



UNIT 1: PRODUCTION AGRICULTURE

Agriculture by the Numbers

Grade level: Upper elementary

NATIONAL STANDARDS

NL-ENG.K-12.2

NL-ENG.K-12.8

NSS-EC.K-4.18

NSS-USH.5-12.7

NS.5-8.6

Student Learning Objectives

After completing this lesson, students will be able to:

1. Explain why agriculture is the business that provides all food, much of our clothing and some shelter.
2. Explain how so many people can be fed with so few farmers and so little land.
3. List ways that science and technology have helped the U.S. agriculture industry produce more food and fiber with fewer people.
4. Describe how agriculture has changed over the last 100 years.

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 farmed full-time. With more efficient and productive agriculture, each of today's farmers feeds about 155 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 22 million people have jobs related to agriculture, from growing food and fiber to selling it in supermarkets. Of the 22 million people, 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 farms or process and market the products from farms. More than 14 million people work in wholesale or retail businesses that help move products from farms to our homes.

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, raise cattle that produce more milk, raise animals that provide leaner meat, harvest more fruit and vegetables with less time and investment and so much more.

Time: 50 minutes

Tools, Equipment, and Supplies: Writing surface, copies of Activity Sheets 3:1, 3:2, 3:3, note cards, tape/glue, encyclopedias (as current as possible), colored pencils, markers



NOTES

Key Term(s): Byproducts

Interest Approach

Today's agriculture industry has a huge impact on our daily lives, but we cannot understand why agriculture is where it is today without looking back at the impact it has had in people's lives over the years.

Use an Almanac and Encyclopedia e-Moment® to introduce Agriculture by the Numbers. Place students in pairs, and then give each pair a volume of the encyclopedia. Assign an agricultural word/topic for each volume (e.g., A – Almonds, B – Biotechnology, C – Cattle, D – DDT, E – Eggs, etc.)

In a moment we will receive a volume of an encyclopedia and an agricultural topic or word. When I say GO, we are going to find the topic or word in the encyclopedia and quickly skim the contents of the article for main points and dates. We will have five minutes to jot down some notes; after five minutes we are going to share what we learned with the rest of the class. We will work with partners today, so find someone near you to work with. Ready, set, GO!

Call on one member of the pair to share content and chronology of the agricultural topic and/or word.

Great job! We are really learning some cool information from the encyclopedia today. Let's see what else we can learn. We looked up agricultural terms because agriculture is so important. Let's listen carefully and participate fully as we discover the enormous impact agriculture has on our lives.

OBJECTIVE 1: Explain why agriculture is the business that provides all food, much of our clothing and some shelter.

Agriculture provides us with all of our food, much of our clothing and some items used to build our homes.

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. Below are some suggestions; however, the list is not comprehensive.

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



NOTES

There are many agricultural products we use every day that we don't always associate with agriculture. These are often **byproducts**, or 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 medicine. **Byproducts** of corn include biodegradable plastic, cooking oil, corn sweetener and diapers. Isn't it amazing? Agriculture really is everywhere.

Next, we are going to learn how so many people are fed by so few farmers and so little land.

OBJECTIVE 2: Explain how so many people can be fed with so few farmers and so little land.

Now that you see how many things in our world come from agriculture, can you guess what percentage of people in the United States are agricultural producers and provide all these products?

Write the above question on the board. Underneath, write the following answers:

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

Let's vote.

Ask students to raise their hands when you announce each possible answer.

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.

Use a Me-You-Us e-Moment® to answer the following question.

Why do you think that only 2 percent of people are employed in agriculture?

OBJECTIVE 3: List ways that science and technology have helped the U.S. agriculture industry produce more food and fiber with fewer people.

Wow! That was some great sharing and I heard some really good answers as to why only 2 percent of people are involved in agriculture. Let's speculate on how so many people can be fed with so few people working in agriculture. Who has some ideas off the top of their heads?



NOTES

Wait for a few responses and comment positively. 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.

Use a Hieroglyphic e-Moment® to expand thinking on what is the number one reason the American farmer can feed so many people by him or herself. Have the students work with the same partners from earlier in the lesson.

After two minutes of discussion, direct students to begin drawing. After five minutes stop the drawing and ask students to share their reasons.

OBJECTIVE 4: Describe how agriculture has changed over the last 100 years.

Hand out the Activity Sheets 3:1 and 3:2, "Agriculture by the Numbers."

Great drawings! There are actually many reasons for this phenomenon. We should all be thankful for these technologies and advancements. Let's take a look at what impact these reasons we have discussed have made over the years.

Let's get into our pairs again and listen carefully. The first graph on the sheet of paper is a line graph showing how the farm population has changed from 1790 to now.

Let's plot each of the percentages on the graph with a dot.

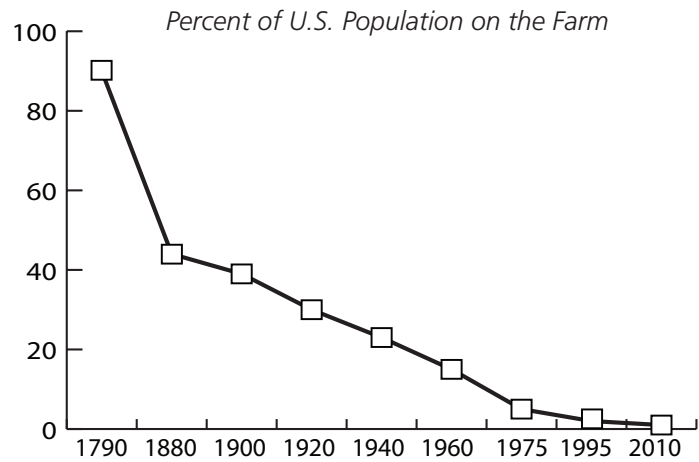
Show students what you are talking about on the large writing surface in front of the classroom.

We are simply going to connect the dots. When I say GO, begin working. Ready – GO!



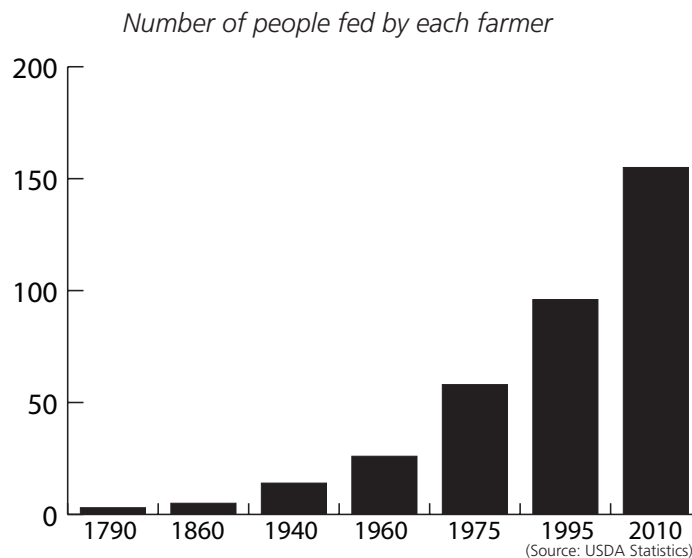
NOTES

The completed graph should look like this:



(Source: USDA Statistics)

Great job with the line graph! The second graph is a bar graph. We are going to record the numbers of people fed by each farmer above the appropriate year on the graph like this:



(Source: USDA Statistics)

Complete the first one on the writing surface in front of the room. Use colored markers or pencils to create the bar graph.

Now it's time for what makes graphs fun—interpretation! What conclusions can we draw from these two graphs?

Take responses and comment positively on each. Answer: the percentage of the population living on the farm has decreased greatly since the 1790s while at the same time the number of people fed by each farmer has increased. Students may want to talk about how this phenomenon may exist in their own families.



NOTES

Do you have any family members who are farming today? Did your grandparents or other relatives farm in the past? What has led to this change?

Let's take a closer look at some specific events that have helped the changes take place.

Give each student a copy of the Activity Sheet 3:3, "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.

REVIEW/SUMMARY

REFLECTIVE REVIEW QUESTIONS:

- Think about the agricultural products we discussed today that provide us with food, clothing or shelter. What are those products we see in classroom today?
- If our class were representative of our population in the United States, how many of us would make up 2 percent in the room and would have to farm to feed the class?
- Other than farming, how has technology changed the lives of Americans over the past 100 years?

American agriculture is amazing! Just think—in all the topics we study in school in all of our classes from history to mathematics, we can see the presence of agriculture.

Since agriculture is so important to our lives, each of us is going to need a Ticket to Get Out the Door today! Your ticket out of class is to write down at least one thing you learned about agriculture today.

APPLICATIONS

APPLICATION 1: Ask students to learn more about one technological innovation in agriculture. Have them present their findings to the class.

APPLICATION 2: Create a large bulletin board with the information from the graphs and timeline of technological innovations in agriculture completed during this lesson.

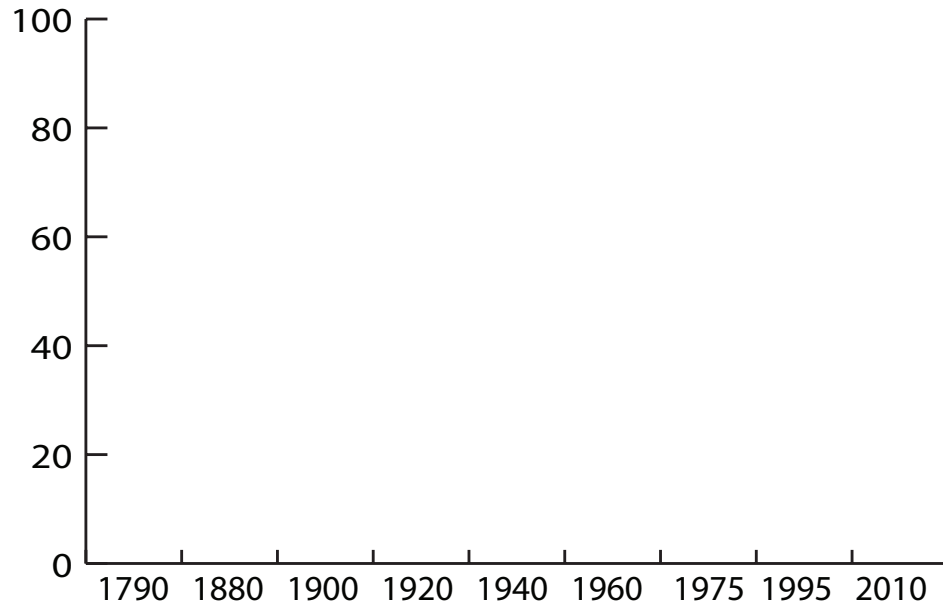
APPLICATION 3: Have students speculate about how agriculture will change in the future. Ask them what inventions they think will be needed.



ACTIVITY SHEET 3:1

Agriculture by the Numbers

Percent of U.S. Population on the Farm



Plot Data

1790 – 90%

1880 – 44%

1900 – 39%

1920 – 30%

1940 – 23%

1950 – 15%

1970 – 5%

1990 – 2%

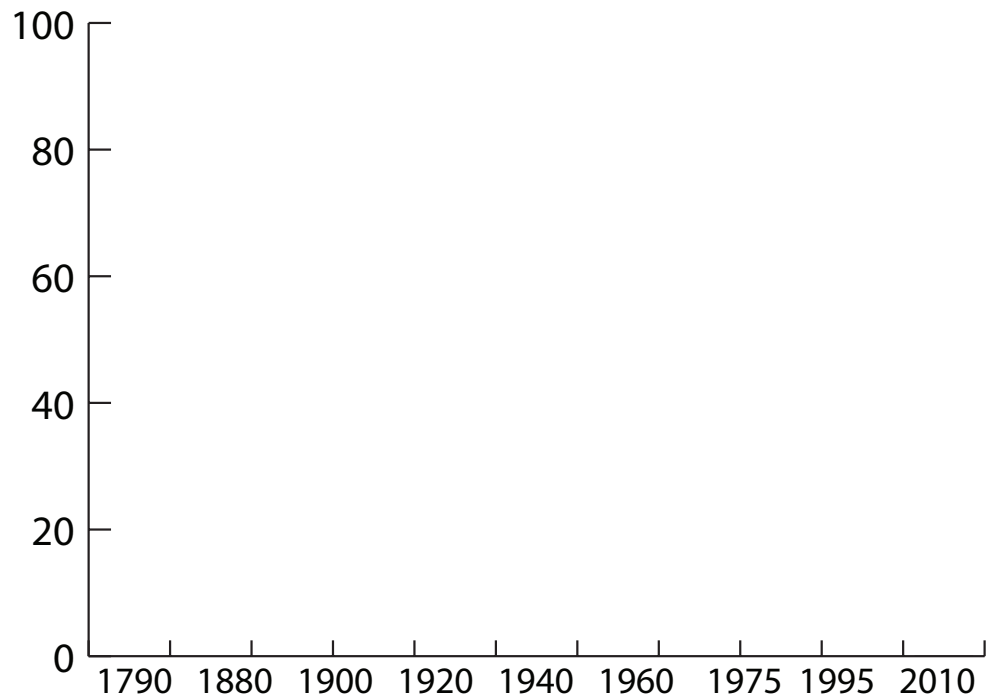
(Source: USDA Statistics)



ACTIVITY SHEET 3:2

Agriculture by the Numbers

Number of people fed by each farmer



Plot Data

1790 – 3

1860 – 5

1940 – 14

1960 – 26

1975 – 58

1995 – 96

2010 – 155

(Source: USDA Statistics)



ACTIVITY SHEET 3:3

Science & Technology Make the Difference

NOTES

- 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 backbreaking labor.
- 1850** Seventy-five to 90 hours of labor were required to produce 100 bushels of corn. Yields were about 40 bushels per acre.
- 1960** By this time, farmers had moved from horsepower to tractor power. Twelve 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** Two and a half hours of labor were required 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** About 35-40 hours of labor were required to produce 100 bushels of corn. Yields were about 40 bushels per acre.
- Early 1700s** 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. During the second and third years, he planted wheat and in the fourth he planted turnips. Townshend thought turnips gave the soil many of the nutrients the other crops took away. (Actually, it was the clover that gave the soil nutrients.) This practice allowed farmers to raise enough forage to feed animals, allowing them to produce fresh meat throughout the year.
- 1950** About 10-14 hours of labor were required 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 properly space the seeds and plant the ideal number of seeds in each row.
- 1921** George Washington Carver, head of Tuskegee Institute's research department, testified before Congress about the many uses of the peanut.