FOOD FOR AMERICA

Teacher's Guide

An educational program about agriculture for students in grades 1-6

Bayer
Agriculture Division

Food For America is a program of the National FFA Organization
and is sponsored by Bayer Corporation, Agriculture Division
as a special project of the National FFA Foundation, Inc.

The FFA Mission

FFA makes a positive difference in the lives of students by developing their potential for **premier leadership, personal growth and career success** through agricultural education.

The Agricultural Education Mission

The mission of Agricultural Education is to prepare and support individuals for careers, build awareness and develop leadership.

Bayer

Agriculture Division

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in cooperation with the U.S. Department of Education
as a service to state and local agricultural education agencies.

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The National FFA Organization affirms its belief in the value of all human beings and seeks diversity in its membership, leadership and staff as an equal opportunity employer.

FOOD FOR AMERICA
TEACHER'S GUIDE

Introduction

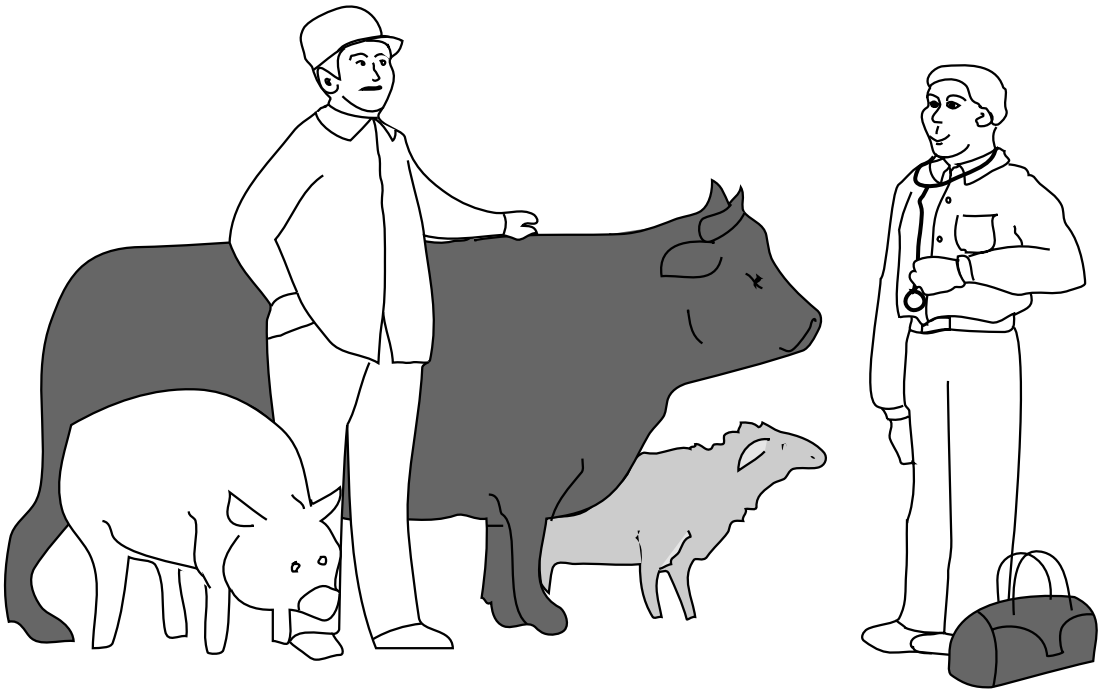
Did you know that more than 18 percent of all Americans are employed in the industry of agriculture? To most people, this information comes as a complete surprise. The food we eat, the clothes we wear, the paper on which this information appears, perhaps even the ink that printed it—all are based in agriculture.

Agriculture is America's largest industry, employing more than 21 million people in everything from growing food to selling it at the supermarket. And less than 2 percent of Americans are actually farmers and ranchers.

Agriculture is America's largest single business.

Today's agriculture employs people in many different professions. They include specialists in production agriculture, processing, distribution, trade and marketing, the environment, nutrition, food safety, research, agricultural policy and nearly 200 other career areas.

Agriculture has grown into a high–technology, futuristic enterprise. It is America's largest single business. Because of this growth, the United States has evolved from a nation in which producers could provide only for themselves to one in which we are helping provide for the basic needs of the world's population.



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Recognition

Following your initial Food For America presentation, present each student with a Certificate of Participation. The page entitled "Dear Parents," should appear on the back of each certificate. By having each student take the certificate home, the students' parents will learn more about the program and hopefully help reinforce the classroom learning at home.

Discover Agriculture as a Teaching Tool

You can help your students discover the fascinating world of agriculture and all of its opportunities by participating in the Food For America program. Initiate the program by agreeing to a presentation by a local organization (the one that may have supplied these materials), or you may introduce your students directly to the program.

Food For America will help you teach students in first through sixth grade about agriculture. It is not a complete curriculum to teach only agriculture. Instead, the lesson plans help you teach *existing curriculum*, allowing you to integrate agriculture into math, science, language arts, social studies and other subjects.

The materials are designed to help you supplement your existing curriculum. It is not an add-on. For example, if your students are learning graphing in math, you can have them put that knowledge to work by creating graphs about American agriculture. If students are learning about the environment in their science classes, they can expand their knowledge by learning how farmers protect the land.

In this program, your students will learn that agriculture includes many careers beyond those traditionally associated with farming. They will understand that every state is involved with agriculture and have a better sense of the development of agriculture from primitive methods to the current state of the art. Most importantly, Food For America will help your students understand how agriculture affects their lives.

How to Use Food For America

This is a *flexible resource package*. You can use as many lessons as you wish. Most of the lessons can be used in any order. (The lessons on production agriculture, however, serve as a good introduction to the entire teaching package).

The lessons are divided into primary (for grades 1–3) and upper elementary (for grades 4–6). However, you should look through all the lessons and make your own decisions about which will work best with your students.

The lesson plans help you teach existing curriculum.

Each instructional lesson begins with a concise statement of the areas and items covered and the grade level suggested. For example, the first unit begins like this:

Grade level: Primary

Unit: Production agriculture

A section of learner outcomes and background information follow. "Teaching This Lesson" offers you a step-by-step outline of how to teach the basic content in that lesson. There are one or more Activity Sheets that offer students plenty of opportunities for hands-on learning. Many units also offer suggestions for additional follow-up activities. Some units include a Quick Lesson–a brief activity that extends students' understanding of agriculture and that can be taught with little advance planning.

If you're working with a sponsoring organization to implement Food For America, a presentation team might visit your classroom to introduce the program. Later, they may want to plan follow-up activities

that could range from planting a garden to sponsoring a "day on the farm". Meet with your sponsors early in the planning stages to determine who will be responsible for carrying out which segments of Food For America.

If you're implementing the program without the assistance of a sponsoring organization, the accompanying *Presenter's Guide* provides essential details about planning a Food For America program and using the program materials.

Resources

If you are working with a sponsoring organization to present Food For America, that group is an excellent resource. Members might arrange for field trips, samples of agricultural products, demonstrations and supplementary information.

In addition, each county in the United States has an office of the Cooperative Extension service that can provide information about local agricultural production and agribusiness. The Extension office is usually listed in the telephone book under your county government or under the name of your state's land-grant university.

Your state's Department of Agriculture and Agriculture in the Classroom contact can also provide information about agriculture specific to your state.

For more information about ***Food For America,*** *write to***:**

The National FFA Organization

5632 Mt. Vernon Memorial Highway
P.O. Box 15160
Alexandria, VA 22309-0160

Evaluation

Dear Elementary Teacher:

Thank you for participating in the Food For America program. Your work in teaching today's children about agriculture will benefit students as well as our nation as a whole.

We value your opinion of the Food For America classroom materials. Please complete and mail this evaluation form to_____ at _____ .

_____

When we receive your evaluation form, we'll send a classroom certificate recognizing your participation to the organization that presented the program. They will present the certificate to you and your class. The presenting organization will also receive recognition when you return this form. Thank you.

Your name _____ Grade you teach _____

School _____

Address _____ City _____ State____ Zip _____

1. Total number of your students who participated in Food For America _____

2. How do you compare Food For America with other similar programs?

☐ better ☐ as good

☐ not as good ☐ not applicable

3. Do these materials fit into your existing curriculum?

☐ yes ☐ no

4. If not, why not?

5. On a scale of 1 to 5, with 1 being very poor and 5 being very good, how would you rate the treatment of the agricultural subject matter in this program?

_____ 1 very poor _____ 2 poor _____ 3 average _____ 4 good _____ 5 very good

If an individual or organization presented the initial Food For America activity, please supply the following information so we can properly recognize your class and the presenting organization or individual with certificates.

Organization _____

Contact person _____

Address _____

City _____ State _____ Zip _____

☐ thorough ☐ adequate ☐ too brief

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6. How easy were the materials to use?

☐ very easy ☐ adequate ☐ not easy

7. How would you rate your students' interest in the materials?

☐ high ☐ good ☐ fair ☐ poor

8. Would you use the program again?

☐ yes ☐ no

9. How would you rate the presentation made by the organization to your students?

☐ excellent ☐ good ☐ fair ☐ not applicable

10. Which units did you use?

11. Have you seen a Food For America program before?

☐ yes ☐ no

How many times? _____

12. Do you have any additional comments or suggestions?

Dear Parents:

Recently, your child participated in an FFA Food For America presentation at school. Several FFA members from a local chapter presented a brief program introducing your child's class to the fascinating world of agriculture.

As you might guess, most Americans don't often consider where their food comes from or where the fiber in their clothing originates. The American agricultural industry has become so efficient that most people don't give it a second thought.

To a large extent, the unparalleled success of American agriculture has made it easy for us to take our food and fiber supply for granted. The access Americans have to high-quality, low-priced food and fiber products is unequaled. Yet, most people simply don't have any direct ties to production agriculture or farming and therefore have little idea of what's involved to bring everyday agricultural products to consumers.

Fewer than 2 percent of Americans are involved in on-the-farm activities–yet agriculture is America's largest industry. It includes everyone from the farmer and rancher who raise the agricultural products to the people who sell them in supermarkets.

Over the coming weeks, your child will receive additional instruction at school about agriculture: including nutrition, food safety and the environment. This presents a perfect opportunity for you to talk with your child about where food comes from, the importance of good nutrition and other agriculture-related topics.

For more information about the Food For America program, contact your child's teacher or the FFA chapter in your area.

Food For America courtesy of:

Bayer Corporation

Agriculture Division

The National FFA Organization

The FFA is a national organization of students in chapters preparing for careers in the science, business and technology of agriculture. Local, state and national activities and award programs provide opportunities for students to apply knowledge and skills acquired through agricultural education. FFA members strive to develop agricultural leadership, cooperation and citizenship.

Certificate of Participation

_____

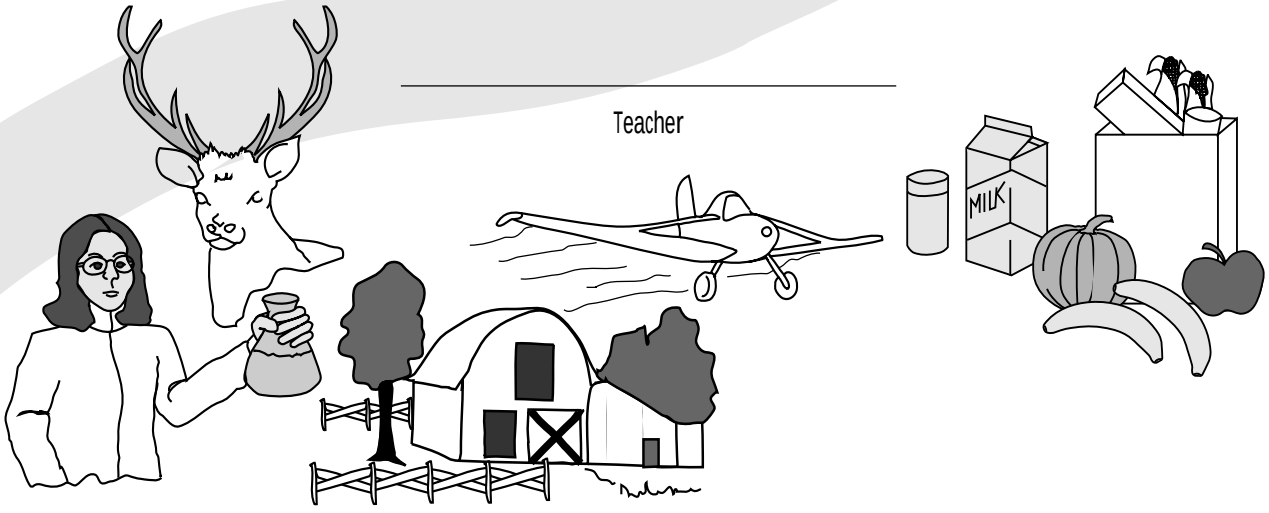
is recognized for participating
in the

FOOD FOR AMERICA PROGRAM

on this ____ day of _____ , 19__.

_____

Teacher



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Where Is Agriculture?

Grade level: Primary

Unit: Production agriculture

Learner Outcomes

After completing this lesson, students will be able to:

1. Identify many of the things in their lives that come from agriculture.
2. Recognize agriculture as the business that provides our food, clothing and shelter.
3. Describe how farmers are good caretakers of the land and animals.

Background Information

Production agriculture, or "farming," is what most students think of when they hear the word "agriculture." It is the actual production of raw commodities. Less than 2 percent of today's American work force is involved in production agriculture.

That figure represents the people typically categorized as farmers and ranchers–people who raise crops and livestock. However, it doesn't stop there. Production agriculture also includes people in a wide variety of specialties such as raising fish, timber, herbs and much more.

Less than 2 percent of today's American work force is involved in production agriculture.

Many of the products students use every day come from agriculture. Agriculture provides our food, clothing and shelter. In fact, agriculture is the only industry people must have to survive.

As we depend on agriculture for survival, agriculture depends on natural resources–air, water and land. Farmers are good stewards of the land and care about animals. Today's farmers are some of our nation's most important environmentalists. They manage about 950 million acres of land in the United States. In 1994, farmers removed 36.4 million acres of land from production to protect the environment and provide habitat for wildlife. Farmers provide food and habitat for 75 percent of the nation's wildlife.

Teaching This Lesson

1. Read "Where Is Agriculture?" (page 13) to students. For older students, you may want to make a copy so students can follow along while you read.

2. Say, "Maria was surprised about all the things in her life that came from agriculture. Let's see if we can list them on the board without looking back at the story."

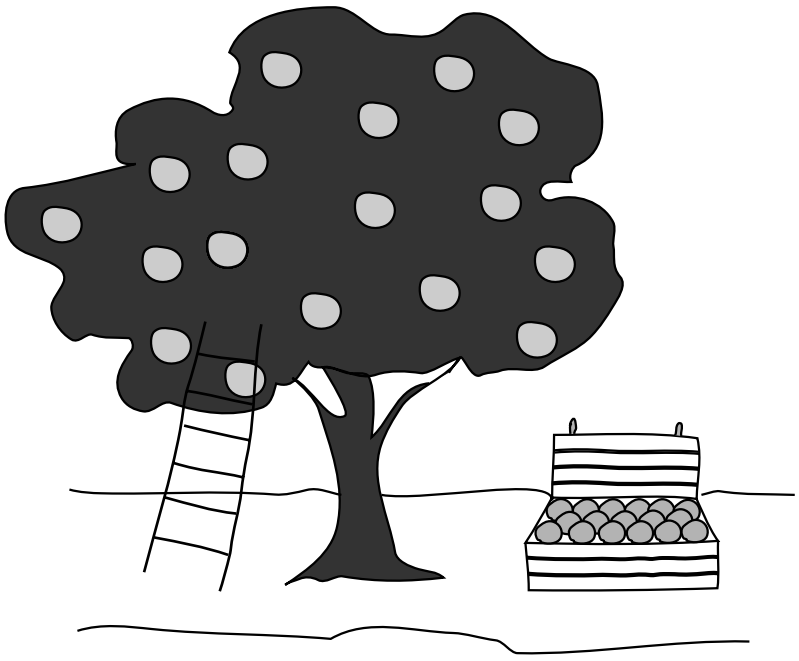
3. Ask, "Who are the people who raise or grow all these things?" (Students will probably answer farmers or farmers and ranchers.) Say, "Yes, those are good answers. What do you think of when you say the word 'farmer'?" (Students will probably give answers that include barns and corn fields and cows and chickens.)

   Ask students, "Did you know there are farmers who raise fish? Farmers who raise trees? Because there are so many different kinds of things that come from agriculture, we will use the word producer to include anyone who produces any of the agricultural products that go into the food we eat, the clothes we wear or the products we use."

4. Tell students that for people to survive, they need three things: food, clothing and shelter. Write these three words on the board. Say, "Agriculture provides us with all our food, much of our clothing and some of the things used to shelter us." Ask students to give examples of agricultural products in each category.

5. Point out to students that farmers take good care of their land and animals. They rotate crops (planting different crops so the soil doesn't wear out). They plant trees to prevent soil erosion. They give their baby animals shots to prevent diseases and call the veterinarian as soon as an animal is sick.

6. Hand out the Activity Sheet "Agriculture: The Big Picture." Have students draw a picture of Ruff'n'Ready showing Maria something from agriculture that is important in their lives.



Additional Activities for Follow-up

1. See if someone involved in production agriculture will "adopt" your class. Students can correspond with the farmer or rancher's family. This will allow students to practice their writing skills and learn more about the day-to-day operation of a farm or ranch.

   The family might send photographs or videotapes, grain or feed samples and other items from the farm. In turn, students can write to the family to ask questions about what they have learned. They might even draw pictures of how they imagine the farm or ranch, then send these and other creations to the family.

   Before involving your students, you should work with the family to set clear goals for the exchange. Set up a schedule for when you will write letters. Perhaps the family could visit your classroom. At the end of the year, your students might be able to visit the farm or ranch.

   Contact the office of your county Extension Service, your state Department of Agriculture or your state's Agriculture in the Classroom program to see how your class might be adopted.

2. "A" is for Agriculture. This activity works well in class or as an assignment students can do with their families. Take an alphabet walk. On it, you'll look for things that start with each letter of the alphabet. Everything you choose must have something to do with agriculture. Collect as many items as you can. Make a display of the things you've collected.

Where Is Agriculture?

Maria was sitting at her desk and feeling very frustrated. Her paper on agriculture was due tomorrow—and so far she hadn't written a word. "The teacher wants us to write about how agriculture affects our lives," she grumbled. "But I can't think of a single thing to write."

Suddenly, she heard a voice. "You're missing the real story," said a little orange creature perched on the top of her computer. "Agriculture is all around you," he said.

"Who - who are you?" Maria asked. Then she spoke up a little more bravely. "Who are you and what are you doing on my desk?" she demanded.

"I'm Ruff. Ruff'n'News Ready," the little orange creature said.

"Well, Ruff, you're in my house. I didn't invite you in–and I'd like you to leave."

"Don't you know me?" Ruff asked. "I'm a world famous agricultural reporter. I just came to help you with your report. But if you already know it all, I'll be glad to leave. Of course, if I go, I'll have to take everything that comes from agriculture with me."

"Agriculture?" Maria asked. "Oh, you mean farming. Well, we live in a city. That doesn't apply to us."

"That's what you think," Ruff answered. "What about those blue jeans you're wearing?"

"What about them?" Maria asked.

"Well, you'd better get used to doing without them–because blue jeans are made from fibers from cotton plants."

"Did you take a shower this morning?" Ruff continued.

"Of course," Maria replied.

"Well, the soap comes from agriculture, too. It's made out of oil from corn and soybeans and fat from cattle. And I suppose you're getting hungry for dinner. Well, you have agriculture to thank for that, too. Everything from the beef in your hamburger to the wheat in your bread to the milk you drink comes from agriculture."

Maria was still a little doubtful. "I can see how all those things are important," she admitted. "But I spend most of my day in school. Agriculture isn't important there."

"I wouldn't be so sure. Do you write your lessons on paper? That comes from trees, another agricultural crop. And the book you read may have been printed with ink made from soybeans. How will you get to school? The tires on your school bus are made from rubber–and rubber comes from trees. It's possible that even the gas that powers the bus might come partly from corn alcohol."

"Gee, Ruff," Maria said. "I guess agriculture is pretty important in my life. You're welcome to stay as long as you like."

Then Maria looked at the clock. It was almost time for dinner. "But since you're staying, I need to ask you a favor. Do you think you could jot down a few of those good ideas while I'm eating dinner?"

Ruff sighed. "Well, at least you realize that without agriculture, there wouldn't be any dinner for you to eat."

Activity Sheet—Agriculture: The Big Picture

Draw a picture of Ruff 'n'Ready showing Maria something from agriculture that is important in your life.

Food from Coast to Coast

Grade level: Primary

Unit: Production agriculture

Additional Activity for Follow-up

1. Have your students research where other agricultural products are grown or raised. Have students draw these products or cut out pictures from magazines. Attach them to a large map of the United States. This would make an interesting bulletin board.

Learner Outcomes

After completing this lesson, students will be able to:

1. Identify agricultural products grown in each region of the country.
2. Discuss how geography affects what is grown or raised in a particular area.

Background Information

The United States is one of the most productive agricultural countries in the world. American farmers produce 16 percent of the world's food on just 7 percent of the world's land.

Each area of the United States has some form of agricultural production. The geography of each area–climate, type of soil, water availability and topography– affects the type of farming, ranching or other production activity.

For example, wheat grows best in natural grassland areas. Corn and soybeans need deep, rich soil and summer rainfall. Cotton and rice thrive in the long, warm summers in the South. Fruits and vegetables require the fertile rolling hills of the West and Northeast. The Great Lakes area is good for dairy farming because plentiful water and rich grasses are available. In the West, beef cattle and sheep graze on land that is too dry, shallow or hilly for crops.

American farmers produce 16 percent of the world's food on just 7 percent of the world's land.

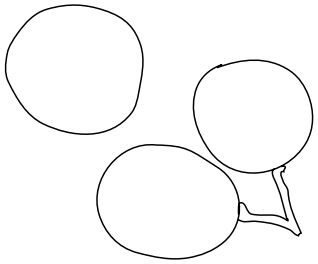
Teaching This Lesson

1. Hand out a copy of the two Activity Sheets, "Food From Coast to Coast," to each student.
2. Say, "The United States is one of the most productive agricultural countries in the world. Each area of our country has some type of agricultural production. But not every crop can be grown in every area. Different crops require different weather conditions, different types of soil and different amounts of water. Today, we're going to learn about some of the products grown in our country."
3. Ask students to think about certain agricultural products they know are grown or raised in specific states or regions of the country. Examples may include potatoes–Idaho; oranges–California and Florida; corn–Iowa; cattle–the West; aquaculture–the Southeast.
4. Review some other agricultural products.

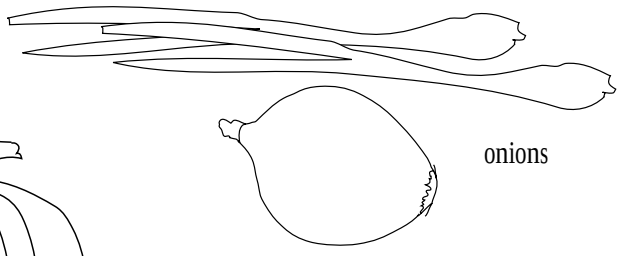
   Wheat — natural grassland
   Cotton and rice — long, warm summers
   Corn and soybeans — deep, rich soil, summer rainfall

5. Have the students color each of the agricultural products. Then have them cut them out and paste them to the part of the country where they live or grow best.

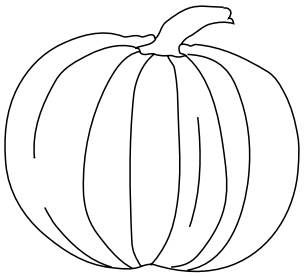
Activity Sheet—*Food From Coast to Coast*



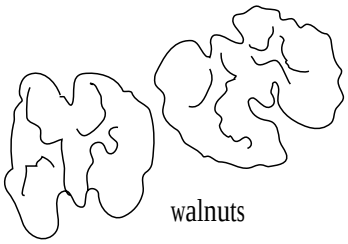
cherries



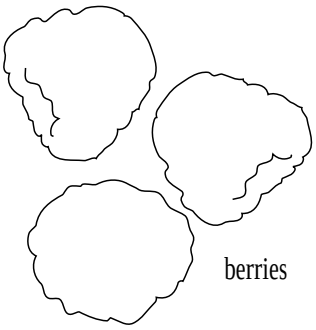
onions



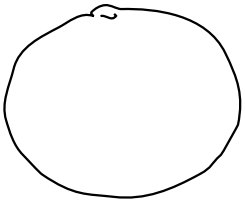
pumpkin



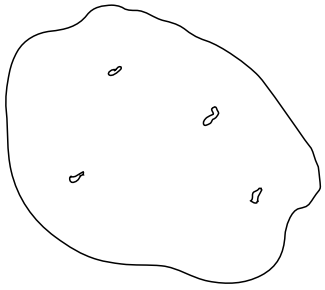
walnuts



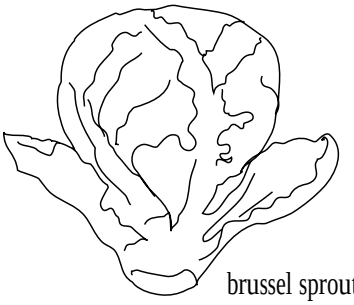
berries



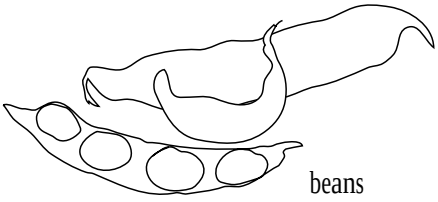
orange



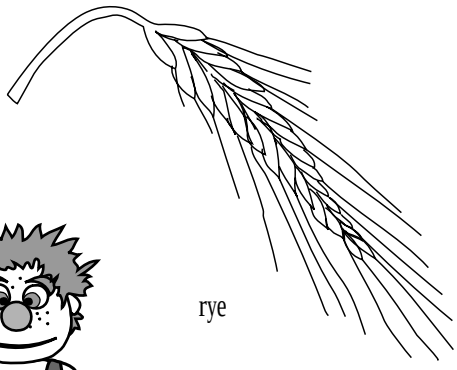
potato



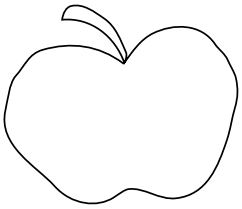
brussel sprout



beans



rye

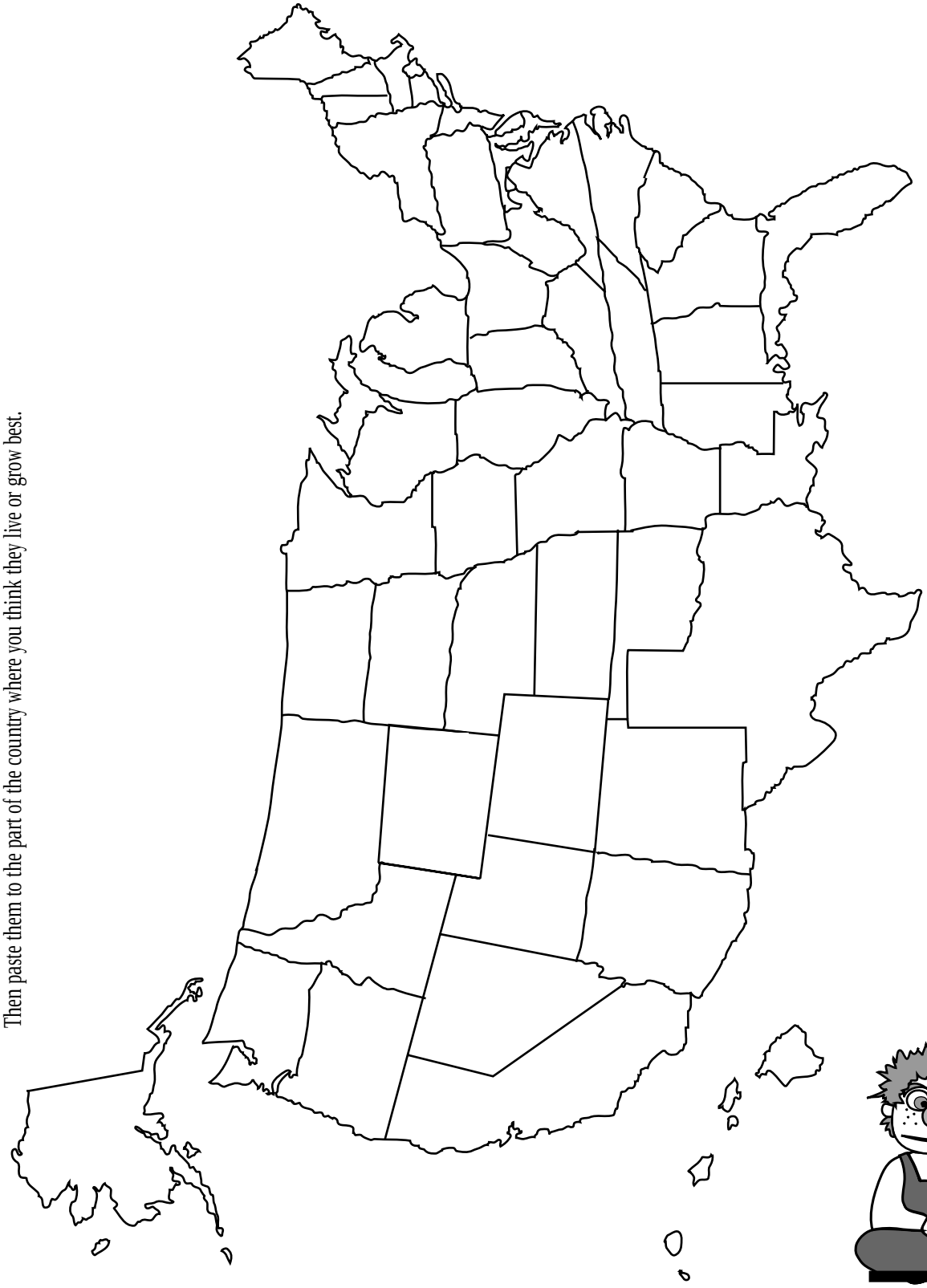


apple

wheat

Different agricultural products come from different parts of the United States. Color each of the agricultural products and cut them out. Then paste them to the part of the country where you think they live or grow best.

Different agricultural products come from different parts of the United States. Color each of the agricultural products and cut them out. Then paste them to the part of the country where you think they live or grow best.



Agriculture by the Numbers

Grade level: Upper elementary

Unit: Production agriculture

Learner Outcomes

After completing this lesson, students will be able to:

1. Recognize agriculture as the business that provides all of their food, much of their clothing and some of their shelter.
2. Describe how agriculture has changed over the last 100 years.
3. List ways science and technology have helped U.S. agriculture produce more food and fiber with fewer people.

Background Information

Today, only 2 percent of Americans live on farms. In the early days of our country, when farmers fed and clothed just their families, about 80 percent of the population were full-time farmers. With more productive and efficient agriculture, today's farmer can feed about 129 people in the United States and abroad.

While the number of people involved in production agriculture has decreased, more people than ever before are involved in the support areas of agribusiness. Today, agriculture is the nation's largest employer. More than 21 million people work in some phase of agriculture, from growing food and fiber to selling it in the supermarket. Of that number, approximately 3.5 million operate farms or work directly on farms. About the same number (3.6 million) produce the machinery and other products used on the farm or process and market the products from farms. More than 14 million people work in wholesale or retail businesses that help move products from the farm to your home.

Today's farmer can feed about 129 people in the United States and abroad.

Modern technology has made American agriculture the envy of the world. American farmers produce 16 percent of the world's food on just 7 percent of the world's land. Scientific advancements have helped us produce more grain per acre, cows that give more milk, leaner beef and pork, machines that harvest fruit, more harvest for less investment and so much more.

Teaching This Lesson

1. Review the importance of agriculture in our daily lives with students. Say, "agriculture provides us with all of our food, much of our clothing and some of our shelter." Write FOOD, CLOTHING and SHELTER across the board. Point out that these are the basic needs people must have to survive. Ask students for examples of products that come from agriculture in each category.

Food	Clothing	Shelter
All food	Wool, cotton, linen	Wood for building

2. Inform students that many things they might not think of come from agriculture. These are often byproducts–things that are produced in the making of something else. For example, byproducts from cattle include leather, soap and marshmallows. Byproducts from pigs include heart valves and medical drugs. Byproducts of corn include biodegradable plastic, cooking oil, corn sweetener and diapers.

Additional Activities for Follow-up

1. Assign students to learn more about one of the technological innovations. Have them present their findings to the class.
2. Create a large bulletin board with the information from these graphs and the time line of technological innovations in agriculture.
3. Have students speculate about how agriculture will change in the future. What inventions can they think of?

3. Ask students, "now that you see how many things in our world come from agriculture, how many farmers and ranchers do you think are needed to provide all these products?" Write the question on the board. Underneath, write the following answers:

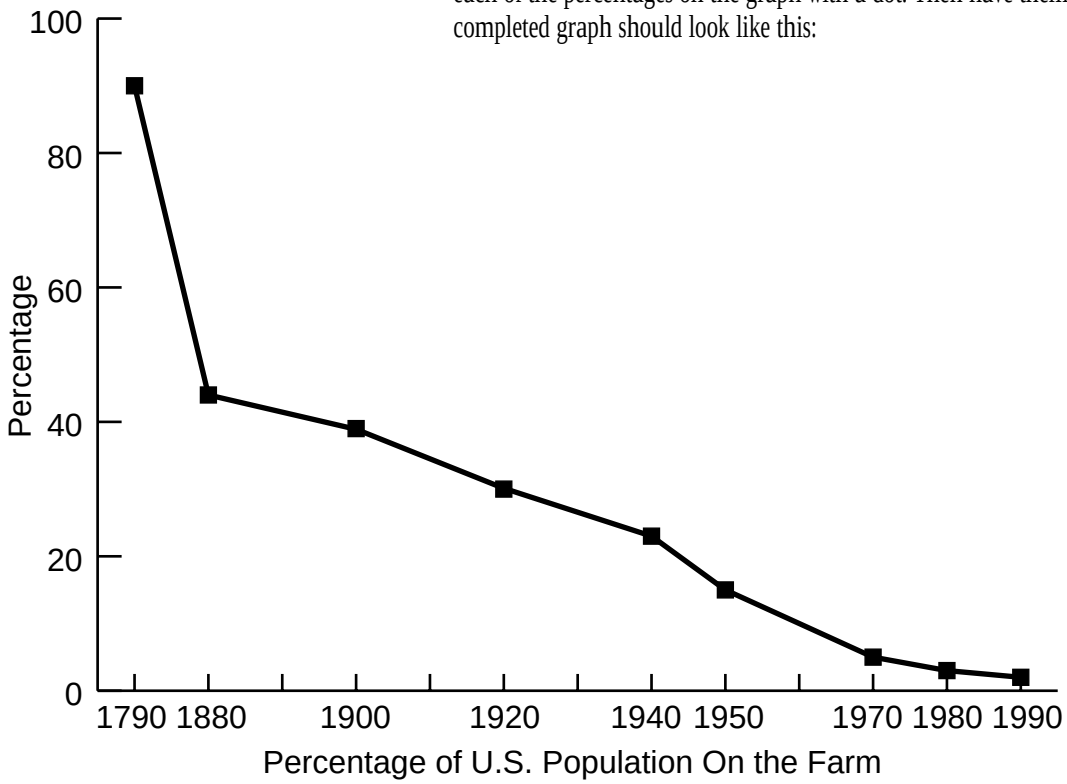
   a. 90 percent of the population
   b. 50 percent
   c. 30 percent
   d. 20 percent
   e. 10 percent of the population
   f. 5 percent
   g. 2 percent
   h. 1 percent

   Ask students to vote. Say, "all of your guesses would have been right at some time in the history of our country. In the early days, most people were farmers. In 1790, 90 percent would have been the correct answer. But today, it's much different. Only 2 percent are needed. Why do you think this is true?"

4. Let students speculate. Answers might include: better machinery so that fewer people can do the work; improved seeds; better methods of controlling plant and animal diseases and pests, including pesticides and fertilizers; better scientific understanding of how to care for crops and animals; irrigation.

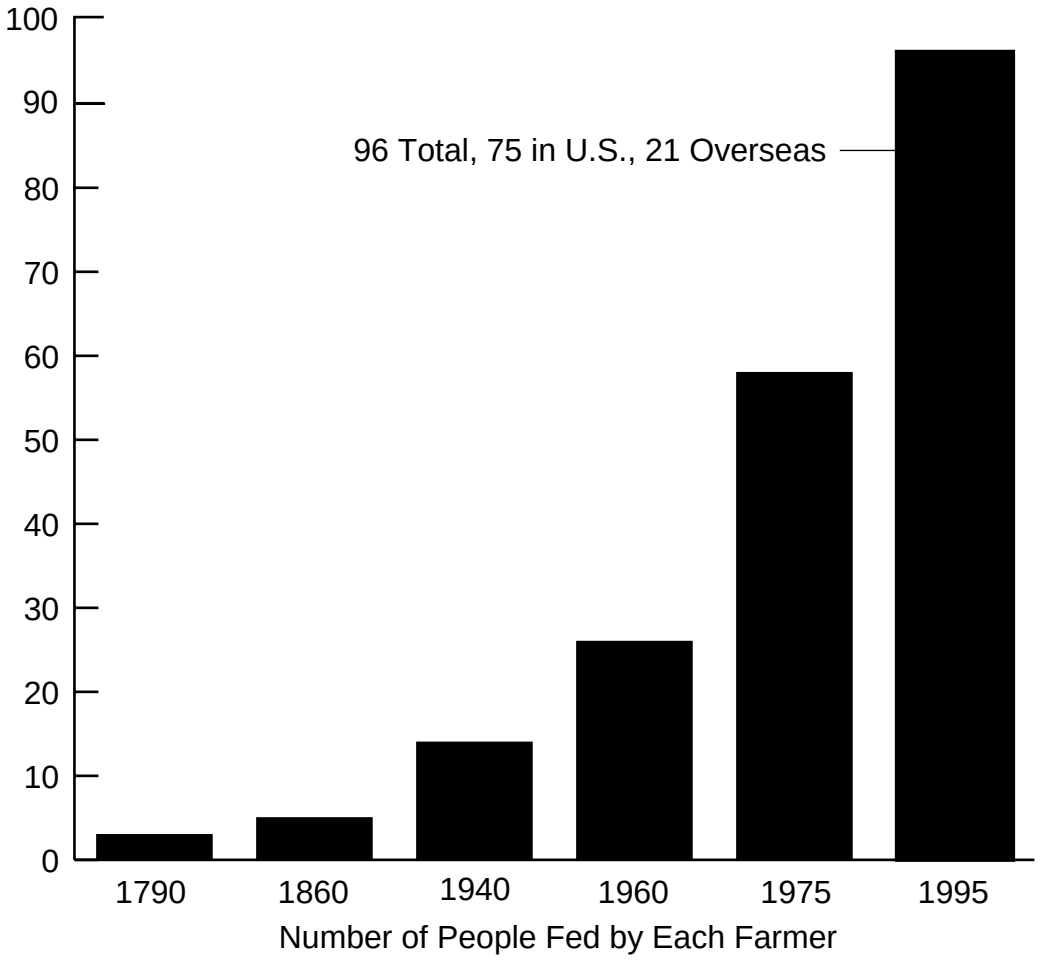
5. Hand out the Activity Sheet, "Agriculture By the Numbers." Say to students, "you are going to use the information on this Activity Sheet to make your own graphs. Then we will draw some conclusions."

6. You may want to have students work in pairs for this activity. The first graph is a line graph showing how the farm population has changed from 1790 to now. First, have students plot each of the percentages on the graph with a dot. Then have them connect the dots. The completed graph should look like this:



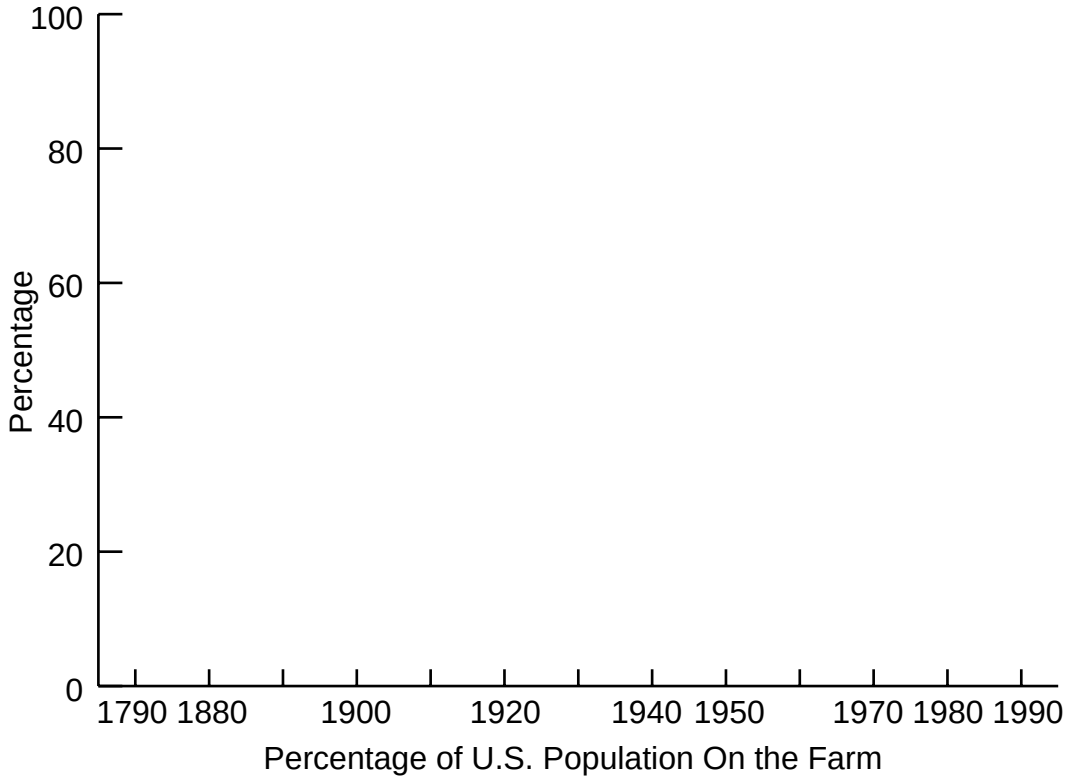
(Source: USDA Statistics)

7. The second graph is a bar graph. Have students record the numbers of people fed by each farmer above the appropriate year on the graph. Then have them use colored pens or markers to create a bar graph. The completed graph should look like this:



(Source: USDA Statistics)

8. Ask students what conclusions they draw from these two graphs. They will include: the percentage of the population living on the farm has decreased greatly since the 1790s. At the same time, the number of people fed by each farmer has increased. Students may want to talk about their own families. Are any family members farming today? Did grandparents or other relatives farm in the past? What has led to this change? Science and technology. Give each student a copy of the Activity Sheet, "Science and Technology Make the Difference." Have students cut out the individual Science & Technology Fact Boxes. With tape or glue, have students put the boxes in chronological order to create the story. When completed, have students read the story.

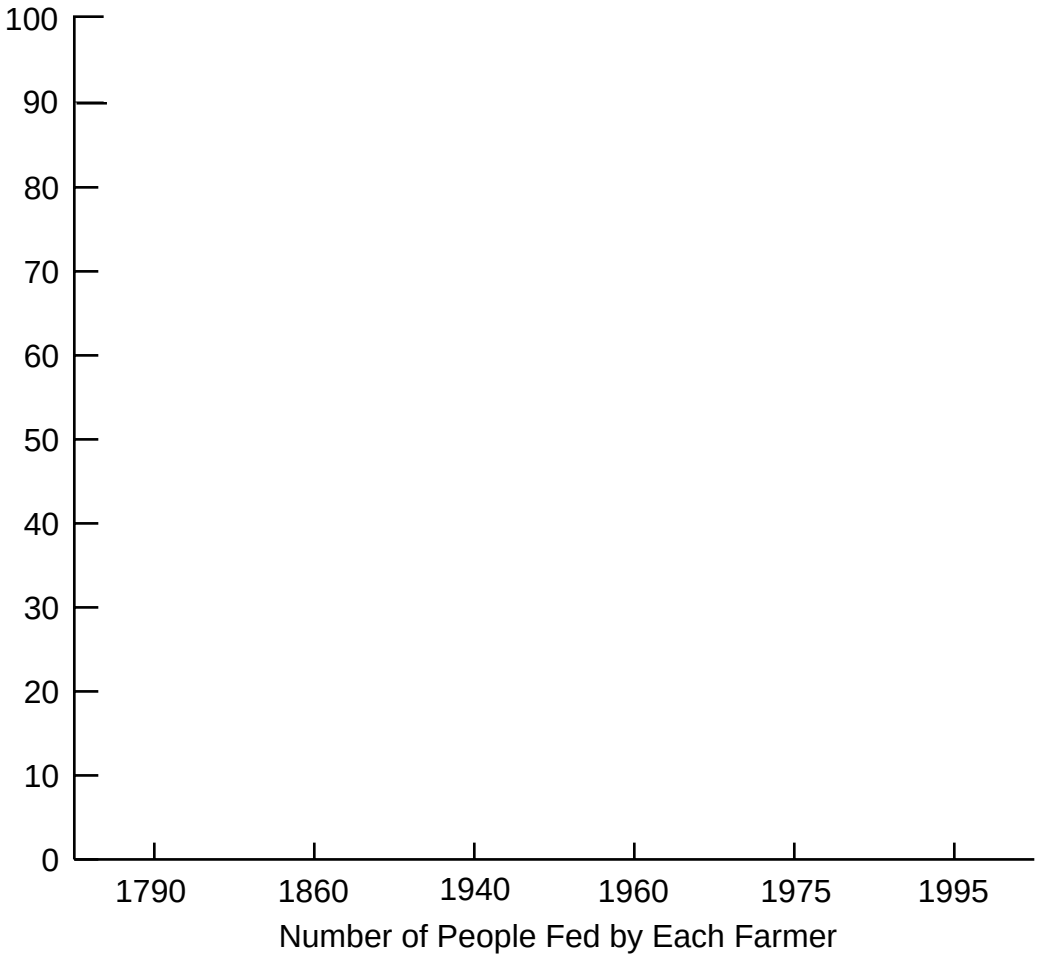


Plot Data

1790 – 90%
1880 – 44%
1900 – 39%
1920 – 30%
1940 – 23%
1950 – 15%
1970 – 5%
1980 – 3%
1990 – 2%

(Source: USDA Statistics)

Activity Sheet #2—Agriculture By the Numbers



Plot Data

1790 – 3
1860 – 5
1940 – 14
1960 – 26
1975 – 58
1995 – 96 (96 total, 75 in U.S., 21 overseas)

(Source: USDA Statistics)

1837 — John Deere began manufacturing steel plows. Previous plows, made of cast iron and wood, did not easily turn the thick soil in the Midwest.

1700 — Jethro Tull of England invented the seed drill or planter. It was the first modern farm machine.

1831 — Cyrus McCormick invented the mechanical reaper. It freed farm workers from hours of back-breaking labor.

1850 — It required about 75 to 90 hours of labor to produce 100 bushels of corn. Yields were about 40 bushels per acre.

1960 — In the last 20 years, farmers moved from horse power to tractor power. In that period, 12 million horses and mules gave way to 5 million tractors.

1860s — Steam power came into use on large farms. As a result, fewer farm workers were needed to produce food crops, and each farm worker could produce more food to feed more people.

1990 — It required about 2-1/2 hours of labor to produce 100 bushels of corn. Improved seeds and better methods of controlling pests meant that yields were about 100 bushels per acre. Farmers used biocontrol for pest management. For example, scientists learned that a species of harmless ladybug would eat aphids that had previously destroyed potato crops.

1900 — It required about 35 - 40 hours of labor to produce 100 bushels of corn. Yields were about 40 bushels per acre.

Early 1700s — For years, farmers knew that planting the same crop in the same field every year was not a good idea. Charles "Turnip" Townshend discovered the four-crop system of crop rotation. In the first year, a farmer planted clover. In the second and third year, wheat. In the fourth year, the farmer planted turnips. Townshend thought turnips gave the soil many of the nutrients the other crops took away. (Actually, it was the clover.) It allowed farmers to raise enough forage to feed animals, allowing them to produce fresh meat throughout the year.

1950 — It required about 10-14 hours of labor to produce 100 bushels of corn. Yields were about 50 bushels per acre. For the first time, there were more tractors on American farms than work horses and mules.

1994 — Farmers began to use satellite technology to track and plan their farming practices.

1960s — The modern grain drill was invented. It could plant a crop, put fertilizer in the ground and provide for weed control all in one pass over the field. This was just one of the specialized machines that allowed farmers to put just the right amount of fertilizer in just the right place and to count out, space and plant just the right number of seeds for a row.

1921 — George Washington Carver, head of Tuskegee Institute's research department, testifies before Congress about the many uses of the peanut.

Top Crops

Grade level: Upper elementary

Unit: Production agriculture

Learner Outcomes

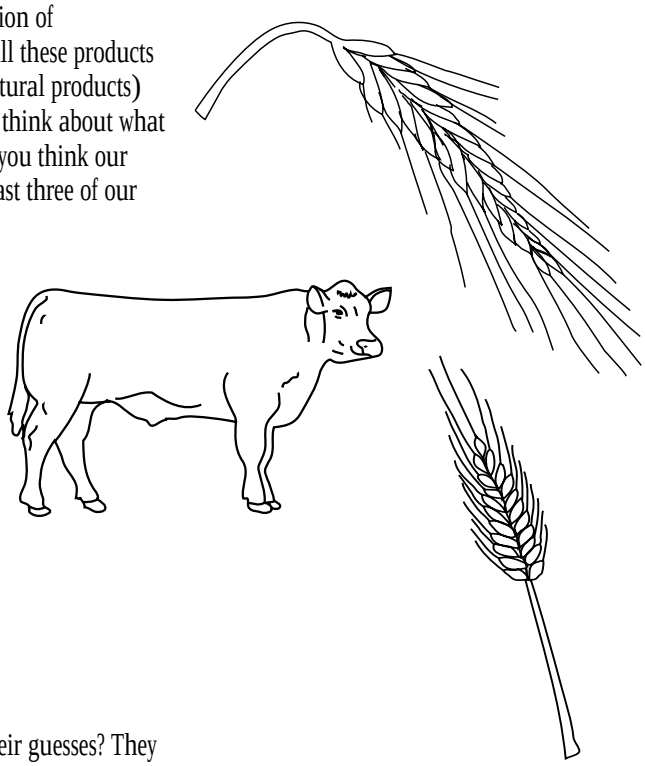
By the end of this lesson, students will be able to:

1. Identify how their state ranks in agricultural production.
2. List at least three leading agricultural commodities of their state.

Teaching This Lesson

1. Tell students, "We are going to look at some data from the U.S. Department of Agriculture (USDA). It is the federal government agency responsible for agriculture. Statisticians from USDA track all kinds of information about farming and ranching and make it available to the public."

2. "The data sheet we will review provides the ranking of the agricultural production of each state as measured in *cash receipts*. That's the money paid for the sale of all these products from the farm. Second, the data sheet lists the five top crops (and other agricultural products) in each state, again measured by cash receipts. Before we look at the data, let's think about what we know about agriculture in our state. On a piece of paper, write down where you think our state ranks in agricultural sales–choose a number from 1 to 50. Then list at least three of our state's agricultural products that you think would be in the top five."

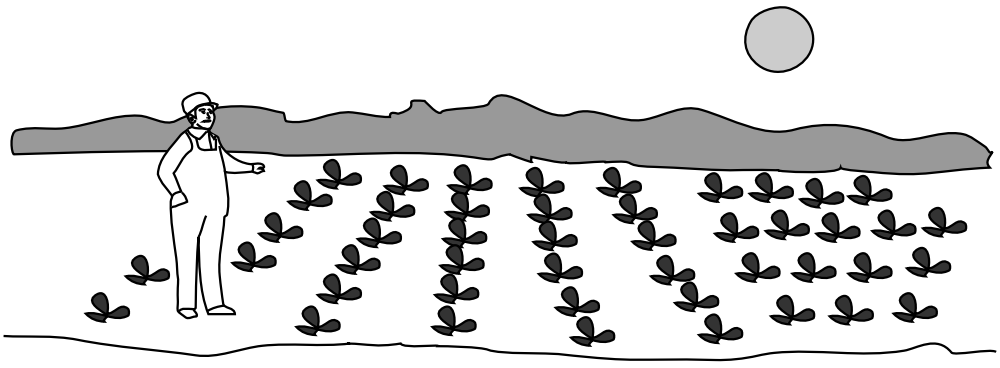


3. Pass out the Activity Sheet, "Top Crops." Let students check their answers.

4. Explain some of the terms that students may not know.

   Broilers — Chickens grown for their meat
   Cattle and calves — Beef cattle
   Greenhouse — Landscape plants, cut flowers and indoor plants
   Dairy — Milk from dairy cows
   Hay — Grown for animal feed
   Sorghum — Grown for animal feed
   Corn and soybeans — Grown for animal feed and many other products
   Aquaculture — Farm-raised fish
   Barley — Used as animal feed, as a cereal and as a grain product

5. Have students discuss the data sheet. How accurate were their guesses? They may want to use the data to create a large bulletin board in your classroom.



Here are the top five agricultural products in each state, as ranked by cash receipts—the amount of money received from the sale of these products.

	Rank	State's top-ranking agricultural products, based on cash receipts, 1994				
Alabama	25	Broilers	Cattle/calves	Greenhouse*	Peanuts	Cotton
Alaska	50	Greenhouse	Dairy prods.	Potatoes	Hay	Cattle/calves
Arizona	32	Cattle/calves	Cotton	Dairy prods.	Hay	Greenhouse
Arkansas	11	Broilers	Soybeans	Rice	Cotton	Cattle/calves
California	1	Dairy prods.	Greenhouse	Grapes	Cattle/calves	Cotton
Colorado	17	Cattle/calves	Corn	Wheat	Dairy prods.	Hay
Connecticut	44	Greenhouse	Dairy prods.	Eggs	Tobacco	Cattle/calves
Delaware	40	Broilers	Soybeans	Corn	Greenhouse	Dairy prods.
Florida	8	Oranges	Greenhouse	Tomatoes	Cane/sugar	Dairy prods.
Georgia	16	Broilers	Peanuts	Cattle/calves	Eggs	Dairy prods.
Hawaii	41	Cane/sugar	Pineapples	Greenhouse	Macad. nuts	Dairy prods.
Idaho	26	Cattle/calves	Potatoes	Dairy prods.	Wheat	Sugarbeets
Illinois	5	Corn	Soybeans	Hogs	Cattle/calves	Dairy prods.
Indiana	12	Corn	Soybeans	Hogs	Cattle/calves	Dairy prods.
Iowa	3	Hogs	Corn	Cattle/calves	Soybeans	Dairy prods.
Kansas	7	Cattle/calves	Wheat	Corn	Sorghum grain	Soybeans
Kentucky	22	Tobacco	Cattle/calves	Horses/mules	Dairy prods.	Corn
Louisiana	31	Cotton	Cane/sugar	Soybeans	Rice	Cattle/calves
Maine	42	Potatoes	Dairy prods.	Eggs	Aquaculture	Blueberries
Maryland	35	Broilers	Greenhouse	Dairy prods.	Soybeans	Corn
Massachusetts	43	Greenhouse	Cranberries	Dairy prods.	Eggs	Apples
Michigan	20	Dairy prods.	Corn	Greenhouse	Cattle/calves	Soybeans
Minnesota	6	Dairy prods.	Corn	Soybeans	Cattle/calves	Hogs
Mississippi	27	Cotton	Broilers	Soybeans	Cattle/calves	Aquaculture

*Greenhouse = greenhouse and nursery products, including cut flowers and indoor plants

Missouri	15	Cattle/calves	Soybeans	Hogs	Corn	Dairy prods.
Montana	33	Cattle/calves	Wheat	Barley	Hay	Sugarbeets
Nebraska	4	Cattle/calves	Corn	Hogs	Soybeans	Sorghum grain
Nevada	47	Cattle/calves	Dairy prods.	Hay	Potatoes	Greenhouse
New Hampshire	48	Dairy prods.	Greenhouse	Apples	Hay	Eggs
New Jersey	39	Greenhouse	Dairy prods.	Eggs	Peaches	Tomatoes
New Mexico	34	Cattle/calves	Dairy prods.	Hay	Chili peppers	Pecans
New York	24	Dairy prods.	Greenhouse	Cattle/calves	Apples	Potatoes
North Carolina	10	Tobacco	Broilers	Hogs	Turkeys	Greenhouse
North Dakota	23	Wheat	Cattle/calves	Barley	Sunflowers	Sugarbeets
Ohio	14	Soybeans	Corn	Dairy prods.	Greenhouse	Hogs
Oklahoma	18	Cattle/calves	Wheat	Greenhouse	Broilers	Dairy prods.
Oregon	28	Cattle/calves	Greenhouse	Dairy prods.	Wheat	Onions
Pennsylvania	19	Dairy prods.	Cattle/calves	Greenhouse	Mushrooms	Eggs
Rhode Island	49	Greenhouse	Dairy prods.	Eggs	Potatoes	Cattle/calves
South Carolina	36	Tobacco	Broilers	Cattle/calves	Soybeans	Cotton
South Dakota	21	Cattle/calves	Wheat	Hogs	Corn	Soybeans
Tennessee	30	Cattle/calves	Dairy prods.	Cotton	Tobacco	Soybeans
Texas	2	Cattle/calves	Cotton	Dairy prods.	Greenhouse	Sorghum grain
Utah	38	Cattle/calves	Dairy prods.	Hay	Turkeys	Greenhouse
Vermont	45	Dairy prods.	Cattle/calves	Greenhouse	Hay	Maple prods.
Virginia	29	Cattle/calves	Broilers	Dairy prods.	Tobacco	Turkeys
Washington	13	Apples	Cattle/calves	Dairy prods.	Wheat	Potatoes
West Virginia	46	Cattle/calves	Broilers	Dairy prods.	Turkeys	Apples
Wisconsin	9	Dairy prods.	Cattle/calves	Corn	Hogs	Greenhouse
Wyoming	37	Cattle/calves	Sugarbeets	Hay	Sheep/lambs	Dry beans

Source: USDA Agriculture Fact Book, 1994

Lots More From Agriculture

Grade level: Upper elementary

Unit: Production agriculture

Learner Outcomes

By the end of this lesson, students will be able to:

1. Define *byproduct*.
2. Identify new-use agriculture products and agricultural byproducts they use every day.

Agriculture is the solution to many environmental concerns.

Background Information

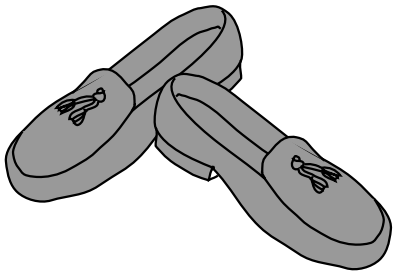
When students think about agriculture, their first thoughts are probably of food. They may be aware that some of their clothing comes from agriculture, as well. But they are probably unaware of the myriad of other products they use every day that come from agriculture. Many of these are agricultural *byproducts*–secondary products produced when making something else. For example, when grains are made into ethanol, a byproduct is a mash that can be used in pet food.

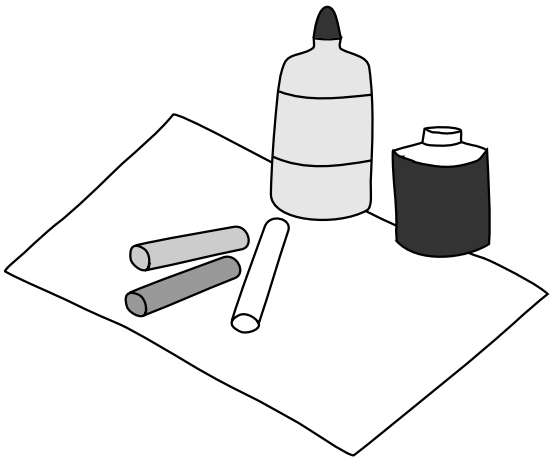
Today, agriculture is the solution to many environmental concerns. Ethanol added to gasoline is reducing our dependence on petroleum. Biodegradable plastics made from corn and other agricultural products are reducing the need for landfill space.

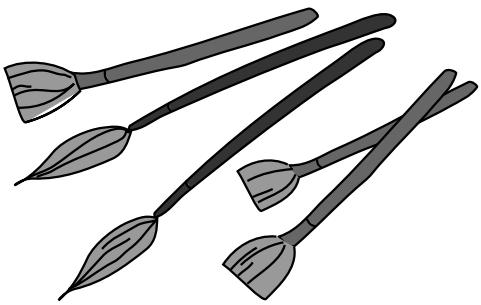
In addition, many agricultural products are used for pharmaceuticals. Researchers continue to look for new uses for agricultural products.

Teaching This Lesson:

1. Review the extent to which agriculture affects students' daily lives. Say, "When you think about agriculture, your first thoughts are probably of food. You may be aware that some of your clothing comes from agriculture, as well. But you are probably unaware of the many other products you use every day that come from agriculture."
2. Hand out the Activity Sheet, "Lots More From Agriculture." Review the list of agricultural products.
3. Define *byproduct*–something produced in the making of something else. Can students think of any byproducts they use?
4. Have students complete the Activity Sheet. (This could also be a homework assignment.)







Activity Sheet—*Lots More From Agriculture*

Agricultural products have many more uses than food and clothing for people or feed for animals. From the ink that printed this Activity Sheet to the medicine you may have taken this morning, agricultural products are found in places where you least expect them.

Go on a scavenger hunt. See how many things made with agricultural products and byproducts you can find. (If you're not sure, look at the label.) List them below.

Beef

- Hide and hair — leather artists' brushes, drum heads
- Intestines — sausage casing, tennis racket strings, instrument strings
- Bones, horn and hooves — adhesive tape, bone meal for plant food, dog biscuits, emery boards, marshmallows, bone china
- Fats and fatty acids — crayons, shaving cream, dish soap, protein hair conditioner and shampoo

(Source: Arizona Cow Belles)

Pork

- Bones and skin — glue, pigskin gloves and shoes, buttons
- Hair — artists' brushes, insulation
- Fatty acids and glycerine — floor waxes, crayons, chalk, cosmetics

Corn

- Corn sweetener used in many food products (check the label), biodegradable packing pellets, fuel (ethanol), road de-icer, diapers, plastic

Sheep

- Oil - lanolin for hand lotion

Soybeans

- Cooking oil, printer's ink, paint

Trees

- Turpentine, paper

The Exploding Cheeseburger

Grade level: Primary

Unit: Processing

Learner Outcomes

After completing this lesson, students will be able to:

1. Identify the difference between a raw agricultural material and a finished product.
2. List the major steps in processing agricultural products.
3. Explain the major steps products take from farm to consumer.

Background Information

Most agricultural products are processed in some way before they are consumed. Milk is *homogenized* and *pasteurized* before it is made into cheese, yogurt and ice cream; pork is ground and spiced for sausage; soybeans are crushed for cooking oil; rice is puffed into cereal.

The pioneers either did all this processing themselves or did without the product. They ground their own wheat into flour and made bread. They salted and smoked their own pork for bacon. They skimmed the cream off the top of the milk to churn into butter. Today, agribusinesses process our food for us. Most of the work is done when we purchase it at the supermarket.

Teaching This Lesson

1. Ask students, "Where does a cheeseburger come from?" Answers may include:

    - the kitchen
    - a fast food restaurant
    - the supermarket

2. Say, "Before the various parts of the cheeseburger can get to your kitchen or a restaurant or the supermarket, they all have their start in agriculture. But each of the parts of the cheeseburger follows a different path from the farm to your table. Let's play a guessing game and see whether you can identify each of the parts of the cheeseburger I'm describing."

3. Read the following descriptions to students. See if they can guess what you are describing.

    I begin as kernels of wheat. Then I'm milled into flour. The flour is mixed with yeast, water and other ingredients and made into a thick dough. When the dough is baked, it becomes a part of the cheeseburger. Which part? (Answer: the bun)

    I start out as a ripe, red tomato. I'm cooked into a sauce, and flavorings and spices are added. I'm poured into a bottle with a long, thin neck. What am I? (Answer: ketchup)

    I start out as milk, fresh from the cow. At a dairy, someone adds a culture to me. That makes me separate into curds and whey. The whey is poured off and the curds are pressed together. Sometimes, flavorings and spices are added. I'm left to age and for my flavor to develop. What am I? (Answer: cheese)

    I start out as soybeans. Crushing removes the oil, which is mixed with eggs, spices and other ingredients. I'm packed in jars and sent to the supermarket. Remember—once you've opened a jar, you should store it in the refrigerator. What am I? (Answer: mayonnaise)

4. Say, "Nearly all agricultural products must be processed in some way before they can be used. Processing changes a raw agricultural commodity into something we can eat, wear or build with."

5. Give each student a copy of "The Exploding Cheeseburger." Say, "Here's a picture of a cheeseburger with all the parts labeled. In the box at the bottom of the page are all the raw agricultural products that go into making the parts of the cheeseburger." Ask the students to choose from the word bank the name of the agricultural product that is the source of each part of the cheeseburger. Write it in the left column.

6. Say, "Which parts of the cheeseburger don't have anything written beside them? Lettuce and onions—because they are not processed."

7. Have students write the name of another favorite food that comes from the same raw product in the right hand column. For example, wheat - bun - pasta.

8. Let students talk about some of their favorite foods and the agricultural products they come from.

Additional Activities for Follow-up

1. Have students research how other agricultural products become finished products. Have them write their own riddles about the products they have researched.

2. Make butter. Divide your class into groups of four or five students. Each group will need:

   - half-pint carton of whipping cream (warmed to room temperature)
   - 1 quart jar with tight-fitting lid
   - a large spoon
   - a bowl.

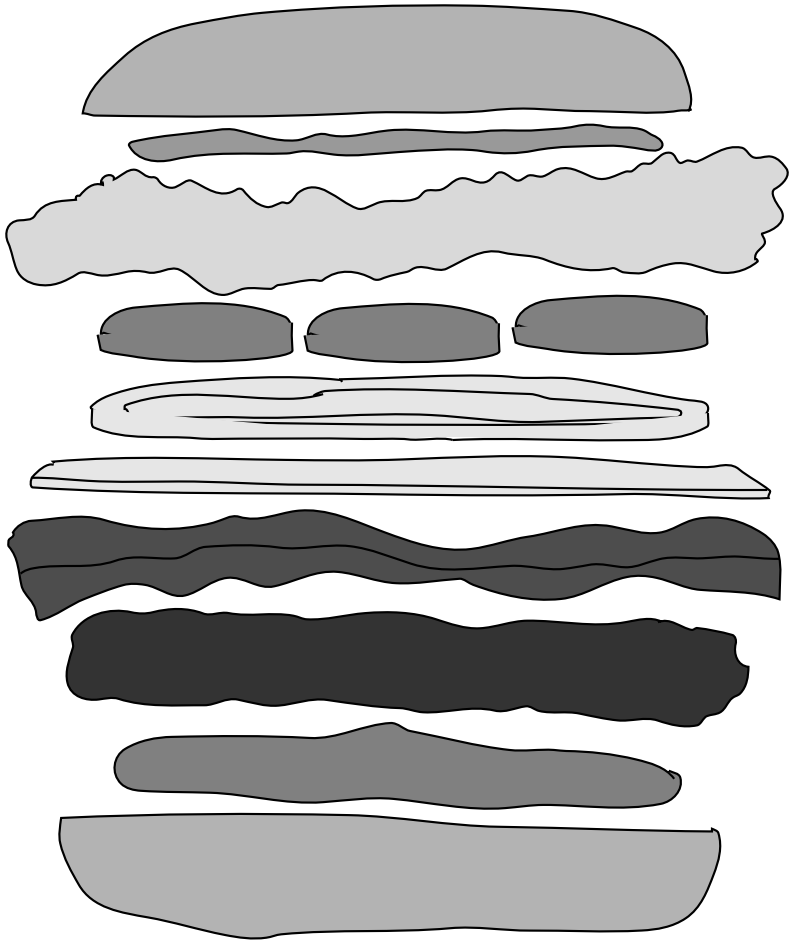
   You will also need salt, a knife and crackers or bread.

   Pour the whipping cream into the jar. Ask each team member to take turns shaking about 20 shakes. After about 10 to 15 minutes, the cream should turn to soft butter. Open the jar, pour off the buttermilk, and scoop out the butter. Add salt, if desired, and spread on bread or crackers.

3. Teach students to look for the "Real" seal on dairy products. It shows that the product was made with milk instead of a milk substitute. Ask students to list all the dairy products they know.

Activity Sheet—The Exploding Cheeseburger

Raw Agricultural Products	Cheeseburger	A Favorite Food of Mine
_____	Bun	_____
_____	Mayonnaise	_____
_____	Lettuce	_____
_____	Pickle	_____
_____	Onion	_____
_____	Cheese	_____
_____	Bacon	_____
_____	Hamburger	_____
_____	Ketchup	_____
_____	Bun	_____



The parts of a cheeseburger come from many different raw agricultural products. From the words in the word bank, choose the name of the agricultural product that is the source of each part of the cheeseburger. Write it in the left-hand column. Then in the right-hand column, write another favorite food that comes from that same raw product.

Word Bank

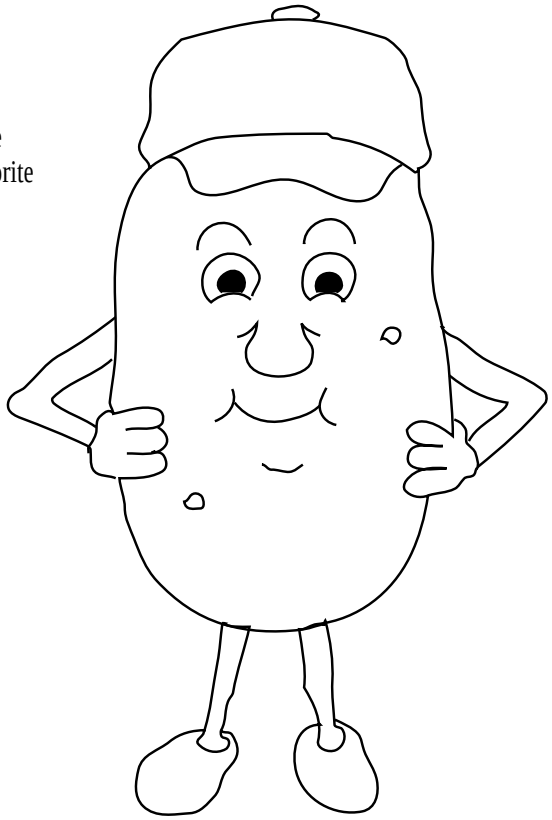
Milk Pork Tomato Soybean and egg Wheat Cucumber Beef

Quick Lesson:
The Adventures of Pete the Potato

Grade level: Primary

Unit: Processing

Hand out "The Adventures of Pete the Potato." Have students read the story and answer the questions. This Activity Sheet helps students see how a favorite American food gets from farm to table.



Activity Sheet—*The Adventures of Pete the Potato*

Lots of things happen to a potato before you get to eat it. Read the story below about Pete the Potato. Then, write your four favorite potato dishes on the lines at the bottom and answer the other two questions.

Hello! My name is Pete and I'm a potato. I enjoy traveling. It's a fun trip from the farm to your dinner table. My stem is edible and it grows underground. That's why I'm sometimes called a **tuber**.

My journey begins in the fall. I'm harvested by a big machine that digs me from the ground. After harvest, I'm stored in a cool, dry place until the farmer sells me.

After the farmer sells me, I travel to the processing plant where I'm washed and sorted. At the plant, I might be boxed or placed in a plastic bag to be sold whole for you to prepare at home. Or, the processor might peel me and cook me into french fries, instant mashed potatoes or potato salad.

Next, I am placed aboard a truck or railroad car and travel to your supermarket or restaurant. I might travel frozen, refrigerated, boxed or canned. I am processed in many different ways because people like to eat me in many dishes. In fact, each American eats about 81 pounds of potato products each year.

What are your four favorite ways to eat potatoes?

1. _____ 3. _____

2. _____ 4. _____

How many pounds do you weigh? _____

Do you eat more pounds of potatoes than you weigh each year? _____

Peanuts to Peanut Butter

Grade level: Upper elementary

Unit: Processing

Learner Outcomes

After completing this lesson, students will be able to:

1. Identify the difference between a raw material and a finished product.
2. Discuss reasons why some agricultural products need to be processed more than others.
3. Explain the steps a product takes from farm to finished product.

Background Information

Nearly all agricultural products must be processed in some way before they can be used. Processing changes a raw agricultural commodity into something we can eat, wear or use in building. Each processing step adds value to the product's final form. For example, pork is processed into sausage, wheat is processed into bread, wool is processed into sweaters and timber is processed into construction lumber. Processing also adds cost. But consumers are willing to pay more for the sausage, bread, sweaters and lumber than they are for the raw commodities.

Today, U.S. agricultural processing is a multibillion dollar industry serving consumers. Engineers design machines that will process agricultural products quickly, efficiently and in large quantities. Commercial agricultural processing is much different from the way you might make a small quantity of a product at home since the machines do so much of the work. The agricultural industry is able to supply low-cost, quality products because of the high technology used in processing today.

Americans spend a lower percentage of their family income on food than people in any other nation in the world. In some developing nations, for example, India, families spend over 50 percent of their income on food. Percentages in other developed countries include: Italy, 25.7 percent; Japan, 19.1 percent; France, 16.3 percent; Sweden, 15.3 percent; and the United States, 9.3 percent.

Teaching This Lesson

1. Assemble the following: a jar of peanut butter, a handful of peanuts with shells, an ear of corn (unhusked), corn tortillas or corn chips, a fresh tomato, ketchup, raw wool or cotton (you can use a cotton ball), wool or cotton cloth, a piece of wood and a piece of paper.

If you will be making your own peanut butter in class, you will also need:

- 1 cup hulled, roasted peanuts
- 1-1/2 tbsp. peanut oil
- Pinch of salt
- Blender
- Rubber spatula

2. Arrange the products on a table so that all students can see them. Say, "Today we're going to learn about processing. Nearly all agricultural products must be processed in some way before they can be used."

Americans spend a lower percentage of their family income on food than people in any other nation in the world.

3. Ask a student to come to the table and match the raw material with its finished product. Say, "As you can see, processing changes a raw agricultural commodity into something we can eat, wear or use in building."

tomato	corn	peanut	wood	cotton/wool
ketchup	corn chips	peanut butter	paper	cloth or clothing

4. Not all agricultural products require processing. Hold up the tomato. Say, "You can eat the tomato as it is. But it can also be processed into ketchup or other products. What other products might tomatoes be processed into?" (tomato sauce, tomato soup, salsa). Ask students to think about other products that these raw materials on the table might be processed into.

   Wood: furniture, construction lumber, oils and medicines

   Peanuts: cooking oil

   Corn: Students might be especially interested to learn about all the uses for corn. They include plastic, cooking oil, animal feed, corn sweetener (used in soft drinks and many other products), diapers, biodegradable packing pellets and ethanol.

5. Now say, "Let's look at how peanuts become peanut butter." Hand out "Peanuts to Peanut Butter." Trace the steps with the students.

   - Peanuts are shelled.
   - The shelled peanuts are then roasted. Roasting gives them their crunch and makes them easier to digest.
   - The roasted peanuts are blanched to remove their skills.
   - Then they're ground. As they are being ground, oil begins to separate from the peanut.
   - More oil, sugar, salt and an emulsifier (to keep the mixture from separating) are added and mixed.
   - The mixture is heated. Heating and mixing turns the mixture into a liquid.
   - The hot liquid is poured into jars and sealed. It is now peanut butter.

6. The Activity Sheet includes a recipe for peanut butter. You may wish to make it with your students in class. Or, you can send the Activity Sheet home for students to make peanut butter at home with their families.

7. Point out that it takes 540 peanuts to make a 12-ounce jar of peanut butter. Although you paid $_____, (insert the price you paid) for peanuts in the store, the peanut butter costs about $1.83 (or whatever you paid). Ask students why. (It costs money to transport the peanuts to the factory. The machinery costs money. The additional ingredients add more cost. So do the jar and the label. All the people who do these jobs need to earn money so they can support their families. This is called a *labor* cost.)

   Discuss with students why people buy a processed food instead of a raw agricultural product. (Processed food is more convenient and is quicker to use.) Point out that a typical large supermarket includes about 10,000 different products. Ask students to talk about a new processed food they've recently tried.

8. Conclude by saying, "Americans spend a smaller percentage of their family income on food than do people in any other country in the world."

Additional Activities for Follow-up

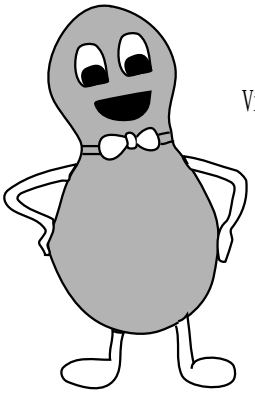
1. Have students learn more about George Washington Carver. What were some of the things he developed to use from the peanut?

2. Ask students to use peanut butter as an ingredient in a healthy snack. Examples might include apple slices spread with peanut butter, celery stuffed with peanut butter, or peanut butter and banana sandwiches.

3. Learn more about how corn is used to make everything from fuels to pharmaceuticals. *Corn: A National Renewable Resource* is a teaching kit developed for upper elementary school students. Contact the National Corn Growers Association, 1000 Executive Parkway, #105, St. Louis, MO 63141.

4. Have students research the impact on the environment of using renewable resources (for example, replacing some gasoline with ethanol).

Activity Sheet—Peanuts to Peanut Butter



I'm a peanut. Nine states grow all the U.S. peanut crop—Georgia, Texas, Alabama, North Carolina, Virginia, Oklahoma, Florida, South Carolina and New Mexico.

Here's how peanuts become peanut butter.

- Peanuts are shelled.
- The shelled peanuts are then roasted. Roasting gives them their crunch and makes them easier to digest.
- The roasted peanuts are blanched to remove their skins.
- Then they're ground. As they are being ground, oil begins to separate from the peanut.
- More oil, sugar, salt and an emulsifier (to keep the mixture from separating) are added and mixed.
- The mixture is heated. Heating and mixing turns the mixture into a liquid.
- The hot liquid is poured into jars and sealed. It is now peanut butter.

You can make your own peanut butter. You'll need:

- 1 cup hulled, roasted peanuts
- 1-1/2 tbsp. peanut oil
- Pinch of salt
- Blender
- Rubber spatula

Place the peanuts and oil in the blender. Start on low speed. (Hold the lid down.) Switch to high, stopping occasionally to scrape down the sides with the spatula. Spread on bread or crackers. This fresh peanut butter needs to be kept in the refrigerator.

Peanut Facts:

A peanut isn't a nut! It's a legume (a pod that grows underground).

It takes approximately 540 peanuts to make one 12-ounce jar of peanut butter.

A St. Louis, Missouri, physician was the first to make peanut butter in 1890. He used it as a food for the elderly because it was easy to digest.

George Washington Carver made more than 300 products from peanuts. They included face powder, printer's ink, soap and a sustitute for milk.

Quick Lesson:
Where Does Your Food Dollar Go?

Grade level: Upper elementary

Unit: Processing

Learner Outcomes

At the end of this lesson, students will be able to:

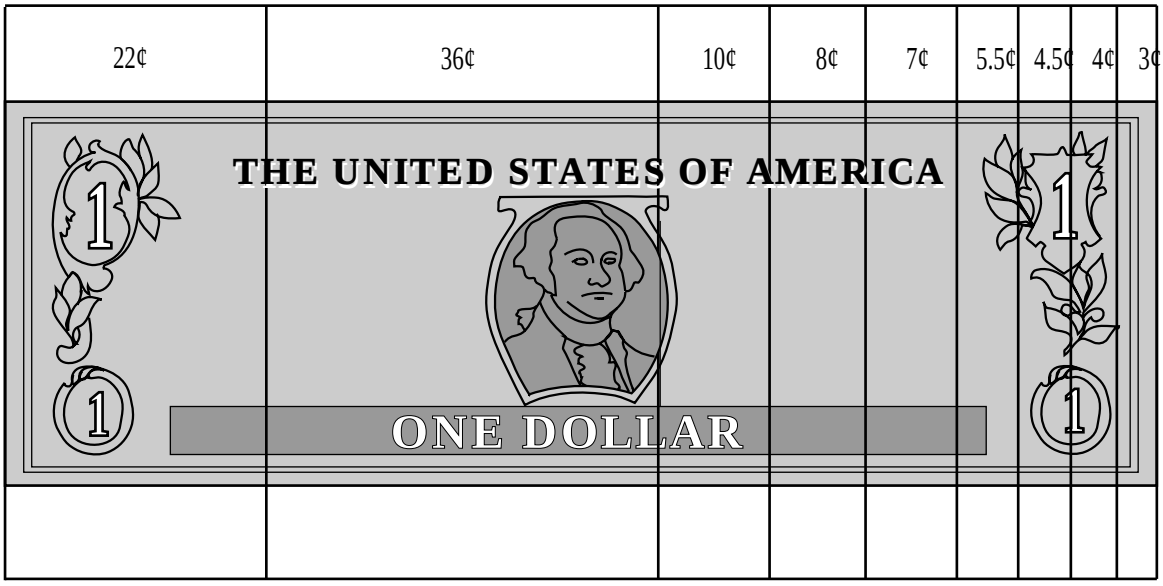
1. Describe how the food dollar is divided.

Background Information

In this lesson, students will see how the money we pay for food gets divided in many ways.

Teaching This Lesson

1. Hand out a copy of the Activity Sheet, "Where Does Your Food Dollar Go?"
2. Tell students the food they eat goes through many steps before it gets to their table. Each of those steps adds to the cost of their food. Farmers and ranchers get only about 22 cents of each food dollar spent.



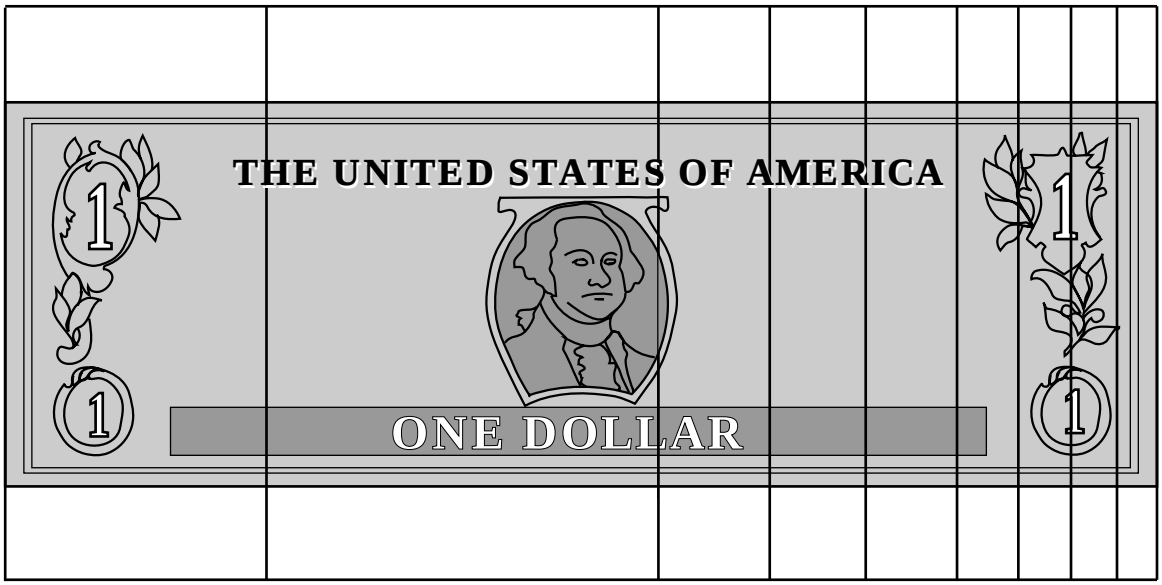
Activity Sheet—*Where Does Your Food Dollar Go?*

The breakdown of a dollar spent on food paid for in 1993

Farm value	22¢
Labor	36¢
Interest, taxes and other costs	10¢
Packaging	8¢
Fuels, electricity and rent	7¢
Repairs and depreciation	5.5¢
Inter-city transportation	4.5¢
Advertising	4¢
Before-tax profit	3¢

Source: Agriculture Fact Book 1994

Each dollar you spend on food gets divided many ways. Each person and process involved in getting the food to you receives a share of each food dollar. Using the numbers on the chart above, label each piece of the dollar with what it is spent on.



How Food Moves From Farm to You

Grade level: Primary

Unit: Distribution

Learner Outcomes

At the end of this lesson, students will be able to:

1. Explain how transportation makes it possible for agricultural products to move from the farm to consumers.
2. List at least three ways that food travels.
3. Describe how one food (pasta) moves from farm to table.

Additional Activities for Follow-up

1. Learn more about the names of different pasta shapes. What do these names mean?

Background Information

Distribution is often a challenge in the food system. American farmers are proficient at producing food, and today modern technology makes it possible to have many foods available around our country and around the world at any time of the year. Most developed countries have railroad systems, river barges, truck fleets and other methods of transportation to distribute goods.

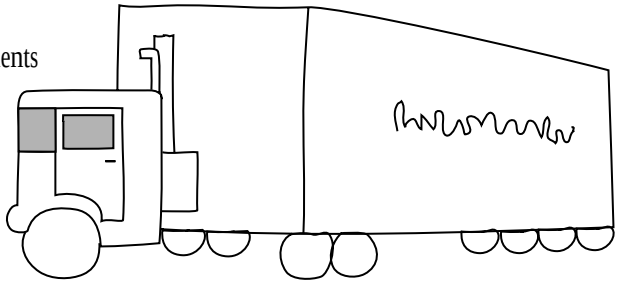
In the United States and other developed countries, technology supplies us with a wide variety of food products year-round. Not too many years ago, fresh fruits and vegetables could be found in the supermarket only "in season." Now we can enjoy most of these foods year-round. Some foods may be stored under refrigeration or in an oxygen-free atmosphere to minimize spoilage. Others are imported from southern hemisphere countries where growing seasons are the opposite of ours.

Teaching This Lesson

1. Read "How Food Moves From Farm to You" (page 41). Duplicate the story for students to follow.

2. Ask, "The story tells you about how food moves from place to place. Can you remember how some of the agricultural products in the story moved?"

   Tomato — Refrigerator truck (or refrigerated boxcar)
   Wheat — Boxcar and truck
   Milk — Special sterilized refrigerated tankers
   Flowers — By airplane



3. "Which of these methods of transportation do you think is the fastest?" (airplane). "It's also the most expensive. That's why it's usually used only for products that would spoil quickly–for example, fresh flowers and fresh fish."

4. Tell students that transportation is a small part of the food dollar. Less than 5 cents of every dollar they spend on food goes to transportation–yet their supermarket is filled with foods from around the world.

5. Hand out the Activity Sheet, "How Pasta Moves From Farm to You." Say, "Remember the story about Maria and Ruff 'n'Ready. Read the words under each picture. Then cut the pictures out and put them in the right order. Use the pictures of the trains, trucks, boats and bus on the page with the story to show how the food moves from farm to you."

Modern technology makes it possible to have many foods available around our country and around the world at any time of the year.

How Food Moves From Farm to You

It was late afternoon, and Maria walked into the family room. "Boy, am I tired," she thought. "Maybe I'll just watch a little TV."

But when she walked into the room, there was already someone sitting in her favorite TV chair. It was Ruff 'n'Ready, and he was sound asleep. Around Maria's room were some fresh tomatoes, a cooler marked "Milk–Keep Cold," a box of spaghetti and a bouquet of fresh flowers.

"Ruff, wake up. What are you doing here–and what's all this *stuff*?" Maria demanded.

Ruff opened his eyes. "You have no idea. You're going to sit down to a wonderful dinner of spaghetti and salad tonight. I bet you don't even think about how it all got here."

Maria sighed. "Somehow, I think you're going to tell me."

Ruff held up a tomato. "These were grown in Florida. I rode with them all that way in a refrigerated truck. Brrr! The things I'll do to get a story."

Next, he held up the box of spaghetti. "This took a long trip," he said. "The wheat grows on a farm in North Dakota. Some of it went by boxcar to the mill, where it was ground. Some of the wheat went by ship to other countries to make their pasta. Did you know that you can't use just any wheat for pasta? You need a special hard wheat called *durum*."

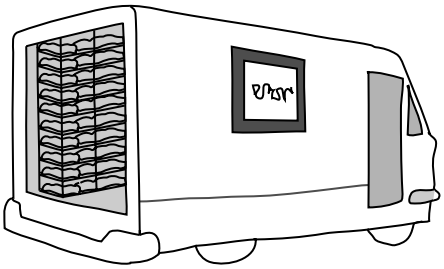
"The flour went by truck to the pasta plant, where it was mixed with water to make the dough. Then the dough was shaped into long, thin strips and dried. Finally, big machines put it into this box." Ruff held up the box of Maria's favorite spaghetti. "It got to the supermarket's big warehouse in a giant truck. A smaller truck took it to your supermarket. Today, luckily, all I had to do was pick it up there. Then I took the bus to your house."

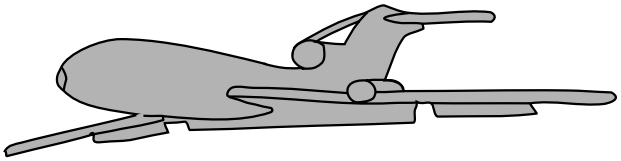
By now, Maria was interested. "Where did the milk come from?" she asked.

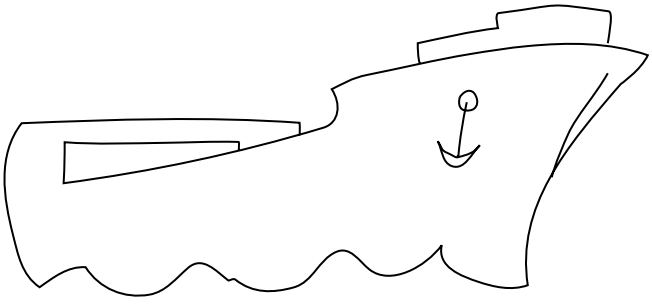
"Pretty close by. I was at the dairy farm. But when the big truck pulled in, they wouldn't let me get inside the refrigerated tank. I had to ride on top of the truck. But keeping everything so clean is what keeps the milk pure."

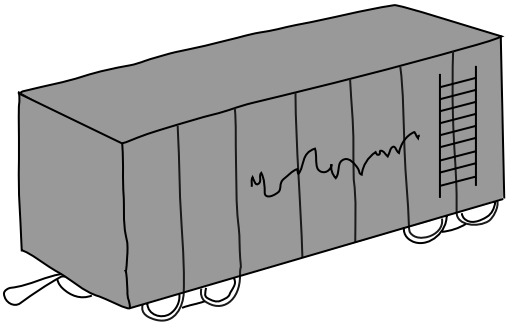
"What about the flowers?" Maria asked.

"I jetted in with these yesterday from the Coast," Ruff said. "That means California, of course. I thought they'd be a nice gift for your mother. Didn't I tell you? I've invited myself for dinner."









Activity Sheet—*How Pasta Moves From Farm to You*

Picture 1: Wheat
Pasta comes from a special hard wheat called *durum* wheat. Most of it is grown in North Dakota.

Picture 2: Wheat kernels and flour
At the mill, the wheat is ground into a special flour.

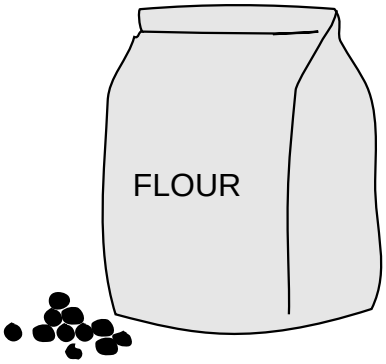
Picture 3: Long strips of spaghetti
At the factory, the flour is mixed with water. Then the dough is shaped into long, thin strips and dried. Big machines put the pasta into boxes.

Picture 4: Warehouse
Warehouses store many kinds of food.

Picture 5: Supermarket
There are many different pasta shapes on a supermarket shelf.

Picture 6: Plate
Americans love pasta. The average person eats about 18 pounds a year.


1



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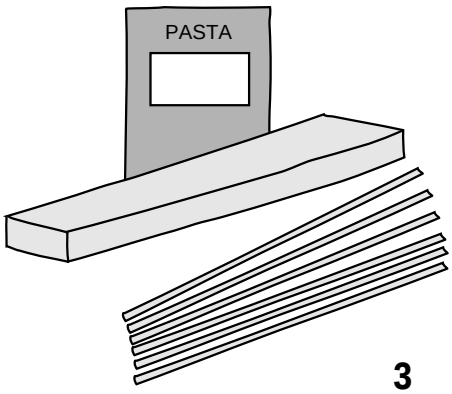

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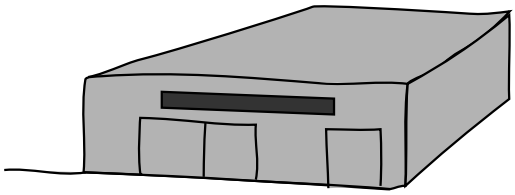
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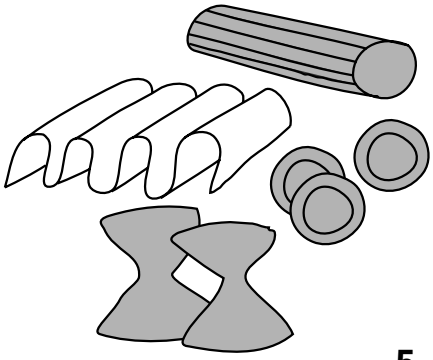
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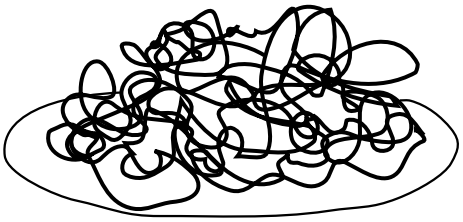
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Quick Lesson:
Open Your Eyes and Watch the Food Go By

Grade level: Primary

Unit: Distribution

A Take-Home Activity

Background Information

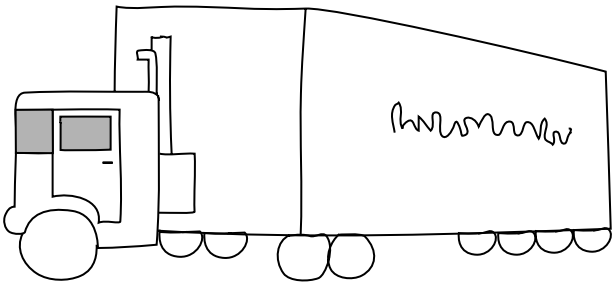
Most agricultural products move from the farm to the supermarket by truck. This take-home activity makes students more aware of the trucks that transport food.

Teaching This Lesson

1. Hand out a copy of the Activity Sheet, "Open Your Eyes and Watch the Food Go By."
2. Ask students to keep track of all the trucks they see during the next three days. (This would be a good homework activity for the weekend.)
3. When the students return their completed Activity Sheets, you could:
   - Make a graph of the different kinds of trucks students saw
   - Make a list of the different food products students saw traveling by truck.
   - Discuss who saw the most unusual truck.

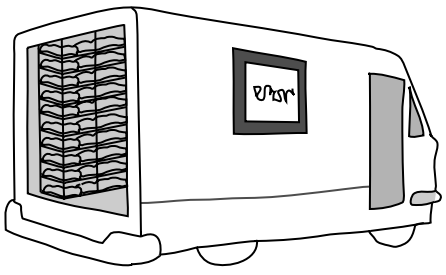
Example:

Kind of Truck
Description of Truck
Food in the Truck (if you can tell)



Example: semi truck

Red & green
Smith's Supermarket
Many foods



Example: bread truck

Blue & white
Bob's Bakery Truck
Bread

Activity Sheet –Foods Made From Wheat

Many of your favorite foods are made from wheat. Draw a picture of two or three foods made from wheat.

Activity Sheet—

Open Your Eyes and Watch the Food Go By

Kind of Truck

Description of Truck

Food in the Truck (if you can tell)

Food For Keeps

Grade level: Upper elementary

Unit: Distribution

Learner Outcomes

By the end of this lesson, students will be able to:

1. Explain the meaning of food preservation and why it is necessary.
2. List four methods of food preservation and give an example of each.

Background Information

Many agricultural products must be prepared, treated or processed to prevent spoilage or decay- and to allow them to be used later. This process is called *food preservation*. No one knows how long humans have been preserving their food. As early as 1500 BC, foods were dried in Egypt and Arabia.

Four important methods of preservation are:

- Canning
- Freezing
- Drying
- Salting or pickling (salt preservation)

Packing and food preservation methods also make more food available. The Pilgrims preserved meat with salt for their ocean journey. Later, Clarence Birdseye developed a method to freeze and package vegetables. It revolutionized the food industry. Canning has been an important food packaging method for many years.

Today, thanks to food preservation, Americans enjoy many different foods throughout the year-not just at the time they are harvested.

Today, thanks to food preservation, Americans enjoy many different foods throughout the year -not just as the time they are harvested.

Teaching This Lesson

1. Ask students what *preserve* means. It means, "to keep." Say, "Food must move from where it is grown to where people eat it. And sometimes, food isn't eaten right away. Those are reasons why some food needs to be preserved."

2. If possible, bring in examples of preserved foods:
   - A canned food
   - A frozen food
   - A dried food (for example, dates or raisins)
   - A salted or pickled food

3. Show the foods to students. Talk about each food and how it was preserved.

Canning – Packing food in a container and then heating the container to sterilize the food.

Freezing – Lowering the temperature of the food to below 28 degrees Fahrenheit. This stops the food from spoiling.

Drying – Taking the moisture out of the food by drying it in the sun, in the air or by using heat.

Salting or Pickling – Adding salt or a *brine* (a mixture of salt and water) to keep the food safe.

FOOD FOR AMERICA
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Additional Activity For Follow-up

1. Learn more about how the Pilgrims preserved food. An excellent resource is "Coming to America," National Livestock and Meat Board, Education Department, 444 N. Michigan Ave., Chicago, IL 60611. (There is a cost for these materials)

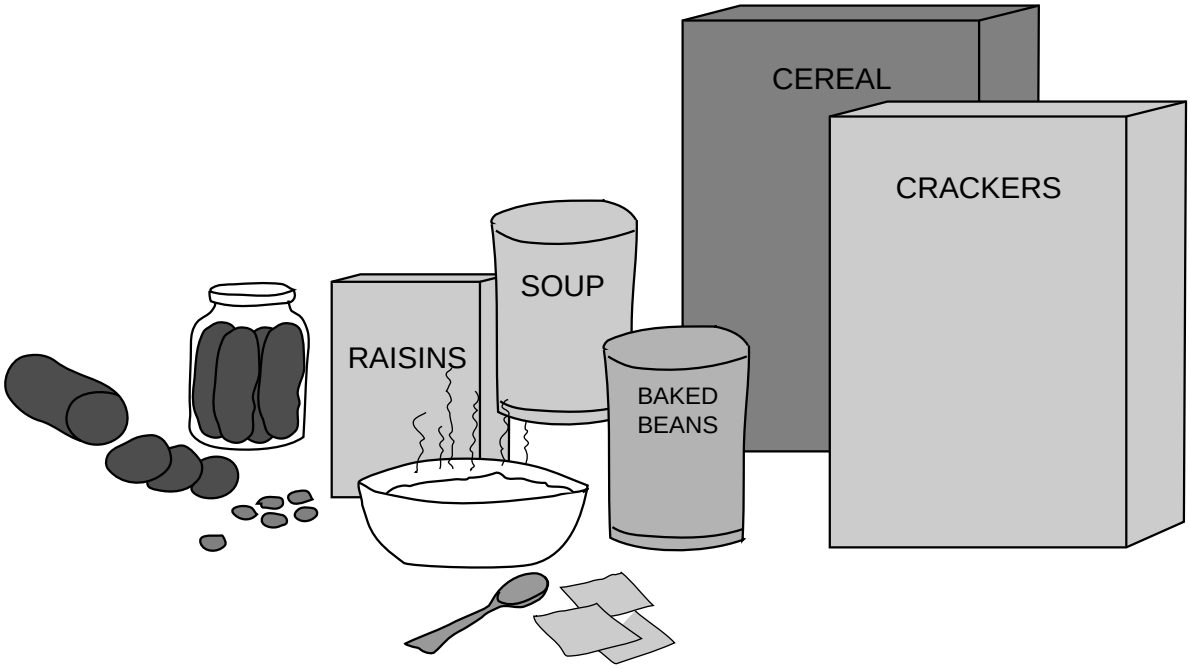
4. Say, "Some of these methods of preserving foods are very old. People have been drying and pickling foods for thousands of years. More than 1500 years ago, people in Egypt and Arabia were drying foods. Can you think of some foods that are still preserved by drying?" (Answers my include popcorn, dried fruit, dried beans, powered milk)

"The Babylonians salted and pickled foods in 1500 BC and George Washington fed his troops salt pork at Valley Forge. Who can think of some foods that are salted or pickled today?" (Answers may include: pickles, olives, slab pork)

"Canning was not invented until the 1800's. Napoleon fed his troops canned foods. Can you think of some foods that are canned today for preservation?" (Answers will include canned fruits and vegetables, canned meat, canned soups)

"Frozen foods was first marketed by a man named Clarence Birdseye. He had visited Labrador, where he had eaten some frozen fish. He came back to the United States and developed a way to freeze foods quickly. Today, you can buy many frozen foods in your supermarket. Can you name think of some of them?" (Answers may include frozen pizza, ice cream, vegetables, frozen dinners)

5. Hand out the Activity Sheet "Food For Keeps." Ask students to take it home and list as many foods preserved by each method as they can find in their house.



Activity Sheet—Food For Keeps

Look around your house. List all the foods you can find that are preserved by canning, freezing, drying or pickling. Put a check mark (✔) by your favorite preserved foods.

Did you know:

- Ice was manufactured in Greece as early as 500 BC
- The Pilgrims brought salted meat when they came on the Mayflower
- George Washington's troops ate salt pork at Valley Forge
- In 1809, Nicholas Appert invented canning, Napoleon fed his troops canned food.
- In 1860, Louis Pasteur first *pasteurized* milk.
- Clarence Birdseye first sold quick-frozen fish in 1925
- The astronauts took many *freeze-dried* foods with them in space.

Canning

Freezing

Drying

Pickling

Pyramis Power

Grade level: Primary

Unit: Nutrition

No one food group is more important than another- for good health, people need them all.

Learner Outcomes

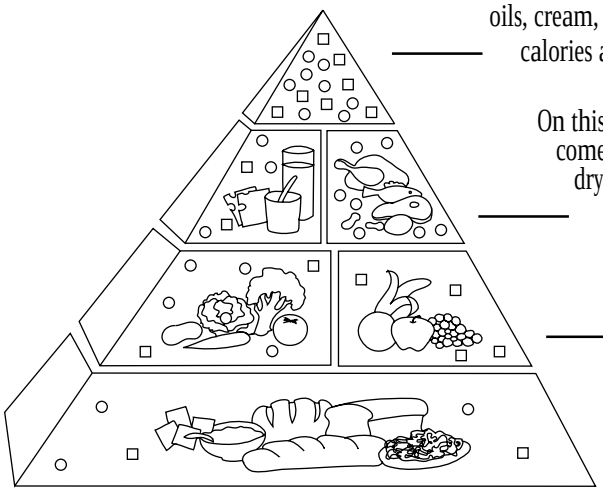
By the end of this lesson, students will be able to:

1. Recognize the Food Guide Pyramid as a guide to healthy eating.
2. List the five major food groups and be able to place familiar foods in the appropriate category.
3. Describe the appropriate number of servings they should choose from each food group.

Background Information

The Food Guide Pyramid was developed by the U.S. Department of Agriculture and the Department of Health and Human Services to help people understand how to choose a healthful diet. The Pyramid calls for eating a variety of foods that provide the needed nutrients, as well as the appropriate number of calories.

The Food Guide Pyramid emphasizes foods from the five food groups. Each of these food groups provides some, but not all, of the nutrients people need. Foods in one group can't replace those in another. No one food group is more important than another-for good health, people need them all. The Pyramid focuses on fat because most American diets are too high in fat-especially saturated fats.



The small tip of the Pyramid shows fats, oils and sweets. These are foods such as salad dressings, oils, cream, butter, margarine, sugars, soft drinks, candies and sweet desserts. These foods provide calories and little else nutritionally. Most people should use them sparingly.

On this level of the Food Guide Pyramid are two groups of foods that come mostly from animals: milk, yogurt and cheese; and meat, poultry, fish, dry beans, eggs and nuts. These foods are important for protein, calcium, iron and zinc.

This level includes foods that come from plants-vegetables and fruits. Most people need to eat more of these foods for the vitamins, minerals and fiber they supply.

At the base of the Food Guide Pyramid are breads, cereals, rice and pasta-all foods from grains. You need the most servings of these foods each day.

KEY

□ Fats ○ Sugars

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Teaching This Lesson

1. Hand out the Activity Sheet, "Pyramid Power". Ask students if they've ever seen it before. Many of them probably have. Say, "The Food Guide Pyramid helps you choose a mix of foods that are good for you."

2. Review each of the food groups. Start at the base of the Pyramid. Tell students, "At the bottom of the Pyramid are breads, cereals, rice and pasta. These are all foods made from grains." Ask students if they have eaten any foods from this food group today.

3. Have students look at the second level of the Pyramid. Say, "This level includes foods that come from plants-vegetables and fruits. Most people need to eat more of these foods for the vitamins, minerals and fiber they supply." Tell students they should try to eat five servings a day from these food groups-three of vegetables and two of fruits. Ask students if they have eaten any foods from this food group today.

4. Have students look at the third level of the Pyramid. Say, "This level mostly includes foods from animals-milk, yogurt and cheese; and meat, poultry, fish, dry beans, eggs and nuts. One of the nutrients from these foods is *calcium*, which makes strong bones. Another is *protein*, which helps you grow." Ask students if they have eaten any foods from this food group today.

5. The small tip of the Pyramid has no pictures in it. If it did, it would be pictures of things that are mostly fats, oils and sugars. These include soft drinks, candy, butter, margarine, salad dressings, oils and sweet desserts. Say, "These foods provide calories and little else. Most people should eat fewer servings of these foods."

6. Let students know that there aren't "good" and "bad" foods. Each of the food groups provides some, but not all, the nutrients they need. Foods in one group can't replace those in another. No one food group is more important than another.

7. Hand out the Activity Sheet, "What group Am I In?" Have the students color in the foods around the Pyramid. Then, have them cut them out and glue them in the appropriate food category.

8. What about pizza? It is a *mixed food*. It belongs in several food groups. The crust is from the bread group. The tomato is from the vegetable group. The cheese is from the dairy group. If the pizza had sausage or pepperoni, that would be from the meat group. Ask students about other mixed foods they enjoy. How can they fit them into the Pyramid?

Additional Activities for Follow-up

1. Create a large Food Guide Pyramid on a bulletin board. Have students cut out pictures from magazines and place them in the appropriate food groups.

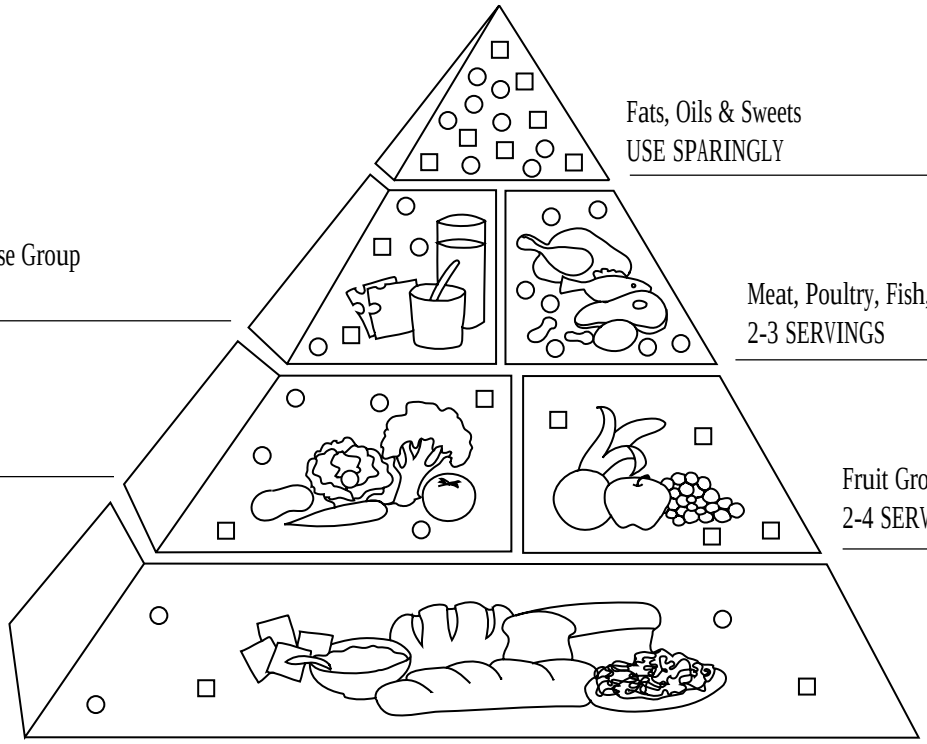
2. Encourage students to Strive for Five- to eat five fruits and veg etables every day. Have them keep track of the fruits and vegetables they eat. You might even want to give students a five-pointed star to put on a chart each day they reach their goal.

3. Good nutrition and fitness go together. Ask students about their favorite fitness activities. Have students keep records or draw pictures of the fitness activities they have done in a week.

4. For an art project, have students do a Pyramid Power picture. Ask them to write or draw something about how the power of the pyramid can make them healthier.

Activity Sheet–*Pyramid Power*

FOOD GUIDE PYRAMID



Fats, Oils & Sweets
USE SPARINGLY

Milk, Yogurt & Cheese Group
2-3 SERVINGS

Meat, Poultry, Fish, Dry Beans, Eggs & Nuts
2-3 SERVINGS

Vegatable Group
3-5 SERVINGS

Fruit Group
2-4 SERVINGS

Bread, Cereal, Rice & Pasta Group
6-11 SERVINGS

KEY
□ Fats ○ Sugars

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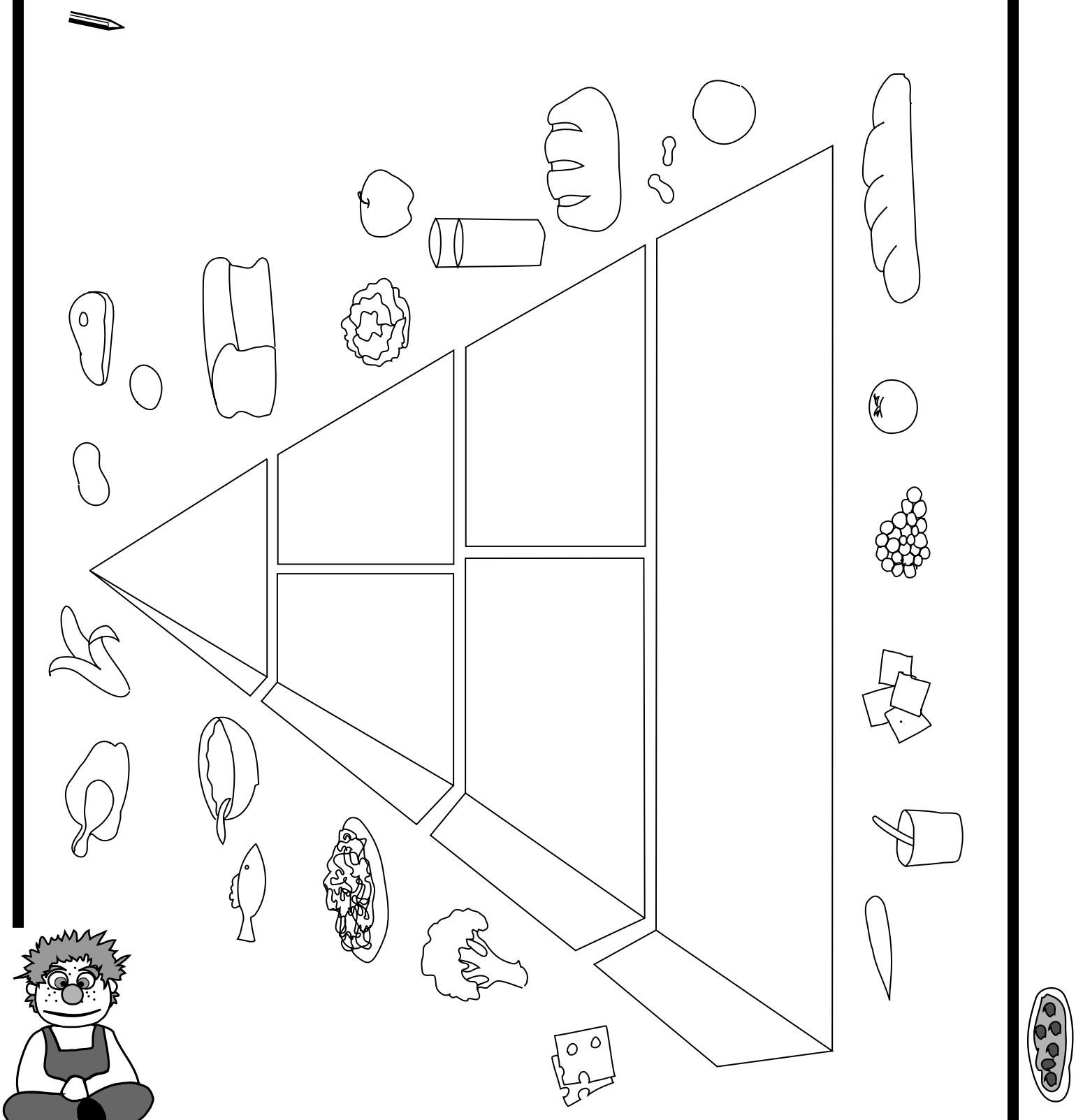
Activity Sheet –What Group Am I In?



FOOD FOR AMERICA
TEACHER'S GUIDE

The Pyramid Counts

Grade level: Upper elementary

Unit: Nutrition

Learner Outcomes

By the end of this lesson, students will be able to:

1. Recognize the Food Guide Pyramid as a guide to healthy eating.
2. List the five major food groups and be able to place familiar foods in the appropriate category.
3. Describe the appropriate number of servings they should choose from each food group.
4. Understand what a mixed food is and how to count it on the Pyramid.

Background Information

The Food Guide Pyramid was developed by the U.S. Department of Agriculture and the Department of Health and Human Services to help people understand how to choose a healthful diet. The Pyramid calls for eating a variety of foods that provide the needed nutrients, as well as the appropriate number of calories.

The Food Guide Pyramid emphasizes foods from the five food groups. Each of these food groups provides some, but not all, of the nutrients people need. Foods in one group can't replace those in another. No one food group is more important than another- for good health, people need them all. The Pyramid focuses on fat because most American diets are too high in fat- especially saturated fat.

The pyramid focuses on fat because most American diets are too high in fat -especially saturated fat.

The Pyramid helps people put into action the Dietary Guidelines for Americans. This is the most up-to-date advice from nutrition scientists and is the basis for federal nutrition policy:

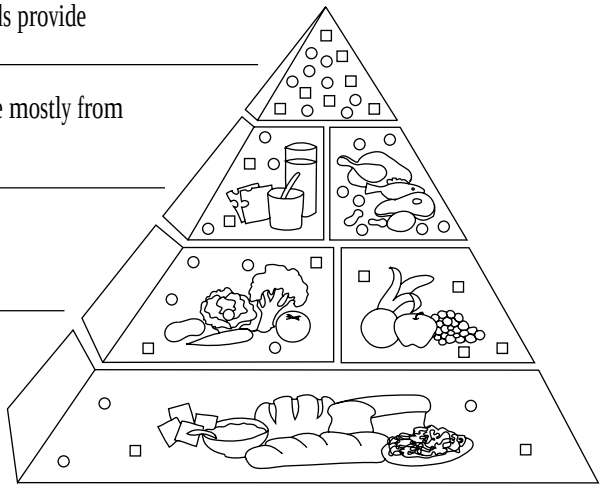
1. Eat a variety of foods to get the energy, protein, vitamins, minerals and fiber you need for good health.
2. Maintain healthy weight to reduce your chances of having high blood pressure, heart disease, a stroke, certain cancers and the most common kind of diabetes.
3. Choose a diet low in fat, saturated fat and cholesterol to reduce your risk of heart attack and certain types of cancer. Because fat contains over twice the calories of an equal amount of carbohydrates or protein, a diet low in fat can help you maintain a healthy weight.
4. Choose a diet with plenty of vegetables, fruits and grain products, which provide needed vitamins, minerals, fiber and complex carbohydrates and can help you lower your intake of fat.
5. Use sugars only in moderation. A diet with lots of sugars has too many calories and too few nutrients for most people and can contribute to tooth decay.
6. Use salt and sodium in moderation to help reduce your risk of high blood pressure.
7. If you drink alcoholic beverages, do so in moderation. Alcoholic beverages supply calories, but few nutrients. Drinking alcohol is also the cause of many health problems and accidents and can lead to addiction.

The small tip of the Pyramid show fats, oils and sweets. These are foods such as salad dressings, oils, cream, butter, margarine, sugars, soft drinks, candies and sweet desserts. These foods provide calories and little else nutritionally. Most people should use them sparingly.

On this level of the Food Guide Pyramid are two groups of foods that come mostly from animals: milk, yogurt and cheese; and meat, poultry, fish, dry beans, eggs and nuts. These foods are important for protein, calcium, iron and zinc.

This level includes foods that come from plant-vegetables and fruits. Most people need to eat more of these foods for the vitamins, minerals and fiber they supply.

At the base of the Food Guide Pyramid are breads, cereals, rice and pasta-all foods from grains. You need the most servings of these foods each day.



Teaching This Lesson

1. Hand out copies of the Activity Sheet, "The Pyramid Counts."

2. Review each of the food groups. Start at the base of the Pyramid. Tell students, "At the bottom of the Pyramid are breads, cereals, rice and pasta. These are all foods made from grains." Ask students if they have eaten any foods from this food group today.

3. Have students look at the second level of the Pyramid. Say, "This level includes foods that come from plants-vegetables and fruit. Most people need to eat more of these foods for the vitamins, minerals and fiber they supply." Tell students they should try to eat five servings a day from these food groups-three of vegetables and two of fruits. Ask students if they have eaten any foods from this food group today.

4. Have students look at the third level of the Pyramid. Say, "This level mostly includes foods from animals-milk, yogurt and cheese; and meat, poultry, fish, dry beans, eggs and nuts. One of the nutrients from these foods is *calcium*, which makes strong bones. Another is *protein*, which helps you grow." Ask students if they have eaten any foods from this food group today.

5. The small tip of the Pyramid has no pictures in it. If it did, it would be pictures of things that are mostly fats, oils and sugars. These include soft drinks, candy, butter, margarine, salad dressings, oils and sweet desserts. Say, "These foods provide calories and little else. Most people should eat fewer servings of these foods."

6. Let students know that there aren't "good" and "bad" foods. Any food can fit into a healthy diet. It's fine to eat some foods higher in sugar and fat- but not too much and not too often. Each of the food groups provides some, but not all, the nutrients they need. Foods in one group can't replace those in another. No one food group is more important than another.

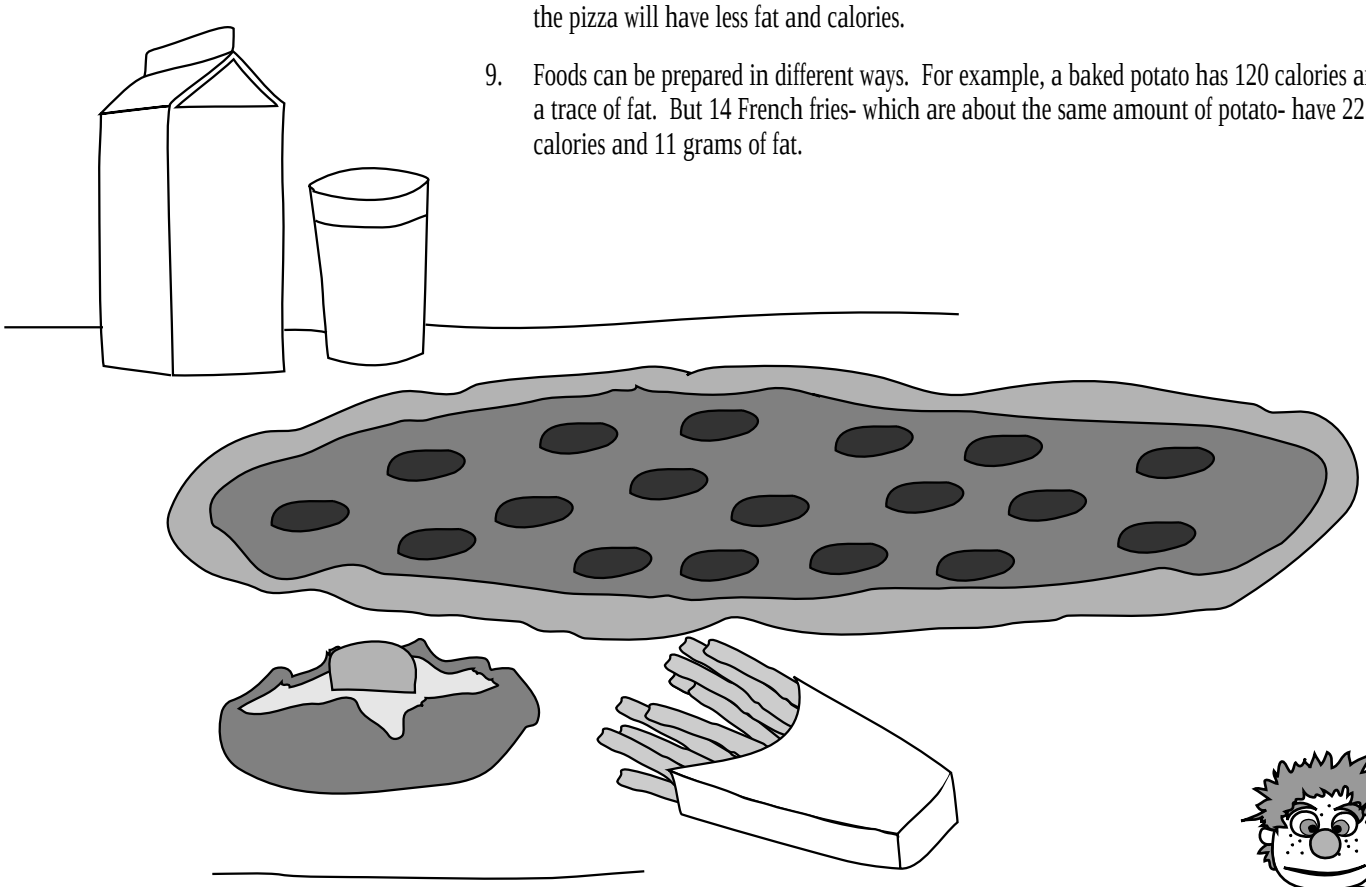
7. Hand out copies of the Activity Sheet, "How Many Servings Are Right for Me?" Explain that the Food Guide Pyramid shows a range of servings. The number of servings people should eat depends on their age, size and activity level. This worksheet, adapted from USDA's *Great Nutrition Adventure*, helps students determine the number of servings they have eaten.

8. Most students will have eaten some *mixed foods*. Help them learn how to count the foods in several food groups. For example, a slice of pizza would include the following servings:

    - *Crust*-a serving from the bread group
    - *Tomato sauce*- a serving from the vegetable group
    - *Cheese*- a serving from the dairy group

    Tell students that if they eat pizza with less cheese and use vegetable toppings instead of meat, the pizza will have less fat and calories.

9. Foods can be prepared in different ways. For example, a baked potato has 120 calories and only a trace of fat. But 14 French fries- which are about the same amount of potato- have 225 calories and 11 grams of fat.



Activity Sheet –The Pyramid Counts

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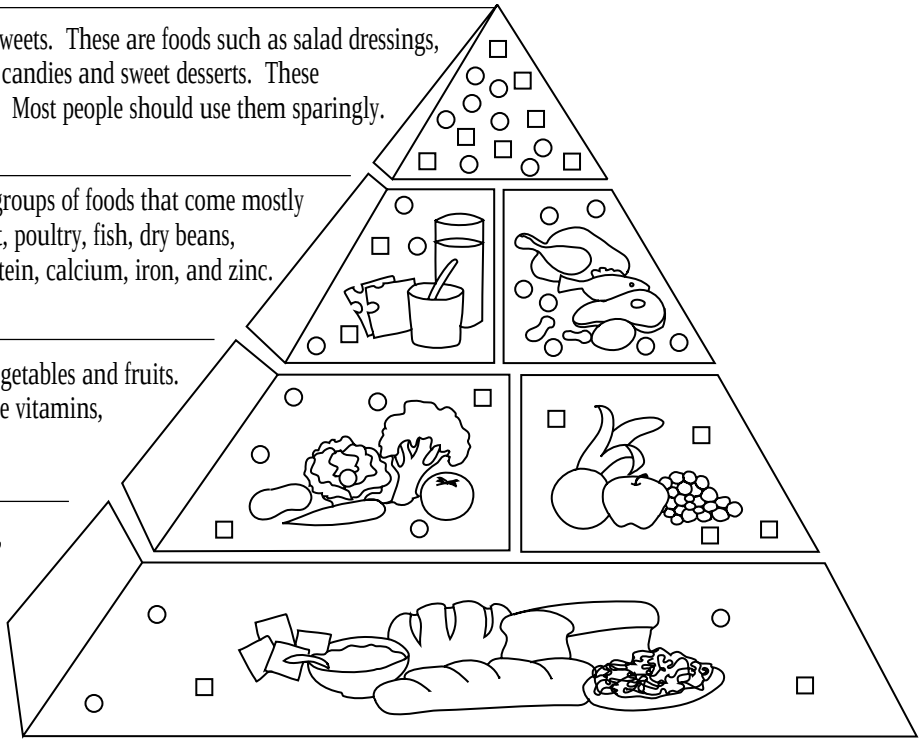
This level includes foods that come from plant-vegetables and fruits. Most people need to eat more of these foods for the vitamins, minerals and fiber they supply.

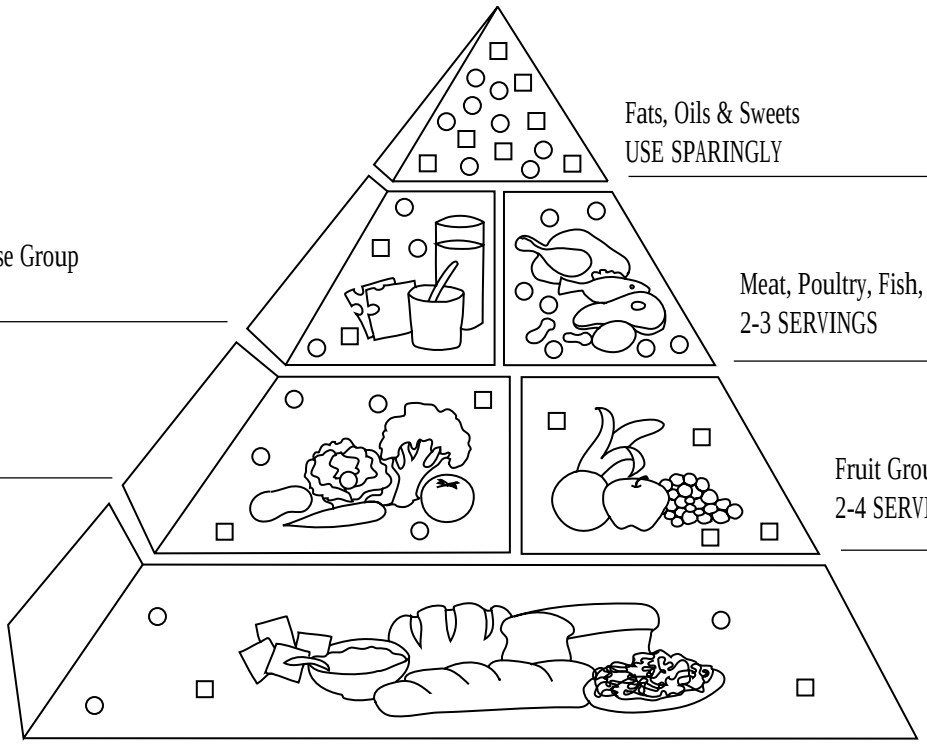
At the base of the Food Guide Pyramid are breads, cereals, rice and pasta-all foods from grains. You need the most servings of these foods each day.



KEY
□ Fats ○ Sugars

Activity Sheet—*How Many Servings Are Right For Me?*

FOOD GUIDE PYRAMID



Fats, Oils & Sweets
USE SPARINGLY

Milk, Yogurt & Cheese Group
2-3 SERVINGS

Meat, Poultry, Fish, Dry Beans, Eggs & Nuts
2-3 SERVINGS

Vegatable Group
3-5 SERVINGS

Fruit Group
2-4 SERVINGS

Bread, Cereal, Rice & Pasta Group
6-11 SERVINGS

KEY
□ Fats ○ Sugars

FOOD FOR AMERICA
TEACHER'S GUIDE

Keeping Food Safe

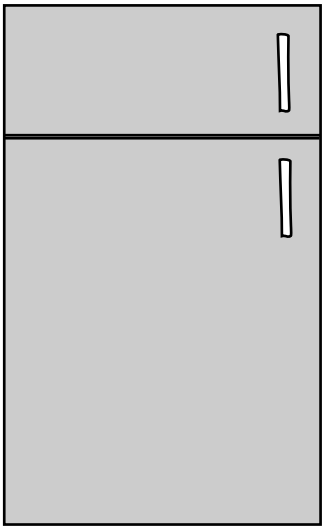
Grade level: Primary

Unit: Food safety

Learner Outcomes

By the end of this lesson, students will be able to:

1. Understand that they have a responsibility in keeping food safe to eat.
2. List three rules for handling food safely.
3. Identify bacteria as the main source of food-borne illness and understand that many bacteria cannot be seen, smelled or tasted.



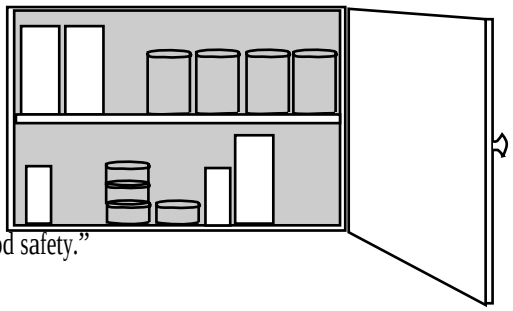
Background Information

Food poisoning, called *food-borne illness*, makes some seven million Americans sick each year. Many of them are children. Because of their small size, children are at higher risk of becoming seriously ill from food-borne illness. For example, most of the serious illnesses and deaths in the 1994 *e-coli* breakout from eating undercooked hamburgers were children.

Food-borne illness is caused by bacteria. At the right temperature, bacteria you can't see, smell or taste can multiply into the millions in a few short hours. That doesn't have to happen, though. About 85 percent of cases of food-borne illness could be avoided with proper food handling.

Young children can begin to learn how to assume responsibility for safe food handling. Here are the basic rules young children can use and understand:

- Always wash your hands before handling food.
- Cook food well. Cooking kills harmful bacteria.
- Keep food cold. Set your refrigerator at 40 degrees or colder.



Teaching This Lesson

1. Read "Keeping Food Safe" to your students. You may want to duplicate it so students can follow along.

2. Tell students that people can get sick it they don't handle food the right way. Say, "Ruff was teaching Maria some important rules about food safety."

3. Review the three rules:

    - Always wash your hands before handling food.
    - Cook food well. Cooking kills harmful bacteria.
    - Keep food cold. Set your refrigerator at 40 degrees or colder.

4. Hand out the Activity Sheet, "Safe Food Rules for Me." Have students color the pictures and take the sheet home.

Keeping Food Safe

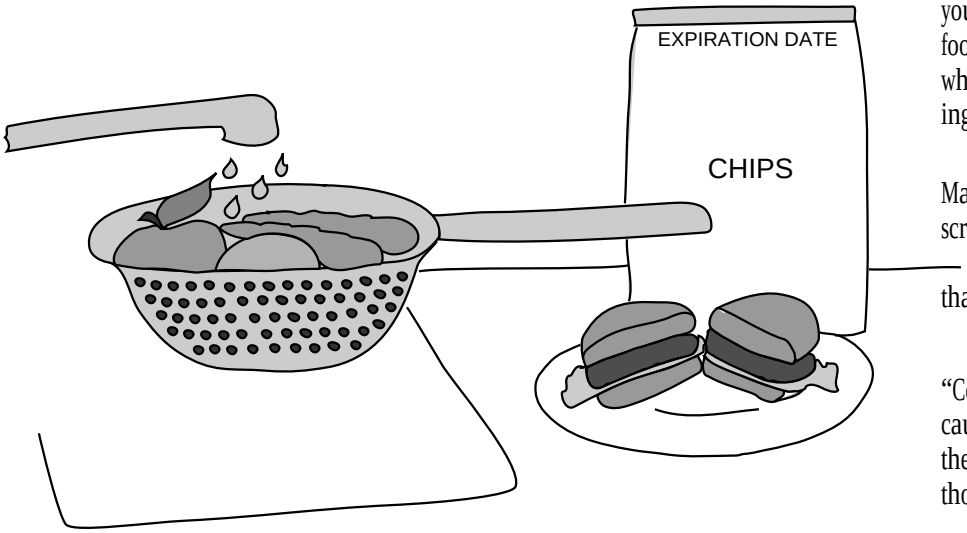
When Maria arrived home from school, she found a note on the counter. "I'll be a little late getting home," her mom had written. "Please put the chicken in the oven for dinner."

Maria went over to the refrigerator to take the chicken out. But as she reached for the door, she heard a loud voice. It was Ruff.

"Don't touch that food," Ruff said. "You haven't washed your hands."

"What's the big deal?" Maria asked. "I took a bath this morning. Anyway, look at my hands-they're perfectly clean" She held her hands out for Ruff to inspect.

"Washing once a day isn't good enough," Ruff said. "Since you took that bath, you've played outside, turned a cartwheel in the dirt and petted the dog. So there are lots of germs and dirt on your hands that you can't see. If your hands touch the food before it's cooked, those germs could spread. Your whole family might even get sick from food poisoning."



"I wouldn't want that to happen," Maria said, as she turned on the water and began to scrub. "We got food poisoning once and it was no fun. My mom said it was probably from eating meat that hadn't been cooked well enough."

"Could have been," Ruff answered. "Cooking kills most of the bacteria and germs that can cause food poisoning. It's a good idea to use a meat thermometer to check your meat to make sure it's thoroughly cooked."

"I've never seen bacteria," Maria said. "How can they make me sick?"

"You *can't* see bacteria," Ruff said. "You can't smell or taste them either. So you don't know they're there. But bacteria like *staph* and *salmonella* can make you sick."

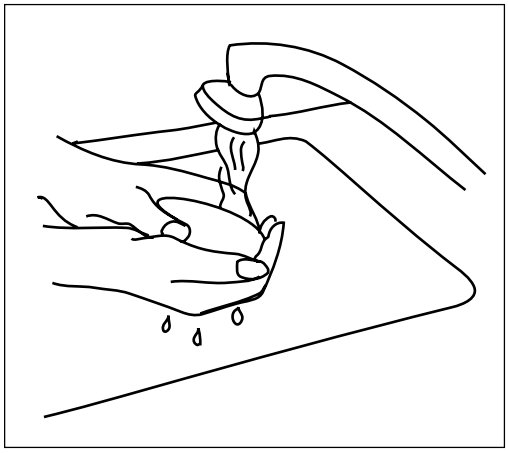
Maria turned on the oven and looked for a pan to cook the chicken. When she open the refrigerator, she had to move a bag of apples and some cans of soda before she finally saw the chicken. "This is such a bother," she said. "I don't know why my mom couldn't just leave the chicken out on the counter. I have homework to do."

"She was just being safe," Ruff said. "Cool temperatures can keep bacteria from growing."

"Boy, those bacteria must be fussy," Maria said. "They don't seem to like cold *or* hot temperatures."

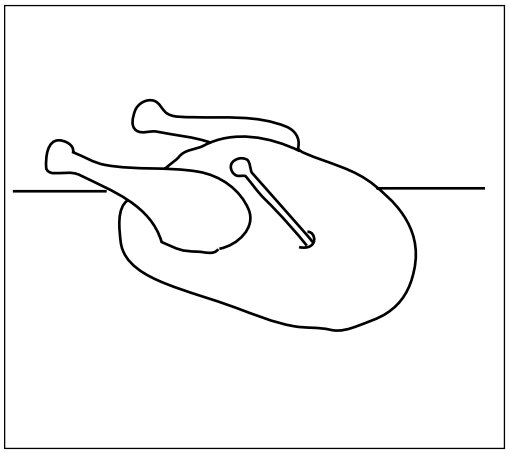
"Right again," Ruff said. "Bacteria multiply most quickly between 40 degrees and 140 degrees. So let's get that chicken in the oven. You've got math problems to do."

Clean



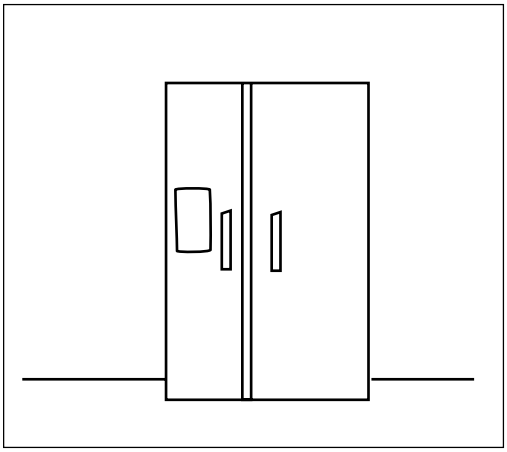
I wash my hands with soap and water before I touch food. I know germs can spread from my hands to the food.

Cook



When my family cooks meat or poultry, we make sure it's completely cooked.

Cool



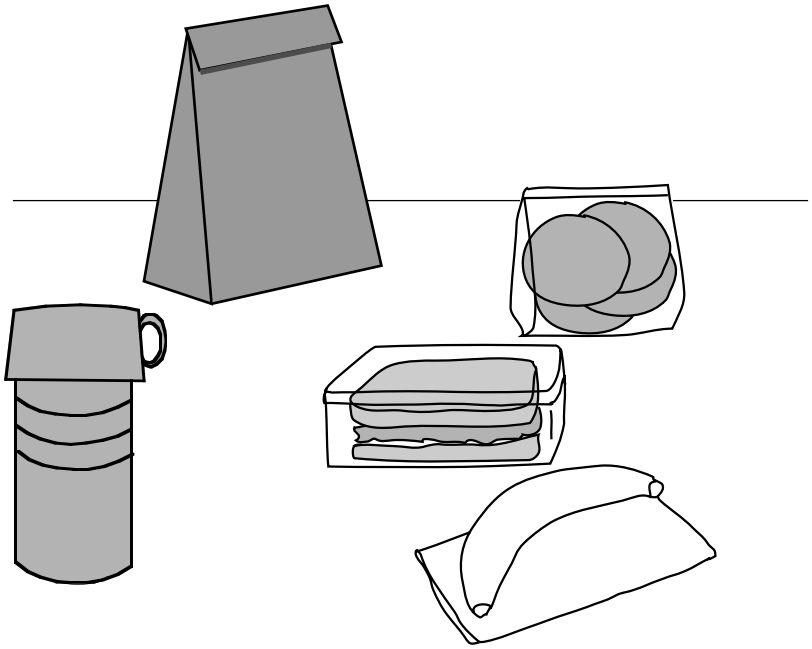
We know that cold temperatures keep bacteria from growing. We keep cold foods cold. When we buy meat or poultry at the grocery store, we buy it last and take it home fast.

Quick Lesson:
After-School Food Safety

Grade level: Primary

Unit: Food safety

1. Talk with students about the foods they prepare at home after school.
2. Hand out the Activity Sheet, "After-School Food Safety."
3. Review the rules with students. Have students take the sheet home for their parents to see.



Activity Sheet—*After-School Food Safety*

1. Place books or book bags on the floor. Don't leave them on counters or the kitchen table.
2. Throw away leftover sandwiches or other "refrigerator type" foods you bring home.
3. Wash your hands before you make or eat a snack. Hands carry lots of germs.
4. Always use clean spoon, forks and plates.
5. Wash fruits and vegetables with water before you eat them.
6. Do not eat bread, cheese or soft fruits or vegetables that look bad or have even small spots of mold.
7. Do not leave cold items, like milk, lunchmeat, hardcooked eggs or yogurt out on the counter at room temperature. Put these foods back in the refrigerator as soon as you've fixed your snack.

Controlling Pests and Disease

Grade level: Upper elementary

Unit: Food safety

Learner Outcomes

By the end of this lesson, students will be able to:

1. Define *pesticide* and *herbicide* (crop protection chemicals).
2. Define *integrated pest management* and give examples.
3. Discuss how farmers balance risks and benefits in using herbicides and pesticides.

Background Information

Since the beginning of agriculture, farmers have known they needed to enrich the soil and kill various insect pests. Since prehistoric times, wood ash and manure were used as fertilizers. Materials included arsenic, pyrethrum and other natural poisons were used to kill insects for centuries.

The dramatic increase in food grown per acre is a result of farmers' ability to control pests and diseases. But there are risks associated with the use of crop-protection chemicals, including damage to beneficial insects and wildlife.

Without pesticides, 25-30 percent of all crops and livestock would be lost and the cost of food would rise 50-70 percent. Eliminating all agricultural chemicals would mean a 40 percent decrease in the world food supply.

In the United States, crop-protection chemicals are carefully regulated. The average crop-protection chemical is researched and tested nine years before it can be marketed. The Environmental Protection Agency determines the greatest amount of residue that can be consumed safely and then sets a limit 100 to 1,000 times less than this amount. Since crop-protection chemicals are expensive and potent, farmers don't use any more than necessary.

Many farmers today apply *integrated pest management*, which is a combination of techniques. It can include the use of natural predators. For example, scientists have learned that a species of harmless ladybug will eat aphids that destroy potato crops and can also make changes in field conditions. Farmers also use biological controls to prevent insects from reproducing. Scientists are always at work developing pest-resistant crop varieties. For example, rotating the crops can reduce or prevent a long-term buildup of certain pests.

Farmers who use integrated pest management closely monitor pest levels in their fields. They use chemical pesticides only when necessary. In this way, they can reduce the potential for harmful effects of pesticides.

Teaching This Lesson

1. Say, "Growing food is not easy. Sometimes, the rain doesn't come and t the plants die. Sometimes, too much rain comes and the seeds wash away. Hail can destroy a crop. So can drought." Ask students if they remember stories from books (for example, the *Little House* books) or stories from their own families about crops that were destroyed by insects or other natural disasters.

2. Say, "Some of the biggest threats to crops are insects, plant diseases and weeds. Farmers have been fighting them forever. Since the beginning of agriculture, farmers have known they needed to enrich the soil and kill various insect pests. Even in prehistoric times, wood ash and manure were used as fertilizers. Materials included arsenic, pyrethrum and other natural poisons were used to kill insects for centuries." Ask students if their family has a garden. Have insects ever eaten what they were growing in the garden? Have weeds ever choked out a crop they had planted and hoped to eat?

3. Say, "In the 1950s, scientists developed chemicals to fight these problems. *Herbicides* were invented to control weeds. *Pesticides* control bugs that eat crops. The use of these chemicals, along with fertilizers, dramatically increased the amount of food produced by farmers. It dramatically decreased the amount of crops lost to disease and pests." (You many want to review the information presented in "Agriculture By the Numbers.")

4. Say, "Scientists and farmers soon realized that there could be problems with using too many crop-protection chemicals. Sometimes, these chemicals can run off the fields into streams and lakes. Now, farmers balance the risks and benefits of using crop-protection chemicals."

5. Explain integrated pest management. Say, "Scientist have now developed many new ways of controlling pests and disease. This is called *integrated pest management*. IPM, as it is called, is a combination of techniques. It can include the use of natural predators. For example, scientists have learned that a species of harmless ladybugs will eat aphids that destroy potato crops. Farmers also use biological controls, preventing insects from reproducing. Scientists are always at work developing pest-resistant crop varieties. Farmers can also make changes in field conditions. For example, rotating the crops can reduce or prevent a long-term buildup of certain pests.

   "Farmers who use integrated pest management closely monitor pest levels in their fields. They use chemical pesticides only when necessary. In this way, they can reduce the potential for harmful effects of crop-protection chemicals."

   "Today, some farmers are farming completely organically. They are not using chemicals, and their fertilizers consist only of materials that come from animals (manure) and vegetables (compost)."

6. Hand out the Activity Sheet, "Risks vs. Benefits." Ask students to define risks and benefits. Explain that every action we take has both risks and benefits. Have the students complete the Activity Sheet to decide if each statement is a risk or a benefit.

Answer key:			
1. benefit	3. benefit	5. benefit	7. benefit
2. risk	4. benefit	6. risk	8. benefit

Discuss the overall risks and benefits of agricultural chemical use. Discuss the overall risks and benefits of other actions (riding in a car, riding in a car without a safety belt, skateboarding, smoking, eating a diet that is high in fat.)

The use of agricultural crop-protection chemicals has both risks and benefits. Determine whether each statement represents a risk or a benefit. Write your answer on the line.

_____ 1. More food can be produced using agricultural crop-protection chemicals.

_____ 2. Farmers may become ill if they apply agricultural chemicals improperly.

_____ 3. Agricultural chemicals destroy disease-carrying insects.

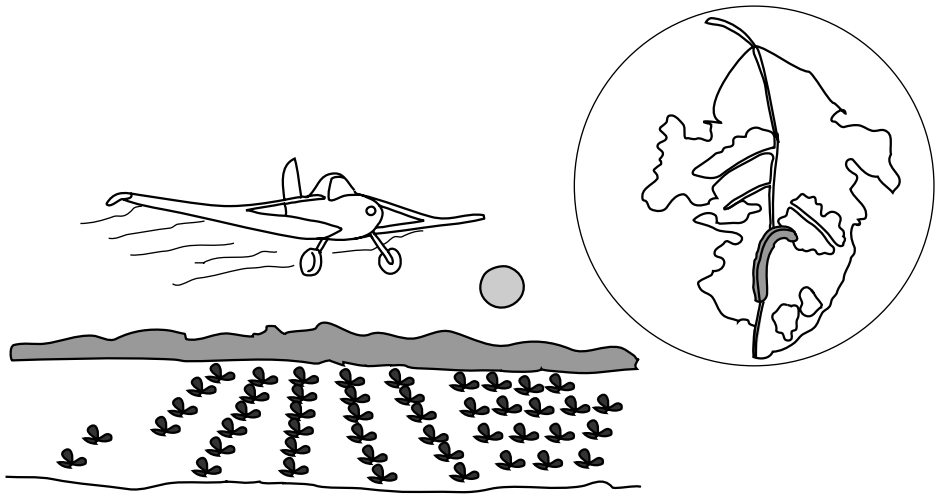
_____ 4. Federal, state and local governments strictly regulate the use of crop-protection chemicals.

_____ 5. Excessive use of agricultural chemicals may cause runoff into rivers, ponds and lakes, harming fish and other wildlife.

_____ 6. If the wind blows agricultural chemicals onto other kinds of plants, those plants may be harmed.

_____ 7. Crop-protection chemicals might lower crop-production costs for farmers.

_____ 8. Crop-protection chemicals help the United States have the most abundant supply of safe food in the world.



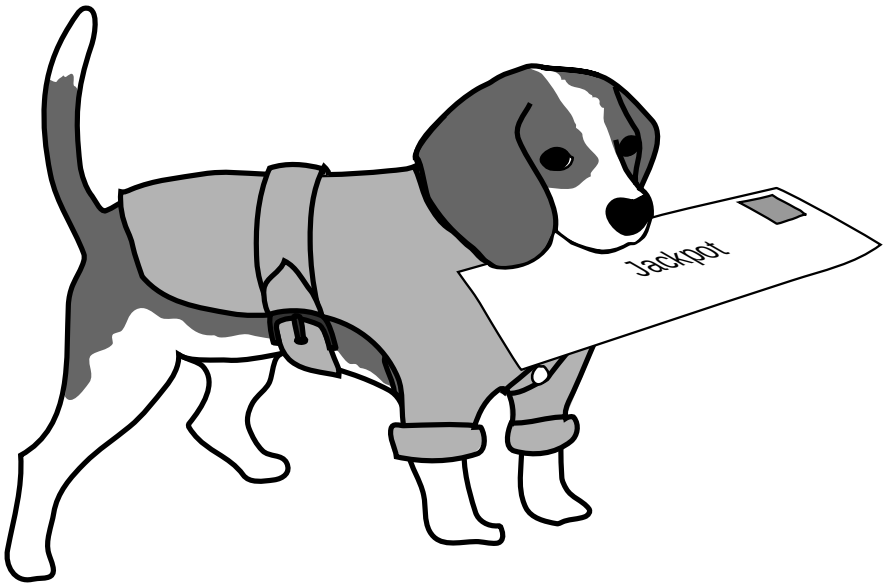
Quick Lesson:
The Beagle Brigade-
Protecting American Agriculture

Grade level: Primary or upper elementary

Unit: Food safety

Have students read the story about Jackpot, the beagle.

After reading the story, have the class write a letter to Jackpot.



The Beagle Brigade–
Protecting American Agriculture

Hi! My name is Jackpot and I'm a beagle. Not just any beagle, though. I'm a very important beagle. I work for the United States Department of Agriculture and help them keep our food supply safe.

Did you know it's illegal to bring in fresh fruits, fresh meats and sausages from other countries? They may bring in plant and animal diseases and bugs that could destroy American agriculture. A few years ago, that's how the Mediterranean fruit fly came into this country and almost destroyed California's orange trees.

We also don't allow people to bring in sausages and other meat products, which can carry animal diseases that could make our cattle and hogs very sick. They chose us beagles for this job because we're known for our nose. I'm not the only dog who works in agriculture. Other dogs are used to herd sheep, and many farmers have dogs to protect the farm.

When I'm at work, I wear my uniform–a green jacket that says "Protecting American Agriculture" on one side and "Agriculture's Beagle Brigade" on the other. I walk around the international passengers' area, delicately sniffing luggage and sometimes even people who've been known to hide prohibited products in their clothing.

When I sniff something suspicious in a suitcase, I sit down next to it. Then my handler opens the suitcase and takes a look. I'm almost always right. I made 1,600 seizures last year at Dulles Airport in Washington, D.C.

There are 41 of us beagles working at international airports all over the United States. If you ever fly to another country, you may see us when you come back. If you want to learn more about the Beagle Brigade, write to:

Jackpot c/o Beth Hulse
USDA-APHID-LPA
4700 River Rd., Unit 51
Riverdale, MD 20737

Dear Jackpot,

Where in the World?

Grade level: Primary

Unit: Trade and marketing

Learner Outcomes

By the end of this lesson, students will be able to:

1. List some foods that the United States exports and some that the United States imports.
2. Describe different foods that are eaten around the world.
3. Learn more about their own ethnic food heritage.

Background Information

The food we eat comes from all over the world. American farmers grow much of the food that feeds the world. About one-third of our grain crop is exported. The United States is the largest exporter of agricultural commodities in the world. In 1993, these exports had a value of $42.5 billion. Our best customers are Japan, the European Union, Canada and Mexico.

The United States is the largest exporter of agricultural commodities in the world.

The United States also sells processed and packaged foods to other countries. For example, frozen vegetables and boxed cereals are found on supermarket shelves around the world. These are called *value-added products*, and the sale of these products has increased over the years. In fact, consumer foods are the fastest-growing segment of United States agricultural products sold abroad.

Some foods Americans eat are grown in other countries. They include products that cannot be produced here—for example, certain spices, coffee, tea, cocoa and bananas. Seasonal items such as fresh fruits and vegetables from the Southern Hemisphere are imported during the United States off-season. Finally, agricultural products such as sugar are purchased in their raw form for processing and packaging in the United States.

Teaching This Lesson

1. Ask students to tell you what they ate for breakfast. Answers might include cereal with milk and sugar, orange juice, hot chocolate or bananas. Say, "Most of these foods were grown by farmers in the United States. But two of them came from other countries. Can you guess which ones they are?"

2. The answers are cocoa and bananas. Say to students, "The plant that the cocoa bean comes from grows in South America. Bananas also come from warm climates. Many come from the islands in the Caribbean." Modern methods make it possible to ship food from one part of the world to another. By selling food to other

countries, we help feed hungry people. We also provide more nutritious food. Selling food abroad also brings in food for America.

3. Hand out the Activity Sheet, "Favorite Foods From Other Countries." It shows some of the foods that grow in different parts of the world. Ask students if they have ever eaten any of these foods. Ask them to write their favorite food from somewhere in the world on the Activity Sheet.

Additional Activity for Follow-up

1. Read *How to Make an Apple Pie and See the World*, by Marjorie Priceman (New York: Alfred A. Knopf, 1994). Students will enjoy this humorous look at food from all over the world.
2. Tell students that many of the favorite foods they enjoy have come from other countries. That's because the people in the United States have come from other countries. Ask students to list as many examples as possible of foreign foods and the countries they came from. Write them on the board.
3. Encourage students to talk about foods from their own ethnic heritage. Perhaps parents would be willing to prepare some traditional foods and share them with children.
4. Put together a class cookbook of favorite family recipes from around the world.

Activity Sheet—*Favorite Foods From Other Countries*

No matter where you live, you have to eat. Depending on where you live in the world, you might eat very different things. Here's what children around the world eat for breakfast.

England

If you ate breakfast in England, you'd probably be served hot cereal. There would be toast and a cup of tea with milk or lemon.

Japan and China

Japanese and Chinese children eat rice three times a day. They may even eat soup for breakfast!

France

French youth eat fresh bread from the bakery with bread and jam. Sometimes they have cheese for breakfast.

Peru

Potatoes are the major crop in this country. They are eaten at breakfast as well as at other meals.

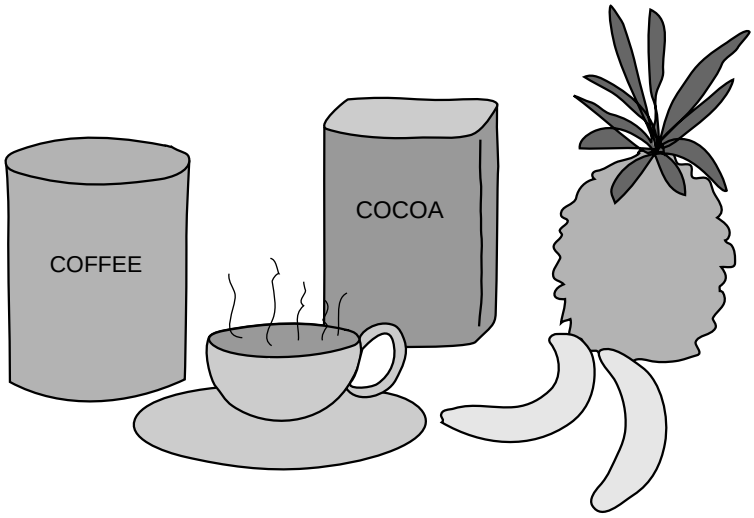
What are your favorite breakfast foods? Write them here.

_____ _____

_____ _____

_____ _____

Put a check mark beside any of these foods that might have come from other countries.



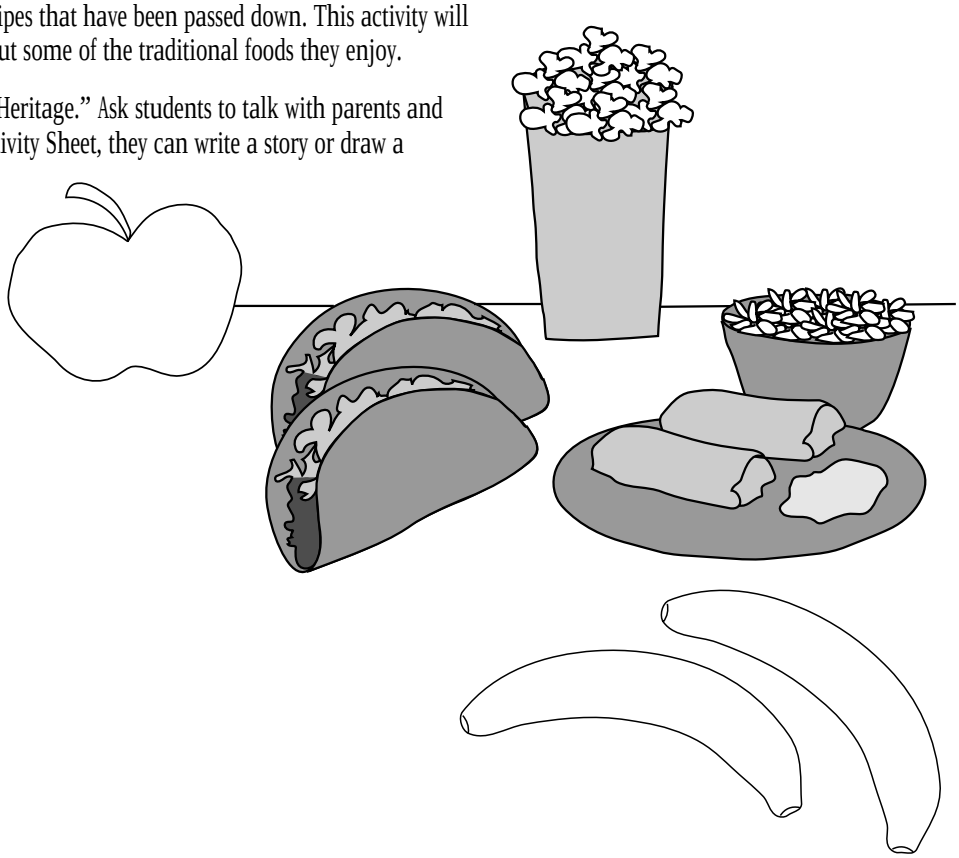
Quick Lesson:
My Food Heritage

Grade level: Primary

Unit: Trade and marketing

Every family has favorite foods and recipes that have been passed down. This activity will encourage students to talk with their parents about some of the traditional foods they enjoy.

Hand out the Activity Sheet, "My Food Heritage." Ask students to talk with parents and family members about a favorite food. On the Activity Sheet, they can write a story or draw a picture of it.



Activity Sheet—*My Food Heritage*

What foods does your family enjoy? Are any of them foods that reflect your ethnic heritage? Talk with older family members about the foods your family loves. Then write a short story or draw a picture of one of them.

The Trade Game

Grade level: Upper elementary

Unit: Trade and marketing

Learner Outcomes

By the end of this lesson, students will be able to:

1. Describe why some U.S. agricultural products are exported to other countries and why the United States imports other products.
2. Define the concept of supply and demand.

Background Information

Trade and marketing are vital to American agriculture.

Trade and marketing are vital to American agriculture. American farmers grow much of the food that feeds the world. About one-third of our grain crop is exported. The United States is the largest exporter of agricultural commodities in the world. In 1993, these exports had a value of $42.5 billion. Our best customers are Japan, the European Union, Canada and Mexico.

The United States also sells processed and packaged foods to other countries. For example, frozen vegetables and boxed cereals are found on supermarket shelves around the world. These are called *value-added products,* and the sale of these products has increased over the years. In fact, consumer foods are the fastest-growing segment of U.S. agricultural products sold abroad.

Some foods Americans eat are grown in other countries. They include products that cannot be produced here–for example, certain spices, coffee, tea, cocoa and bananas. Seasonal items such as fresh fruits and vegetables from the Southern Hemisphere are imported during the United States off-season. Finally, agricultural products such as sugar are purchased in their raw form for processing and packaging in the United States.

Teaching This Lesson

1. Assemble your materials. You will need:

- 4 large manila envelopes
- 4 task sheets, 1 for each of the 4 groups (see the next page)
- 3 pairs of scissors
- 20 paper clips
- 1 ruler
- 1 bottle of glue
- 2 felt pens
- 2 pencils
- 2 packages of colored paper–8" x 11"

2 sheets red	5 sheets gold
5 sheets white	3 sheets green
3 sheets blue	1 sheet purple

Cut one sheet of the red paper and one sheet of the white into two squares, each 4" x 4".

Additional Activities for Follow-up

1. Sponsor a world trade conference. Divide the class into teams of three to five students each. Assign each team to represent a country. Students should study their country to learn what products they have available to export. In a trade conference, encourage each team to export their excess products and import what they need.
2. Have students design labels for U.S. food products that would encourage foreign buyers to purchase them. Of course, these labels can be written in English, though a U.S. company must know about a country's language and customs to export its products.Compare the students' labels to ads they have seen for foreign products.

2. Fill the four manila envelopes as follows:

Envelope #1

2 pairs scissors
20 paper clips
two 4" squares of red paper
two 4" squares of white paper
1 task sheet
1 ruler
2 pencils

Envelope #2

1 pair scissors
2 sheets of paper in each of these colors: blue, white and gold
1 task sheet
1 bottle of glue

Envelope #3

2 felt pens
2 sheets of paper in each of these colors: green, white and gold
1 task sheet

Envelope #4

1 sheet of paper in each of these colors: green, gold, blue, red and purple
1 task sheet

Task sheet

1. Make 4 strips of gold paper, each 3" x 1".
2. Make a green "T" 4 inches high.
3. Make a 4" link paper chain, with each link a different color.
4. Make a white square 2" to a side and attach a gold triangle to one side of the square.

3. Divide the class into four groups, representing four different communities. Each group should give itself a name. List communities on the board. Have each community select a leader.

4. Give each leader an envelope. Say, "This contains all the natural resources your community has to meet the needs of its citizens." Do not allow the students to open the envelope until you tell them to do so.

5. Tell students, "You must complete all the activities on the task sheet, even though the resources you need won't be in the envelope. You must trade with other communities in whatever way is necessary to complete the task sheet. The first community to complete the task sheet is the winner."

6. Give the signal to begin. Watch the groups as they complete their tasks. Make a few notes of the comments students make as they try to be productive. Write the order that the groups finish on the board.

7. Discuss the activity. Questions should include:

   Could you have completed your tasks without trading resources with another community? Why or why not?

   How did your community solve the problem of not having all the resources it needed to satisfy the needs of its residents?

   Were there conflicts between communities? Why or why not?

Farmers Love the Land

Grade level: Primary

Unit: Environment

Learner Outcomes

At the end of this lesson, students will be able to:

1. Describe how water, soil and air are necessary for life.
2. Describe what soil, air, water and sunlight do.
3. Define natural resources.

Background Information

Farmers use natural resources to produce our food and fiber. Soil is needed to grow crops or grass for livestock to eat. Clean water and air are required for both plants and livestock.

Agriculture is a sustainable industry. This means farmers do things to maintain or prolong natural resources. These include management practices such as strip cropping, terracing, organic farming and crop rotation.

Because it takes 100 years for nature to replace one inch of topsoil lost to erosion, farmers must act as stewards of the land. By protecting the soil now, farmers can continue making a living off the land and enable future generations to reap an adequate harvest.

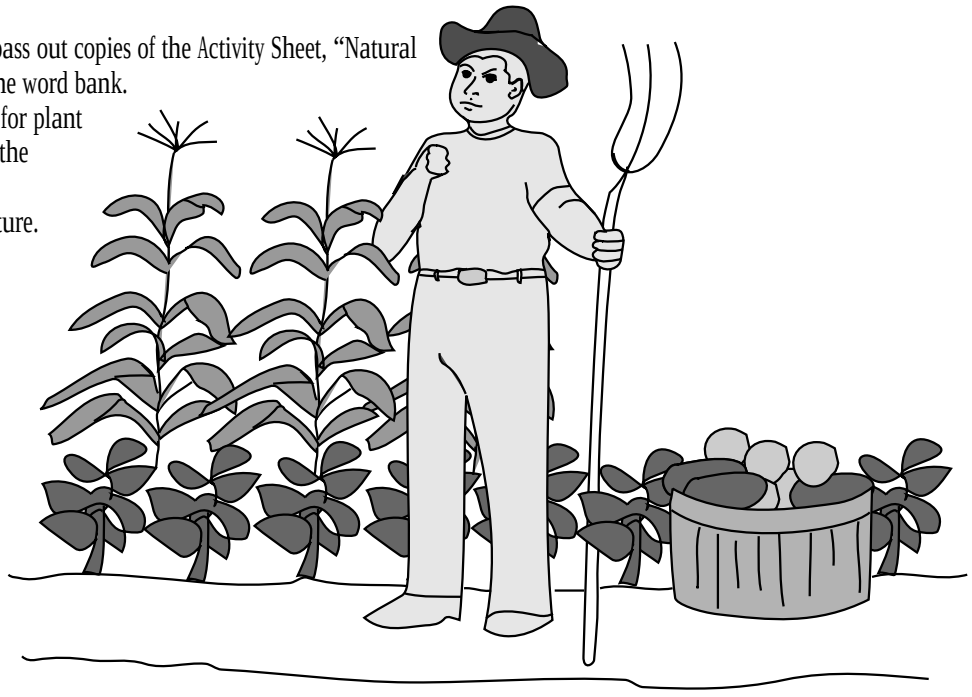
Teaching This Lesson

1. Read "Farmers Love the Land," to students. You may want to reproduce copies of the story so students can follow along.

2. Review the key points of the story with students:
   - Soil, water and air are natural resources–they come from nature and cannot be manufactured.
   - Farmers take care of natural resources.

3. To review the importance of soil, water and air, pass out copies of the Activity Sheet, "Natural Resources for Plants." First, tell students to use the word bank. Write in each of the natural resources necessary for plant growth. Ask students to draw a line from each of the fact boxes to the natural resource they describe.

   Then, have students color the picture.



Farmers Love the Land

Maria had just come from soccer practice. As she was putting her water bottle on the shelf, she noticed that Ruff had returned. This time, he was carrying a large pail of soil, a jug of water and a balloon.

"What's this stuff doing here? Get this mess out of here before my mom sees it," Maria said.

"Don't call it *stuff*. These are *natural resources*," Ruff said. "You should show them some respect. After all, you wouldn't be alive without them."

"Well, I'm sure glad I had water at my soccer practice. I got really thirsty."

"That's not surprising," Ruff said. "Your body is more than half water. Water is the most important food of all–you could live for only a few days without it. But you're not the only one who needs water," Ruff continued. "Look outside. It hasn't rained in three weeks. The grass is brown."

"I guess I never gave it much thought. But plants need water to live, too," Maria said.

Ruff nodded. "Water helps plants move the food they need from their roots to their stems and leaves. Without water, there wouldn't be any agriculture–and there wouldn't be any food." Then he added, "I bet there's another thing you don't know about water. It's the oldest thing in this room."

"Older than my great-grandmother's locket?"

"Only a couple million years. In fact, the water you used to take your shower this morning has the same molecules that were in the water the dinosaurs drank. Water is constantly being recycled–and we'll never have any more. So we need to make sure the water we have stays clean."

Then Maria said, "Well, if we're trying to keep things clean around here, what's that pile of dirt doing in the middle of the floor? If my mom sees that, she'll be really upset."

"Your mom may call it *dirt* when it's tracked on her clean floor or it's all over your hands," Ruff said, "but you should really call it *soil*. And believe it or not, you couldn't last long without it, either. Soil holds plants in place in the ground. It holds water in the ground so plant roots can drink. It also holds minerals that plants need for food and growth. Without soil, nothing could grow. And that means no tomatoes for your salad, no wheat for your bread and no oranges for your orange juice," Ruff said.

"But your mom is right about one thing–it's important to keep soil in its place. Otherwise, when it rains, soil gets washed into rivers and lakes. It can clog drains and lead to flooding. It can even slide down the side of a mountain in a landslide. Farmers take care of their soil."

Maria said, "Then why does that farm outside of town have fields that are filled with brown corn stalks? It sure looks ugly."

"That's what's left of last year's corn crop," Ruff said. " The farmer leaves the stalks there all winter so the soil won't blow away in the wind or wash away in a storm. In the spring, a special machine allows him to plant the new corn seeds right through the old stalks. That's called *no-till* farming. All over the country, farmers are doing things like this–and it's really worked. There's much less soil erosion today."

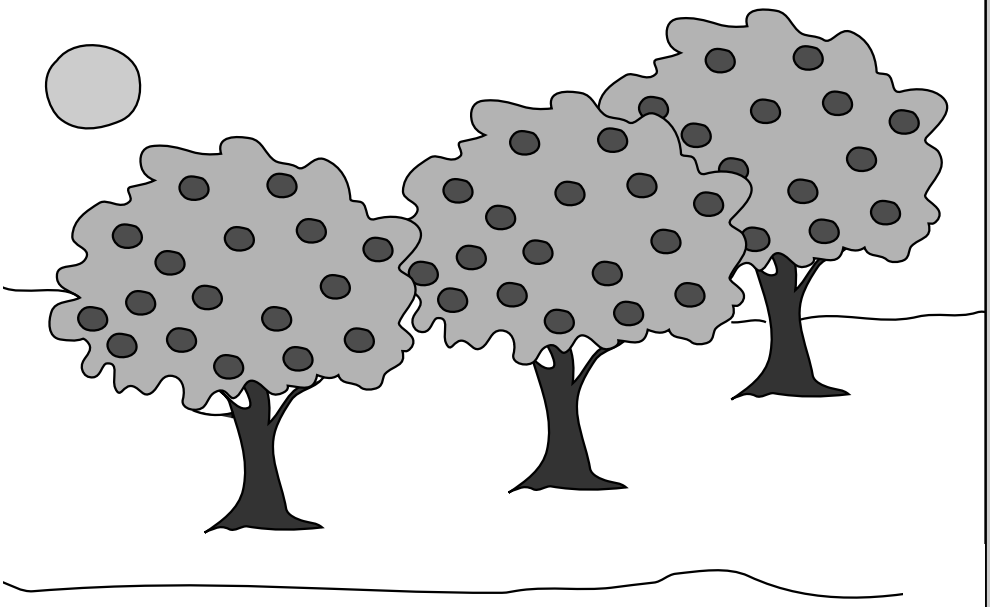
"Okay," Maria said. "I understand about the water and the dir–er, soil. But what's with the balloon?"

"It's not the balloon. It's what's inside it–air."

"I know why air is important. If I couldn't breathe, I couldn't live for five minutes."

"Right," Ruff said. "So you should thank a plant every time you take a breath. You know, air isn't easy to keep clean because it travels so quickly. Polluted air can blow a long way. Luckily, green plants help clean the air. They soak up carbon dioxide and release oxygen. That's called *photosynthesis*. Sunlight makes it all happen," Ruff said.

"Gee," Maria said. "I never knew that water, soil and air were so important. Come to think of it, there's a place where our back yard is eroding. Maybe tomorrow, you can help me go out there and plant a tree."



Additional Activity for Follow-up

1. Make a dirt cake. You'll need
   - A 20-oz. package Oreo cookies
   - 8-oz. package low-fat cream cheese
   - 1/2 stick low fat margarine
   - 1 c. powdered sugar
   - 2 pkg. instant vanilla pudding (six-serving package)
   - 3-1/2 c. milk
   - 12-oz. container frozen whipped topping
   - Large bowl
   - Measuring cups
   - Food processor (or small zipper-closed plastic bags for each student)
   - Large mixing spoons
   - Sand pail and shovel

   1. Crush the cookies in the food processor.
   2. Cream the cheese, margarine and sugar.
   3. Mix the pudding using the 3-1/2 c. milk.
   4. Fold together the cream cheese mix, pudding and whipped topping.
   5. Layer into a plastic flower pot: cookies, pudding mix, cookies, pudding mix. End with the cookies on top. Use a CLEAN plastic pot only. Ceramic pots contain lead!
   6. Lay some gummy worms across the dirt. Or, insert a silk or plastic flower for decoration.
   7. Serve with a plastic sand pail shovel.

   Or, have students crush two or three cookies in a plastic bag. Layer into single serving cups (clear cups will show the layering).

("Great Pumpkins," New York State Agriculture in the Classroom Program)

Use the words from the word bank to label the natural resources necessary for plant growth. Draw a line from the fact box to the natural resource it describes.

Fact Box

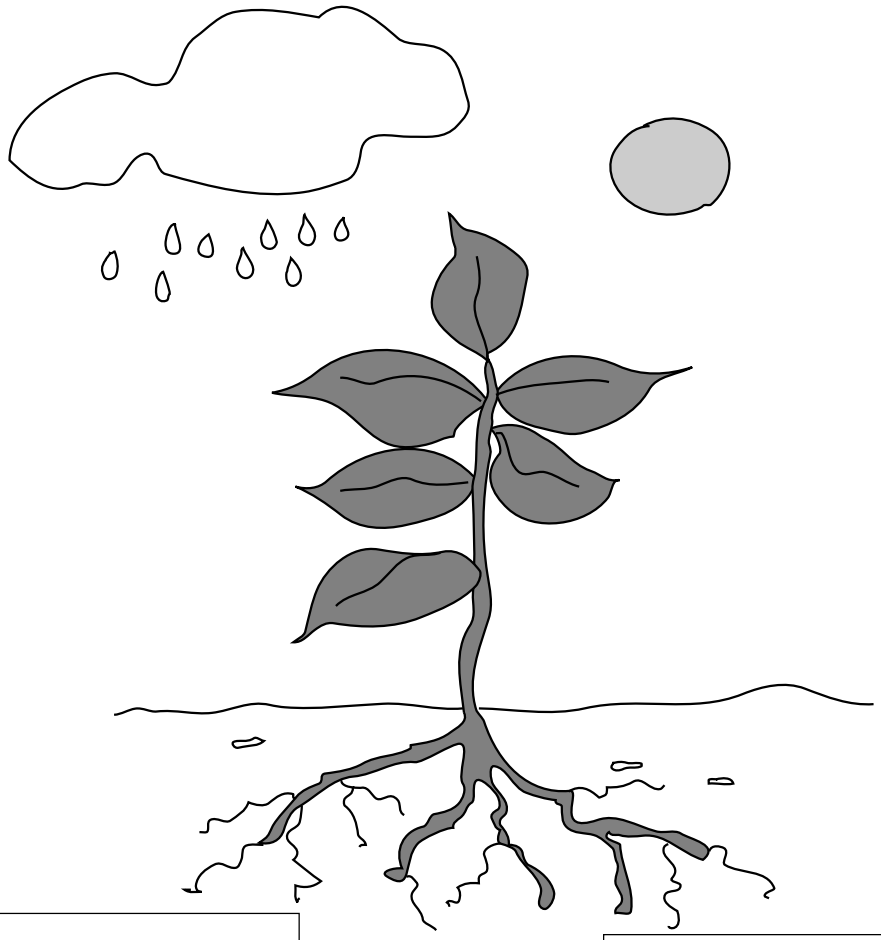
Moves the plant's food from the roots to the stem

Without it, plants turn brown and die

Fact Box

Cleaned for us by plants

Gives plants the carbon dioxide they need to live



Fact Box

Keeps water and minerals near the plant's roots

Holds the plants in place in the ground

Fact Box

Shines on the leaves to make food for the plant

Word Bank

air	sunlight
soil	water

Compost It!

Grade level: Primary

Unit: Environment

Learner Outcomes

By the end of this lesson, students will be able to:

1. Define composting and demonstrate how to do it.
2. Define recycling.

Background Information

An important part of the life cycle is decomposition–breaking down dead plants and animal tissues and returning the nutrients to the soil. If dead plants and animals did not decompose, they would pile up. Decayed plant and animal matter is called *humus* or *compost*. Humus is rich in minerals and organic matter. It is returned to the soil and is important to a plant's roots.

Teaching This Lesson

1. To teach this lesson, you'll need:

    - A variety of organic matter–from leaves and twigs to food scraps
    - A waterproof container–an old milk carton will work
    - Soil
    - Water
    - A large spoon

2. Review what students already know about soil. Say, "In the last lesson, we talked about how important soil is. Today, we're going to learn how soil is made."

3. Take a Soil Stroll. Walk through your school yard or neighborhood. Collect leaves, grass, weeds, twigs and dead insects.

4. Have students save food scraps from lunch–banana peels, orange peels, lettuce leaves. Don't use dairy products or meat.

5. Lay the waterproof container on its side. Cut a flap into it. Make sure you can reach in with a spoon. Add the organic matter students collected outside. Cut the food scraps into small pieces–the smaller, the better. Spread the food mix in the milk carton. Cover it with a layer of soil.

6. Stir the mixture inside the carton every day. Add layer upon layer. If the mixture is too dry, add a little water. Fill the milk carton to within an inch of the top. Now let the bacteria and mold do their work.

7. In three to four weeks, you should have brown soil to add to the garden.

Soil Conservation

Grade level: Upper elementary

Unit: Environment

Learner Outcomes

By the end of this lesson, students will be able to:

1. Explain how farmers practice conservation of natural resources.
2. Recognize the importance of conserving soil.

It takes 100 years for nature to replace one inch of topsoil lost to erosion.

Background Information

Farmers use natural resources to produce our food and fiber. Soil is needed to grow crops or grass for livestock to eat. Clean water and air are required for both plants and livestock.

Agriculture is a sustainable industry. This means farmers do things to maintain or prolong natural resources. These include management practices such as strip cropping, terracing, organic farming and crop rotation.

Because it takes 100 years for nature to replace one inch of topsoil lost to erosion, farmers must act as stewards of the land. By protecting the soil now, farmers can continue making a living off the land and enable future generations to reap an adequate harvest.

Teaching This Lesson

1. Assemble your materials. You will need:

    - Soil
    - An apple and a paring knife
    - Plastic trays (or shoe boxes) 5" deep
    - Plastic sheeting to line trays
    - Beakers and sprinkling cans (1 for each tray)
    - Trowel
    - Stop watch
    - Sod
    - Water

2. Scoop some soil out onto a table where students can see it. Say, "Your mom might call this dirt, but its real name is soil. And without it, you couldn't live." Review briefly the importance of soil. It holds plants in the ground and holds water so the roots can absorb it. Soil also holds minerals and organic material.

3. Say, "Very little of the earth's surface can actually be used for food production." Use an apple to demonstrate:

    - Using the paring knife, cut the apple into four equal parts. Three of the parts represent the area of the earth covered by water. The fourth represents the earth's land mass. Ask students to convert 3/4 to a percentage. (Answer: 75%)

- Cut the "land section" of the apple in half lengthwise, creating two 1/8 pieces. One of these pieces represents land such as desert, swamp, Antarctic, Arctic and mountain areas that are not suitable for people to live in. Ask students to calculate the percentage of the earth's surface that is land not suitable for people. (Answer: 12.5 %)

- Take the other 1/8 section. It represents the area where people can live. Slice it lengthwise into four equal parts. Three of these sections represent the areas of the earth that are too rocky, too wet or too hot for the production of food or are occupied by cities, factories and highways. People can live in these areas but cannot grow food. Have students calculate the percentage of the earth's surface that is habitable but not suitable for food production. (Answer: 9.375 %) What percentage of the earth's surface is land used for food production? (Answer: 3.125%)

- Now carefully peel this last 1/32 section. This peeling represents the amount of soil used for the production of food that feeds the world.

4. Ask students why the soil must be conserved. What would happen if it suddenly disappeared?

5. Say, "It takes nature 100 years to replace one inch of topsoil lost to erosion by soil or water. That's why farmers act as 'Earth Keepers.' They protect the soil today so it can grow food today and in the future. They use many different conservation methods to prevent the soil from *erosion*—being carried away by wind or water."

6. Hand out the Activity Sheet, "Soil Conservation Practices." Discuss each of the methods farmers use to conserve soil.

   Contour planting—Planting crops around the curve of a hill rather than up and down the hill.

   Terraces—Making wide ridges that go around a hill to prevent water from rushing down the hill too fast.

   Grassed waterways—Planting grass and not plowing low areas in a field where water usually runs down the hill.

   Forest and grass areas—Keeping steep hillsides in trees or grass rather than clearing for cropland.

   Windbreak—Rows of trees planted to slow down the wind and prevent soil loss from blowing wind.

7. Have students look at the graph on this activity sheet. What has happened to cropland erosion because of these practices by farmers? (It has declined.)

8. Have students conduct this experiment to see which soil conservation methods work best to prevent soil erosion:

   - Cut a "V" in one end of each tray. Line the trays with plastic. Leave about 2" of extra plastic at the notch.

   - Fill each tray with a different type of soil. These might include: moist, bare soil packed firmly; sod (representing a cover crop); moist, bare soil packed firmly with furrows running across the width of the tray (to represent contouring); moist, bare soil packed firmly with furrows running the length of the tray (to represent plowing up and down a hill); moist soil packed firmly with steps formed across the width of the tray (to represent terracing); strips of moist soil alternated with strips of sod (strip cropping).

- Raise one end of the trays. Make sure all are tilted at an equal incline. Put the beakers beneath the "V" at the lower end of the tray.
- Measure an equal amount of water into each sprinkling can. Then hold the can about one foot above the tray. Have students pour water for about 5 seconds.

9. Hand out the Activity Sheet, "Soil Facts." Review the importance of soil conservation. Encourage students to take this Activity Sheet home and share it with their parents.

Additional Activity for Follow-up

1. Help students learn more about photosynthesis with this experiment. You'll need:

   - A potted plant (bean plants work well for this experiment)
   - Two paper squares about 1" on a side
   - A paper clip
   - A sunny window

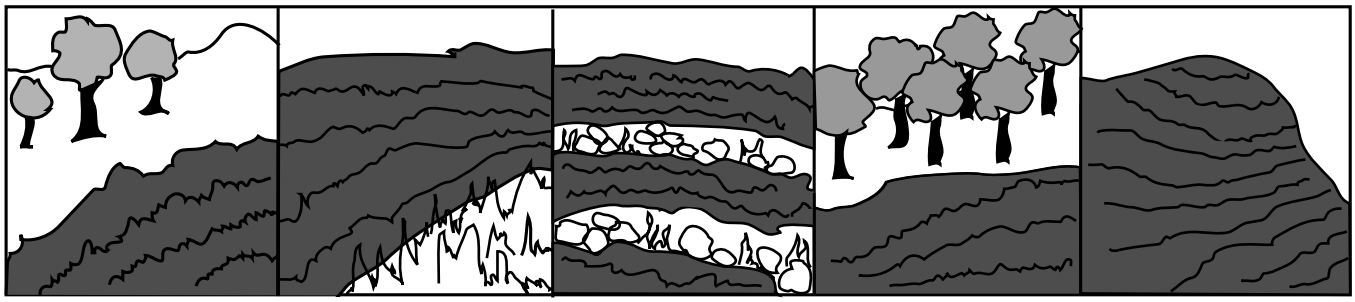
   Tell students that green plants need water, minerals and chlorophyll to make food. The word *chlorophyll* means "light-green leaf." The process is called *photosynthesis.*

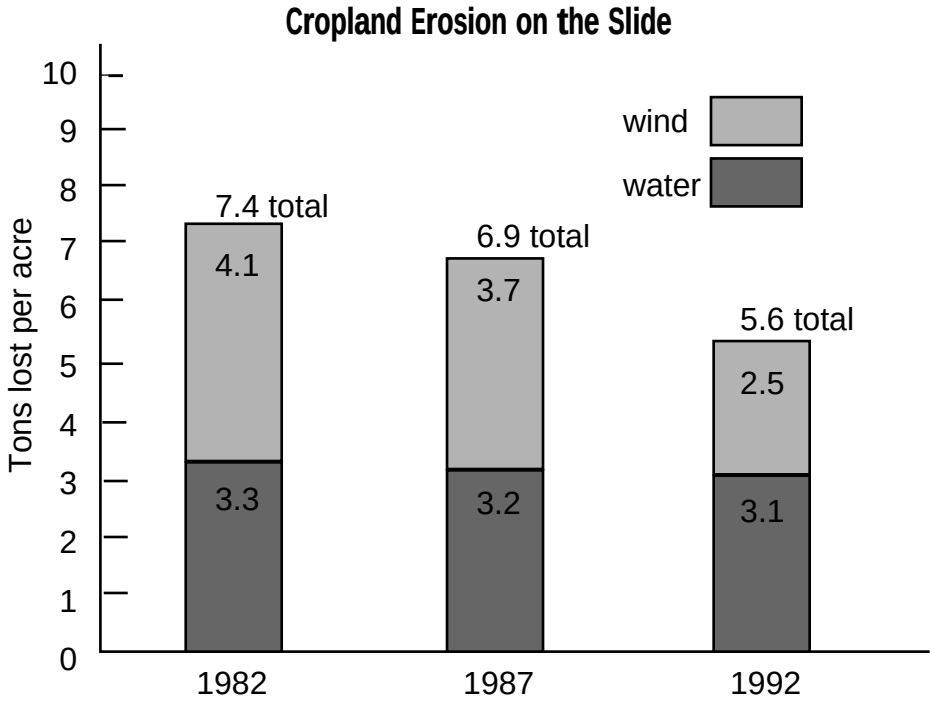
   Near the top of the plant, place two paper squares on the top and bottom of the same leaf. Use the paper clip to fasten the squares in place. Place the plant in a sunny window. After a few days, remove the paper clip. The area you have covered with the paper is lighter. Because that area of the leaf got no light, the plant could not produce chlorophyll there. This experiment shows that without sunlight and chlorophyll, plants cannot make food.

Activity Sheet—*Soil Conservation Practices*

Farmers use several different methods to conserve soil. Match the number of the practice below to the correct box on the picture.

1. *Contour planting*—Planting crops around the curve of a hill rather than up and down the hill.
2. *Terraces*—Making wide ridges that go around a hill to prevent water from rushing down the hill too fast.
3. *Grassed waterways*—Planting grass and not plowing low areas in a field where water usually runs down the hill.
4. *Forest and grass areas*—Keeping steep hillsides in trees or grass rather than clearing for cropland.
5. *Windbreak*—Rows of trees planted to slow down the wind and prevent soil loss from blowing wind.





Source: USDA Statistics

Fill out the chart below for each tray. Let the runoff settle and measure the volume of sediment in each beaker.

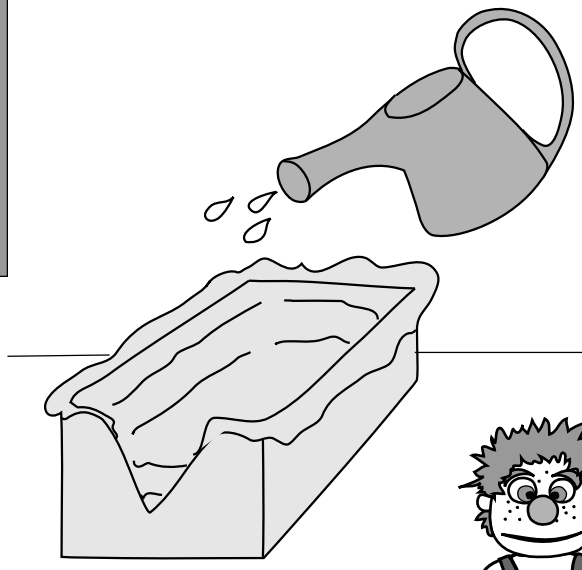
	Soil type	Amount of time water flows from the spout	Amount of runoff	Volume of sediment
Tray 1				
Tray 2				
Tray 3				
Tray 4				
Tray 5				
Tray 6				

Q. When's the best time to plant a tree?

A. Twenty years ago.

Q. When's the next-best time to plant a tree?

A. Today.



Activity Sheet—Soil Facts

The United States is losing 6.4 billion tons of soil each year because of erosion. That would fill 320 million dump trucks, which if parked end to end would extend to the moon and three-quarters of the way back.

Eroding soil is washed into lakes and rivers and blown into the air, where it pollutes our environment. If we all knew a little more about soil, we could each do our part to preserve this precious resource. Here are some facts and conservation tips about soil.

- Soil makes up the outermost layer of our planet.
- Topsoil is the most productive soil layer. It has varying amounts of organic matter (living and dead organisms), minerals and nutrients.
- Five tons of topsoil spread over an acre is as thick as a dime.
- Soil scientists have identified over 70,000 kinds of soil in the United States.
- Soil is formed from rocks and decaying plants and animals.
- An average soil sample is 45 percent minerals, 25 percent water, 25 percent air and 5 percent organic matter.
- Different-sized mineral particles, such as sand, silt and clay, give soil texture.
- Lichens help to break apart rocks to form soil.
- Fungi and bacteria help break down organic matter in the soil.
- Plant roots break up rocks, which become part of new soil.
- Roots loosen the soil and allow oxygen to penetrate. This is beneficial to the animals living in the soil.
- Roots hold soil together and help prevent erosion.
- Five to ten tons of animal life can live in an acre of soil.
- Earthworms digest organic matter, recycle nutrients and make surface soil richer.
- One earthworm can digest 36 tons of soil in one year.
- Mice take seeds and other plant materials into their underground burrows. This material eventually decays and becomes part of the soil.
- Mice, moles and shrews dig burrows that help aerate the soil.

Source: National Wildlife Federation

What Decomposes? What Doesn't?

Grade level: Upper elementary

Unit: Environment

Learner Outcomes

By the end of this lesson, students will be able to:

1. Define composting and demonstrate how to do it.
2. Define recycling.

Background Information

An important part of the life cycle is decomposition–breaking down dead plants and animal tissues and returning the nutrients to the soil. If dead plants and animals did not decompose, they would pile up. Decayed plant and animal matter is called *humus* or *compost*. Humus is rich in minerals and organic matter. It is returned to the soil and is important to a plant's roots.

Teaching This Lesson

1. Assemble your materials. You will need:

   - 10 different organic items–leaves, grass, etc.
   - 10 different nonorganic items, such as plastic
   - 2 one-gallon milk jugs
   - Scissors
   - Shovel

2. Explain the process of *decomposition* with students. Say, "Decomposition is the process by which leaves and other organic matter breaks down. This process brings the nutrients back into the soil to make it rich. Some things do not decompose, as this experiment will show."

3. Have students define *organic*. It means something that originally came from a plant or an animal. Have students make lists of items that are organic and nonorganic.

4. Cut the tops off the milk jugs. Carefully punch holes in the bottom and the sides.

5. Place the 10 organic items in one container. Record what you have placed in this container. Place the 10 nonorganic items in a second container.

6. Dig two holes, each about a foot square. Place one container in each hole. Cover with soil. Wait three months.

7. Dig up both samples. Were any items decomposed to the point where they could not be identified?

8. Some agricultural products are replacing materials that are not biodegradable. For example, corn is now made into packing pellets. If possible, obtain some of these pellets. Have students pour water on the pellets. What happens?

9. Have students talk about the importance of recycling. Encourage them to recycle at home and at school.

Additional Activity for Follow-up

1. Make recycled paper. Warning: This activity is very messy. It also requires a food processor and an electric iron. If you do this activity in class, you will need two or three parent volunteers.

For each piece of recycled paper, you will need:

- 2 full sheets of newspaper, torn into small (about 2") squares
- 2 tablespoons white glue
- 2 or 3 cups water
- Large basin (or sink) that can hold 4" of water
- Old panty hose
- Coat hangers
- Food processor and electric iron

Use the coat hanger to make a flat rectangle about 6" x 8". Stretch a piece of panty hose over the rectangle. When it is tight and flat, tie the ends.

Place some of the paper (not all) and some water in the food processor. Process until it is a smooth liquid. Keep adding paper. When the paper has liquefied, run the food processor for two minutes.

Add the glue to the water in the basin. Pour in the liquefied paper. Mix well, using hands. Mix a second time. Then put the frame in the basin. Press it to the bottom and lift it very slowly. Let the water drain for at least one minute.

Hang the frames on a line or set them in the sun to dry. When they are completely dry, peel off the paper. Iron with an electric iron set at the highest setting.

Careers in Agriculture

Grade level: Upper elementary

Unit: Careers

Learner Outcomes

By the end of this lesson, students will be able to:

1. Identify which agricultural careers require various skills.
2. List the major categories of agricultural careers.
3. Describe what is involved in one agricultural career: agricultural pilot.

Background Information

Approximately 22 million people now work in agriculture and ag-related careers. Only about two percent of the workforce is involved in production farming. The rest work in agribusiness, communications, science, government, education, processing and distribution, marketing and sales, as well as dozens of other occupations that serve the farmer or the total agricultural industry.

Approximately 22 million people now work in agriculture and ag-related careers.

As new technologies emerge in agriculture, so will new job opportunities and the need for well-trained and educated people. Today's agriculture offers more than 200 rewarding and challenging careers, from livestock production to nursery management, and from genetic engineering to landscaping and law.

Agricultural careers are open to both men and women. Today, nearly half the students enrolled in agricultural courses at the college level are women. Agricultural careers are divided into eight categories. They include:

- *Agricultural Production*—agronomist, animal breeder, aquaculturist, beekeeper, mushroom grower, peanut producer, rice farmer, tree farmer
- *Ag Processing/Distribution*—Christmas tree grader, food and drug inspector, fruit distributor, grain broker, meat cutter, quality control supervisor, wine maker

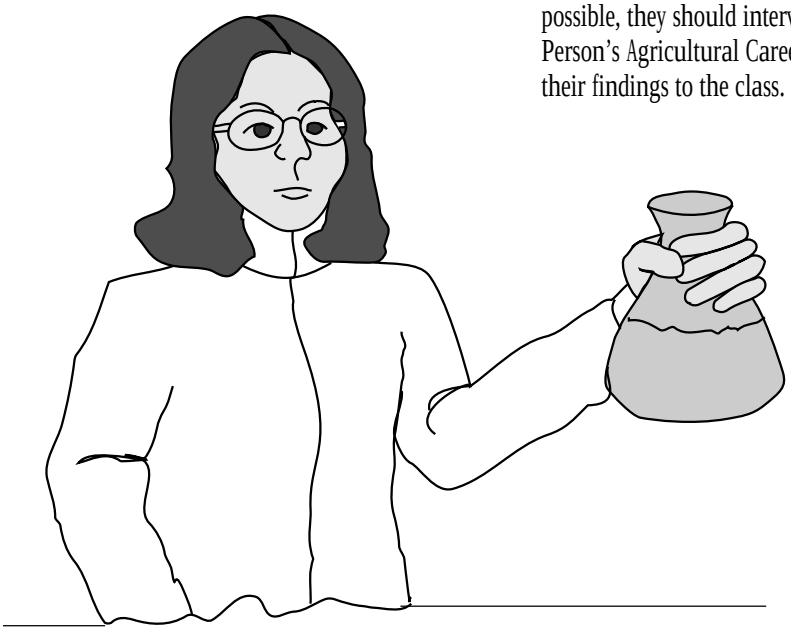
Additional Activities for Follow-up

1. If possible, invite a guest speaker or speakers to your class. Contact your local FFA chapter for help in finding possible speakers.
2. Read *My Mom's a Vet* by Henry Horenstein (Candlewick Press, Cambridge, MA).

- *Ag Mechanics/Engineering*—ag construction engineer, diesel mechanic, equipment operator, land surveyor, machinist, parts manager, soil engineer, welder
- *Agribusiness*—agricultural pilot, ag equipment dealer, animal groomer, computer analyst, farm auctioneer, feed ration developer, fertilizer plant supervisor, field sales representative, kennel operator, poultry hatchery manager, salesperson
- *Resource Management*—animal ecologist, environmental conservation officer, forest fire fighter, forest ranger, game warden, ground water geologist, soil conservationist, water resources manager
- *Ag Research/Health Sciences*—animal nutritionist, avian veterinarian, biochemist, botanist, entomologist, food chemist, plant geneticist, pomologist, veterinarian
- *Horticulture/Forestry*—floral designer, forester, golf coursesuperintendent, greenhouse manager, landscape architect, log grader, turf farmer
- *Ag Specialist*—ag accountant, ag corporation executive, ag educator, ag journalist, ag lawyer, ag loan officer, ag market analyst, computer specialist, farm investment manager, rural sociologist

Teaching This Lesson

1. Say to students, "We have learned that agriculture involves much more than farming. Today, we're going to learn more about some of the careers that are available in agriculture."
2. Hand out the Activity Sheet, "Careers in Agriculture." Review the eight categories and discuss the many jobs that are available. Do students know anyone who works in any of these careers?
3. You may want to have students read, "A Career That's Really Taking Off." It is the story of an agricultural pilot. One of the key points you should make after students read the story is that agricultural careers are open to both men and women. Today, half the students enrolled in agricultural courses at the college level are women.
4. Have students choose one of the agricultural careers from the list and learn more about it. If possible, they should interview a person who is currently in that career. The worksheet, "One Person's Agricultural Career," may guide them as they do their research. Have them present their findings to the class.

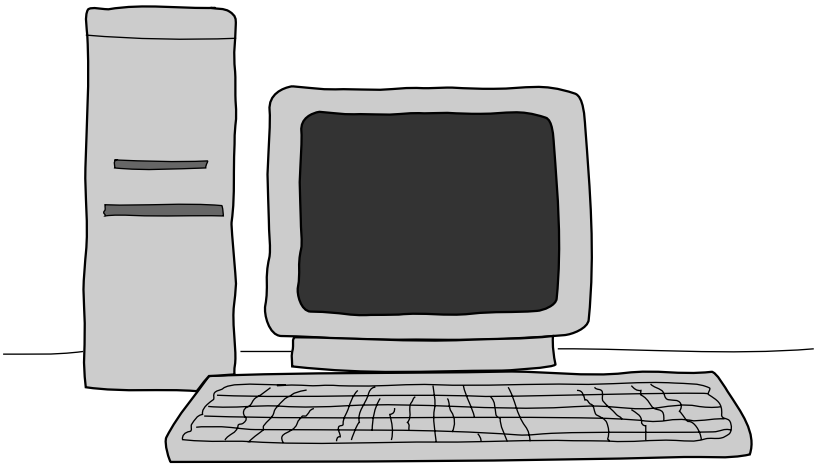


Activity Sheet—Careers in Agriculture

Today, agriculture offers more than 200 rewarding and challenging careers, from livestock production to nursery management, and from genetic engineering to landscaping and law. Here are some of them:

- *Agricultural Production*—agronomist, animal breeder, aquaculturist, beekeeper, mushroom grower, peanut producer, rice farmer, tree farmer
- *Ag Processing/Distribution*—Christmas tree grader, food and drug inspector, fruit distributor, grain broker, meat cutter, quality control supervisor, wine maker
- *Ag Mechanics/Engineering*—ag construction engineer, diesel mechanic, equipment operator, land surveyor, machinist, parts manager, soil engineer, welder
- *Agribusiness*—agricultural pilot, ag equipment dealer, animal groomer, computer analyst, farm auctioneer, feed ration developer, fertilizer plant supervisor, field sales representative, kennel operator, poultry hatchery manager, salesperson
- *Resource Management*—animal ecologist, environmental conservation officer, forest fire fighter, forest ranger, game warden, ground water geologist, soil conservationist, water resources manager
- *Ag Research/Health Sciences*—animal nutritionist, avian veterinarian, biochemist, botanist, entomologist, food chemist, plant geneticist, pomologist, veterinarian
- *Horticulture/Forestry*—floral designer, forester, golf course superintendent, greenhouse manager, landscape architect, log grader, turf farmer
- *Ag Specialist*—ag accountant, ag corporation executive, ag educator, ag journalist, ag lawyer, ag loan officer, ag market analyst, computer specialist, farm investment manager, rural sociologist

A career that interests me _____



Activity Sheet–A Career That's Really Taking Off

"Don't forget," Mrs. Smith told the fifth graders as school was ending on Friday. "Your report on a career that interests you is due in one week."

That night at dinner, John told his family about the assignment. He said, "I'm stuck. I don't know what to write about."

John's dad said, "Well, we're going to visit your Uncle Neil at his farm tomorrow. Maybe you'll get some ideas there."

The next day, as the family drove down the road to the farm, John saw an airplane out the window of the car. It was flying much closer to the ground than any other airplane he'd ever seen. As he watched, he saw a gentle mist coming from the back of the plane. "Look at that!" he said. "Wouldn't it be exciting to fly in a plane like that? I wonder what that pilot is doing."

"Let's ask your uncle," John's dad said. "That's his field."

John could hardly wait to get to the farm. Before anyone could say hello, he rattled off a list of questions to his uncle. "I saw an airplane flying over your field. What was it doing? Did you know it was there? Have you ever ridden in one of those planes?"

"Slow down," Uncle Neil said. "I'll be glad to answer all your questions. Say, maybe you'd like to meet Pat, the pilot of the airplane. I'll make a call and see if we can arrange it."

About an hour later, John and Uncle Neil pulled into a small air strip. There was the plane John had seen. And there, washing the outside, was a woman. "That's Pat," Neil said. "She's the best pilot in the county. Pat, I'd like you to meet my nephew. He's got about 100 questions to ask you."

Pat and John talked for more than two hours. He learned that there are nearly 10,000 airplanes and almost a thousand helicopters working in agriculture. These pilots spray crops to protect them against bugs, mold, weeds and plant diseases. They can work much more quickly than a tractor–just one or two passes over a field and the job is usually done. But there's a lot more that agricultural pilots do, John learned.

"Just last week," Pat said, "a farmer wanted me to spread seeds on a field–the ground was too wet for a tractor to get into the field. Tomorrow, I'm flying up to Green Lake, where I'm doing a different kind of seeding–I'll be putting tiny fish in the lake. I've also planted trees on steep hillsides where other equipment couldn't travel."

John learned that other pilots help clean up oil spills in rivers and harbors. Others have helped fight forest fires. "It's an exciting career," Pat said. "But you have to know a lot. You have to be a good pilot to miss power lines and trees when you're flying so low. You have to figure out exactly where to spread your cargo–luckily, I have a computer in my office and another one in the plane to help. And you have to pay close attention to the weather. Still, it's a good career for someone who loves flying as much as I do."

"It sounds wonderful," John told Pat. "Thanks so much. Not only have I learned about a career, but I've figured out what I'm going to write in that report for Mrs. Smith."

Activity Sheet—One Person's Agricultural Career

Use this guide to interview a person who works in an agricultural career.

What is the title of your career? _____

Why did you choose this career? _____

Why do you enjoy it? _____

_____

What are the not-so-good things about this career? _____

_____

What training does this career require? _____

_____

What are the job opportunities in this field? _____

_____

What does your average day include? _____

_____

Other questions I want to ask: _____

_____

Agriculture Through the Centuries

Grade level: Primary and upper elementary

Unit: History and social development

Learner Outcomes

By the end of this lesson, students will be able to:

1. Explain why agriculture has changed from subsistence farming to specialized farms with products to sell.
2. Describe the role of the farm population in U.S. history.
3. Explain the evolution of technology in agriculture.
4. Identify inventions that have contributed to agriculture.

Background Information

Agriculture has always been a part of history. Around 8000 B.C., primitive people began growing food as well as hunting and gathering it. This enabled them to live together in one place. Before, they moved wherever the animals they hunted roamed and picked wild edible plants as they went.

The plow was invented in a Middle Eastern country around 3000 B.C. The first plow was probably a Y-shaped branch pulled by an ox. When settlers first came to the United States in the 1600s, the only farm tools they had were these Y-shaped plows. Native Americans showed them how to make a hoe with a large stick and the bone of an animal.

Inventions gradually made farm work easier. The cotton gin was invented in 1793 by Eli Whitney to separate the seeds from the cotton. For the first time in agriculture, a machine replaced the work of many people.

Grain had been harvested for thousands of years by hand with scythes and sickles, but Cyrus McCormick's invention of the reaper in 1834 was the first horse-drawn grain harvester. Another machine, called a thresher, then came to the fields to separate the grain from the chaff. Today, these two steps are combined in a machine called the combine.

The steel plow was developed in 1836 by John Deere to make breaking and turning the soil easier. This invention was lighter in weight to pull through the fields, and soil didn't cling to the steel as it did to the wood and iron plows. Through the early 1800s, other machines powered by horses were invented, such as the grain drill, mower and cultivator.

When the Civil War started, new technology was adopted quickly because of the labor shortage and strong demand for farm products. In 1862, President Abraham Lincoln signed the Homestead Act, which helped settle the West with farmers.

In the late 1800s and early 1900s, technology made rapid advances in agriculture. Production increased dramatically as hybrid corn was developed. By crossbreeding, corn plants grew faster and produced more kernels per ear. Other developments improved crops and livestock. With these advancements providing surpluses, prices stayed low until World War I.

By the 1930s, most farmers owned tractors to pull equipment, but the Dust Bowl wiped out many Great Plains producers. During the years of drought, many farmers moved west to find jobs.

World War II led to the complete change-over from animal to mechanical power on farms because of a shortage of farm workers and incentives to produce food. After the war, technology helped production skyrocket. Fertilizers, improved seed and feed, new breeds of livestock and pesticides were just a few of the revolutionary additions.

Until 1900, most producers were subsistence farmers, growing just enough to feed their families with a little left to trade. In the 1800s, one farm worker could feed five people.

Today, farmers keep their records and make feeding, planting and marketing decisions with computers. Farms are larger than ever but still require less labor thanks to modern machinery. Now farmers usually specialize by producing one or two crops or one type of livestock. Today, one farmer can produce enough to feed 96 people. Fewer farmers are needed to feed the world, so people are free to pursue other careers.

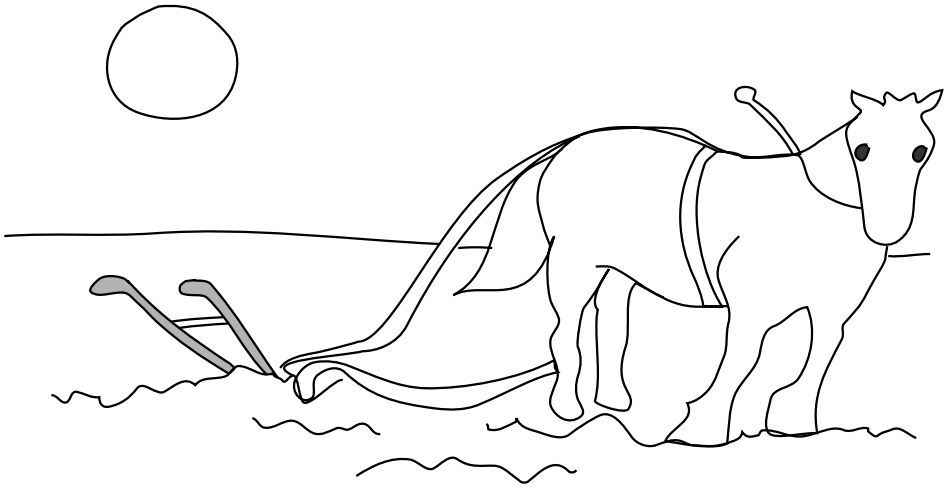
American agriculture has come a long way. Science and technology continue to make advancements to provide consumers with higher-quality, less-expensive food.

Teaching This Lesson

1. Hand out the three Activity Sheets that tell the story of agriculture as first-person accounts of young people in three different time periods. Little Bear is a boy who lived 35,000 years ago. Layla is a girl who lived about 3000 B.C. Joshua is a teen who lived during the 1860s. Read these stories with the students, or read them to students. Discuss them. How does agriculture change during the centuries? How do these changes affect people's lives?

2. Have students write their own story about a child living on a farm today.

3. If you have not used the Activity Sheet, "Science and Technology Make the Difference," (page 23), your students might enjoy it now.



Little Bear is a 12-year-old boy who lived about 35,000 years ago. This is his story.

I woke up early and rolled over on my bed of leaves. I was cold, so I pulled my animal skin up around my neck. I wanted to go back to sleep, but my stomach was grumbling too loud.

I was hungry!

I hurried outside. There, I saw my own family and several other families, too. We all live together–it's safer that way.

My father and the other men of the tribe were picking up their clubs and stones. They're going hunting today. They'll hunt for buffalo, bears or reindeer. But these large animals are very hard to catch. So they'll probably come home empty-handed again.

After the men had left, my friends and I knew we had to do something to help the tribe find food. We went out searching for berries and nuts. There wasn't much there. I suppose we'll have to move on soon, because there isn't much food left anywhere.

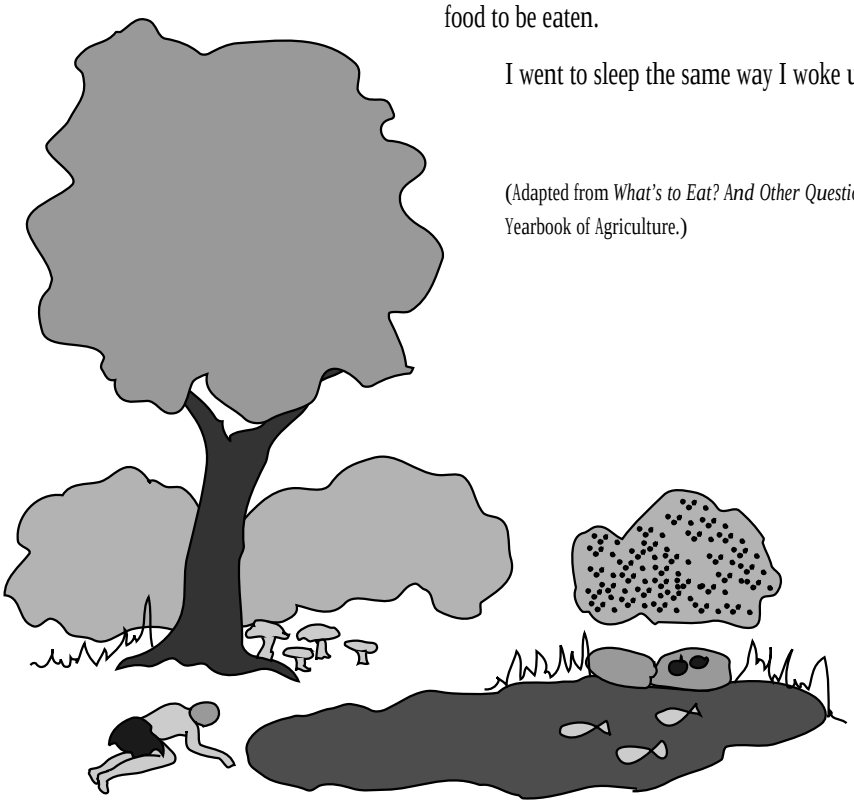
There were some mushrooms by a big tree, but we left them. We ate some a few days ago and got sick.

Soon, we came to a pond. I dived in to see if I could catch a fish. I wasn't quick enough. But as we sat on the shore, I saw some little beetles. I ate a few.

When night came, everyone gathered together. But there wasn't any food to be eaten.

I went to sleep the same way I woke up–hungry.

(Adapted from *What's to Eat? And Other Questions Kids Ask About Food,* the 1979 Yearbook of Agriculture.)



Activity Sheet–Layla's Story

Layla is a 10-year-old girl who lived about 3000 B.C. This is her story.

Today was an exciting day in our village. The first crop is harvested, and we had a big celebration. We sang and played games, and everyone had plenty to eat. My mother brought out a new pot that she had made. She and her sister are the best potters in the village.

I think one of our neighbors will want to trade for it. The woman who lives in the next hut has some beautiful cloth that came from far away. She said it was made in a place where thousands of people live–a city. But I don't believe her. How could so many people live in a small area? There wouldn't be enough to eat.

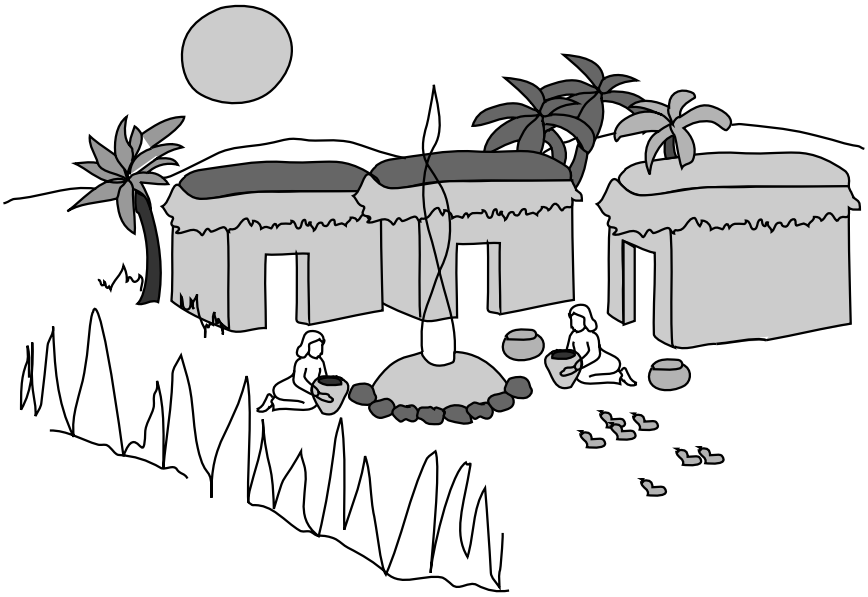
My brother says I'm wrong about that. His friend saw a whole train of camels loaded down with dried fruits and grain. They said they were headed for that far-away city.

We don't always have a harvest to celebrate. But this year, the rains came when they were needed–and the sun shone when the little plants were growing. Not like that terrible year my sister died, when we were all hungry all the time.

Last month, our ox gave birth to a baby. It's already taller than I am. We need that ox to pull our plow. When our ox got sick, we had to break up the ground ourselves with sticks. I'm sure glad I don't have to do that job forever.

I can't complain, though. Our life is much better than it used to be. I've heard stories that long ago, people had to move from place to place. We're lucky. We get to stay here all the time.

I'm glad, because this is a good place to live. The crops have been good for the last few years. More and more babies are growing up.



Joshua is a 16-year-old who lived in Kentucky around 1875. This is his story.

Work never seems to end on this farm. We grow most of what we eat. We have some cows, some chickens and some hogs. There's a horse for the carriage to take us to town and mules to pull the plow.

Ma and my sisters have a huge vegetable garden. My granddad planted an orchard of peach and apple trees. They produce some fruit–and I surely do love to eat it when it's in season.

We have great fruit and vegetables all summer, and Ma and my sisters put them up in jars that feed us all through the winter. They make so much that my sister Sara sells some jam in town to Mr. Murdock's general store. She's saving up for her wedding next year. She's marrying Zeke Brown, who lives on a farm nearby. They're talking about going west to get some farm land of their own. The government's giving it away free out there.

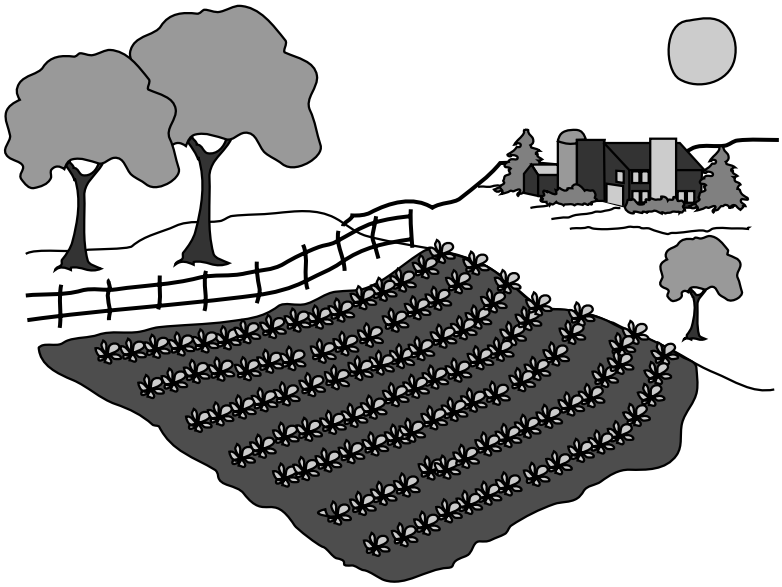
We grow things to sell, too. We have a cash crop of wheat and rye, and we also produce some tobacco. That's worth a lot of money.

Mr. Jackson, who owns the grain mill in town, told Pa he's sold our wheat as far away as New York. It's the railroad that made that possible.

We get into town every week. My brothers Joseph and Jacob have left the farm and are working in town. Just yesterday, I went into the general store to get Ma some sugar for the jam she's putting up and some new cloth all the way from Paris that my sister insists she has to have for her wedding dress. I also bought some blue jeans. That's sure better than the old days. Grandma tells me that her grandmother spun the wool from our sheep, wove the cloth and made the wool. She still spins and knits. She weaves, too, but that's just to keep up the tradition. My sister says she's not having a loom in her house–it takes up too much room.

My dad and my two younger brothers and I do most of the work on the farm. Things are much easier for us now. Dad saved up for years to buy one of those machines that Mr. McCormick invented. It's called a reaper, and it makes the harvesting of our crops a lot easier. We've even bought a few more acres, because with the machines, we can work a lot more land.

My brothers, who live in town, just started a business repairing all these new machines. They're even talking to Mr. McCormick's company about being a dealer for this whole part of the state. They think they're going to make thousands. But me? I'm going to stay on the farm.



Activity Sheet—Agriculture Today

Write a story about a young person who lives on a farm today. Remember everything you have learned. If possible, interview people who live on farms. Then write your story here.