

CLEIMUN20

“Diplomacy in a Challenging Global Environment”

A Research Report

COMMITTEE: Ecology and Environment Committee (ECOE)

QUESTION: The Environmental Impact of Genetic Engineering

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Introduction and Background

With constant scientific advancements occurring, our environment is undergoing rapid change. The emergence of genetic engineering brought about a number of effects, such as a greater surplus of agricultural goods and a greater knowledge of what scientists can do with genetic material. Genetic engineering, or the act of genetically modifying organisms, is the manipulation of genetic material (DNA, for example) to enhance or modify the characteristics of an individual organism. In regards to the environment, genetic engineering is often used by scientists in plants or animals to improve resistance to disease or crop yields. Although humans have been influencing DNA for thousands of years through selective breeding and domestication of animals, it wasn't until 1973 when Herbert Boyer and Stanley Cohen were the first to successfully create a genetically modified organism. Since Cohen and Boyer's breakthrough, plants of all varieties, like tomatoes and corn, became genetically engineered (GE), compelling people to form departments or organizations to regulate consumed GE food crops like the U.S.

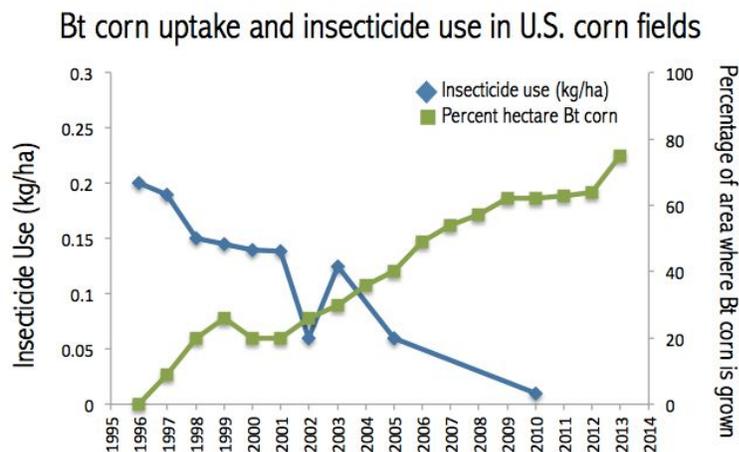
Department of Agriculture in the United States of America and the Food Safety Branch in the European Commission.

How does the Environment Benefit from the use of Genetic Engineering?

Genetic engineering can benefit the environment in a number of ways, by decreasing the need for space for agriculture, yielding more food, and lessening the amount of harmful chemicals used on plants. By genetically modifying and improving the quality of a plant to yield more food, less space may be required to yield a greater amount of food. Farmers need less area to produce a similar amount of money or crops, thus, logging and deforestation are reduced.

Pesticides and fertilizers contaminate soil, water, and turf. Pesticides can also be toxic to other plants, animals, and microorganisms that they weren't intended for and has been linked to many diseases in humans such as different types of cancers, diabetes, neurodegenerative disorders like Parkinson's, Alzheimer's, and amyotrophic lateral sclerosis (ALS). Now, plants like corn and cotton have been genetically engineered to be pest resistant. These plants are called *Bacillus thuringiensis* or Bt plants and are a great alternative to pesticides. By allowing the plant to produce the pesticide inside it, the pesticide can't spread to other unintended plants through

runoff or evaporation and rainfall.



With a steadily increasing number of Bt plants grown in farms across the globe, insecticide use is rapidly diminishing, saving the environment

Adapted from Malakof D. and Stokstad E. Pesticide Planet. Science Magazine. 16 August 2013.

from its harmful effects with smarter ways to keep plants insect-free.

What are the Environmental Downsides to the Continuation of Genetic Engineering?

New organisms created by genetic engineering could present an ecological problem. Ecosystems are organized in a state of stability where species coexist with other species and with their environment. The release of a new genetically engineered species would have the possibility of causing an imbalance in the ecology of the region just as a foreign species would. Favorable traits give the new species an unnatural advantage over their prey, which can cause a disruption in the predator-prey relationship. This can lead to the forming of an invasive species that causes a decrease in biodiversity. Invasive species wipe out the existing plants or organisms that supply food for other organisms causing an imbalance in ecosystems or extinction. Ultimately, this is detrimental to the environment because of the breaking down of many ecosystems and increase of carbon dioxide from the decline of plant species.

Animal welfare is also a great concern when it comes to genetically modifying organisms. In a study, ten transgenic pigs (meaning an organism that contains genetic material that was artificially introduced from an unrelated organism) were monitored from birth until adolescence. They had severe health problems and half either died or had to be euthanized. Three of the piglets who survived displayed low cardiac output. Another instance where animals were compromised due to failed genetic modification was when scientists developed a growth hormone and inserted it into salmon. While the fish did grow at a faster rate, some developed severe deformities. Cases like these feed distrust from the potential of harming genetically engineered organisms.

How has Genetic Engineering Impacted Consumers?

Extensive progress in agricultural technologies over the past twenty years has enabled higher yields without having to use more of our limited resources. Through the use of genetically modified organisms (GMOs), farmers are able to produce enough food at affordable prices to consumers. If GMOs did not exist, food prices would be drastically higher in many nations across the world. This is especially important to low-income consumers who have limited amounts of money to spend on food.

Past Efforts to Solve the Problem

The development of departments was the most effective effort for regulating genetic engineering. By going through the approval and regulatory process, genetically engineered organisms such as plants or animals can be tested for safety of consumption and the environment. In almost every country there is a department that ensures the GMO doesn't create an environmental hazard, approves insect-killing genes, and evaluates if it is safe to eat. In the United States, it takes an average of about eight years and the expenditure of more than 135 million dollars to move a new GMO product through the regulatory process. In the European Union, approval times are much faster, at less than five years. Although, since most of the member nations in the EU ban cultivation of GMO crops, many applications do not ask for approval in growing new plants.

Possible Solutions

Investing in research that can provide further investigation for problems that were caused by genetic engineering like damaged ecosystems and impaired animals can be used as a form of prevention to stop problems in the future. After understanding why these things may have happened, combatting specific complications like invasive species or defects in genetically treated animals is the next step to averting these environmental disruptions. Technology is also key for moving past these issues. New biotechnologies allow researchers less-expensive options with more precise control and the ability to avoid the controversial practice of transgenics.

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