

## NATIONAL SCIENCE STANDARD

- Science and Technology: Abilities of technological design

## NATIONAL SOCIAL SCIENCE STANDARD

- World History: Age of Revolutions-causes & consequences of the agricultural and industrial revolutions

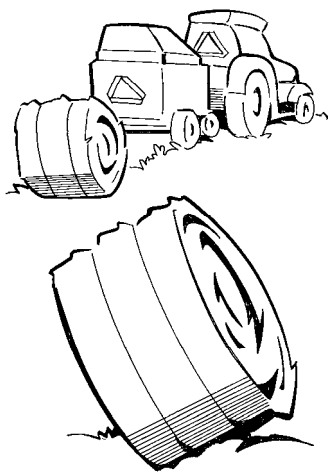
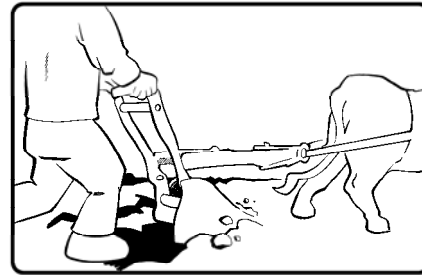
## OBJECTIVES

The student will:

1. identify three forms of technology used in modern US agriculture: biotechnology, pesticides, and satellites.
2. understand how technology has helped the US change from an agricultural society to an industrial society.

## BACKGROUND

In the mid 1800s the first industrial and agricultural revolution was taking off in the US. These revolutions involved the move from people growing their own food and providing their own needs to people specializing in trades and crafts that were sold to people outside their family.



Industrial and agricultural revolutions continued to evolve. A second Industrial Revolution (1910-1959) saw an increase in the manufacture of consumers goods. At the same time, the farming industry took its most rapid strides. The development of mechanized farm equipment and the electrification of farms caused an agricultural revolution which increased the yields of most farmers. In addition, in the 1940-50s a huge increase in the number of available pesticides decreased the number of crops lost to pests, which further increased the yield.

As the number of new industries developed at the same time that farming was requiring less labor, farmers had a wider choice of how to make a living.



## BACKGROUND, CONTINUED...

From 1970 to today, advances in farming have included the improvement of pesticide use, scientific advancements in biotechnology, and space.

### Pesticides

Pesticides have been used for centuries. Many newer pesticides are more effective in smaller quantities, less persistent in the environment and applied with greater care and concern for safety. Without pesticides, bugs would eat almost half of a farmer's crops. With pesticides bugs only eat 1/10<sup>th</sup> of a farmer's crop.



### Biotechnology

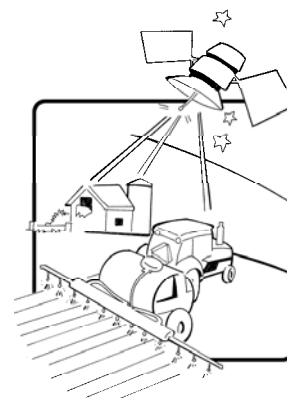
Scientists can now create plants that have beneficial traits. The methods used to produce these new crops involve changing material within the crops called genes. Genes are in the cells of all living things. They guide how living things are made and how they function.

Scientists can create plants that are resistant to chemicals that kill weeds, plants that produce chemicals to kill insects, plants that can grow in poor dry soil, and plants that last longer after harvesting. By using biotechnology in this way, scientists are

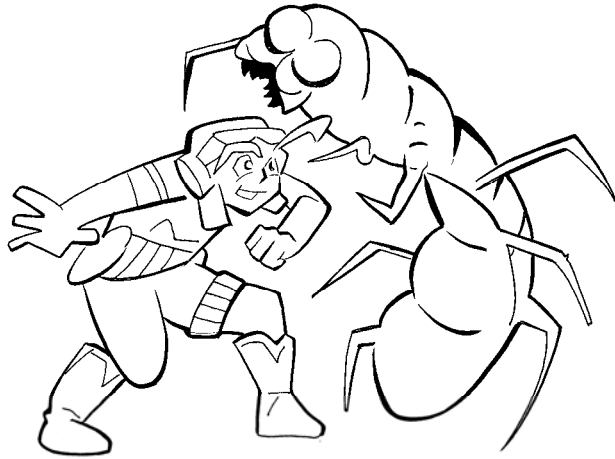
helping farmers grow more food on less land, which keeps the cost of food very low in the US.

### Space

Global Positioning Satellites (GPS) uses a satellite in outer space to take special pictures of a farmer's field. These pictures can show a farmer how much fertilizer or pesticides needs to be applied in each small area of the field. The satellite then sends these pictures to the computer on the farmer's sprayer and tells it exactly how much fertilizer or pesticide to apply as it travels over the field.



The reason GPS is important is that a farmer's field is actually like a bunch of smaller fields put together. Different areas of the field have very different requirements for the soil. By applying the same amount of fertilizer or pesticides to the entire field, farmers might easily spray the areas of the field that don't need spraying. This is wasteful, expensive, and harmful to the environment.



## INSTRUCTION PROCEDURE

1. Review background information.
2. Have the students complete “Agriculture and Technology” Activity 1
3. Do assessment 1.

## ASSESSMENT

1. Using the pictures in the compare and contrast activity, have the students identify, analyze and compare the industry of farming including the tools, machinery, size, and role of the farmer.

## WORD POWER

**agricultural society** *n.* A society in which crops are grown and people have specialized roles.

**biotechnology** *n.* Using scientific discoveries about living things to solve problems.

**genes** *n.* The part of a chromosome that determines one or more characteristics that living things inherit from their parents.

**industrial society** *n.* A society in which the production of food and other products is performed by machines, demanding large amounts of energy and resources.

**pesticides** *n.* Chemicals used to kill pests on crops.

**satellite** *n.* An object that orbits a planet and carries out a variety of jobs.

**technology** *n.* Using scientific discoveries and inventions to solve problems.

**global positioning satellite (GPS)** *n.* 24 satellites arranged so that several can be seen from any one point on Earth by radio at any given time. Radio signals from the satellites are then used to locate a position on Earth’s surface with greater accuracy.

NAME \_\_\_\_\_

## ACTIVITY 1: AGRICULTURE AND TECHNOLOGY

### FILL IN THE BLANKS

Technology is using scientific discoveries and inventions to solve problems. The United States leads the world in developing new technology.

Using the Word Bank at right, choose the correct word to complete each sentence.

1. Technology allows us to grow \_\_\_\_\_ food on \_\_\_\_\_ land.
2. Technology allows farmers to be gentler on the \_\_\_\_\_.
3. Technology allows farmers to \_\_\_\_\_ more people.

### WORD BANK

- MORE
- LESS
- FEED
- ENVIRONMENT



NAME \_\_\_\_\_

## ACTIVITY 1: AGRICULTURE AND TECHNOLOGY, CONTINUED

### FILL IN THE BLANKS

In the past 100 years, the use of technology has changed the United States from an agricultural to industrial society.

- **Agricultural Society:** a community or nation where farming drives the economy.
- **Industrial Society:** a community or nation where the economy is driven by skilled labor

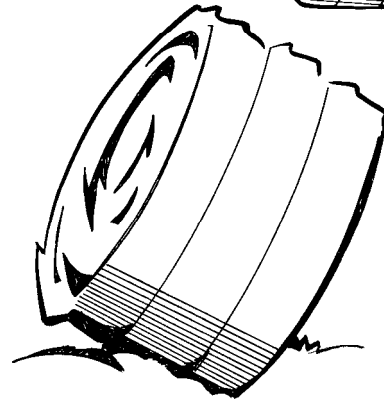
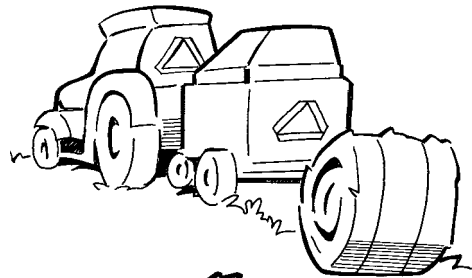
Using the Word Power vocabulary words at left, identify the type of technological advancement described.

- \_\_\_\_\_ Engine powered tractors
- \_\_\_\_\_ Information from this technology allows more controlled application of pesticides
- \_\_\_\_\_ Inserting plant genes with beneficial characteristics onto other plants to improve their performance
- \_\_\_\_\_ Decreases crop destruction so that 90% of crops are usable
- \_\_\_\_\_

### WORD POWER

#### TYPES OF TECHNOLOGICAL ADVANCES

- MECHANICAL ADVANCES
- BIOTECHNOLOGY
- PESTICIDES
- GLOBAL POSITIONING SATELLITES



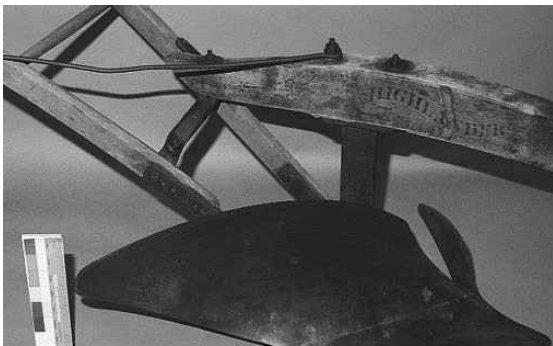
### THINK FOR YOURSELF

In your own words, explain the reason food costs in the United States are the lowest in the world.

NAME \_\_\_\_\_

## ACTIVITY 2 — COMPARE / CONTRAST AGRICULTURE TECHNOLOGY ?

### EARLY PLOWS



### MODERN PLOWS



### COMPARE / CONTRAST

Identify two differences and similarities between early plows and modern plows.

#### DIFFERENCES

1. \_\_\_\_\_

2. \_\_\_\_\_

#### SIMILARITIES

1. \_\_\_\_\_

2. \_\_\_\_\_