

# CASE TEACHING NOTES for "Frankenfoods?"

by  
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## INTRODUCTION / BACKGROUND

This case examines the drama currently being enacted worldwide over the risks (and perceived risks) as well as the benefits (and perceived benefits) of biotechnology, which has pitted environmentalists, conservationists, and some religious groups against agricultural businesses, scientists, and farmers.

The case was first used in a slightly different format in a vegetable crops course (HORT 456/656) at Clemson University in the fall of 2000. The students in that course were horticulture/turf grass majors, primarily juniors and seniors as well as two graduate students. Since that time the case has been rewritten to focus on a fictionalized account of an attack on a research facility by environmental activists opposed to plant biotechnology.

## Case Objectives

Biotechnology is now an integral part of agricultural and vegetable production and the stakes are high for industry and agriculture as well as the consumer. In working through the case, students examine the scientific and ethical issues of agricultural biotechnology and are asked to consider the following:

- The advantages and disadvantages of genetically modified crops.
- The economic and socio-political issues associated with increasing corporate control of our food supply.
- The ethics of modifying the genes of an organism.

## ANALYSIS OF MAJOR ISSUES

One topic of discussion is what are the most important elements of plant food production. The contribution of environment (soil nutrients and salt concentration, water, temperature) and genotype (varieties, cultivars, clones, etc.) should become evident to the students as the discussion proceeds. The instructor should point out the differences between food production on a portion of land in one specific locale in contrast to corporate growers who manage thousands of acres around the world. More traditional farmers have saved seed, and the fate of these seed varieties in the future is unclear. Many farmers continue to use outmoded toxic pesticides to protect their crops against increasingly resistant pests. The corporate farmer, on the other hand, is more capable of change and of managing the risk but may use only a handful of seed varieties with the same genetic background. If more food can be produced on fewer acres with fewer pesticides, less land will be required by agriculture. A fuller discussion of these issues can be found in the sources cited under References below.

Another topic for discussion is the impact of agriculture on the land and on people. Discussion of this topic can be found in World Resources 2000-2001 or the website associated with it (see References below). Biotechnology is not a panacea, and students will learn that agricultural production requires many inputs, any of which can doom an ordinary or a high tech food crop. For example, agricultural production depends on soil fertility and structure, rather narrow temperature and day length parameters, and adequate soil moisture, whether from normal rainfall or supplemental irrigation.

With this background information, the nature of plant biotechnology, how discoveries are made and applied to agriculture, who owns the lion's share of biotechnology, and who is able to pay for it should be discussed. Biotechnology is largely in the hands of huge international companies that have the technological capacity to quickly exploit and patent new genes. Most third world farmers simply cannot afford the new technologies themselves and must rely on others for their development.

Questions concerning how the science of biotechnology squares with the press generated by the activists and why the term “genetically modified” food is actually a misnomer should be explored. Almost all human food has been genetically modified by mankind for thousands of years to suit our preferences and our environment—unfortunately, the term “genetically modified” has become confused with recombinant DNA techniques. One of the most disturbing changes taking place is the use of genes from unrelated or distantly related organisms. New genes can direct plants and animals to generate large quantities of products that they never before produced. These genes can escape their new species bounds and create new plant and animal species. However, activists seldom give a balanced perspective of risks and regulation.

In summing up, the class discussion should center on the benefits and perceived benefits of biotechnology. Both risks and benefits are described more fully in the answers to the case questions below.

### **Answer Key**

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to **the key**. You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online** or write to [answerkey@sciencecases.org](mailto:answerkey@sciencecases.org).

### **CLASSROOM MANAGEMENT**

When the case was taught in the fall of 2000, the class comprised 27 students divided into five teams of three to five students. Students were randomly assigned to their teams before the course began.

The case was taught as a discussion case. Students were given the case and a set of questions similar to those that appear at the end of the case a week before the in-class discussion and expected to discuss the issues and develop answers to the questions as a team. Teams worked together with the aid of a computer-based tool for online collaboration called MYCLE (My Collaborative Learning Environment). MYCLE has built into it discussion boards and chat sessions, which the students made use of to discuss the case study questions. In addition to the references and websites provided (see **References** below), excerpts from the online debates on the AgBioView website (see <http://www.agbioworld.org>) also were made available in a resource folder in MYCLE. To access these debates, the reader can go to the AgBioView Discussion List Archives at <http://comet.sparklist.com/scripts/lyris.pl?visit=agbioview>.

The in-class discussion of the case was led by the instructor and covered the topics included under “Analysis of Major Issues.” In conjunction with the case, the class spent an hour on “A Short Course on Biotechnology,” an industry-developed slide presentation with sound and script, and an hour on an open discussion of the recent StarLink corn taco shell case.

### **Variation for Teaching the Case**

In preparation for an in-class discussion, you could give each group a separate role as a stakeholder in this debate:

- Group 1 could represent a large agri-biotech corporation like Monsanto
- Group 2 could represent a third world country in Africa or Asia
- Group 3 could represent a European country, such as Germany or Sweden
- Group 4 could represent university researchers
- Group 5 could represent a militant activist group, such as Reclaim the Seeds

The groups would be given the case and questions a week before the class in which the case was scheduled to be discussed and asked to research and prepare written responses to the questions from their particular group's perspective. Then, on the day of the case, the students would discuss their answers in their groups as preparation for a general class discussion. As each question was raised, the groups could be called upon to give their different viewpoints on the issue. It would also be possible to use a cooperative learning strategy called jigsawing here. One person from each of the groups would be placed together in a new group arrangement. The job of these new groups would be to hammer out a policy statement or position paper to present to the United Nations to solve the problem of how to regulate genetically modified foods internationally. The position paper would have to articulate the concerns as well as the roles and responsibilities of each of the interest groups.

### **Student Reactions: A Sampler**

When the case was taught at Clemson, each team was asked to submit a team report, which consisted of the group's answers to the questions in the case narrative. In addition, each student in the class had to submit an individual report on some aspect of biotechnology related to agricultural seeds or plants. In general, the essays were quite good and indicated an increased understanding and appreciation for hard science, government regulation, and the potential of biotechnology. Grading of the team reports was difficult. Justified opinions were given high scores, and poorly prepared answers without sources were not.

For the individual reports, the students were asked to focus on one particular aspect of the biotechnology of crops and seeds that interested them. Selected comments from the individual reports are reprinted below:

- *The most obvious concern about biotechnology has to be the aspect of safety... Like Jimmy Carter said, starvation is our enemy, and "Without adequate food supplies at affordable prices, we can't expect world health or peace."*
- *Before last week, I had never heard of biotechnology. Now I realize that it is a major accessory of our lives. With all of these advantages, I do not think anyone could disagree that biotechnology is a positive discovery for people throughout the entire world.*
- *Genetically modified foods offer more benefits than...disadvantages.*
- *Like all technologies, you can use them to destruct or to build. To avoid one technology to be used for undesirable purposes it's necessary to keep it under control, and the means for that are supervision and honesty. Using these principles, any technology is safe and productive... I think it's our obligation to keep the society aware of who are its real friends, and to show the pros and cons of any existing technology. Up to now, it's not proved that biotechnology is anyway damaging the environment. So, why not?*
- *There is almost no scientific proof that any biotech products are unsafe.*
- *I have personally witnessed how effective Bt cotton actually works... I still highly recommend Bt cotton to anyone inquiring about it. I feel like its advantages outweigh its disadvantages.*

- *As with any “new idea” genetically altered food will slowly work its way into the mainstream population, as more testing results and benefits are made public.*
- *But there are still many questions... Will they affect some area of our environment that has not even been thought about? Is it worth modifying our plants with animal or bacterial genes, even if it is considered “safe” by those who do it? Will genetic engineering of plants lead to the engineering of humans? Do we have the right to do so? No, in my thinking we don’t although there are benefits. We need to be sure that genetic engineering is left in areas where we do not have an emotional attachment.*

## REFERENCES

An excellent source of information for instructors is:

- Mitra, Barun, editor. March 2000. *Thirty-One Critical Questions in Agricultural Biotechnology*, [http://www.agbioworld.org/biotech\\_info/articles/critical.html](http://www.agbioworld.org/biotech_info/articles/critical.html)

In addition, the following references are provided to the students with the case:

### Print

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- *World Resources 2000-2001*. The World Resources Institute. New York: Oxford University Press. <http://www.wri.org>

## Internet

- AgBioView Discussion List Archives  
<http://comet.sparklist.com/scripts/lyris.pl?visit=agbioview>
- Agricultural Biotechnology. 2000. USDA. Frequently Asked Questions.  
<http://www.aphis.usda.gov/brs/>
- Action Group on Erosion, Technology and Concentration (formerly Rural Advancement Foundation International)  
<http://www.rafi.org>

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