Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_

AP Biology: Biotechnology Unit Mr. Collea

**Objective:** The student is able to predict consequences of human actions on both local and global ecosystems.

**"Harvest of Fear"**

**Summary:**

In "Harvest of Fear," FRONTLINE and NOVA explore the intensifying debate over genetically-modified (GM) food crops. Interviewing scientists, farmers, biotech and food industry representatives, U.S. regulators, and critics of biotechnology, this two-hour report presents both sides of the debate--exploring the risks and benefits, the hopes and fears, of this new technology.

 Hugh Grant, an executive with Monsanto--the leader in agricultural biotechnology - and farmers like Gerald Tumbleson in Minnseota, tout the benefits of GM crops. They say they can help feed the world and preserve the environment by reducing the need for pesticides. One example: by inserting a gene from the organic pesticide Bacillus thuringiensis (BT) into crops such as cotton, corn, and apples, farmers can grow these crops using very little pesticide.

 Even more promising is the hope that GM technology can save lives. Scientists like Charles Arntzen are working on GM techniques to make edible vaccines - inside bananas and other foods - to combat viruses in developing countries. But others aren't so sure. Organic farmer Paul Muller argues that GM crops can increase pest resistance and have other bad consequences for sustainable agriculture. And opposition groups such as Greenpeace, Friends of the Earth and the Union of Concerned Scientists are concerned that in redesigning plants using genes from other organisms--even other species--a new, possibly reckless experiment is underway with unforeseen impacts on nature and the environment.

 "Harvest of Fear" chronicles how in Europe, opponents like Charles Margulis with Greenpeace, campaigned and nearly halted, the development and use of genetically-modified foods. However, in the U.S., genetically modified crops like corn and soybeans have been in the food supply since 1996 - in everything from cereals to sodas. Interviewing scientists like Martina McGloughlin and U.S. regulators such as Jim Maryanski with the FDA, this report asks the key question: Is GM food safe to eat?

 This FRONTLINE/NOVA report also examines the contrasting public perceptions about GM foods and what explains it. In Europe, there is skittishness about this new technology. But in the U.S., focus group research reveals that American consumers' top priority is 'choice'--if GM foods are labeled, it will help reduce fear. Throughout this FRONTLINE/NOVA report, cameras take viewers inside the laboratories of scientists developing the latest applications of GM technology, and show anti-GM demonstrations in Europe and the U.S., including violent tactics employed by some opponents. Some farmers had genetically-modified crops hacked away during the night by "eco-terrorists." And members of the Earth Liberation Front claimed responsibility for a fire at Michigan State University that destroyed a building being used for work related to agricultural biotechnology.

 Such demonstrations and protests, however, haven't deterred the technology's supporters. Pandora's box has been opened, they say. No amount of protests or violent tactics can put the lid back on. "We'll not be able to stop this technology," USDA Secretary Dan Glickman says. "Science will march forward."

***“Consider God’s handiwork; who can straighten what He hath made crooked?”***

- Ecclesiastes 7:13

***“I not only think we will tamper with Mother Nature. I think Mother Nature wants us too.***

- Willard Gaylin

**Video Questions:**

**1.** What is The E.L.F.?

**2.** What devastated the Papaya crop in Hawaii?

**3.** How did the researchers possibly solve this problem?

**4.** What were 3 of the early genetic modifications?

**5.** What school is at the center of Agricultural Research?

**6.** How is the "natural fiber" cotton a problem for the environment?

**7.** What are GMO's?

**8.** Who are the:

 USDA?

 FDA?

 EPA?

**9.** What is the basic story behind the "Starlink" controversy?

**10.** What is Organic Farming?

**11.** What is the resistance problem?

**12.** What is the story behind the GM Salmon?

**13.** What is the story behind the GM banana?

**14.** What is the modification of traditional rice to make golden rice?

**15.** What is the advantage of golden rice?

**16.** Why is the biotech industry afraid of labeling GMO's?

**17.** **Personal Reflections:**

 **a)** What do you feel about GM foods?

  **b)** Would you eat them?

  **c)** Would you let or want your future children to eat them?

 **d)** What do you think about labeling?

  **e)** Do you see a difference between modifications for medicine into plants VS: modifications for creating resistance to a particular pesticide into plants?

 **f)** Is there a difference about plant-to-plant modifications VS: insect/animal to plant modifications?

**GMO Project:**

The issues of the safety of and need for genetically modified organisms are being hotly debated in the United States, Europe, and other countries. To help you understand this complex issue, you have been appointed to brief a special Food and Drug Administration Review Board about the pros and cons of your genetically modified organism via a power-point presentation.

The board wants to know:

**(1)** The science behind the production of genetically modified organisms.

**(2)** All the arguments for allowing the use of genetically modified organisms.

**(3)** All the arguments against the use of genetically modified organisms.

**(4)** The potential risks and benefits of genetically modified organisms.

**(5)** What plants or foods have been allowed or banned in which countries, and why.

**(6)** How these foods are different, and how they are the same, as other products currently being sold.

 (Refer to #1)

**(7)** Whether foods should be allowed if they are labeled, and why.