

Field Trip #4

Corn, Soybeans, and Wheat. Oh, My!

MAIN IDEAS

- Grain and seed crops, such as corn, soybeans, and wheat, are important crops for Kentucky's farmers.
- Grain crops are an important source of energy for humans and livestock as well as fuels to power vehicles and generate electricity.
- Soybeans are a good source of protein and oil. Soybeans are fed to livestock and used in human food. The oil can be used for cooking, as a food ingredient, or as an alternative to petroleum in many products.
- Grain and seed crops are renewable resources because they can be grown in just a few months.
- Plants are used in a number of non-food products we use daily.

BEFORE WATCHING THE VIDEO

Write the following words on the board or have examples for students to touch: corn, wheat, soybeans, oats, rice. Ask the students what these things have in common. Some may say foods. Ask what type of foods? They are seeds of plants (Grains come from grasses. Oil seeds and pulses come from legumes, broad-leaf plants that fix nitrogen in the soil.) How are seed crops different than fruits and vegetables? They can be stored for a long period of time in a secure, dry place, which provides a consistent food source all year long. Seeds also contain varying amounts of starch, fiber, protein, and oil (fat). Those parts can be used in many ways.

WHILE WATCHING THE VIDEO

Have older students use the graphic organizer worksheet to make notes about the crops they see in the video. The answer key is below. Ask younger students a new fact they learned or complete the Option 1 activity. Feel free to provide the answers if they missed them in the video.

	CORN	SOY	WHEAT
Planted in the spring, harvested in fall	✓	✓	
Planted in fall, harvested in spring			✓
Used for human food	✓	✓	✓
Used to feed farm animals	✓	✓	
Main ingredient to make breads			✓
Used to make fuel	✓	✓	
Has the highest oil and protein content		✓	
Harvested with a combine	✓	✓	✓
Can be found in batteries and fireworks	✓		
Can be found in cereals	✓	✓	✓
Used to make a type of milk		✓	
Is a renewable resource	✓	✓	✓
Can be used to make plastics	✓	✓	



Kentucky Academic Standards

PRACTICAL LIVING, TECHNOLOGY & VOCATIONAL STUDIES

Consumer Decisions

Information, Communication and Productivity

Research, Inquiry/Problem-Solving and Innovation

SCIENCE

Energy

Structure and Properties of Matter

Matter and Energy in Organisms and Ecosystems

Structure, Function, and Information Processing

Interdependent Relationships in Ecosystems

Correlating Lessons & Resources

LESSON: Living Seed Necklace
Students will learn what a seed requires to germinate and a plant needs to grow while making a wearable greenhouse.

GAME: Bushels or Bust?
Students will learn what factors affect farmer decisions and profitability while learning economics concepts.

AFTER WATCHING THE VIDEO

OPTION 1: AMAZING GRAINS

Grade Level(s): K-2

Estimated Time: 10 - 20 minutes

Purpose

- Students use what they learned in the video to select the products that are made with grains. *PL.2.30 Students evaluate consumer products and services and make effective consumer decisions.*

Materials

- “Amazing Grains” Activity Sheet

Optional Materials

- BOOK: *Corn* by Gail Gibbons
- BOOK: *The Super Soybean* by Raymond Bial
- BOOK: *Bread Before the Store* by Jody Jensen Shaffer

OPTION 2: WHICH CROP IS BEST? - CREATIVE MARKETING ASSIGNMENT

Grade Level(s): 3-8

Estimated Time: 40 - 60 minutes

Purpose

- Students will use information sources, their creativity, and team work skills to come up with a campaign to promote their crop of choice. *Information, Communication and Productivity; Research, Inquiry/ Problem-Solving and Innovation; ELA*
- Students will use their communication skills to encourage the class to pick their crop. *Information, Communication and Productivity, ELA*

Materials

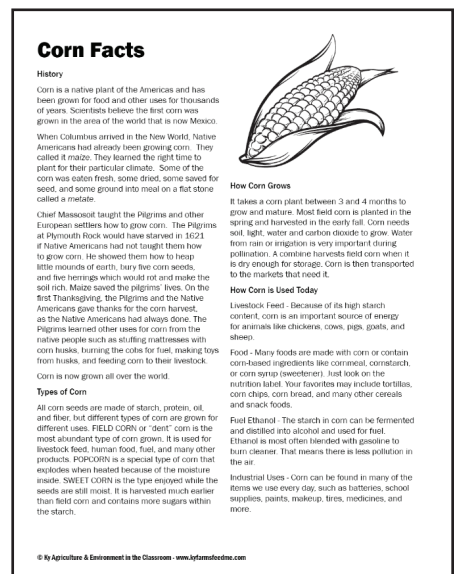
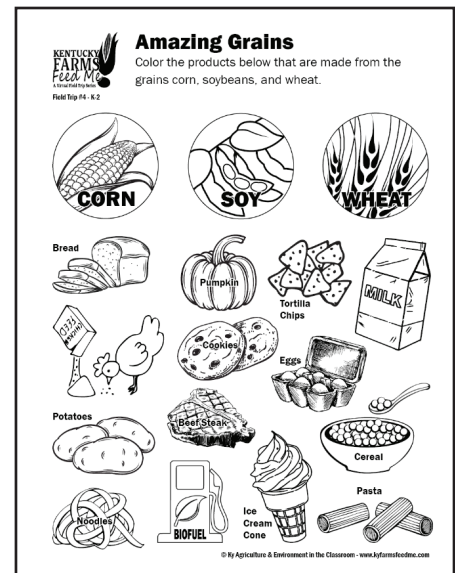
- “Crop Information” Sheets
- Poster board or paper for creating a poster, or students may use a digital presentation tool

Optional Materials

- BOOK: *Corn* by Gail Gibbons
- BOOK: *The Super Soybean* by Raymond Bial
- BOOK: *Bread Before the Store* by Jody Jensen Shaffer

Background Information

Almost every crop or animal raised on a farm has a group of people working to encourage people to buy and use their product. This is called agricultural marketing. The Kentucky corn, soybean, and wheat associations produce web sites, radio ads, and videos to share information about their crops.



Procedures

1. Place students into smaller groups with a copy of the “Crop Information” sheets. Groups may choose which crop they want to market or the teacher may assign them. More than one group can select the same crop as long as all crops are chosen.
2. Ask students to read the information card and make notes about the things that make their crop interesting or more important than the other crops. If the resources are available, students may also visit these web sites to learn more: www.kycorn.org, www.kysoy.org, www.kysmallgrains.org.
3. Students will then BRAINSTORM and CREATE a slogan, poster, and/or speech to share with the class about their crop. The teacher may choose to hold a vote for the most impactful presentation.
4. Discuss how farmers may benefit from growing each of the crops.

OPTION 3: WHAT’S IN A SEED?

Grade Level(s): K-5

Estimated Time: 20 - 40 minutes

Purpose

- Students will learn the components of a seed and the conditions needed for a seed to germinate.
LS2.A: Interdependent Relationships in Ecosystems - Plants depend on water and light to grow. (2-LS2-1)
Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- Students will learn the life cycle of a plant and what is needed for a plant to complete photosynthesis to create its own food.
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- Students will create a mini greenhouse to watch a seed germinate.
3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Materials

- Living Seed Necklace Kit and Lesson - If you do not have access to the kit, visit this link to view the lesson: <http://www.teachkyag.org/plant-science.html>

OPTION 4: MAKE PLANT-BASED BUILDING MATERIALS

Grade Level(s): 2-5


Estimated Time: First session 40 - 60 minutes; second session 10 minutes

Purpose

- Students will learn that plant materials are renewable resources for industrial items.
- Students will create two building materials they can evaluate and compare.
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
5-PS1-3. Make observations and measurements to identify materials based on their properties.
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Materials

- Small paper cups for mixing ingredients
- Wood stirrers or spoons
- Corn starch (16 oz. box)
- Vegetable oil (made from soybeans)
- All purpose wheat flour
- Salt
- Water
- Food coloring (optional)
- Microwave Oven
- “Plant-Based Materials” Data Sheet

Plant-Based Materials Data Sheet	
 Use the data sheet below to write down observations about your plant-based materials. Based on what you know now, which material do you predict will make a better building material? Field Trip 44 Intermediate Hypothesis: _____	
Corn	Wheat
How does the cornstarch look and feel?	How does the wheat flour look and feel?
Describe the mixture after the oil and water have been added and mixed.	Describe the mixture after the oil and water have been added and mixed.
Has your hypothesis changed? Why or why not?	
Describe the material after you have placed it in the microwave oven for 20 seconds. Be sure to let it cool before handling.	Describe the material after you have placed it in the microwave oven for 20 seconds. Be sure to let it cool before handling.
Roll your material into a ball and drop it from a height of 12 inches onto the table. Describe what happens.	Roll your material into a ball and drop it from a height of 12 inches onto the table. Describe what happens.
Try molding it into a different shape and let it dry. Describe the result.	Try molding it into a different shape and let it dry. Describe the result.
What is your conclusion? What would be a better use for the other material? What additional experiments do you want to conduct?	
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Background Information

Renewable plant materials, such as starches, oils, and fibers, can be used to make all sorts of products. Each plant component has different characteristics that make them more suitable for some uses than others. Corn starch particles, for example, are a different size and shape than other plant starches. Wheat flour contains more protein (gluten) which gives it better binding ability. These properties also respond differently to temperature. Wheat flour and cornstarch are both used in cooking as thickening agents, but cornstarch thickens liquids much more quickly than wheat flour.

Procedures - Cornstarch Material

1. Place 1 tablespoon of cornstarch in a paper cup or microwave-safe container.
2. Then add 2 to 4 drops of soybean oil into the cornstarch.
3. Add 1 tablespoon of water and 2 drops of food coloring, if you have it.
4. Stir the mixture and observe and record the properties.
5. Then place your material in the microwave for about 20 seconds on high.
6. Mold your materials into a ball after it cools.

Procedures - Wheat Flour Material

1. Place 1 tablespoon of wheat flour in a paper cup or microwave-safe container.
2. Then add 2 to 4 drops of soybean oil into the flour.
3. Add 1 tablespoon of water and 2 drops of food coloring, if you have it.
4. Stir the mixture and observe and record the properties.
5. Then place your material in the microwave for about 20 seconds on high.
6. Mold your material into a ball after it cools.

Students will use their data sheet to record their observations and answer questions. Allow the materials to dry overnight for additional observations.

DISCUSS

What are the advantages of using plants for building materials over materials that are mined or pumped from the earth (rock, metal, oil, etc.)? Renewability? Biodegradable/Compostable? What are the disadvantages? Durability and strength? Does this experiment encourage additional experiments? What could you do differently?

HUNGRY FOR MORE?

Read about NatureWorks Ingeo, a renewable, plant-based polymer - <http://www.natureworkslc.com>.

Read about new uses for soybeans - <http://soynewuses.org/>.

Read about biofuels in Kentucky - <http://www.kybiofuels.info>.

Play Bushels or Bust? - Economics, Vocational Studies, and Math. Developed for the Kentucky Corn Growers Association, this lesson has students plan and produce a theoretical crop of corn to learn economic concepts, use their math skills, make decisions, and understand the risks of farming and depending upon nature. This game is ideal for grades 5+, but modifications are available for younger students.

Find it at <http://www.teachkyag.org/bushels-or-bust.html>.



Field Trip #4 - Intermediate Activity
Corn, Soybeans & Wheat,
Ok, My!

Watch the video and fill out the chart. Place a check in the box that applies to the crops listed across the top of the table. One has been done for you.

	CORN	SOY	WHEAT
Planted in the spring, harvested in fall			
Planted in fall, harvested in spring			
Used for human food			
Used to feed farm animals			
Main ingredient to make breads			
Used to make fuel			
Has the highest oil and protein content			
Harvested with a combine			
Can be found in batteries and fireworks			
Can be found in cereals			
Used to make a type of milk		✓	
Is a renewable resource			
Can be used to make plastics			

Now write one more fact that you learned by watching the video.

Funny Farm: What did the baby corn say to the mama corn?
 Where's pop?



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Amazing Grains

Color the products below that are made from the grains corn, soybeans, and wheat.

Field Trip #4 - K-2



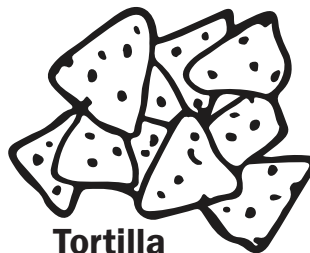
Bread



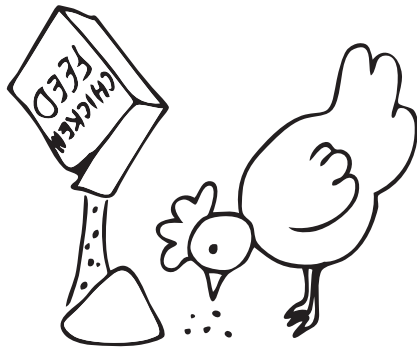
Pumpkin



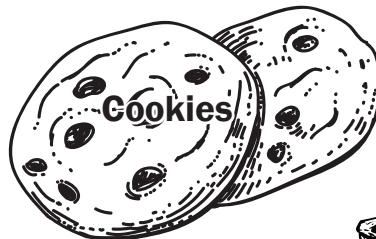
**Tortilla
Chips**



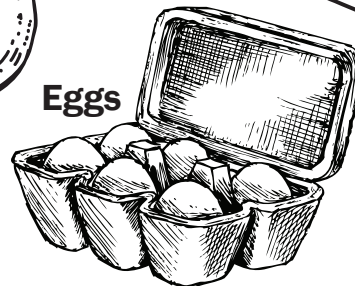
MILK



Cookies



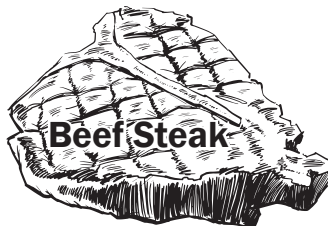
Eggs



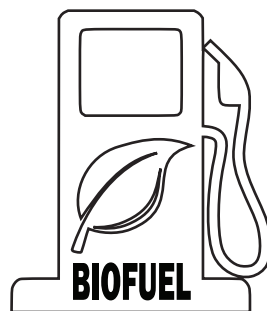
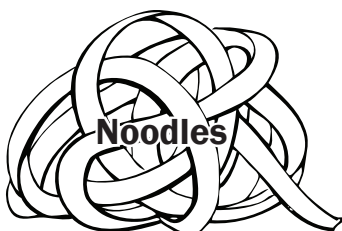
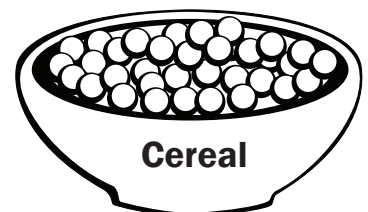
Potatoes



Beef Steak



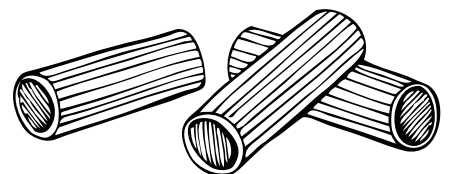
Cereal



**Ice
Cream
Cone**



Pasta



Corn Facts

History

Corn is a native plant of the Americas and has been grown for food and other uses for thousands of years. Scientists believe the first corn was grown in the area of the world that is now Mexico.

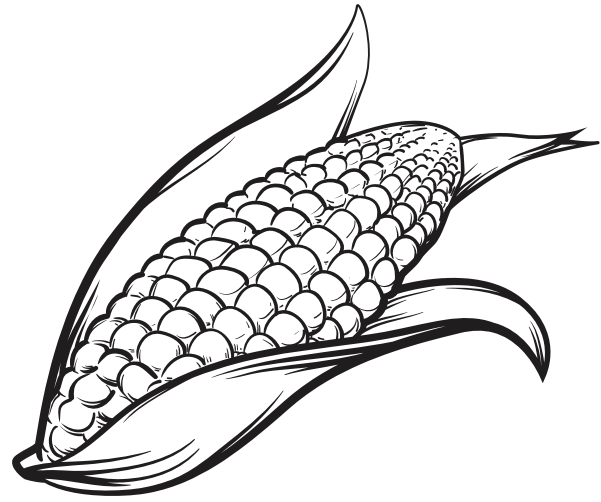
When Columbus arrived in the New World, Native Americans had already been growing corn. They called it *maize*. They learned the right time to plant for their particular climate. Some of the corn was eaten fresh, some dried, some saved for seed, and some ground into meal on a flat stone called a *metate*.

Chief Massasoit taught the Pilgrims and other European settlers how to grow corn. The Pilgrims at Plymouth Rock would have starved in 1621 if Native Americans had not taught them how to grow corn. He showed them how to heap little mounds of earth, bury five corn seeds, and five herrings which would rot and make the soil rich. Maize saved the pilgrims' lives. On the first Thanksgiving, the Pilgrims and the Native Americans gave thanks for the corn harvest, as the Native Americans had always done. The Pilgrims learned other uses for corn from the native people such as stuffing mattresses with corn husks, burning the cobs for fuel, making toys from husks, and feeding corn to their livestock.

Corn is now grown all over the world.

Types of Corn

All corn seeds are made of starch, protein, oil, and fiber, but different types of corn are grown for different uses. FIELD CORN or "dent" corn is the most abundant type of corn grown. It is used for livestock feed, human food, fuel, and many other products. POPCORN is a special type of corn that explodes when heated because of the moisture inside. SWEET CORN is the type enjoyed while the seeds are still moist. It is harvested much earlier than field corn and contains more sugars within the starch.



How Corn Grows

It takes a corn plant between 3 and 4 months to grow and mature. Most field corn is planted in the spring and harvested in the early fall. Corn needs soil, light, water and carbon dioxide to grow. Water from rain or irrigation is very important during pollination. A combine harvests field corn when it is dry enough for storage. Corn is then transported to the markets that need it.

How Corn is Used Today

Livestock Feed - Because of its high starch content, corn is an important source of energy for animals like chickens, cows, pigs, goats, and sheep.

Food - Many foods are made with corn or contain corn-based ingredients like cornmeal, cornstarch, or corn syrup (sweetener). Just look on the nutrition label. Your favorites may include tortillas, corn chips, corn bread, and many other cereals and snack foods.

Fuel Ethanol - The starch in corn can be fermented and distilled into alcohol and used for fuel. Ethanol is most often blended with gasoline to burn cleaner. That means there is less pollution in the air.

Industrial Uses - Corn can be found in many of the items we use every day, such as batteries, school supplies, paints, makeup, tires, medicines, and more.

Soybean Facts

What's a Soybean, and where does it come from?

The soybean is a seed crop that is high in protein and oil and a member of the pea family (also called legumes). Soybeans and other legumes have special bacteria in their roots, called Rhizobia, which supply the plant with the nitrogen it needs to grow. Many Kentucky farmers grow soybeans in their crop rotations for this benefit.

The soybean originally came from China, where it has been grown for food for thousands of years. Soybeans made their way to America in the mid-1800s, and is now one of the top crops grown in the United States.

How Soybeans Grow

Some Kentucky farmers plant their soybeans in late April and May and will start to harvest in September. If they have a crop of winter wheat, however, farmers will harvest their wheat in June and immediately plant soybeans in the same fields. Harvest is delayed until October or November, but this allows farmers to grow two crops in one year on the same land. The practice is called double-cropping.

Once soybeans are harvested, they may be sold to a soybean processing plant or a grain elevator that will transport the soybeans to where they are needed. Many of Kentucky's soybeans are exported and shipped around the world to feed people and livestock. China is the top importer of U.S. soybeans.

Soybean Characteristics and Uses

The soybean's high protein content makes it a healthy choice for both humans and animals. It is the only bean with complete protein.

The soybean is 40% protein and 20% oil.

Soybean oil is one of the leading vegetable oils used worldwide and can be found in many food products such as baked goods, cooking oils, coffee creamers, candies, margarine, mayonnaise, and salad dressings. Soybean oil is also used to make soy lecithin, which makes chocolate and other foods smooth and creamy.

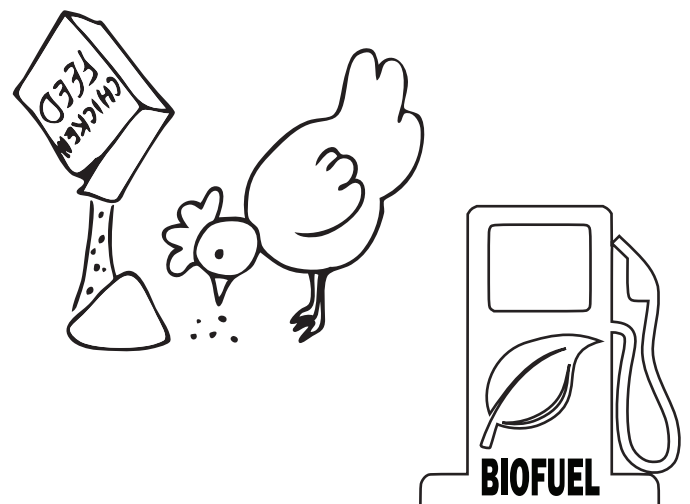


Vegetable oil is the most common way soybeans are consumed by humans in the U.S., but whole soybeans can also be processed into soy milk, soy sauce, soy flour, tofu, tempeh, and miso.

Once the oil is extracted, soybeans are processed into soybean meal. Ninety-seven percent of the U.S. soybean meal is fed to livestock. Poultry consume the most soybean meal in Kentucky, but it is also fed to pigs, beef cattle, dairy cattle, horses, fish, and pets, among other animals.

Soybeans are renewable and used in many industrial products. Biodiesel is a fuel that is most often made with soybean oil. Soybean oil is also the base for more than 80,000 newspapers in the country, and can be found in lotions, soaps, and cosmetics.

You can also find soybeans in particle board, building materials, and the protective coating on CDs and DVDs.



Wheat Facts



History and Wheat Facts

Wheat is a native plant of western Asia (Middle East) and has been grown by humans for 10,000 years. The Egyptians were credited with baking the first bread about 5,000 years ago.

Wheat was first planted in North America by the English colonists, and Thomas Jefferson was credited with bringing the first “macaroni” machine to America in 1789. Macaroni was a general term used for all pastas.

Wheat is now grown on more land than any other grain in the world and is the leading source of plant protein in human food.

How Wheat is Grown

Wheat is a grain that is grown through the fall, winter, and spring in Kentucky because it likes cooler temperatures. Soft Red Winter Wheat is planted in the fall, and Kentucky farmers harvest the wheat kernels in June. They then sell the grain to local flour mills. The part of the plant that is left behind can be harvested for straw that is used as livestock bedding and landscaping.

Milling Wheat

Millers will clean and grind the wheat kernels into flour that can be made into grain foods. Siemer Milling, in Hopkinsville, supplies wheat flour for baking mixes and foods sold nation-wide. If you have ever eaten a McDonald’s biscuit or pancake, or a Girl Scout cookie, you have most likely eaten Kentucky-grown wheat.

One bushel (volume measurement of crops) of wheat weighs about 60 pounds, has 1 million kernels, and will make 90 one-pound loaves of whole wheat bread.

Different Wheats for Different Foods

There are different classes of wheat grown in the United States, and each class is used for a different purpose.

Soft wheats have excellent milling and baking characteristics are used for cookies, crackers, pretzels, pastries, cake mixes and flat breads. This is the type of wheat grown in Kentucky.

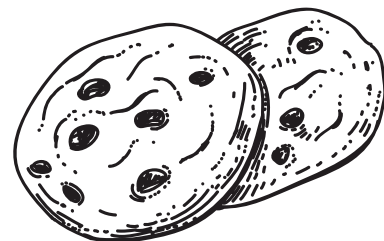
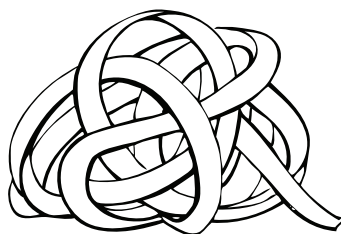
Hard wheats are used for breads and pizza crusts.

Durum is the hardest of all wheats and is ideal for pasta and couscous.

Nutrition

Wheat is full of nutrition that is important in the our diet. It contains fiber, vitamins, and minerals we need to stay healthy. Wheat is also a good source of carbohydrates for energy and protein for building muscle.

U.S. nutritionists recommend we consume six 1-ounce servings of grains each day for optimum health. Of those six servings, at least half – or three servings – should come from whole grains. Whole wheat breads, crackers, and pastas are good choices.





Plant-Based Materials Data Sheet

Use the data sheet below to write down observations about your plant-based materials. Based on what you know now, which material do you predict will make a better building material?

Field Trip #4
Intermediate

Hypothesis: _____

Corn	Wheat
How does the cornstarch look and feel?	How does the wheat flour look and feel?
Describe the mixture after the oil and water have been added and mixed.	Describe the mixture after the oil and water have been added and mixed.
Has your hypothesis changed? Why or why not?	
Describe the material after you have placed it in the microwave oven for 20 seconds. Be sure to let it cool before handling.	Describe the material after you have placed it in the microwave oven for 20 seconds. Be sure to let it cool before handling.
Roll your material into a ball and drop it from a height of 12 inches onto the table. Describe what happens.	Roll your material into a ball and drop it from a height of 12 inches onto the table. Describe what happens.
Try molding it into a different shape and let it dry. Describe the result.	Try molding it into a different shape and let it dry. Describe the result.
What is your conclusion? What would be a better use for the other material? What additional experiments do you want to conduct?	