**GM CROPS: THE ARGUMENTS PRO AND CON**

**1. Is genetic engineering fundamentally new?**

***Pro-GM:*** Genetic modification is nothing new. People have manipulated foods and food crops for millennia, through methods ranging from fermentation to classical selection. Genetic engineering is just the latest form of biotechnology—the most precise method yet.

***Anti-GM:*** Genetic engineering is fundamentally different from traditional methods of plant and animal breeding because it crosses biological barriers, transferring genes from one species to another.

**2. Are foods from GM crops safe?**

***Pro-GM:*** There are no inherent differences between foods produced from genetically modified (GM) plants and those from non-GM crops. All living things contain DNA, and all DNA consists of the same four building blocks, known as nucleotides. By moving a piece of DNA from one organism into another, scientists are not introducing a "foreign" substance. The new gene merely prompts the modified organism to express a desired trait. Companies that wish to release a GM seed or the product of a GM crop are required to test the safety of that product. If the product is made from an organism containing a known allergen, it must be tested for safety. No one has substantiated a single human death, or even illness, as a result of consuming GM foods.

***Anti-GM:*** There are too few independent (non-industry) studies of the health effects of GM foods to have confidence in their safety. In an experiment in Scotland, rats fed GM potatoes containing a gene for a protein, lectin, fared poorly and suffered internal organ damage. Pro-GM scientists have attacked the study, but at the very least it highlights the need for more research. The mistaken release into the food system of "Starlink" GM corn approved only for animal feed illustrates another danger—that of allergens being introduced into otherwise non-allergenic foods through genetic engineering.

**3. What is the impact of GM crops on the environment?**

***Pro-GM:*** As it's practiced today, agriculture damages the environment more than any other human activity. Genetically engineered crops will ease that negative impact. Insect resistant GM crops, such as those containing the bacterial Bt gene (which makes the plant itself toxic to key pests), allow farmers to dramatically reduce their use of spray insecticides. Next-generation seeds may allow farmers to maintain high yields while using less water and chemical fertilizer. Potential problems with GM crops, such as the creation of “super weeds” and “super pests,” are overblown by opponents, but to the extent those dangers are real they can be managed and prevented. For example, farmers can avoid promoting Bt-resistance in insects by planting non-GM acreage near each GM plot.

***Anti-GM:*** Bioengineered crops will do wide-reaching damage to the environment. Insect-resistant crops may harm species that are not their target, such as monarch butterflies. On the other hand, the insects that GM crops are designed to kill could develop resistance to those crops, ultimately requiring farmers to use more aggressive control measures, such as increased use of chemical sprays.

More research is needed on the potential of GM crops to transfer their genes to other crops or wild relatives. Transfer of pesticide-resistant genes to related weeds may produce "super weeds" —those immune to commonly used control methods. Likewise, viral genes added to a plant to confer resistance may be transferred to other viral pathogens, leading to new, more virulent strains of the viruses. Gene transfer could also cause non-GM crops to be contaminated by GM crops in neighboring fields, threatening the rich crop diversity of many developing countries.

**GM CROPS: THE ARGUMENTS PRO AND CON (continued)**

**4. Could GM crops reduce world hunger?**

***Pro-GM:*** Through GM seeds even the smallest subsistence farmers can produce bigger, more reliable crops. GM seeds will help poor farmers grow more food for themselves and more profitable crops for the marketplace. Nutrition-enhanced GM crops now in development can directly address the effects of malnutrition, both for the farmers who grow those crops for themselves and for poor consumers in developing-world cities.

In the long term, GM crops may be the only way to ensure that worldwide food production keeps pace with the growing population—which may double to 12 billion by the year 2050. After decades of dramatic increases in food production, the rate of growth has declined in the past ten years. The last round of increases came from “green revolution” methods such as high-yielding hybrid seeds and intensive use of fertilizers, irrigation and chemical pesticides. Those technologies can’t produce the food production growth that’s needed in the coming decades without doing severe environmental damage. GM crops can.

***Anti-GM:*** The real causes of hunger are poverty, inequality, and lack of access to food and land.Bioengineering will do nothing to alleviate these problems. Most GM crops available so far do not address the needs of food production in developing countries. They offer conveniences to the farmer—the ability to apply more or less pesticide spray—but do not produce higher yields. Adoption of GM crops by farmers in the developing world will actually increase hunger by making poor farmers reliant on the few multinational corporations that control the market for those seeds. A better way to improve the lives of subsistence farmers is to teach them ecological farming methods by which they can grow better crops without the expense associated with GM seeds.

**5. Should food products made from GM crops be labeled?**

***Pro-GM:*** Labeling would incite fear and needlessly hinder public acceptance of these products. The US Food and Drug Administration requires labeling based on food content and nutrition but not on the process by which the product was created. That policy is appropriate.

***Anti-GM:*** Consumers have the right to know whether the product they are purchasing is genetically engineered or contains ingredients from GM crops. Consumers may object to consumption of GM foods on the basis of health, religious, or ethical concerns. Lack of evidence proving that such products are not safe should not be taken as proof that they are safe.

**6. Who benefits from GM crops?**

***Pro-GM:*** Farmers benefit from GM crops that deliver enhanced production traits. For example, pesticide resistance reduces the need for the farmer to mix and apply dangerous chemicals. Consumers will soon benefit from GM products offering traits such as enhanced nutritional content, taste, and shelf-life. If it's allowed to flourish, GM technology will eventually provide widespread benefits for virtually all people, including the poor, as well as the global environment.

***Anti-GM:*** Biotech companies themselves reap the benefits of GM technology. Farmers pay a premium, a “technology fee,” when purchasing GM seeds. Crop yields are not greatly improved. In the future, because of wariness by consumers, farmers may not find a market for their GM crops. Consumers get no benefits and are all but forced to eat foods with uncertain long-term health effects.

**7. Should patenting of GM crops be permitted?**

***Pro-GM:*** Protection of intellectual property is necessary to foster the research and development of new, beneficial products. Patents also encourage dissemination of new discoveries—of genes and bioengineering processes, for example—by giving inventors an incentive to share their discoveries.

***Anti-GM:*** Patenting of life forms is unethical and offensive on its face. Furthermore, it encourages bio-piracy, that is, the virtual theft of natural resources from developing countries. A biotech company may take a plant from a public seed bank, for example, a seed variety that's been saved and protected by the stewardship of local farmers for many generations. After introducing a new gene into the plant, a biotech company can gain a patent on its “creation” and profit from it. Developing countries, especially, should ban the patenting of seeds.