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Acceptance and contribution of Genetically Modified Foods to Human Nutrition

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Food Biotechnology

The term "food biotechnology" covers a wide range of techniques for using live organisms—such as plants, animals, microbes, or any part of these organisms—to produce new or improved food products. It consists of the most modern forms of food biotechnology, which offer a speedier and more precise method of producing food products.

A food product generated by the genetic alteration of a plant, animal, or microbe in a laboratory by scientists is the current connotation of food biotechnology, also known as Genetically Modified Organism (GMO) or Genetically Engineered (GE), among other names. However, conventional crossbreeding methods have been used for thousands of years to increase crop yield through trial and error. These methods date back to ancient civilizations and the teachings of Gregor Mendel in the 19th century, which spurred the green revolution of the 20th century, during which Norman Borlaug crossed wheat varieties to prevent starvation. Scientists more recently created novel plant varieties in the 1980s and 1990s, such as herbicide-resistant tobacco plant that reduced weed growth without harming the plant itself. The transgenic FlavrSavr tomato, created in the US in 1994 to delay ripening until after harvest, was the first application of food biotechnology that the FDA allowed. Food biotechnology has been utilized to create several products during the last 20 years. Food biotechnology was used to create more than 80% of US corn and cotton in 2012, with the US leading other nations in this regard. Today, in the arena of food, the primary goals of food biotechnology are to provide a more abundant, less expensive, and a more nutritious food supply in order to address the needs of our growing global population.

Genetically modified foods

A genetically modified food is produced using an organism or living thing that has undergone genetic engineering. A GMO might be an animal, or a plant. Genetic engineering,

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often known as contemporary biotechnology, gene technology, or recombinant DNA technology, is a technique used by scientists to genetically alter an animal, plant, or microbe. "GMOs" (genetically-modified organisms) is most frequently used to describe agricultural plants developed for human or animal use utilizing the most recent molecular biology techniques. These plants have undergone laboratory modifications to achieve desired features like higher herbicide resistance or better nutritional value. Breeding has historically been used to improve desirable features, however traditional plant breeding techniques may be quite time-consuming and frequently are not particularly precise. Conversely, genetic engineering may quickly and accurately produce plants with the exact desired characteristic. For instance, plant geneticists are able to extract the gene for drought tolerance and introduce it into a different plant. Additionally, drought resistance will be added to the new genetically engineered plant. Genes can be used from non-plant creatures as well as transmitted from one plant to another. The application of B.t. genes in maize and other crops is the best-known illustration of this. A naturally occurring bacteria called B.t., sometimes known as Bacillus thuringiensis, creates crystal proteins that are fatal to insect larvae. Corn may now create its own poisons to fight insects like the European corn borer thanks to the introduction of B.t. crystal protein genes.

Bioengineered Plants include:

The FDA and the United States Department of Agriculture (USDA) report that over 40 plant cultivars have met all legal requirements for commercialization. Soybeans and sugar beets that are herbicide-resistant, tomatoes and cantaloupes with altered ripening traits, corn and cotton plants with heightened insect pest resistance, and soybeans are some examples of these plants. Although not all of these items are presently available in supermarkets, GM foods are more ubiquitous than is generally believed in American grocery shops. Although there are incredibly few wholes genetically modified fruits and vegetables available at produce stands, highly processed foods, like vegetable oils or breakfast cereals, most likely do contain a very small amount of genetically modified ingredients because the raw ingredients have been combined from various sources into one processing stream. Additionally, the prevalence of soybean derivatives as food additives in the current American diet almost guarantees that every consumer in the United States has had contact with GM

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food items. To produce meat that has been genetically engineered, scientists are working. Salmon with a quicker growth rate has previously been commercialized.

In 2000, genetically modified crops were grown commercially in thirteen different nations, with the U.S. producing the bulk of those crops. U.S. farmers grew 68% of all GM crops in 2000. Comparatively speaking, production in Argentina, Canada, and China was just 23%, 7%, and 1%, respectively. Eighty-two percent of all GM crops harvested in 2000 were soybeans and corn, with cotton, rapeseed (or canola), and potatoes coming in last. 74% of these GM crops were altered to be herbicide-tolerant, 19% to be resistant to insect pests, and 7% to be both herbicide- and pest-tolerant. Nearly twice the size of the United Kingdom, GM agricultural acreage rose 25-fold globally in just 5 years, from around 4.3 million acres in 1996 to 109 million acres in 2000.Only in the U.S. and Argentina were GM crops grown on about 99 million acres. About 54% of the soybeans grown in the U.S. in 2000 were genetically engineered, up from 7% in 1996 and 42% in 1998. Genetically modified cotton cultivars made up 61% of the whole cotton harvest in 2000, compared to only 42% in 1998 and 15% in 1996. The rise was comparable but less pronounced for GM corn. In 2000, maize output climbed to 25% of all corn cultivated, which is a rise from 1.5% in 1996 and around the same as 1998 (26%). As expected, these GM types drastically reduced their usage of pesticides and herbicides while, for the most part, increasing yields.

Advantages of GM foods

The population of the globe has surpassed 7.3 billion, and it is expected to double in the next 50 years. It will be extremely difficult to provide enough food for this expanding population in the years to come. GM foods promise to meet this need in a number of ways:

- **Pest resistance**: Insect pests may cause huge crop losses, which can leave farmers in the underdeveloped world starving to death. Consumers are reluctant to consume pesticide-treated food due to possible health risks. Growing GM crops, like corn with the Bacillus thuringiensis bacterium, can lessen the need for chemical pesticides and lower the price of bringing a harvest to market.
- **Herbicide tolerance:** Farmers frequently spray large quantities of various herbicides (weed killers) to kill weeds because physical methods, such as tilling, are not cost-effective for some crops. For instance, Monsanto has developed a type of genetically altered soyabeans that are resistant to the effects of its Roundup ready soyabeans

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herbicide. Growing these soyabeans allows a farmer to reduce production costs and the risks associated with agricultural waste runoff by just needing one application of weed killer rather than many treatments.

- **Disease resistance:** Plant diseases can be brought on by a wide variety of viruses, fungi, and bacteria. To develop plants with genetically modified resistance to these diseases, plant scientists are working.
- **Cold tolerance:** Sensitive seedlings might be killed by unexpected frost. In plants like tobacco and potatoes, an antifreeze gene from cold water fish has been inserted. These plants can withstand freezing temperatures that would ordinarily kill unaltered seedlings because to the antifreeze gene.
- **Drought tolerance/salinity tolerance:** Farmers will need to cultivate crops in areas that were previously unsuitable for plant cultivation as the global population rises and more land is used for housing instead of food production. People will be able to cultivate food in previously uninhabitable areas by developing plants that can endure protracted droughts or environments with high salt concentrations in the soil and groundwater.
- **Nutrition:** In third-world nations, where poor people are dependent on a single crop, like rice, as their major food source, malnutrition is a widespread problem. Nutrient deficits may be reduced if more vitamins and minerals could be genetically added to rice. For instance, vitamin A deficiency-related blindness is a widespread issue in developing nations. An abnormally high concentration of beta-carotene (vitamin A) is found in a variety of "golden" rice developed by scientists at the Swiss Federal Institute of Technology for Plant Sciences.
- **Pharmaceuticals:** The production of drugs and vaccines is frequently expensive, and they may need specialized storage conditions that are not always available in developing nations. In tomatoes and potatoes, researchers have created vaccinations that are edible. Compared to conventional injectable vaccinations, these vaccines are simpler to transport, store, and give.
- **Phytoremediation:** Not every GM plant is developed for food. Pollution of the soil and groundwater is still an issue everywhere in the world. Poplar trees and other plants have been genetically modified to remove heavy metal contamination from polluted soil.

Potential contribution of GM technology

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Malnutrition can be reduced by breeding rice that is high in beta-carotene and iron. Many children and adults, especially women in childbearing years, suffer more from a lack of essential vitamins and minerals in their diets than from a lack of calories. Nutritious varieties can be developed and their adoption by farmers can be started, and such a strategy is sustainable once breeding has been finished. Background on the problem of micronutrient malnutrition in poor countries, its economic costs, and costs of current interventions to address the problem. Bio fortification naturally targets the poor who consume a lot of basic foods and nothing else, and it has the ability to cover isolated rural areas that supplementation and fortification initiatives may not be able to reach. It makes the most impact in lowering malnutrition. However, it will take several years for this to materialize, as well as wise government policies and a substantial investment in agricultural research as well as other forms of public and farm infrastructure.

Genetic engineering acceptance, pros and cons:

The goal of Riberio *et al.*'s study "Genetically Modified Foods and their Social Representation"was to examine public views regarding genetically modified food (GMF). About 64% of the respondents showed a favourable attitude about employing genetic engineering in food production after being presented to basic, objective notions of biotechnology, GMOs, and transgenics, although with cautions regarding potential long-term effects. However, approximately 18% of people expressed opposition to these GMF, citing the belief that they were manufactured in a lab and were thus artificial, unnatural, and abnormal. About 14% of respondents said that the technology was unreliable and that there were potential threats to their health and the environment, particularly in the long run.

Consumer reaction to Genetically Modified foods:

Numerous studies on customer perceptions of biotechnologically produced food products have been conducted in a number of different nations. For instance, a 2003 survey found that US consumers are prepared to spend an additional 15–30% of the average price to forgo food goods made with biotechnology. Pesticides, hormones, and antibiotics were found to be the top three food production concerns for US consumers in 2005 research, followed by food components produced using biotechnology. More recently, a survey on consumer views of food biotechnology found that lack of knowledge is the greatest deterrent to the acceptance of goods generated through biotechnology, with over two-thirds of Americans confidence in

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the safety of the US food supply. Consumer knowledge is increasing, mostly as a result of more extensive media coverage and planned legislation, such as California's genetic labeling Proposition 37, which did not become law in 2012. It is expected that legislation proposals would continue.

Conclusion

Genetically modified crops have the potential to address many of the world's hunger and malnutrition issues as well as to assist protect and preserve the environment. For governments, there are still a lot of obstacles to overcome, particularly in the areas of food labeling, international policy, regulation, and safety testing. A lot of individuals believe that genetic engineering is unavoidably the way of the future and that we cannot afford to ignore a technology with such great potential advantages. Our enthusiasm for this potent technology must, however, be tempered with prudence in order to prevent inadvertent damage to human health and the environment.

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