



Objective:

At the conclusion of this lesson, the students will be able to

- understand the difference between monoculture and organic farming.
- understand how monoculture and organic farming impact biodiversity.
- create a valid argument for and against monoculture and organic farming.

Introduction:

Biodiversity plays an important role in maintaining the health of an ecosystem. Areas with high levels of biodiversity are able to adapt to changes such as environmental shifts, introduced species and diseases. Currently the accepted practice of agriculture in the USA is the planting of one type of crop in one area. This practice puts this crop at risk to disease and infestation, but allows for high yields. Crops grown through monoculture regularly need increased amounts of pesticides to stave off infestations. GMO's have been touted to help increase the natural immunity of crops by inserting pest and disease resistant genes. However the public is very wary of GMO crops.

Polyculture is a method of farming by planting a variety of crops. Polyculture could have a lower yield than monoculture, but has benefits such as increase resistance to disease and preservation of biodiversity. Polyculture typically will cost more to plant and harvest because of less use of mechanized ways of farming.

Procedure:

1) Research

- a. Students will research the differences between monoculture and polyculture and create a debate between the two types of farming.
- b. Main questions to be answered include:
 - o What is polyculture and monoculture?
 - o Why is biodiversity important?
 - o Which system increases biodiversity? Which system harms biodiversity?
 - o Are GMO's helpful to decrease pesticide use? Is the fear of GMOs founded?
- c. Students should make sure they have enough facts to back up their arguments. It is ok for students to make cards to reference their facts and should be able to provide the source for their facts when asked.

2) Debate

- a. Set up a debate to answer a policy question of which system of farming, polyculture or monoculture would work best to:
 - i. Provide the largest yield per cost
 - ii. Ease the workload of the farming community
 - iii. Conserve biodiversity
- b. In the debate, some of the students will take on certain roles. It would be a good idea to split your class up so 2-3 students could share each role. It would be good to give the set of students a card with the description of the role on it. These roles could include:
 - o **Corn Farmer:**
Has been growing the same crop for 25 years and needs to feed his/her family. Sees monoculture as the only way to farm and is not willing to take on the added expense or work just for pesky environmentalists.
 - o **Organic Farmer:**
The organic farmer tries to not use pesticides on the crops and instead rotates the fields and plants many types of crops to preserve biodiversity.
 - o **Environmental Activist:**
The environmental activist does not want polyculture to be used in the USA at all because of the destruction to biodiversity and increase use of pesticides that further damages the environment.
 - o **Geneticist-makes GMO:**
The geneticist has no problem with GMOs and thinks that they will save the world from pesticides. The Geneticist is in agreement with the environmental activist about reducing pesticides in the environment.
 - o **Plant Seed Bank Scientist:**
The seed bank scientist wants to preserve the biodiversity of plants as much as possible and realizes that current farming practices is decreasing plant biodiversity making them susceptible to disease.
 - o **Suburban mom:**
The suburban mom wants to buy the healthiest food possible but pay the least amount for it.
 - o **US Congressman-Kansas:**
The congressman wants the constituents happy.
 - o **Biogeographer:**
Tries to see the big picture and put everything into perspective and reminds everyone that all things are related.
 - o **Small grocery store owner:**
Worries about money and can not pay that much for stock to keep profits as high as possible. They have two children and one will be entering college soon.
 - o **Large grocery chain CEO:**
The CEO has money to buy expensive products if there is a market for them.

Assessment:

See rubric document: RICHARDDEBATERUBRIC.html

The debate will be graded on the following categories:

- Presentation of information
- Organization of arguments
- Use of facts/statistics
- Rebuttal of arguments
- Understanding of topic
- Respect for classmates

References:

Guide to GMOs

<http://www.csa.com/discoveryguides/gmfood/overview.php>

Overview of polyculture

http://www.satavic.org/cropping_systems.htm

PBS: The Botany of Desire – Control Lesson

<http://www.pbs.org/thebotanyofdesire/lesson-plan-control.php>

Wikipedia article on polyculture

<http://en.wikipedia.org/wiki/Polyculture>

Wikipedia article on Monoculture

<http://en.wikipedia.org/wiki/Monoculture>