Oklahoma Ag in the Classroom

Round and Round We Go

The Benefits of Crop Rotation

Objective

Students will read about crop rotation methods used on commercial farms in the US. Students will play a game to demonstrate crop rotation. Students will plant a wheat field.

Background

In the early days of commercialized farming in the US, farmers concentrated on crops that would yield the highest revenue. For example, throughout the mid- to late-1800s, cotton was widely grown across the southern states because it was considered a high value cash crop. Even though cotton depleted the soil of nutrients, farmers grew as much cotton as possible during that time period. As people become more aware of better land management practices, farming began to change. One scientist in particular, George Washington Carver, was well known for his development of many sustainable agriculture methods. One method that became widely used was crop rotation. Carver geared his efforts toward the poor farmer who relied on soil that had been exhausted after years of growing cotton. His desire was to steer farmers toward nutrient-enriching crops such as peanuts and soybeans in order to conserve and replenish their soil. In order to convince farmers to grow different crops, Carver devoted years of research into finding many uses for these different crops, especially peanuts.

Crop rotation is the practice of growing different crops in sequential seasons on the same soil. There are many reasons that crop rotation is important in modern-day farming. Farmers must take care of their land, and growing the same crop in the same place for many years in a row depletes the soil of certain nutrients. With rotation, a crop that leaches the soil of one kind of nutrient is followed during the next growing season by a different crop that returns that nutrient to the soil or draws a different ratio of nutrients.

Two common crops that deplete the soil are corn and cotton. With crop rotation practices, those crops would be followed during the next growing season by nutrient-enriching crops such as rice or soybeans.

Rotating the crops from year to year can also help reduce pest and diseases, which can become a problem when the same crop is grown year after year. When wheat is grown year after year in the same field, weeds become resistant to pesticides and require more expensive methods for killing them.

Also, when wheat is harvested, the more weed seed found in the harvested wheat, the less the farmer is paid for the crop.

Recently, farmers have discovered the benefits of growing canola in rotation with wheat. Weeds are more efficiently controlled in canola/wheat rotations because more different herbicides can be used, which reduces the

Oklahoma Academic Standards

GRADE 5

Speaking and Listening: R.1,2,3; W.1,2. Critical Reading and Writing: R.1,2,7; W.2,3,4. Research: R.1,2,3; W.1,2,3,4

Life Science: 2-1, 2

Visual Art: 1.2,3,4; 4.4

GRADE 6

Speaking and Listening: R.1,2,3; W.1,2. Critical Reading and Writing: R.1,2,7; W.2,3,4. Research: R.1,2,3; W.1,2,3,4

Visual Art: 1.2,3,4; 4.4

likelihood of resistance developing. Canola roots push deep into the soil. After harvesting, the canola taproot decomposes and leaves the soil richer than it was before. This helps the farmer eliminate some costs in weed control and in soil enrichment and to make more money from both crops.

If farmers choose not to rotate crops, they must allow their fields to rest or lie fallow (without a crop) for at least one growing season in order to control weeds. Therefore, one of the most economical reasons farmers use crop rotation is to keep their fields under constant production rather than having to let certain fields lie fallow for a season, which would reduce revenue.

English Language Arts

1. Students will read the background information and discuss as a class any unfamiliar words or ideas.
2. Students will use online or library resources to find at least two sources on the subject of crop rotation.
   —Students will analyze the sources. Note similarities and differences.
   —Students will make comparison charts to assist in this analysis.
   —Students will use the following questions to guide their analysis:
   - What is the author's point of view on crop rotation? Is he/she in favor of it?
   - What does the author use to support his/her opinion?
   - How does each author relate the history of crop rotation?
   - What does each author state as the reasons for crop rotation?
   - What are some of the crop examples the authors use?
   - How do the authors describe the properties of these crops?
   - Do the authors incorporate environmental benefits beyond farming?

   —Divide students into groups of 3-4 to discuss their findings. The students should be able to effectively relate how the authors of their texts discussed the benefits and/or drawbacks of crop rotation. They should use specific points in the text to support their discussions.
3. Students will write short, informative texts on why they would (or would not) want to use crop rotation if they were farmers. Student should clearly state their ideas and present information using facts, definitions and details obtained from the texts they researched. The writing should be clear, coherent and organized.
4. Invite a local farmer or related agriculture professional to the class to discuss the methods he/she uses in crop rotation.
   —Students will prepare questions ahead of time.
   —Students will listen effectively and take notes.
   —Students will write short reports about the speaker's visit, based on their notes.
   —Students will discuss as a class or in small groups, the different points the speaker made.

Materials

Small plot of ground or flower pots filled with soil

Student crop journals

Wheat seed (For information about getting wheat seeds, check with your local grain elevator or feed store or contact your local OSU Extension office. Wheat seeds are also available at health food stores or in the health food section of your grocery store, marketed as wheat berries.)

Science

1. Farmers determine their crop rotation cycles based on many different properties of the plants themselves. One of these properties is how the different crops create and use their energy sources. Using the Oklahoma Agricultural Commodities map (See "Additional Resources on the OAITC website), students will choose two different crops to study.
   —Students will use online or library resources to research the selected crops and develop charts that detail the types of nutrients and minerals each crop needs to survive.
   —Using the charts and additional research, students will write informational pieces on the plants they chose. The reports should describe how the plants convert water and sunlight into the nutrients they need as well as what nutrients, if any, the plants put back into the soil. The reports should conclude by deciding whether or not the crop they chose would be a suitable crop to use in a rotation cycle, and, if so, how it should be used.
2. Students will study a crop like a scientist by planting a test plot of wheat in the schoolyard.
   —Oklahoma farmers start planting winter wheat in September. As a class, students will plant a plot of wheat to harvest at the end of the school year.
   —Students will prepare a bed, as follows:
   - Strip off the overgrowth from the plot, removing weeds, grasses and other materials.
   - Turn the soil as deeply as possible, using a shovel or motor-driven rotary tiller.
   - If the soil is clay-like, add compost.
   - Turn the soil and mix thoroughly one more time after compost has been added. Allow the soil to rest for several days, and keep it moist, if possible, before planting.

   —Students will scatter the wheat and water it.
   —Through the course of the school year, students will observe the wheat growing and record their observations in a journal. Observations should include growth patterns in association with weather patterns as well as the effects of predators and pests.
   —Students will leave the wheat alone during the winter and start watering again in the spring.
   —Students will also grow wheat in pots in a sunny window for comparison.
   —Students will keep the pots of wheat watered and cut it back occasionally with scissors.
3. Students will use online or library resources to research the nitrogen cycle.
   —Students will work in groups to develop skits demonstrating how using soybeans, peanuts and other legumes in rotation with cotton help replenish nitrogen.

Vocabulary

cash crop—a crop for direct sale in a market, as distinguished from a crop for use as livestock feed or for other purposes
commercialized farming— the production of crops and farm animals for sale, usually with the use of modern technology
crop rotation—the process of planting a variety of crops in a definite order on the same ground, especially to avoid depleting the soil and to control weeds, diseases, and pests
deplete—to decrease seriously or exhaust the abundance or supply of
fallow— plowed and left unseeded for a season or more
leach— to dissolve out soluble constituents from ashes, soil, etc.
nutrient— providing nourishment
revenue— an amount of money regularly coming in
sequential— following; subsequent; consequent
sustainable agriculture— any of a number of environmentally friendly farming methods that preserve an ecological balance by avoiding depletion of natural resources
yield— to give forth or produce in return for cultivation

Ag Career: Agronomist

Agronomist, also known as crop scientists, work to improve the quality of food crops that we consume. These scientists also develop new methods for keeping food pests and weeds at bay. Crop scientists might work in a variety of settings, including laboratories, offices or locations where crops are grown. This means working outside some of the time, in all kinds of weather, but also getting to travel.

According to the Crop Science Society of America, completing a bachelor's degree program can provide entry into the field, but positions in areas of advanced research or teaching require completion of graduate-level degree programs.

It is important that an agronomist develop critical thinking, data analysis skills, decision-making skills, as well as learn close observation, communication and problem-solving skills. Computer skills and learning to use important software is also important in the field of crop science.

4. Create nametags for students using the names "Cotton," "Wheat," "Corn," "Soybeans," "Canola" and "Peanuts."
   —Using a timer, give students a certain amount of time to find their "rotating partner." For example, someone with a "Cotton" nametag would pair up with someone that has a "Soybean" nametag. Play a couple of times, telling students to try to find a different crop than the first time.
5. Students will keep the same nametags from the previous activity.
   —Give each student a sheet of paper and pencil.
   —Students will mill about in a group and conduct crop interviews with a person representing a crop different from his/her own.
   —Students will work with that person to find three similarities and three differences between the two crops.
   —Students will share their interview findings as a class.
6. Set up chairs as if to play musical chairs, with one less chair than the number of players.
   —Students will sit in two groups with group names of "Soybeans" and "Canola.
   —To facilitate activity, call out crop names such as wheat, corn, cotton, rice and peanuts.
   —When you call out a group's rotation crop, that group will race to get a chair. (Note: Remind students that soybeans generally rotate with corn and canola generally rotates with wheat.)
   —If a student is unable to find a chair, he/she is "out."

Visual Art

1. Cotton was one of the first crops that modern scientists studied as they developed crop rotation methods. Show students the painting "Cotton Picking," by Oscar E. Berninghaus, included with this lesson.
   —As a class or in small groups students will answer the questions about the painting included with this lesson.
   —Students will compare this painting with another painting of cotton or another painting of a crop in a field. (See "Ag in Art," in the "Additional Resources" link on the website.)

Extra Reading

Hesser, Leon, *The Man Who Fed the World: Nobel Prize Laureate Norman Borlaug and His Battle to End World Hunger,* Durban House, 2006.

Name_____

Cotton Picking

- **Describe the sky. Can you determine the time of year from the color of the sky?**
- **Find the horizontal lines in the painting.**
- **Find the geometric shapes.**
- **What is the predominant color?**
- **Where is the center of interest?**
- **What is the mood of the painting?**
- **What objects are in the distance? How can you tell?**
- **Which objects are closer? How can you tell?**

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.