Ethics of Genetically Modified Crop Bans

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Ethical Dilemma

Although the use of biotechnology in agricultural production is a fairly recent strategy, the use of genetic modification has evolved into a world-wide debate. The terms 'genetic modification' and 'biotechnology' are used interchangeably as the process by which foreign genes are introduced into a host organism in an attempt to replicate desired traits. These terms refer to a variety of medical, industrial, and agricultural practices, but, for the purposes of this paper, are focused solely on the agricultural sector. Proponents and opponents of genetic modification (GM) offer strong opinions as justification for their given stance. Although numerous reasons are cited, the majority of proponents suggest that the proven benefits of GM foods validate production while opponents argue that the environmental and health risks should be avoided at all costs. With any controversial issue, disagreeing positions are assumed. Opposing views are welcomed and it should be noted that the dilemma is not based on the validity of individual belief nor does it concern which side is "correct". The specific ethical dilemma with biotechnology is in regards to the political regulations surrounding its production. Political sanction banning the production and consumption of genetically modified agricultural crops is unethical.

History of Genetic Modification

Genetic Modification, as we know it, has been around only for a few decades. However, mankind has used similar techniques of modifying agricultural crops to produce desired traits for thousands of years. Ever since the introduction of agriculture, farmers have used a process of selection and cross breeding to improve the quality of crops.[1] In 1492, Christopher Columbus introduced corn, native to the Americas, to the rest of the world. European farmers adapted and modified the plant to the unique growing conditions of the land. In the 1800's, Austrian botanist and plant scientist Gegor Mendel successfully cross-bred pea traits, such as color, height, and pea size. He realized that these differences could be attributed to the passing of genes. Individual of Mendel's research, other Europeans re-discovered these findings on their own a

few decades later.[2] In the early 20th century, agricultural expert Henry Wallace utilized hybridization to develop new, higher yielding seeds. Hybridization is the process of combining genes from two or more plants to attain desired results and is a direct precursor to biotechnology and genetic modification as we know it. With the discovery of the DNA structure in 1953, the groundwork was laid for biotechnology. The first successful application of biotechnology came in 1973 as researchers Stanley Cohen and Herbert Boyer lifted genetic material from one organism's DNA and copied it to another. The ensuing result of their initial attempt, insulin, has been critical to the medical field since.[2] Genetic modification of crops became popular in the 1980's as the potential rewards were realized. The Food and Drug Administration approved the first genetically modified crop for production and consumption in the mid 1990's. Soon after, a total of 18 other biotechnology derived crops were approved by the U.S. government.[2]

While genetic modification of agricultural crops is common today, fears about the negative effects of the technology are large. These fears, most of them based on perceptive rather than scientific data, have led numerous countries to ban the production and consumption of genetically modified crops. Although recently lifted, much of Europe enforced these bans through the turn of the century and certain countries and regions still enforce these regulations. Advocates of these bans present three concerns as justification: environmental hazards, human health risks, and economic concerns.[3] These concerns will be addressed in detail in subsequent sections.

Benefits of Genetically Modified Foods

The Green Revolution, marked by increased use of fertilizer, irrigation, and pesticides, came in response to an increased demand for agricultural production. This demand stemmed from the concurrent population increase and decreased available agricultural land. The introduction of synthetic pesticides in 1947 to reduce crop loss led to larger and more predictable crop yields. From the start, pesticides proved to be effective. However, the effects of pesticides on human health and the environment were unknown. It was not until the late 1960's that Rachel Carson uncovered and illustrated the negative effects of pesticides in her book "Silent Spring".[4] It is now well known and agreed upon that pesticides are harmful to both human and environmental health. According to the World Health Organization, there were 500,000 pesticide related poisonings and 5,000 pesticide related deaths annually in the 1970's.[5]

Furthermore, the Environmental Protection Agency estimates that between 10,000 and 20,000 pesticide related illnesses occur each year in the United States, and even more incidences are probable in developing countries due to less education, lack of awareness, and lack of appropriate safety training.[6] The effect of pesticides on wild life is undeniable as well. The Environmental Protection Agency estimates that Carbofuran, a common pesticide, kills 1-2 million birds per year and other notable sources argue that close to 70 million birds are killed annually in the United States as a direct effect of pesticide use.[7] As the world population surpasses 7 billion in coming years, agricultural food production will have to keep up. It is obvious that the costs to human and environmental health of pesticide use are great. Societal pressure suggests that food production will need to increase while maintaining a high level of safety. Genetically modified crops provide an answer to this dilemma. Simple modifications to crops result in herbicide tolerant species, meaning fewer general pesticide applications are needed to obtain similar weed control results. The reduction of pesticide use is backed by sound scientific research. According to a study of the effect of genetically modified cotton on pesticide use in China in 1999 and 2000, evidence points to an average reduction from 55 to 16 kg of formulated product per hectare and reduced the number of times the crop was sprayed from 20 to 7.[8] They also noted that 30 percent of farmers using traditional methods experienced health problems as opposed to 9 percent who used the modified cotton. Likewise, a study of herbicide tolerant maize has shown a 30 percent reduction of pesticide use, resulting in a worldwide reduction of 1.5 million kg of formulated product per year. In addition, an 80 percent adoption rate of herbicide tolerant oil seed rape in Canada in 2000 led to a reduction of 6 million kg of formulated product in the same year.[9] Countless studies and sources agree. Genetic modification of crops decreases the pesticide application process significantly.

Conservative estimates predict that the world's population will reach 8 billion by year 2025. To satisfy this population increase, an estimated 1.2 percent annual increase in food and feed production is necessary.[10] A dilemma arises in that our population has encroached on almost all of the world's agricultural land, leaving little new land that is cultivatable with current technologies. Therefore, in order to meet this demand, the same amount of land must be responsible for increased output. Genetic modifications of crops allow for these increased yields. "Hybrid-variety development of rice, wheat, and other crops can increase yields by 20 percent."[10] Additional evidence supports a new plant type that could increase rice yields by 30

percent.[10] While the majority of this research is still being conducted in experimental stations, certain provinces in China that have already adopted the technology are experiencing great success.[10]

"Whoever could make two ears of corn, or two blades of grass grow upon a spot of ground where only one grew before would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."[11] With the increasing pressures of globalization the idea of a unified global economy is constantly being pressed. Concerns in dealing with genetically modified foods stem from the apprehension felt by society that our natural resources are rapidly becoming more and more of a scarcity, and that if we do not do something, this scarcity could be met with widespread undernourishment. Also, due to our changing global environment (a.k.a. global warming), farmers and producers in the future will face even greater uncertainty with issues such as shortened growing seasons, dried up land, loss of efficient water use, etc. At least encouraging and certainly not banning the cultivation of GM crops would largely combat such issues or at least add far more stabilization to the industry. Paul Enrlich argues that the greatest challenge of this century will be, "maintaining growth in global food production to match or exceed the projected doubling of the human population."[12] With the current resource scarcity concerns and with global climate change already happening GM foods offer us the greatest options in securing our food production, distribution, and consumption.

Malnutrition is common in developing countries due to a heavy reliance on a single crop. Rice, for example, does not contain appropriate amounts of necessary nutrients to prevent malnutrition. Genetic modifications to these staple crops could result in vitamin and mineral packed yields, alleviating nutrient deficiencies. Researchers at the Swiss Federal Institute of Technology Institute for Plant Services have developed a strain of rice containing a high content of vitamin A to combat blindness, a common third world health problem. "The lack of this vitamin causes the death of an estimated 1 million of Asia's poorest children from weakened immune systems. Another 350,000 go blind."[13] The technology has been developed, however, its distribution has proven more difficult. Deborah Whitman argues that various European bans and political pressures have made the development and distribution of modified crops difficult.[3]

Humanitarian Argument

Humanitarian ethics is based on strong values and a philosophy that recognizes all of humanity. Humanity is the link that unites all human beings: a feeling that urges each person to acknowledge another as his or her equal.[14] Through the various cultures and unique histories, it is the principle of humanity that creates a tie between all human beings. It is this very principle, for example, that governs the choice to provide relief to a wounded person merely from the fact that it is a person and we, as humans, are affected by his or her situation. Our conscience is what sees this person as a fellow human being and what tells us to treat them as a brother or sister.[14] By extending the principle of humanity beyond the individual, we can apply the same virtues to governmental regulations. With a significant percentage of people living in poverty, malnutrition, and disease while fighting to stay alive each day, we as humans, feel compelled to provide assistance. Banning genetically modified crops, while knowingly accepting the proven benefits, is similar to denying a wounded individual assistance when needed. Based on humanitarian ethics, bans on the production of biotech foods is inhumane.

Social Justice Argument

Going hand in hand with humanitarian ethics is the social justice argument, which is generally based on the idea of a society that gives individuals and groups fair treatment and a just share of the benefits that the society has to offer. Included within the fair treatment piece is freedom of choice, that is, the freedom to choose what one eats, how one creates wealth, and how one chooses to improve his or her life. Banning the production and trade of GM foods clearly infringes these basic rights. The ethical argument in this sense then becomes a scientific responsibility to the poor to at least pursue possible solutions to fight worldwide hunger and malnutrition; especially to pursue, as much as possible, a solution that has the evident short term benefits. Obviously we already know the proven benefits of GM foods would largely combat these issues in developing and undeveloped countries. In the sense of social justice we are not imposing that all countries and all farmers must favor food modification, or that it is the absolute solution to end worldwide starvation, but that the choice needs to be out there. People in poverty have the justified right to try and lift themselves out of it. They have the right to know all the benefits and risks entitled to them as human beings, and more importantly, the right to make up their own minds on how to act on those risks and benefits. Banning GM foods only spreads fear

and confusion in the minds of consumers, and discourages further research that could give us greater knowledge and understanding of the perceived risks.

Effects of Bans on Other Countries

According to Robert L. Paarlberg there are four kinds of international pressures that help to explain why the general population and some developing countries are acting with such caution when coming to a decision about allowing the cultivation of genetically modified crops: (1) Environmental groups based in Europe and North America have used media campaigns, lawsuits, and direct actions to project into the developing world a tone of extreme caution toward genetically modified crops; (2) consumer doubts in Japan and Europe regarding GM crops have discouraged planting of those crops by developing-country exporters; (3) the precautionary tone of the 2000 Bio-safety Protocol governing trans-boundary movements of GM crops is reinforcing bio-safety caution in the developing world; and (4) donor assistance in developing countries in the area of agribiotechnology has often focused more on the possible bio-safety risks of the new technology than on its possible agronomic or economic advantages. Paarlberg continues to argue that in order for developing countries to benefit from the advantages that GM crops can bring it will take more than just the availability of suitable technology. It will depend on the willingness of bio-safety authorities in developing countries to give farmers permission to plant GM crops and, in turn, will fully depend on the very same external pressures and influences Paarlberg identifies above.[15] An ethical dilemma arises when you consider that developing countries are being put at a large disadvantage based on perceived risks. Although genetically modified cultivation may not be flawless, these delays and negative publicity will only keep it from getting better and better, in areas such as taste, nutritional value, higher yields, etc. "Any delays impede scientific-technological progress: GM crops will be essential for enhancing European economic competitiveness, and for reducing environmental harm from agriculture, so regulatory delays deprive us of the benefits."[16] In the age of global climate change and mass undernourishment in developing nations, it is imperative to pursue a means of food production and distribution that could reach the whole world in much higher numbers with much higher assurance. Undernourishment and malnutrition in developing nations presents the opportunity to benefit greatly from advantageous biotech crops. The anti-GM pressures of some developed nations are detrimental to this solution. Events in Zambia provide a clear illustration of just this.

In 2002, the government of Zambia rejected thousands of tons of corn donated by the United States because it had contained genetically modified kernels. This refusal left an estimated 2.9 million people at risk of starvation, according to the United Nations Food and Agriculture Organization, and as it turned out the government was only following the advice of its own experts. A delegation of Zambian scientists and economists, after completing a tour of labs and GM regulatory offices in South Africa, Europe, and the United States, urged the government to reject the corn. The delegation refused the corn on the basis of a precautionary principle because "studies of the health risks of GM foods are inconclusive." [12] According to Prakash, "The Zambian rejection of GM food was based on pseudoscience; economic rather than health risks motivated the Zambian decision, referring to the possible loss of Europe--which is friendlier to non-GM products--as a food export market if GM crops are planted in Zambia." [12] Also, according to an article written by Elizabeth Becker, the US was not very happy about the Zambian corn rejection. The official United States trade representative, Robert B. Zoellick, said that when famine-threatened, African nations refused American GM food, they were acting under the influence of the European position. "The European antiscientific policies are spreading to other corners of the world and African leaders are seeking to avoid the food that you and I eat and are letting their own people starve", [17] said Mr. Zoellick. He also stated, "I find it immoral that people are not being able to be supplied food to live in Africa because people have invented dangers about biotechnology." [17] Bans on the production and consumption of GM foods in countries of power directly affect developing countries as well. Zambia is just one country that provides a clear representation of this. Zambia feels the burden of decreased exports because of GM bans in their trade partners country. An important consideration in this debate is the benefits associated with genetically modified crops.

Counter Arguments

While the proven benefits of GM crops are apparent, it is also important to consider the risks associated with the technology. Environmental hazards, human health risks, and economic concerns appear to be the most common sources of skepticism. Although the majority of concern revolves around potential, rather than proven risks, the validity of these concerns is great.

The effect of biotech crops on unintended organisms is concerning. Biotech corn pollen, for example, has led to high mortality rates in monarch butterfly caterpillars. Environmentalists fear that this pollen, spread by the wind, could infect neighboring milkweed plants, a popular location for monarch butterflies. Proponents of genetic modification offer two solutions: buffer zones and sterile crop seeds. Buffer zones of six to thirty meters between fields may reduce the spread of pollen, however, with additional cultivatable land becoming hard to find, this solution may no be economically feasible. The second solution uses similar plant gene technology as biotech crops. Scientists could, potentially, create crops that produce sterile seeds, thus eliminating the harmful pollen altogether. This strategy presents obvious problems. Farmers would need to reinvest in new seed annually, decreasing efficiency and raising the cost of production. [3]

Additional environmental concerns with GM crops involve the potential transfer of genes to non-target species. A fear exists that biotech crops will cross breed with weeds, resulting in pesticide resistant "super weeds" that withstand the very herbicides designed to kill them. Currently, this threat is only skepticism. No documented evidence supports this claim. [3]

Although the Food and Drug Administration has approved numerous biotech foods, it is not completely safe to assume that there are no risks. Perhaps the most valid concern is increased risk of allergic reaction. Adding new genes to a plant may create a new allergen or cause an allergic reaction in a susceptible individual.[3] Labeling GM products with potential allergic consequences could avoid these problems, however, the labeling controversy draws into an entirely separate debate. Long term health implications are unknown. Although the majority of scientists believe there to be no long-term risks, sufficient evidence to support either claim does not exist. [3]

The technology surrounding GM foods creates a highly competitive economic market and is both a lengthy and costly developmental process. Large companies compete to produce valuable crop seeds in an attempt to patent the process and maintain profitable returns. The costs of development are eventually absorbed by the farmer through seed prices. Simple supply and demand laws result in even higher seed prices, as the patents act to keep supply relatively low. Often times, small farms, especially those in developing nations, have trouble affording the new seed, while larger farming businesses do not. The big farms are able to prosper, acting to further the gap between the rich and poor. [3]

Conclusion

Perhaps Dr. Norman E. Borlaug said it best, “The affluent nations can afford to adopt elitist positions and pay more for the food produced by so-called natural methods; the one billion chronically poor and hungry people of this world cannot. New technology will be their salvation, freeing them from obsolete, low-yielding, and more costly production technology."[18] Developing countries are affected the most from biotech bans as they have the greatest to gain from the benefits associated with GM crop production. Humanitarian and social justice ethics drive the argument that government sanctions banning the production of genetically modified foods are unethical. We must realize that it is our responsibility to extend a helping hand to those in need. Biotech crop production provides an easy, yet suitable method to lift many humans out of poverty, malnutrition, and undernourishment.

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