Oklahoma Ag in the Classroom

The Farmer Cares for the Land

Objective

Students will read about various issues related to land use and find problem/solution and cause/effect relationships. Students will research issues related to agriculture and the environment and argue both sides.

Background

Farmers care about the environment. The land is their livelihood. Most people, farmers included, try to avoid practices, which might harm or destroy their way of life. Despite this fact, agriculture is blamed for many environmental problems.

People began polluting long before they knew that was what they were doing. Early settlers in this country dumped their trash into rivers and streams without considering the harm it might do. Before gasoline-powered tractors began releasing exhaust fumes into the rural countryside, work horses were creating pollution problems of their own. The average farm horse produced 35 pounds of manure or solid waste and two gallons of liquid waste each day. Although horse manure can be an excellent fertilizer when spread across a field, large amounts in small areas can create high concentrations of nitrogen and bacteria. This can filter through the soil into the underground water supply.

Thousands of years ago people began to farm because they found they could produce more food that way than they could by hunting and gathering. Over the years people discovered that some farming practices hurt the land. Cutting down trees, clearing away vegetation and letting animals overgraze left topsoil unprotected so winds and water could erode it away. Planting the same crop on the same field year after year used up all its nutrients. As a result, the fields lost their ability to produce good crops.

Early farmers learned from their mistakes and developed better farming methods. They learned to farm on the contour and build terraces—ridges of soil built across the slope to slow the runoff of water. They learned to rotate their crops—move them from one field to another to let the land rest. They learned to spread animal manure on their fields to restore organic matter and nutrients.

When European settlers came to the New World, they were dazzled by acres and acres of rich soil. Many farmers abandoned the methods their ancestors had learned for protecting the land. When one field began to produce poor crops, the farmer would simply abandon it and move farther into the wilderness.

As more people moved in, they began farming sloping lands that could easily wash away and sandy soils that could easily blow away. In the early 20th Century, farmers began plowing up the native grasses of the Southern Plains to plant wheat. Since that land had never been farmed before, farmers had no way of knowing that their hard work would be the first step toward creating what came to be known as the Dust Bowl. A severe drought dried up the exposed soil. With no grass roots to hold the sandy soil in place, it simply blew away with the strong summer winds.

Oklahoma Academic Standards

GRADE 3

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.1,2,3. Critical Reading and Writing: R.6,7; W.3. Research: R.1,2,3,4; W.1,2,3. Multimodal.R.1,2; W.1,2
Social Studies Content: 2.1,3; 3.2B; 4.9
Life Science: 3-2; 4-3,4. Earth Systems: 2-2

GRADE 4

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.1,2,3. Critical Reading and Writing: R.6,7; W.3. Research: R.1,3; W.1,2,3. Multimodal.R.1,2; W.1,2
Social Studies: 1.3,4,5
Earth Systems: 2-1; 3-2

GRADE 5

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.1,2,3. Critical Reading and Writing: R.6; W.3. Research: R.1,2,3; W.1,2,4. Multimodal.R.1,2; W.1,2
Life Science: 2-1,2. Earth Systems: 3-1

Recognizing a problem is the first step toward solving it. Farmers didn't know plowing up the Plains would cause the soil to blow away. Once they saw what had happened, they did what farmers have been doing for thousands of years. They began thinking of different farming methods they could use that would protect the soil. One method involved using chemicals on weeds instead of turning the soil with a plow. For many years, this method seemed like an excellent way to keep the soil in place while producing the food people needed. Then scientists discovered the chemicals were getting into the water supply and making birds, fish, animals and people sick. Today farmers and agricultural researchers are working on ways to solve that problem and many more.

English Language Arts

1. Hand out the Reading Page for students to read and discuss as a class.
   —Students will brainstorm actions early settlers took that were harmful to the land.
   —Ask students if they have ever done things that were harmful without knowing it.
   —Students will cut up the reading page to make a timeline of the development of agriculture.
2. Discuss problem/solution and cause/effect relationships.
   —Divide students into groups, and hand out copies of one of the situation pages to each group.
   —Students read the situations independently and highlight the main idea in one color and the details in another.
   —Students work in groups to discuss the cause and effect of each situation.
   —Students cut up the situation sheets to make timelines showing the sequence of events for each situation (problem, solution, new problem, alternative, effect, etc.)
3. Students will work in pairs and choose an issue related to agriculture and the environment to research online.
   —Each student will take one side of the issue and write a letter to the other defending his or her position, with special emphasis on facts.
   —Students will work together to find common ground and report the resolution to the class.
4. Students will make posters of items cut from the newspaper that show good agricultural practice or develop Power Point presentations using information found online.
5. Students will search social media, newspapers, magazines and TV for examples of facts and opinions about agriculture and the environment (wetlands, endangered species, etc.) Discuss findings as a class.

Social Studies

1. Lead a discussion on the conflicts between individual rights and the common good, e.g., the individual rights of people who want to smoke in public places conflict with the need to protect the public from second-hand smoke.
   —Lead the discussion toward the individual right of the farmer to use his or her land to make a living in conflict with the public need to protect the environment.
   —Students should also recognize the common good that comes from having a safe, inexpensive and abundant food supply and that individual rights sometimes work toward the common good, e.g., the public benefits if the farmer is able to earn a living by producing food.

Science

1. Draw a Venn diagram on the chalkboard.
   —Students will describe what farmers do.
   —Students will define the word "environmentalist."
   —Students will list what farmers and environmentalists have in common. (Both care about the land. Both need food to eat.)
   —Students will list issues on which farmers and environmentalists might disagree. (Environmentalists may think no fertilizers should be used. Farmers think there are ways to use them safely. Environmentalists may be more concerned about land in general while farmers may be more concerned about the land they own and work.)

Extra Reading

George, Jean Craighead, *Who Really Killed Cock Robin: An Ecological Mystery,* Harper Collins, 1991.
Pollock, Steve, *Ecology, Eyewitness Science*, Dorling Kindersley, 1993.

Vocabulary

agriculture– the science or occupation of cultivating the soil, producing crops, and raising livestock.
drought— a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions
Dust Bowl— part of the Great Plains region of the US which is subject to severe droughts
environment— the total of all external conditions which act upon an organism or community of organisms to influence development or existence.
erode— to wear away by wind, water or other forms of abrasion
livelihood— the way a person makes his or her living
rotate— to plant or grow (crops) in a fixed order of succession
terraces— ridges of soil built across the slope to slow the runoff of water

Name_____

The Farmer Cares for the Land

Farmers care for the land. The land is their **livelihood**. Farmers make a living from the land. Farmers try to avoid practices, which might harm or destroy their way of life. However, **agriculture** is often blamed for many **environmental** problems. These problems started thousands of years ago. However, farmers work hard to improve their farming practices to care for the land.

Thousands of years ago, people began to farm. They found they could produce more food farming than they could by hunting and gathering. When settlers came to the New World, they were dazzled by acres and acres of rich soil. During this time, many farmers did not protect the land. When one field began to produce poor crops, the farmer would simply quit using it and move farther into the wilderness. Over the years, some farming practices hurt the land. Cutting down trees, clearing away plants and letting animals graze too much, left topsoil unprotected. Wind and water began to **erode** the soil away. Planting the same crop, on the same field, year after year used up all of the soils nutrients. As a result, the fields lost their ability to produce good crops.

People began polluting long before they knew that was what they were doing. Early settlers in this country dumped their trash into rivers and streams. They did not consider the harm it might do. The average farm horse produced 35 pounds of manure. Horse manure can be an excellent fertilizer when spread across a field. However, a large amount, in small areas, is not good for the soil. It can create bacteria. This can filter through the soil into the underground water supply.

As more people moved in, they began farming land that had never been farmed. They farmed sloping lands that could easily wash away and sandy soils that could easily blow away. In the early 20th Century, farmers began plowing up the native grasses of the Southern Plains to plant wheat. Farmers had no way of knowing that their hard work would be the first step toward creating the **Dust Bowl**. A severe **drought** dried up the exposed soil. With no grass roots to hold the sandy soil in place, it simply blew away with the strong summer winds.

Recognizing a problem is the first step toward solving it. Farmers didn't know plowing up the Plains would cause the soil to blow away. However, once they saw what happened, they learned from their mistakes. Early farmers began to develop better farming methods. They learned to build **terraces**. Terraces are ridges of soil built across a field on a slope. Terraces slow the runoff of water. Farmers learned to **rotate** their crops. By moving their crops from one field to another they allowed the land to rest. They learned to spread animal manure on their fields to restore organic matter and nutrients.

Farmers began using different farming methods that would protect the soil. One method involved using chemicals on weeds. By using the chemicals they did not have to turn the soil with a plow. This kept the soil from blowing away. For many years, this seemed like the best way to keep the soil in place while growing food. Then scientists discovered the chemicals were getting into the water supply. This made birds, fish, animals and people sick. Through research, farmers and scientists work to find ways to prevent chemicals from spreading into water. They work hard to make sure they do not use too much chemical. Farmers care for the land and for the people. Farmers want to make sure we are all safe.

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.

Situation Page A

Wetlands

Identify the problem and the solution and the main cause and effect relationship in the information below.

Wetlands are low areas that are saturated with water. Marshes and swamps are wetlands. Most of the wetlands in Oklahoma are the areas along creeks and rivers. They are between the water and the land. These are called riparian areas. Oklahoma has some marsh and swamp areas, too, mostly in southeastern Oklahoma.

At the time of European settlement, there were about 215 million acres of wetlands in the lower 48 states. In the last 200 years, over 54% of these wetlands have been lost. Most are now used for agricultural uses. For many years people thought of wetlands as obstacles to farming. They also thought they were breeding grounds for mosquitoes. The government even encouraged landowners to turn wetlands into dry lands.

Wetlands are an important part of the earth's ecosystem. They act like sponges to store water during the wet times of the year. They then release water into the aquifers and underground streams. This is where we get most of our drinking water. When there are no wetlands to soak up the water, rains are more likely to turn into floods. Floods destroy homes, businesses and farms. Plants that grow in wetlands hold the soil and help keep it from being washed away.

Wetlands also help clean the water. They filter out harmful chemicals and wastes. Dirty water gets a good cleaning when it flows through a wetland. Wetlands provide homes for many birds and animals that need wet places to grow and reproduce. They are important rest and food stops for migrating birds. Many endangered plants, and over one third of our endangered animals, live in wetlands.

Now we know more about wetlands. We realize how much they help the environment, wildlife and humans. Federal laws have been passed to protect and preserve wetlands. Some people don't like the wetland laws. People who have wetlands on their land think they should be able to use their land to earn money to support their families.

Problem_____

Solution_____

Cause_____

Effect(s)_____

Does the solution create another problem? If so, what is it? _____

Situation Page B

Soil Erosion

Identify the problem and the solution and the main cause and effect relationship in the information below.

Soil erosion is what happens when soil is washed or blown away. Trees, grass and other plants hold soil in place. When these plants are removed, winds and rains can carry the soil away. Over the years, farmers have removed grass and weeds from soil before planting their crops. Cattle and other farm animals can also cause erosion. If there are too many animals, or if they are left in one place for too long, they will eat too much. Without plants to hold the soil in place, it can erode. Once gone, soil is not likely to be replaced within our lifetime.

On the Southern Plains, the soil is sandy. The annual rainfall is low. There are large, open areas and high winds are common. The first settlers allowed their livestock to roam and graze the Plains. This left very few plants left to hold the soil in place. Early in the 20th century, farmers plowed up grass on the Plains and planted winter wheat. Between 1934 and 1937, the area had even less rainfall than usual. With large areas of plowed land, and no roots to anchor it, much of the soil blew away. This was called the Dust Bowl. The dust storms buried roads and houses. Clouds of dust reached as far East as Washington, DC.

In response to the Dust Bowl, the government created the Soil Erosion Service and the Civilian Conservation Corps. They worked to find ways to protect the land. Workers replanted grass, planted trees and showed farmers better farming methods to help protect the soil. One method was to let animals graze on one piece of land for a short period of time and then move them to a new pasture. This allowed the animals to get the nutrition they needed while cutting down on overgrazing and erosion.

Another method was no-till farming. A farmer using this method plants crops directly in the plant stems, stalks and leaves from the last harvest. For this method to work, the farmer must use chemicals to kill unwanted grass and weeds. This method helps stop soil erosion. However, some people worry that the chemicals used might pollute the underground water supply.

Problem_____

Solution_____

Cause_____

Effect(s)_____

Does the solution create another problem? If so, what is it? _____

Situation Page C

Chemical Pesticides and Fertilizers

Identify the problem and the solution and the main cause and effect relationship in the information below.

In the natural plant cycle, plants take nutrients from the soil. When leaves and other plant parts die and decompose the nutrients return. When people take plant matter from the soil, they are also removing nutrients. Over time, if the nutrients aren't replaced, plants cannot grow. In early years, farmers replaced these nutrients by adding animal manure. Farmers also grew legume crops, such as beans. They let fields rest. They rotated crops so fields could restore nutrients.

In the 1920s, farmers began using tractors instead of horses and mules. They began using new fertilizers, instead of manure, to replace nitrogen in the fields. Nitrogen is one of the main nutrients plants need to grow. In the 1940s, farmers learned to use chemicals to kill insects and weeds. These chemicals now help one American farmer provide food and fiber for 150 non-farmers.

Chemicals have caused some problems, too. Pesticides can kill other organisms, besides the ones for which they are intended. Some of the organisms are useful ones that help crops grow. Fertilizers can also cause the soil to be less desirable for plant growth. Chemicals can contaminate the water we drink. Sometimes they move through the soil and enter the underground water supply. Sometimes they are carried by rainwater into lakes, rivers and streams.

Farmers are concerned about these problems. They are trying new methods to farm. These methods will help them grow enough food for all the people to eat, without damaging their land and water. These methods help farmers use fewer chemicals. One method is Integrated Pest Management. Using this method, farmers don't use pesticides unless there are enough pests to cause large amounts of crop damage. They often choose pesticides that are better for the environment. Sometimes good insects are used to control the pests. Another method uses GPS on the farmer's tractor. The computer tells the tractor where fertilizer is needed and how much to use.

Problem_____

_____

Solution_____

_____

Cause_____

_____

Effect(s)_____

_____

Does the solution create another problem? If so, what is it? _____

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The Farmer Cares for the Land (answers)

A. WETLANDS
- Problem: Loss of wetlands
- Solution: Passing laws to protect wetlands
- Cause: Draining or filling in wetlands
- Effect(s): Flooding, loss of habitat for wildlife, loss of natural water purification
- New problem: People are unable to use their property as they wish.

B. SOIL EROSION
- Problem: Soil Erosion
- Solution: Rotational grazing, no-till farming
- Cause: Overgrazing, clearing vegetation from soil
- Effect(s): Soil washes or blows away
- New Problem: Use of herbicides may cause water pollution.

C. CHEMICAL FERTILIZERS AND PESTICIDES
- Problem: Overuse of chemicals
- Solution: Integrated Pest Management, computers to monitor fertilizer use
- Cause: Using chemical fertilizers and pesticides
- Effect(s): Increases production, pollutes water
- New Problem: None identified in text.

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