

Why is crop diversity desirable?

MY OWN FOOD CHAIN PROGRAM (K-2)

Crop Diversity **(ILS 15B, 15C)**

Overview

This curriculum explores the relationship between people and the food they eat. It aims to give children in grades K-2 a basic understanding of the flow of energy through the food chain, and the place of people in the food chain. If teachers complete the entire curriculum, their classes will explore food chains in nature, focusing on its individual links and looking at the flow of energy as a whole. Students will then look at the place of people in the food chain, and discover how people have appropriated nature's systems in agricultural practices – making the food chain our own. Classes will compare traditional and sustainable agricultural practices.

Sustainable Agriculture, for the purpose of this curriculum, shall be defined as "a system of food production, supported by consumers, where farming operations, practices and technologies work in harmony with the natural systems that sustain life on earth."

Suggested Grade Level

This curriculum is designed for kindergarten through second grade levels. The topics covered can be built upon in complexity throughout that age range.

Approximate Time

Approx 45 min., not including optional but strongly recommended pre- and extension activities.

Objectives

1. The students will understand some reasons why a field of diverse crops is preferable to a monoculture.

Activity Abstract

In this lesson, students will play a game that models a farm with and without crop diversity. The game will demonstrate that without crop diversity, farmers are susceptible to losing their crops due to diseases, weather, and other environmental problems.

Background Information

The world over, 7,000 species of plants are used for agricultural purposes. However, only three – wheat, corn and rice – provide over half of the world's calorie intake from plants, (Cromwell, et al.) Furthermore, over 70% of all the corn planted in the US is one of six varieties or corn, (Muir, P.)

Many people would argue that this trend toward planting the same thing in every field is detrimental to the long-term sustainability of farming practices. Crop diversity refers to the planting of different types of crops on a farm, as well as having genetic variations within one type of crop planted on a farm. Crop diversity helps farmers reduce the risks of devastation due to weather, market fluctuations, diseases, weeds, and soil health, (http://www.dakotalakes.com/Publications/Div_Int_FS2pg4.PDF).

Genetic diversity within plant species is necessary for the species to be able to adapt to environmental problems and pests, (Cromwell et al.) In other words, when pests, climate, or pathogens affect a farmers' crops, they are less likely to be entirely destroyed if there is diversity within the crops planted., (Muir, P.)

This is illustrated by the words of a Mexican farmer visited by H.D. Thurston. "In 1980 I traveled to Mexico with a group of students. On one visit we went to the farm of a traditional farmer near Puebla, Mexico. As the students were talking to him, I noticed a pot containing beans and separated out 17 different types from the pot. Later we found out that they included common beans (*Phaseolus vulgaris*), lima beans (*P. lunatus*), and scarlet runner beans (*P. coccineus*). The farmer said he grew all of them on his 1.5 ha farm. When asked why he grew so many varieties, he noted that some years it was wet, and some years it was dry. Some varieties did better in wet years, and some did better in dry years. Certain years, when insects attacked, some varieties survived while others did poorly. His wife preferred certain varieties for specific cooking purposes. The diversity of his many varieties doubtless gave him some protection against the vagaries of climate and biological sources of stresses."

Materials

- Paper laminated cut-outs of various vegetables – for a class of 30 students, have 45 green beans, 45 tomatoes, 45 broccolis, 45 pumpkins, 90 yellow corns, 90 white corns. (Can use plastic toys or other substitutes for game pieces if available.)
- Orange cones to mark playing field.
- Sign that says "Bankrupt" and clip to hang it.

Preparatory Activity

(Optional but recommended). Go out and do two nature journaling/drawing sessions, one in a local natural area (prairie, forest, wetland) and one in a mono-culture farm field – all corn or soy beans. Use these as the basis for comparison in procedure step #2.

Procedure (Session 1)

1. **Tap Prior Knowledge.** Ask students if they've ever seen a farm field as they were driving. What types of plants were in the field they saw? Did they have one type of plant or more than one in each field? Was it pretty?
2. **Share with neighbor.** Compare and contrast those farm fields (presumably monoculture) with a forest/prairie/wetland or whatever natural habitat the students are most familiar with. Create a t-chart on the board.
3. **Hands-on Experience.** Go outside to play the crop diversity game, explained below.

4. Relate this to real life. Share a kid-friendly version of the story presented in the “Real Life Story” section.
5. **Introduce Scientific Principle.** Talk about the results of the game. Have the students summarize what happened, and then teach them the term “diversity,” differences in living things that make different things able to survive better in different conditions of life.
6. Go out to a natural area and look for examples of diversity. Compare them to the diverse crops in the game.
7. Remember this lesson when planning a garden!

Rules of Crop Diversity Game

Each “farmer” (student) needs to “harvest” (collect) at least three “crops” (paper cut-outs) to have enough food to sell and eat and have a successful farm. They can harvest from within a coned-off area. In round 1, spread the corns only – both colors -- and have students “harvest” them all. Most students will succeed in collecting a minimum number. (Determine your minimum number by dividing the number of crops you’re using in round one by the number of students. Each child should be able to meet the minimum with a few left over. With competitive groups, you may need to set a cap, or maximum number children can harvest.) Students who fail to get enough crops will go out of business and go sit in the bankrupt area. (Explain what bankrupt means, if necessary). After round one, “re-plant” the corn by having children spread it on the playing field. Play round two. This time, announce that there has been a terrible disease that is killing corn. All yellow corn is affected, and can’t be harvested. Students have to leave the yellow corn pieces on the ground. This round, it will be harder for farmers to make a living. Discuss why. Ask if students have any suggestions of how they could make it less risky to farm. With luck, they will suggest planting more different types of crops. Play the game with more crop variety in the fields, making some things get eaten by insects, killed by unexpected frosts, heat waves or droughts, or ravaged by disease. The more types of crops there are, the more “farmers” will be able to survive despite certain problems that may affect one type of crop only.

Crop Diversity Story

“When a new crop variety is released, it is usually resistant to most of the dominant current diseases. This is, of course, part of the plant breeders' strategy, as disease resistance is an important, usually genetically-controlled, trait.

“In the early 1970's, a new variety of corn was released in the US; the ‘Texas male sterile’. This variety had many desirable properties, and growers were excited about it, planting it over miles and miles of corn acreage in US. It was, of course, bred to be resistant to the most common corn diseases. However, it did not have genes for resistance to a previously unimportant strain of a fungal disease; the southern corn leaf blight (caused by the fungus *Helminthosporium maydis*). Ninety percent of the corn sowed in the US in 1970 was genetically susceptible to this pathogen. The fungus encountered all this acreage of susceptible host and wiped out one fourth of the US corn crop in 1970, a loss of over one billion dollars in production! If the corn acreage hadn't been such a

monoculture, the fungus wouldn't have been able to spread as rapidly, as it would have encountered barriers of genetically resistant plants.” – Muir, P.

Extensions (optional)

Visit an organic farm and look for examples of crop diversity. Draw maps of the fields or journal about the differences between it and the field you visited before.

References

Cromwell, E., Cooper, D., and Mulvany, P. Agriculture, Biodiversity and Livelihoods: issues and entry points for developmental agencies.

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Muir, P. Diminished Crop Diversity.

<http://oregonstate.edu/instruction/bi301/cropdiv.htm>

Thurston, H.D. Traditional Practices for Plant Disease Management in Traditional Farming Systems. <http://www.tropag-fieldtrip.cornell.edu/tradag/default.html>.