Possible Impacts of GMOs: A Review

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ABSTRACT *Genetically Modified Foods has been around us for a considerable length of time, By genetically modified food means that food is no longer natural, it is the product of combining genes from different types of organisms. Genetically modified organisms (GMOs) include plants, animals or microorganisms excluding humans that have had their genes altered, using biotechnology, to express desired traits that don't otherwise occur naturally. Much of the current debates on agricultural biotechnology have focused on the potential risks of GM crops for human health. There are many ethical issues related to the growing and consumption of genetically engineered crops. They carry potential to greatly increase the nutritional value of food as well as the productivity of crops, while at the same time provide many safety as well environmental concerns. This paper presents an overview on possible impacts of GMOs.*

Introduction

People have domesticated plants and animals since around 12,000 BCE, using Selective breeding **(Noel Kingsbury; 2009).** The process of selective breeding, in which organisms with desired characters (and thus with the desired genes) are utilized to breed the next generation and organisms lacking the trait are not bred, is a precursor to the modern concept of genetic modification. **(Clive Root; 2007)** Various research in genetics enabled people to directly alter the DNA and therefore genes of organisms. **(Clive Root; 2007)** As humans evolved, we grew into an agricultural based society; we breed plants. Presently in this new century, engineers and researchers can combine and specifically modify the genetic sequence of the DNA of a species; let it be a plant or animal. This possibility of altering plants and specifically crops for the food supply raises many ethical and possible safety issues which need to be explored. For centuries, we have been doing our own sort of genetic modification, by cross or selective breeding to obtain more pests and disease resistant crops. However, with the introduction of genetic engineering, this process can be speed up faster and providing an unlimited number of possibilities. With increasing global population, massive 3rd world hunger, and with an estimation that a child dies for every two seconds worldwide from starvation, there is a great promise in the use of this technology to benefit not only the farmers, but also societies worldwide. The new agricultural biotechnologies that are producing genetically modified organisms (GMOs) are seen as exciting and significant developments by some people, while others are objecting strongly to their utilization. Both environmental and food safety concerns have been raised by opponents of GM crops. That in turn is causing consumers and policy makers in various countries around the world to react. A majority of people want at least to have labels on items that may contain GMOs, while the most extreme opponents (particularly in Western Europe) want to see GM crops totally excluded from production and consumption in their country.

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1. Harmful effects of GMOs:

No increase in yields: soya decreased yields by up to 20 percent compared with non-GM soya **(Mae-Wan; 1998),** and up to 100 percent failures of Bt cotton have been recorded in India **(Mae-Wan; 2003),** New studies confirmed these discoveries. Research from the University of Kansas found a 10 percent yield drag for Roundup Ready soya **(Gordon et al; 2012)** that required extra manganese applied to the soil to make up the yield deficit. A team of scientists from the USDA and the University of Georgia found growing GM cotton in the US could result in a decline in income by up to 40 percent **(Jost et al; 2008)**

No reduction in pesticides use: on the contrary, USDA data showed that GM crops increase pesticide use by 50 million pounds from 1996 to 2003 in the United States **(Ching et al; 2003)**

Grimmer picture: the use of glyphosate on major crops went up more than 15-fold between 1994 and 2005, along with increases in other **herbicides (Lopez et al; 2008)** in order to cope

with rising glyphosate resistant super weeds **(GM Science Exposed; 2007)**. Roundup tolerant canola volunteers are top among the worries of Canadian farmers **(Mauro et al; 2008).** Roundup herbicide is lethal to frogs and toxic to human placental and embryonic cells **(GM Science Exposed; 2007**). Roundup is used in more than 80 percent of all GM crops planted in all over the world.

GM crops harm wildlife, as revealed by UK's farm scale evaluations **(GM Science Exposed; 2007),** and more recently in a study led by Loyola University, Chicago, Illinois in the United Stated, which found that wastes from Bt corn impaired the growth of a common aquatic insect **(Emma et al; 2007)**

Bt resistance pests and Roundup tolerant super weeds render the two major GM crop traits practically useless (GM Science Exposed; 2007). A recent review concluded that **(Powles et al; 2008)** "evolved glyphosate-resistant weeds are a major risk for the continued success of glyphosate and transgenic glyphosate-resistant crops." And the evolution of Bt resistant bollworms worldwide have now been confirmed and documented in more than a dozen fields in Mississippi and Arkansas between 2003 and 2006 **(Science Daily; 2008)**

Vast areas of forests, pampas and cerrados lost to GM soya in Latin America, 15 m hectares in Argentina alone **(GM Science Exposed; 2007);** and this has worsened considerably with the demand for biofuels .

Transgene contamination unavoidable, scientists find GM Pollination of non GM crops and wild relatives 21 kilometers away **(Peter; 2007).**

GM food and feed linked to deaths and sicknesses both in the fields in India and in lab tests around the world.

2. Benefits of GMOs:

1. GMOs promote resistance to certain pests, diseases, or environmental conditions (droughts, flooding, heat waves), to improve crop yield. Some crops have been genetically modified to express agriculturally desirable characters including resistance to pests and to herbicides.
2. GMOs can be modified to have increased nutrient profiles compared to similar non GMO foods. This can be particularly important in developing countries where people depend on a small number of crops for their complete nutrition. An example of a GMO with an enhanced nutrient profile is "golden rice", rice that was genetically modified to contain additional Vitamin A (beta-carotene) to prevent blindness in developing countries.
3. GMOs can potentially help in reducing human disease through transgenic plant derived vaccines. In other words, there is potential to deliver oral vaccine antigens through food to protect against a variety of infectious diseases. An interesting study describes the clinical trials on oral transgenic plant vaccines against diseases such as enterotoxigenic E. coli and noro virus, which are the leading bacterial cause of diarrhea in the developing world. Another study demonstrated the success immunization for hepatitis B virus via a transgenic potato which may place a crucial role in hepatitis B prevention and even eradication worldwide. Still early research, however it's heading in a promising direction.
4. Transgenic animals are used as experimental models to perform phenotypic and for testing in biomedical research. **(Sathasivam K et al; 1999)** Genetically modified (genetically engineered) animals are becoming more vital to the discovery and development of cures and treatments for many serious diseases. By changing the DNA or transferring DNA to an animal, we can develop certain proteins that may be used in medical treatment. Stable expressions of human proteins have been developed in many animals, including sheep, pigs, and rats. Human-alpha-1-antitrypsin**, (Spencer et al; 2005)** which has been tested in sheep and is used in treating humans with this deficiency and transgenic pigs with human histo-compatibility have been studied in the hopes that the organs will be suitable for transplant with less chances of rejection.

Conclusion and Future Perspectives:

There is controversy over GMOs, especially with regard to their use in producing food. The dispute involves buyers, biotechnology companies, governmental regulators, nongovernmental organizations, and scientists. The key areas of controversy related to GMO food are whether GM food should be labeled, the role of government regulators, the effect of GM crops on health and the environment, the effect on pesticide resistance, the impact of GM crops for farmers, and the role of GM crops in feeding the world population. GMOs have certain harmful effects and benefits. Today's GMO crops are developed with specific useful benefits in mind, both for the farmers who grow them and the

consumers who purchase them. There are more potential benefits on the horizon. Scientists around the world are working on a number of GM seed varieties that could deliver several benefits in the future.

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