

# Agriculture in Motion

## Objective

Students will read about machines used in agriculture.

## Background

Early in our nation's history, nearly everyone was involved in food production. Most families raised their own food, with every able-bodied family member working long, hard hours to help. In 1830, it took 250 to 300 labor hours to produce 100 bushels of wheat. Here are some of the steps involved:

### Step 1—Plowing

A heavy iron plow was used to break up the soil and turn it over. Usually a horse, ox or mule pulled the plow while someone walked behind to steer it, row by row, until the whole field was plowed.

### Step 2—Harrowing

After plowing, a brush harrow was dragged along the rows to smooth the soil for planting and to clear away debris. A brush harrow was made of small rigid tree branches interwoven into a frame so that the brush stuck out underneath. (See "Simple Farm Tools" worksheet.)

### Step 3—Planting

Seeds were broadcast (scattered) by hand. Then the brush harrow was dragged through the field again to cover the seeds.

### Step 4—Weeding

As the crop grew, hoes were used to keep out weeds.

### Step 5—Harvest

When the wheat was ready to be harvested, the farmer used a sickle to cut it by hand. Then it was tied into bundles.

### Step 6—Threshing

The wheat had to be threshed to separate the wheat kernels from the rest of the plant. The implement used was a flail—a wooden handle with a stouter and shorter stick hung at the end so it would swing freely.

All this motion didn't even include milling (grinding) the wheat and baking the bread.

It took a lot of motion to produce food back then, but it would have taken more if it hadn't been for the machines the farmer used—the plow, the brush harrow, the hoe, the sickle and the flail.

Over the years machines were developed that combined some of these tasks so that farmers could produce food for more people with fewer hours of hard labor. The steel plow was invented in 1834. It was lighter and cut through the soil more easily than the earlier wood and iron plows. This made it easier to farm the thick thatch of grassland

## Oklahoma Academic Standards

### GRADE 6

Speaking and Listening: R.1,2,3;  
W.1,2

Reading and Writing Process: R.1,3

Critical Reading and Writing:  
R.2,3,4,6,7

Research: R.1,2,3; W.1,2,3

Visual Art History and Culture: 1,2,5

Visual Art Appreciation: 4

### GRADE 7

Speaking and Listening: R.1,2,3;  
W.1,2

Reading and Writing Process:  
R.1,2,3

Critical Reading and Writing:  
R.2,3,4,6,7

Research: R.1,2,3; W.1,2,3

Visual Art History and Culture: 1,2,5

Visual Art Appreciation: 4

### GRADE 8

Speaking and Listening: R.1,2,3;  
W.1,2

Reading and Writing Process:  
R.1,2,3

Critical Reading and Writing:  
R.2,3,4,6,7

Research: R.1,2,3; W.1,2,3,4

Visual Art History and Culture: 1,2,5

Visual Art Appreciation: 4

## What is a machine?

A machine is a device that makes jobs easier by changing the size or direction of a force. People use machines because they save time and human energy. Almost everything we do depends on machines.

When you brush your teeth you are using a lever, a simple machine. When you unscrew the lid off the peanut butter jar you are using a screw, another simple machine. When you turn the door knob you are using a simple machine known as a wheel and axle. A complex machine uses two or more simple machines to make work even easier.

that would become Oklahoma. The McCormick Reaper used a wheel and horse power to make harvest easier and faster. By the 1860s, many other farm tasks had been combined and made easier by machines. Human energy was helped along by that of horses, oxen or mules. Chemical fertilizers cut down on the work by helping the farmer grow more of the crop on less land. Hybrid seeds produced better crops. Pesticides helped control weeds and insects.

The first gasoline tractor was built in 1892 by John Froelich. All purpose, rubber-tired tractors were introduced in the 1930s, along with machines that could be used with the tractor. These tractors were practical and affordable for the average farmer. Soon gasoline replaced animals as the most common source of energy on the farm. In 1954 there were more tractors than horses on farms for the first time.

In the 1970s farmers in Oklahoma and the US learned to save energy by not using their machines as much. No-till agriculture helped hold the soil in place and prevent erosion. Rather than plow the field after harvest, the farmer would leave the stubble from the harvested crop in place. Besides holding the soil in place, this method also saved fuel because the farmer took fewer trips across the field. Integrated Pest Management (IPM) helped the farmer cut pesticide use. Under this method chemicals are used only when absolutely necessary.

In the early 1990s farmers started using computers to make their work easier. “Smart tractors” use satellites and computers to tell the farmer exactly how much fertilizer and pesticide is needed in the field. This is called “precision agriculture.” Computer software also saves work by helping the farmer with planning.

All these developments save time, money and energy. Today one farmer can feed many more people than just the family. One American farmer today can grow enough food to feed 130 people. This frees the rest of us to work in other areas—medicine, communications, science, art and agricultural research—to develop even better machines and technology for feeding the world.

Source: “A History of American Agriculture, 1607-2000” USDA Economic Research Service, 2000, <http://www.agclassroom.org/gan/timeline/index.htm>

## Language Arts

1. Divide students into groups for brainstorming.
  - Groups will take 3-5 minutes to brainstorm and write answers to each of these questions: “What work do farmers and ranchers do?” “What machines do farmers and ranchers use?”
  - Allow an additional 3-5 minutes for each group to review and identify two or three of their best ideas for each question and write the ideas in complete sentences on separate sentence strips.
  - Groups will share their ideas with the class and post them in the classroom.
  - Hand out copies of the “Machines in Agriculture” reading page for students to read. Discuss unfamiliar vocabulary.
  - After reading, students will repeat the brainstorming activity and

compare new answers with their first answers.

—Students will develop and illustrate a timeline, based on the reading.

2. Lead a discussion on the pros and cons of machines in agriculture.

Some pros:

- Machines help make our work easier.
- Machines help the farmer provide food and fiber for more people on less land with fewer hours of labor.
- Machines give us more time for other pursuits, such as medicine and art.

Some cons:

- When people had to work harder for their food, they got more exercise.
  - Machines use energy sources which can pollute the environment.
- Students will write short papers defending one side of the question.

3. Students will consider the economic and cultural impact of the changes in agricultural production from 1830 until now. For example, what is the impact on the culture when advances in agriculture allow people to move from the farm? How does it affect rural areas? How does it effect urban areas?

—Students will discuss the economic impact of the switch from horses to tractors on the farm.

- What did the change mean to people who worked as blacksmiths, wagon makers, store owners, field hands? What jobs might have been created to support greater use of tractors?
- Students will write a page from the diary from the point of view of someone who works on a farm that is switching from horses to tractors. How will this change impact you?
- Discuss advances in modern technology that has changed the kind of work people do. (oil industry converting to wind and other green technology, for example)

4. Students will work in groups to develop a storyboard showing the steps involved in producing a wheat crop in 1830.

—Students will use the storyboard to act out the steps.

5. Hand out copies of the poem “Tillage Marks,” included with this lesson.

—Students will read the poem and participate in a class discussion, based on some or all of the questions included with the poem.

6. Use these online resources from the Oklahoma Ag in the Classroom website “Additional Resources” section (<http://oklahoma4h.okstate.edu/aitc/lessons/extras/index.html>) to discuss writing a research paper: “How Reliable Are your Sources?” and “How to Write a Research Paper,”

—Each student will use online or library resources to research and write a paper on one of the following topics:

- Select one of the operations described in the background— plowing, harrowing, planting, harvesting, threshing—and trace the ways in which those tasks have changed from 1830 until now.
- Research the steps for developing a wheat crop in 2009. Compare and contrast those with the steps used in 1830 listed in the reading “Machines in Agriculture.”

## Vocabulary

**crop**—a plant or animal or plant or animal product that can be grown and harvested

**energy**—the capacity for doing work

**fertilizer**—a substance (as manure or a chemical) used to make soil produce larger or more plant life

**flail**—a tool for threshing grain by hand

**harrow**—a cultivating tool that has spikes, teeth, or disks and is used for breaking up and smoothing the soil

**harvest**—the gathering of a crop

**hoe**—a farm or garden tool with a thin flat blade at nearly a right angle to a long handle used especially for weeding and loosening the earth

**hybrid**—an offspring of parents with different genes especially when of different races, breeds, species, or genera

**kernel**—a whole grain or seed of a cereal

**machine**—an instrument (as a lever or pulley) designed to transmit or change slightly the application of power, force, or motion

**pesticide**—a substance used to destroy pests

**plow**—a farm machine used to cut, lift, and turn over soil

**reaper**— a machine for harvesting grain

**screw**—a simple machine consisting of a solid cylinder with a winding groove around it and a correspondingly grooved hollow cylinder into which it fits

(Continued on Next Page.)

## Vocabulary (Cont.)

**scythe**—an implement consisting of a long, curved, single-edged blade, with a long, bent handle, used for mowing and or reaping

**sickle**—a tool with a sharp curved metal blade and a short handle used to cut grass

**stubble**—the stem ends of herbs and especially cereal grasses remaining attached to the ground after harvest

**thresh**—to separate seed from a harvested plant especially by using a machine or tool

**tractor**—a vehicle that has large rear wheels or moves on tracks and is used especially for pulling farm implements

- Research the machines used in animal agriculture to care for cattle and calves, swine, poultry, sheep or goats.
- Trace the changes in machines used to produce another one of the crops grown in Oklahoma—soybeans, corn, hay, rye, peanuts, pecans, watermelons, peaches, strawberries, vegetables, etc.
- Select a plant or animal crop and find how it is raised in a third world or developing country. Compare and contrast how it is grown there as opposed to how it is grown in Oklahoma. Determine how technological advances in agriculture have changed the culture in that country.

—Students will share their reports with the class.

7. Students will use online or library resources to trace the country of origin of these basic farm tools: shovel, plow, barbed wire, hoe.
8. Students will choose any machine used in agriculture, and use online or library resources to find information for writing an informational and promotional brochure about it.

## Visual Art

1. Go to “Additional Resources” on the Oklahoma Ag in the Classroom website and click on “Ag in Art” (<http://oklahoma4h.okstate.edu/aitc/lessons/extras/art.html>)
  - In the “Crops” and “Farm Scenes” columns, locate paintings that depict the work involved in agriculture over the years. Use a smart board or overhead projector to show students some examples.
  - Students will compare and contrast the different styles used to portray the different aspects of farm work.
  - Use some of the following questions to discuss specific paintings:
    - The painting “Fall Plowing” by grant Wood shows a very simple hand plow with apparently enormous fields in the background. Consider the amount of work it would have taken to plow all those fields using the plow that is pictured.
    - Identify and discuss the tools used in “Haymaking,” by Pieter Brueghel the Elder.
    - In Winslow Homer’s “The Brush Harrow” what is providing the energy for the work taking place. (the horse)

## Extra Reading

Artley, Bob, *Once Upon a Farm*, Pelican, 2000.

Durham, David Anthony, *Gabriel’s Story*, Doubleday, 2001.

Greenwood, Barbara, and Heather Collins, *A Pioneer Sampler: The Daily Life of a Pioneer Family in 1840*, Ticknor Fields, 1999.

Larsen, Kirby, *Hattie Big Sky*, Delacorte, 2006.

McMullan, Margaret, *How I Found the Strong*, Houghton Mifflin, 2005.

Miller, Brandon Marie, *Buffalo Gals: Women of the Old West*, Lerner, 1995.

# Machines in Agriculture

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Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.

# Poem: Tillage Marks



## Tillage Marks

On this flat stone,  
too heavy for one man alone  
to pick up and carry  
to the edge of his field,  
are the faint white marks  
of a plow, one plow  
or many, the sharp blade  
crisscrossing its face  
like a lesson scratched there  
in chalk, the same lesson  
taught over and over,  
to one man alone in his field  
for fifty or sixty years,  
or to fifty such men,  
each alone, each plow striking  
this stone, in this field  
which he thought to be his.

—Ted Kooser

1. Why are there plow marks on the stone?
2. Does the poet know the farmer or farmers who have plowed this field? How do you know?
3. Explain the difference between “one man alone ...for 50 or 60 years” and “fifty such men, each alone?”
4. How was the work of placing the stone different from the work of plowing?
5. What does the poet mean when he says the man thought the field was his?
6. What is the author’s point of view? Purpose?
7. Find an example of personification in the poem.
8. How is the stone like a lesson scratched in chalk? Is this an example of a simile or metaphor?
9. What does the stone symbolize?
10. What is the poetic style?
11. What is the lesson the plow is teaching the man?
12. Describe or draw the scene the poem makes you see. What is the effect of the imagery?
13. Compare and contrast the scene presented in this poem with the reading, “Machines in Agriculture.”
14. Is the poet describing a modern farmer or someone who plowed the field in the past? (Leave it up to student to decide from his/her own interpretation.)

# Poem: Tillage Marks (answers)



1. Why are there plow marks on the stone? (because the plow hits it each time it comes to the edge of the field)
2. Does the poet know the farmer or farmers who have plowed this field? (no) How do you know? (because he doesn't know if the marks were made by one man or 50 men)
3. Explain the difference between one man alone for 50 or 60 years and fifty men, each alone? (Could be one man who plowed the field for 50-60 years or a different man each year for 50 years)
4. How was the work of placing the stone different from the work of plowing? (Placing the stone took more than one person. Plowing was done alone.)
5. What does the poet mean when he says the man thought the field was his? (From the poet's perspective the field no longer belongs to the man who did the plowing, but the man doing the plowing probably wasn't thinking about a time when it would no longer be his.)
6. What is the author's point of view? (Looking into the past.) Purpose? (to entertain and reflect)
7. Find an example of personification in the poem. (The stone has a face in line 8. The plow teaches the same lesson over and over in lines 10-11)
8. How is the stone like a lesson scratched in chalk? (Because the marks made on the stone look like chalk marks on a chalkboard.) Is this an example of a simile or metaphor? (simile)
9. What does the stone symbolize? (Possible answer: The stone stays the same while the field is plowed year after year and the man or men who plowed are no longer there.)
10. What is the poetic style? (free verse)
11. What is the lesson the plow is teaching the man? (Possible answers—that the field doesn't belong to him or that he has to keep plowing over and over again or whatever he is thinking about as he plows the field alone.)
12. Describe or draw the scene that the poem makes you see. What is the effect of the imagery? (loneliness, solitude)
13. Compare and contrast the scene presented in this poem with the reading "Machines in Agriculture." (open ended discussion question)
14. Is the poet describing a modern farmer or someone who plowed the field in the past? How would the modern farmer's experience be different from one that plowed in the past? (open ended discussion questions)

## Tillage Marks

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