

NATIONAL SCIENCE STANDARD

- Personal and Social Perspectives: Science and technology in local challenges

OBJECTIVE

The student will identify the environmental benefits biotechnology has to offer.

BACKGROUND

Plant biotechnology enables farmers to conserve natural resources.

Promotes Land Conservation

Biotech crops allows for higher yields on less land. Improved farm productivity results in less impact on prairies, wetland and forests that wildlife habitats depend upon.



Biotechnology helps produce plants that grow in extreme heat, dry or poor soil, thus making use of land that may have been considered unfit for farming.

Decreases soil erosion

Some biotech crops require less tilling helping to preserve precious topsoil and reduce farm run-off into streams and rivers. (improved water quality)

Biotech crops allowing farmers to leave their fields untouched which leaves more plant residue on the ground to replenish nutrients and hold topsoil in place.

Decreases fuel use

Biotech crops require fewer pesticide applications, which results in fewer trips across the field with fuel-powered equipment.



Improves Air Quality

The use of no-till farming practices reduces the release of greenhouse gas emissions, which may help slow global warming.

(In contrast, when cultivated soil is exposed to air, organic matter is oxidized, releasing carbon dioxide--an ozone depleting gas--into the atmosphere.)



Improves wildlife diversity

Biotech cotton has been documented to have a positive effect on the number and diversity of beneficial insects in US cotton fields. In addition, the use of no-till farming methods creates wildlife habitat for birds and other wildlife.

WORD POWER

biotechnology *n.* Using scientific discoveries about living things to solve problems

genetically modified seed *n.* Seeds from plants that have been enhanced by inserting genes from another plant to achieve a plant with a desired trait.



BACKGROUND, CONTINUED...

Reduces need for pesticides

Biotechnology develops disease-resistant plants that reduce the need for pesticides.

Biotechnology is helping to make hardier strains of staple crops such as sweet potato, cassava, papaya, rice and corn that provide better protection against insects and disease. For example, researchers are developing sweet potatoes that are resistant to the sweet potato feathery mottle virus, which can destroy between 20 to 80 percent of a sweet potato crop.

Improves food quality

Biotechnology helps to develop enriched food like enriched Cassava, a staple in many poorer regions of the world. Cassava now contains 35-45% more protein which promises to aid in multiple health problems of these regions.

Feeds the growing population

To preserve the environment, some argue for a simpler, organic style of farming. However, organic farming yields are much lower than yields using modern farming methods.

Two hundred thousand people are being added to the population every day. An additional 4 billion acres will need to be farmed by 2050 to feed all these people if there is no increase in farm productivity. That's more than twice the size of the continental United States.

Biotechnology helps farmers grow more food while protecting their farmland from deteriorating, as well as protecting prairies, forests and other natural areas from cultivation.

INSTRUCTIONAL PROCEDURE

1. Review the background materials.
2. Have the students do Activity 1 and Activity 2.

ASSESSMENT

Discuss how the students' opinions on biotechnology changed after having more complete and accurate information about biotechnology. Discuss whether or not having correct information influenced the way survey participants thought about biotechnology.

ADDITIONAL RESOURCES

Council for Biotechnology Information **www.whybiotech.com**

This site has an excellent section for teachers and students. Articles include:

- "Environmental Benefits: More Studies Show How Biotech Crops Help Wildlife, Environment"
- "Resistance to New Foods Has Been the Norm"

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ACTIVITY 1: BIOTECH CROPS

LISTING

Soybeans, corn, and cotton are the main biotech crops in America.

Crop	Number of acres grown in the United States	% of crops that are biotech crops
Soybeans	72.7 million acres	85%
Corn	72.7 million acres	45%
Cotton	13.1 million acres	75%



List products (food or non-food) from each one of these major crops. Discuss what impact these products have in the student's daily lives. Discuss the likelihood that biotech crops were used in these products.

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ACTIVITY 2: BIOTECH SURVEY

SURVEYING THE SITUATION

Have the student choose 5 benefits of biotech crops. Divide the class into groups of approximately 5 students each, and have them practice explaining these benefits to each other.

Outside the classroom, have the students survey 10 people about the use of biotech crops using the question below:

1. Do you think farmers should use seeds that have been genetically modified by scientists? (Putting a gene from one plant into another to give the new plant the desired trait.)



Person surveyed	YES	NO	Did their opinion change?

DISCUSSION

How did knowledge about the benefits of biotech crops affect the person's opinion? Can you think of other products that people feared when first introduced? What helps people change their views about these products?