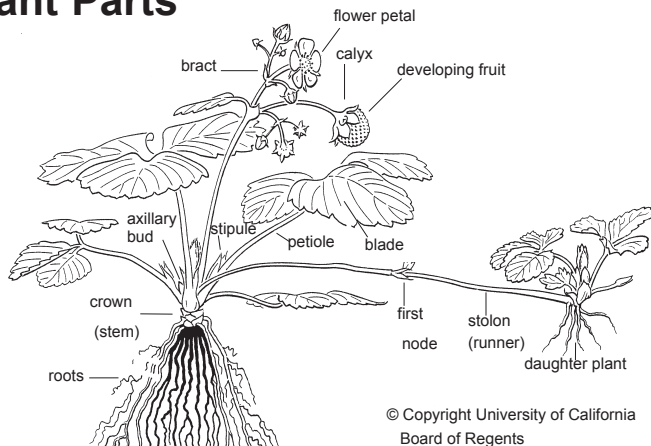
California Strawberry Commission
(831) 724-1301

Website: www.californiastrawberries.com



Strawberry Activity Sheet

Plant Parts



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Growing Season and Peak Production

		JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
CENTRAL COAST and SANTA MARIA VALLEY*	Winter Plantings (short-day)												
	Winter Plantings (day-neutral)												
	Summer Plantings												
	Second Year												
SOUTHERN CALIFORNIA and OXNARD PLAIN*	Winter Plantings												
	Summer Plantings												

* Strawberries are also grown in the San Joaquin and Central Valleys.

Lesson Ideas

- Create a map of California highlighting the major counties where strawberries are grown.
- Estimate the number of seeds on a strawberry and devise a simple method for determining the number of seeds.
- Calculate the surface area and volume of a strawberry.
- Discuss different pests that affect strawberry production and methods for controlling these pests.
- Devise a method of estimating the quantity of strawberries produced on an acre of land.
- Write a paper entitled, "California—The Strawberry Capitol of the United States." Use www.calstrawberry.com for your research.
- Discuss the advantages and disadvantages of hand and machine harvesting. Invent a machine to harvest strawberries.
- Analyze the economic impact export markets have on the California strawberry industry.

Fantastic Facts

1. The average strawberry has 200 seeds.
2. Strawberries are harvested by hand.
3. Strawberries are typically propagated using vegetative reproduction.
4. One serving of strawberries contains 140 percent of the recommended daily value for vitamin C.
5. Strawberries do not continue to ripen after harvesting.
6. During California's peak production, 50 million pounds of strawberries can be picked in one week.
7. An average acre of California farmland can produce 21 to 27 tons of strawberries.
8. Strawberries are perennial plants, but are often planted annually.
9. California grown strawberries account for 87 percent of the nation's production.

Lesson Plan: Make Your Own Strawberry Leather

Introduction: Strawberries can be used to make several tasty and nutritious snack foods.

Objective: Students will demonstrate measuring, food processing, and food safety skills as they make a strawberry treat.

California Standards: CC ELA: RI.3-5.3, 4; RST.6-12.3, 4
CC Math: 3-4.MD.2, 5.MD.3

Materials: Strawberries (1½ cups per group of 4 students), light corn syrup, lemon juice, jelly roll pan, blender or food processor, masking tape, processor, plastic wrap.

Procedure:

1. Place 1½ cups of clean strawberries in a blender or food processor and process until smooth.
2. Stir in ½ teaspoon lemon juice and 1½ teaspoons light corn syrup.
3. Line a jelly roll pan with heavy-duty plastic wrap, taping the plastic wrap to the corners of the pan with masking tape.

4. Pour the strawberry mixture into the pan, spreading evenly. Leave at least a one-inch margin on each side.
5. Dry in an oven at 150°F for seven to eight hours or until the surface is dry and no longer sticky.
6. Remove the leather and plastic wrap from the pan while still warm (hands must be clean and dry) and roll up in a jelly roll fashion. Cut into logs and store in plastic wrap for a maximum of five days. Have the students take their strawberry leather home or enjoy it as a class snack.
7. Math extension: Write the cooking measurements in standard units, such as milliliters, liters, or cubic units.

Processing Tomatoes

Information compiled by the California Tomato Growers Association, Inc.

How Produced – Tomato plants are planted in the field as seeds or as young plants, called seedlings. If sowing seeds directly into the ground, the producer sows seeds in late January or early February. If planting by seedling, plants are grown in greenhouses until they are hardy enough to be planted outside in the spring.

Tomatoes are ready for harvest between early July and mid-October. To avoid the daytime heat, tomato growers often harvest the crop after sunset. Mechanical harvesters move through the fields picking the entire tomato plant and shaking the tomatoes off the vine. Specially designed electronic sensors on the harvesters sort the ripe, red tomatoes from the vine and transfer them into a gondola pulled by a tractor following alongside. The tomatoes are immediately transported from the fields by trucks, which can hold approximately 50,000 pounds of tomatoes. Trucks haul the crop to a nearby state-controlled grading station to be graded, then on to a tomato processing plant where they are peeled, sliced, diced, or sauced into the familiar canned tomato products seen on store shelves.

History – The first tomatoes can be traced to the South American Andes Mountains where they grew wild as cherry-sized berries. Padres following the Spanish conquistadors most likely sent the first seeds to Spain in the early 1500s. The fruit gained little attention in Spain, but soon traveled to Italy—a country that embraced tomatoes with great passion and developed numerous recipes which are still popular today. By the mid-sixteenth century, tomatoes made their return to America via English colonists. They did not become an important part of the American diet, however, until after World War I. Today, tomatoes are grown in every state except Alaska.

Varieties – There are more than 2,750 genetic varieties of fresh market and processing tomatoes at the Tomato Genetics Stock Center at the University of California, Davis. These varieties have been developed to suit the various growing conditions around the state, taking into account soil type, climate, and disease. Processing tomatoes have been selectively bred for more than 50 years to differ from fresh market tomatoes. The varieties designated for processing have a thicker skin and firmer consistency than fresh market

tomatoes. These qualities enable the mechanical harvester to pick the fruit when it is ripe without damaging the fruit and ensure tomatoes can survive transportation. The processors prefer the “meatier” character of the processing tomatoes because it provides consumers with more of the tomatoes’ essence.



Commodity Value – California is the nation’s leading producer of processing tomatoes. In 2015, California’s processing tomato growers grew approximately 14 million tons on 296,000 acres throughout the state. The state’s crop value reached \$1.38 billion in 2015.

Top Producing Counties – As of 2015, Fresno County leads production followed by Yolo, San Joaquin, Kings, and Merced counties. However, nearly the entire state is involved in producing processing tomatoes, with some being grown as far south as Kern County and as far north as Colusa County.

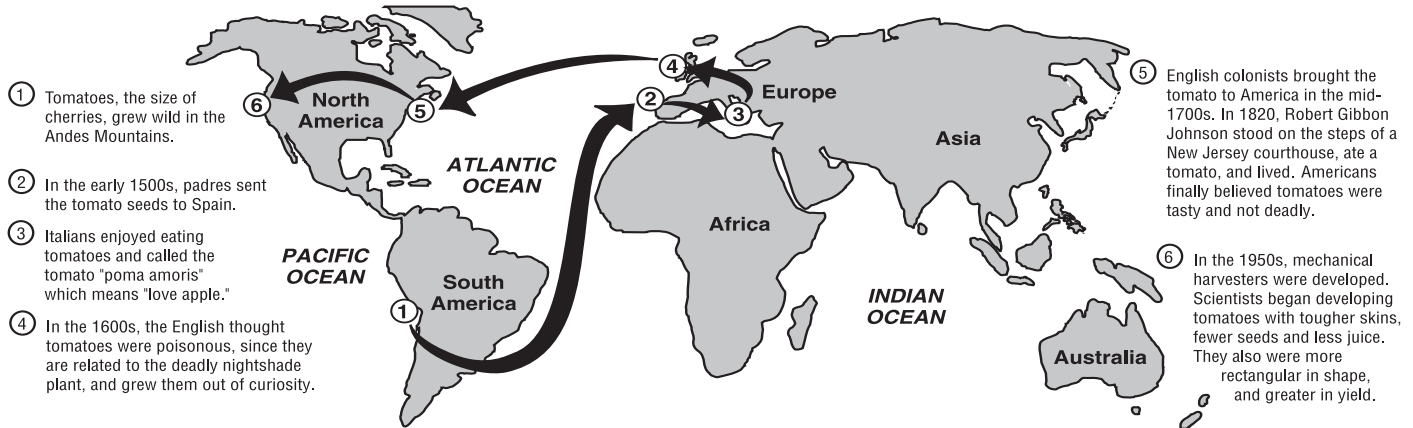
Nutritional Value – Processing tomatoes are a nutrient dense food. One, four-ounce tomato supplies about one-third of the recommended daily allowance for vitamin C, plus contains beta-carotene, potassium, folic acid, and other B vitamins, iron, and fiber. Tomatoes are a naturally low-calorie food.

Studies show processing tomatoes are the leading source of lycopene in the American diet. Lycopene, the ingredient that makes tomatoes red, is an antioxidant that blocks cellular damage and is highly effective in preventing cancers. Tomatoes do not lose their health benefits as they are processed and cooked. In fact, lycopene in cooked and processed tomatoes (sauce, paste, salsa, canned tomatoes) is more easily absorbed than fresh tomatoes. This fact, along with their popularity, makes tomatoes a leading nutritional source in the American diet.

For additional information:
California Tomato Growers Association, Inc.
(209) 478-1761
Website: www.ctga.org

Processing Tomato Activity Sheet

The Tomato's Journey to North America



Lesson Ideas

- Label and color the top seven counties in California for processing tomato production.
- Make a collage from labels of various processed tomato products.
- Make a Venn diagram which compares processing tomatoes to fresh market tomatoes.
- Find out why a tomato is scientifically a fruit but is also known as a vegetable.
- Create a class cookbook which includes favorite student recipes using a tomato product.
- Research the Spanish exploration movement of the 1500s. What other "treasures" came from the New World?
- Locate your nearest tomato processor. Where do the tomatoes they process come from?

Fantastic Facts

1. California leads the nation in processing tomato production.
2. Processing tomatoes are harvested by machines.
3. Processing tomatoes have thicker skins than fresh market tomatoes so they can be mechanically harvested and successfully transported.
4. There are 2,750 different varieties of tomatoes.
5. Tomatoes were once thought to be poisonous.
6. Processing tomatoes are rich in vitamin A, vitamin C, potassium, folic acid, beta-carotene, iron, B vitamins, and fiber.
7. The first tomatoes originated in the South American Andes and were berries the size of cherries.

Lesson Plan: pH Perfection

Introduction: When food is preserved, the microorganisms causing food spoilage are destroyed or slowed down. This is done by using extreme temperatures, changing the moisture level, or altering the acidity of the foods. The temperature of canning is extremely important for safety reasons. Foods with a pH higher than 4.6 must be canned at 240°F or greater. Foods that are more acidic, having pH measurements less than 4.6, may be preserved at 212°F. This difference in temperature can affect food taste and cost.

Objective: Students will conduct an experiment to determine the ideal temperature for canning tomatoes.

California Standards: NGSS: 5-PS1-3, MS-PS1-4

Materials: Lemon, pear, carrot and tomato juice, litmus paper which shows varying pHs, six paper cups or test tubes, forceps.

Procedure:

1. Discuss reasons and ways people preserve food. Talk about the importance of acidity and heat in canning.

2. Explain what pH is and how scientists determine the pH of a substance. Talk about the indicator litmus and how it will be used.
3. Pour an equal amount of each substance to be tested into a cup or test tube.
4. Using the forceps, have the students dip one piece of litmus into one substance and record its pH. Repeat this procedure for each juice.
5. Discuss which foods could be preserved at the lower temperature and which need to be canned at the higher temperature. Where do tomatoes fall in this test?
6. What could be done to the foods to change their pHs? When do you think scientists should check the pH of the item to be canned?

Commodity Fact Sheet

Walnuts

Information compiled by the California Walnut Board

How Produced – After an orchard is planted, it takes approximately four years until it produces its first major crop. Constant attention is given to each tree every step of the way—from pruning, spraying, and fertilizing to irrigation—to ensure a healthy orchard. Once a walnut tree has been planted and stabilized, it will continue to bear fruit for as long as a century.

Harvest begins in September when the protective outer covering, called a hull, splits, signaling that the nuts are ready to be removed from the trees. Nuts are often harvested by a mechanical shaker. After walnuts have been shaken to the ground, they are blown into a row to allow mechanical harvesters to pick them up for cleaning and hulling. The harvest season usually continues into early November.

After hulling and washing, the nuts are transferred from the mechanical harvester into a hopper where they are mechanically dehydrated (air-dried). This protects the nut during transport and storage. Mechanical dehydration is quick, thorough, and scientifically controlled—a major improvement over the sun-drying method formerly used. Walnuts with desirable traits such as big beautiful shells are selected for the in-shell market. Other walnuts are shelled and processed into walnut halves and pieces, and chopped walnuts to be sold in supermarkets across the country.

History – Walnuts are recognized as the oldest known tree food, dating back to 7000 B.C. In fact, walnuts are one of only a handful of trees and plants that can be found growing naturally in both eastern and western hemispheres—strong evidence that the trees existed before the continents split apart. Records indicate Persian nuts (English walnuts) were known during the reign of Tiberius. Remains of this nut have also been unearthed in ancient Rome where walnuts were considered food for the gods and called "Juglans Regia" in honor of Jupiter.

The term "English" applied to the Persian nut is a misnomer. The name "English walnut" refers to the English merchant marines whose ships transported the product for trade around the world. It is thought that the first English walnuts were brought to California by Mission Fathers around 1770. Joseph Sexton planted the first commercial walnut orchard in California in 1867, near Goleta in Santa Barbara County.

Varieties—In recent years, Chandler has been the most popular variety used for shelled walnuts. However, there are more than 30 varieties of commercially produced walnuts, hybrids of the English (Persian) walnut. The varieties were developed to have specific characteristics such as early or late harvest times, thin or thick shells, high percentages of walnut meat, or specific pest tolerances. Five varieties account for more than 80 percent of production: Chandler, Hartley, Tulare, Howard, and Serr.



Commodity Value – In California, 300,000 bearing acres, primarily from Redding to Bakersfield, produce two-thirds of the world's trade in walnuts. California's crop generates

more than \$1.9 billion in farm gate revenue. Approximately 60 percent of the crop is exported. China, Germany, Japan, Korea, Turkey, and Spain are some of the largest export markets.

Walnut shells can be burned to generate power and heat, or ground and used as pet litter and in sandblasting. In Japan, the shells are used in snow tires to aid traction. Walnut oil is used in gourmet cooking and cosmetics.

Top Producing Counties – San Joaquin County leads production. Other top counties include Butte, Tulare, Stanislaus, and Sutter.

Nutritional Value – In March 2004, the United States Food and Drug Administration affirmed that eating 1.5 ounces per day of walnuts as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease. A one-ounce handful of walnuts (12-14 halves) contains good polyunsaturated fats (PUFAs) and is an excellent source of the plant-based essential omega-3 fatty acids ALA (2.5 grams). Walnuts contain many antioxidants and are naturally cholesterol and sodium free. They also have four grams of protein and two grams of fiber per serving.

For additional information:
California Walnut Board
(916) 932-7070
Website: www.walnuts.org



Walnut Activity Sheet

Year 1

Seedling grafted to Paradox or Black Walnut rootstocks.

Harvest

Orchard floors cleaned to remove vegetative growth.

Shaker shakes nuts from trees; walnuts swept into windrows by a sweeper, picked up by harvester and delivered to a hauler.

Large wire brushes remove remaining husks from walnuts; walnuts dried to moisture content of 8 percent.

Walnuts packaged for market or sent to processors.

Year 2

Orchard leveled, irrigation system installed, trees planted.



Years 2-6

Trees pruned, irrigated and fertilized: weeds and insects controlled by biological chemical and/or mechanical methods; limited nut production.



Years 7-100

Trees produce full crops averaging 2.01 tons/acre.

Annual Practices

September-October
Early harvest begins.

April-August
Fertilization, irrigation and pest management strategies implemented.

November
Late harvest completed; orchard floors cleaned; pruning begins.

December-March
Pruning continues; dormant sprays control mites and other insect pests.

Lesson Ideas

- Make a list of different uses for walnuts and walnut by-products.
- Research how walnut shells are used as an abrasive in industrial applications.
- Classify different nuts based on their size, origin, nutritional value, texture, and color.
- Use walnut shells in math and art activities.
- Discuss the importance of polyunsaturated fats. Walnuts are an excellent source of omega-3 fatty acids, which are necessary because they cannot be produced by the body.
- Bring products made from walnuts or walnut by-products to class.
- California exports walnuts to more than 100 countries around the world. Find some of these countries on a world map. Use the map scale to determine the distance a walnut travels from California.

Fantastic Facts

1. Walnuts are the oldest known tree food.
2. There is no cholesterol in walnuts, and eating walnuts helps reduce the level of cholesterol in the blood.
3. Two-thirds of the world's walnuts are produced in California.
4. A healthy walnut tree can produce crops for approximately 100 years.
5. By-products of walnuts include cosmetics, oil, sand blasting materials, snow tires, and pet litter.
6. After a walnut orchard is planted, it takes four years to produce the first crop.
7. Walnuts used for the in-shell market must have big beautiful shells.

Lesson Plan: Walnut Shell Dye

Introduction: Walnuts are a delicious and healthful snack, and provide valuable by-products for a variety of purposes. Walnut shells can be burned to generate power and heat or ground up to be used as pet litter, sand paper and snow tires. Processed walnut shells can be used for dyeing fabrics and other textiles, as well as staining wood. The color of the dye will change slightly from harvest season to harvest season depending on the health of the walnut tree and nuts.

Objective: Students will use walnut shells to create a dye for art or woodworking projects.

California Standards: NGSS: 5-PS1-1, MS-PS1-2

Materials: Two cups of walnut shells, 1 quart water, stove or heating source, large enamel or stainless steel (not aluminum) pot, sturdy wooden spoon, sieve, container to collect dye, fabric to dye.

Procedure:

1. Review class safety procedures before beginning this experiment.
2. In a large pot, combine two cups walnut shells and one quart water. Soak the shells in the water overnight.
3. The following day, boil the shells in the water for one hour. Be careful not to let the water evaporate completely.
4. Use the sieve to strain the mixture and discard remaining shells. Add the fabric to be colored directly into the dye. Let the material soak in the dye until the desired color intensity is reached. The dye may also be applied to hard surfaces using a paint brush.
5. Discuss the scientific concepts that explain the color change, and have students provide evidence for their reasoning. Does the dye contain walnuts? What would happen if all the water evaporated? Are they observing a chemical or physical change?