

# GENETICALLY MODIFIED FOODS CASE STUDY: THE USDA

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## **Abstract**

The introduction of Genetically Modified Foods to the United States food supplies has become a great concern to the environment and public. The United States Department of Agriculture regulates the production and distribution of all agricultural products in the country and, thus, must regulate the newly engineered crops. There are many benefits to such products, but also many risks involved. This report presents these facts and provides insight to the future of the market and a concept toward a safe and effective future for Genetically Modified Foods.

## **INTRODUCTION**

The United States Department of Agriculture (USDA) was founded in 1862, in order to provide farming information and good seeds to the American farmers. It was a department to serve the farmers, who composed 58 percent of the countries population at the time. The development of the industry in the last century along with the introduction of genetically modified (GM) and transgenic foods, in the last couple decades, has changed several things within the agricultural market. In stride with these changes in the business, the USDA remains committed to serving the American people and the farmers, with regard to their business and health issues.

New technologies are introduced to the public everyday, and at an increasing rate. Now that these technologies and advances in science are affecting the foods we eat, many people have become concerned. Many of these concerns are founded upon moral issues with regards to altering nature and creating what some in the media have regarded as “Frankenfoods,” in a reference to the classic story of Frankenstein, a man created with an assortment of human parts. This portrayal has lead to a wide misunderstanding of the science and exactly what kinds of genetically modified foods are currently in production. There are many kinds of modifications possible within our foods, and not all of which use the genes of other animals, vegetables or fruit—transgenic modification. And even when this is done, only specific traits are used—traits that have been shown to induce no ill effects upon the resulting crops and have so far been very successful.

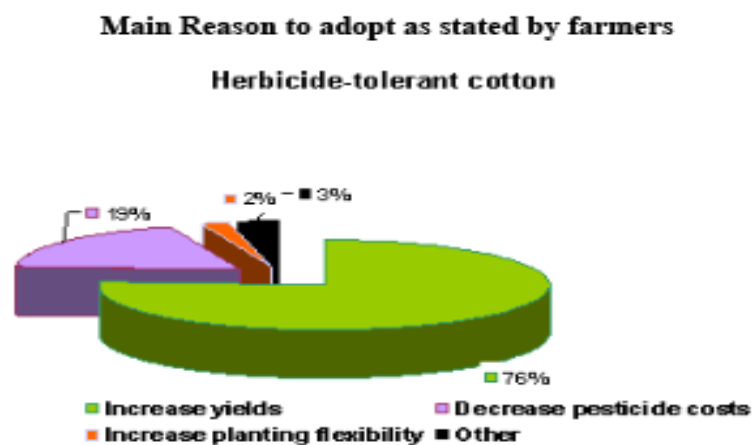
These new GM foods have a lot to offer to us as private consumers and farmers, along with the hope of fighting world hunger. Current GM foods on the market have not used any animal genes, though many of these are under research. The foods that are currently produced and tolerated by the USDA are those that have been engineered to boost production by being able to fight weeds, resist herbicides, and resist other pests and bacteria. These foods greatly assist farmers through increased yields, but consumers also benefit through a decreased likelihood of food bacteria in the fruits and vegetables they buy. Some GM foods also produce pharmaceutical and industrial chemicals, but these are foods not sold in our stores.

Many of the GM foods on the market undergo a regulation process by the USDA. The fundamental duties of the department are to regulate the import, interstate movement, field-trial release, and commercial release of GM crops through the Animal and Plant Health Inspection Service’s (APHIS) Federal Plant Pest Act and Plant Quarantine Act. The primary task undertaken by these departments is to ensure no GM plant allowed for production in our market is a “plant pest,” which is any plant that poses the risk of having adverse effects upon the environment due to contamination or mutation. The new opportunities offered by implanting specific attributes into some of our foods is being investigated and researched all around the world, as it is obvious to many researchers that the benefits of GM foods are bountiful. The regulation of such foods is most certainly important, and the USDA intents to do it, while also educating the public as to what these new GM foods are, how they are made, how we benefit, and how to know if that fruit you buy at the market has used these new biotechnologies (Cockburn et al.).

## THE INDUSTRY TODAY

Genetically modified foods certainly offer consumers and farmers great benefits such as increased pest and disease resistance, drought tolerance, and increased food supply. By altering the genetic properties of some of our crops we can produce more, with less money, and less wasted crop. Pesticides have been a necessary part of farming for over a century, but with crops that are genetically altered to fight off those pests that can contaminate our foods and crops, these costs can now be avoided and crop yields can be increased by assuring that each unit is produced as specified by the genetic engineers (Berkley).

There is an overwhelming amount of support for GM crops among the farmers of the United States and also throughout other regions of the globe. Figures 1, below, illustrates the results of a recent survey conducted by the USDA regarding why farmers, who have adopted GM crops, find the modified crops to be beneficial to their production.

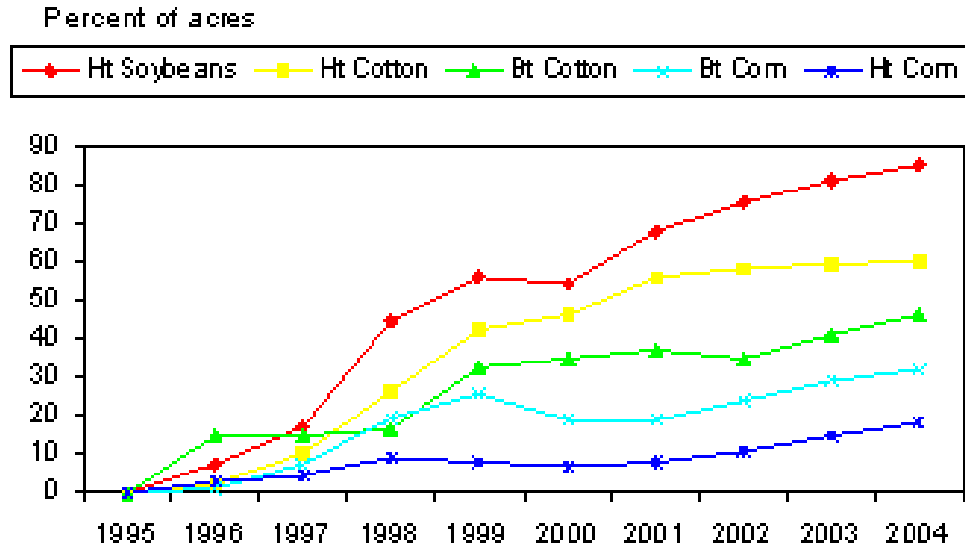


**Figure 1: USDA 2002-2004 Survey of Why US Farmers Adopt GM Crops**  
Image courtesy of [ers.usda.gov](http://ers.usda.gov)

There is a wide range of industries that can benefit from GM crops, from fruits and vegetables, to wheat, cotton and even pharmaceutical production. More and more farmers are jumping at the opportunities that the technologies provide. Jorge Fernandez-Cornejo, of the Economic Research Service (ERS) division of the USDA explains that, “Driven by farmers' expectations of lower production costs, higher yields, and reduced pesticide use, the rate at which U.S. farmers adopt genetically engineered (GE) crop varieties has jumped dramatically (Caswell).” The growth of GM crops being adapted by farmers has been steadily growing over the last decade, due to these benefits.

The usage of herbicide-tolerant (Ht) and insect-resistant (Bt) crops has been on the rise since 1995, when such products were introduced. The Ht crops carry genes that fend off certain herbicides meant to kill weeds and the Bt crops contain the *Bacillus Thuringiensis*

gene from a soil bacterium to help fight off destructive insects. Figure 2, below, shows an increase of 85 percent in soybeans' acreage and 60 percent in cotton acreage for crops using the Ht genes, along with substantial gains among the crops using Bt genes.



**Figure 1: Adoption Rates of GM Crops in U.S.**

Image courtesy of ers.usda.gov

Sources: 1996-2001: Fernandez and McBride, 2002-2004: Tables 1-3 USDA surveys

These results make it clear that genetically modified foods have a lot to offer our society and our farmers. Because of such strong results, there is more and more research going into new areas of genetic modification. In Nebraska, “Researchers are zeroing in on the gene they think could boost wheat yields by 15 percent. They've also genetically modified soybeans to produce more than four times as much oleic acid as a conventional plant, which should increase their worth, too (‘Gene Dreams are Now Reality’).”

## **THE USDA TODAY**

The USDA's involvement with the regulation of GM foods and crops is spread out among a number of branches within the department. One of these is the Animal and Plant Health Inspection Service (APHIS), which regulates the genetically engineered food plants and administers the Federal Plant Pest Act. This group, thus, regulates the movement of products, plants and organisms that have been produced through genetic engineering, all of which may be considered to be plant pests. The APHIS has compiled a list of organisms that are considered to be plant pests, so any new genetically engineered organism is subject to investigation by the APHIS in order to ensure it is not a plant pest. If not a plant pest, the organism is classified as a “regulated article (‘Regulating Biotechnology’).”

In order for a newly developed GM Food to be approved by the USDA and APHIS, an applicant is required to obtain three basic types of permits. One permit is for the movement and importation of the plant or organism. The second permit is for the release of the product into the environment. Then once these permits are evaluated and approved, a third permit for a field test of the plant must be obtained. Once the applications for the permits are reviewed, the APHIS makes a “pest risk analysis” and sends a letter to the appropriate state departments in order for them to also review the proposed movement. Officials from the state and the APHIS then inspect the applicant’s facility in order to ensure the organism is not accidentally released into the environment. Evaluations are made upon the facility’s personnel, security, growth chambers, greenhouses, and operational procedures in order to ensure they are within the guidelines of the National Institutes of Health.

After this thorough process of evaluation, a written letter of approval or denial is written. If approved, the field test permit may be given and an extensive field test of the product is conducted to ensure that all of the criteria of safety are met and to prove that the product is not a plant pest. The APHIS then inspects the field test site at the beginning of the test, during the test, and at the end of the harvest to be certain the data is collected in an efficient manner and to ensure the safety of the surrounding natural environment.

Before the genetically engineered crop can be sold commercially, a petition for USDA exemption must be filed. This requires even more information than the previous permits, including safety information of the product on the environment. The USDA and APHIS are very thorough with their permit approval for a new product and ensure that each and every product allowed to be produced for the market is equally as safe to the environment and people as any other product currently on the market. (“Regulating Biotechnology”)

Aside from the permit process, which is generally demanded of pharmaceutical plant applicants, there is a “Notification” option. Several GM crop and food developers use this option as a more efficient means of obtaining clearance from the department for production of the product commercially. This can be done considering that the plant is not considered to be a noxious weed to the environment and also passes other APHIS standards of such crops.

Whether a Permit or a Notification is received for the product, the developer of the new GM crop then seeks “non–regulated status” from the APHIS. This allows full commercialization and no further formal oversight from the department. This requires extensive information of the product’s genetics and biological properties, along with all information of the potential environmental and plant pest impacts as a result of the engineering. This process even includes a period of public comment and environmental assessment before the final decision is made for the product’s “non–regulated status (Johnson).”

## **GENETICALLY MODIFIED FOOD BENEFITS**

The opportunities that biotechnologies offer, such as modifying our foods genetically, are vast. As the technology and science evolves, more and more opportunities will arise. The science as a whole is still in its infancy. With less than two decades of research and barely a decade of actual production, there is still so much for us to learn about what such a science can offer our industries, environment and health. Some of the benefits currently being pursued focus on:

- **Human Health and Disease**  
The Agricultural Research Service (ARS) of the USDA has discovered that transgenic animals may be able to provide a valuable source of hormones and drugs which can be produced in a variety of crops and then used to treat emphysema and infections in babies.
- **Food Nutritional Value**  
Food that is derived from biotechnology can boost the nutritional value of our foods. New rice, for example, called “Golden Rice” contains beta-carotene for the production of Vitamin A, which can prevent blindness and death in deficient children.
- **Food Security and Possibility**  
Crops engineered to be pest-resistant, disease-resistant, and bred to tolerate dry and saline soil will increase crop yields and help feed the hungry in developing countries. Farmlands currently not suitable for ordinary crops could flourish with healthy crops engineered to grow successfully in such previously hostile land.
- **Animal Health and Diseases**  
Vaccines have been produced through biotechnology to protect animals in the wild against rabies and have developed a vaccine for the biggest killer among beef cattle in feedlots, “shipping fever.”
- **Environment**  
The use of herbicides and insecticides has been reduced through the development of crops that will naturally defend themselves against common pests. Pigs that have been engineered to express salivary phytase produce low-phosphorus manure that benefits the environment.
- **Agricultural Economics**  
The crop market can be rescued by crops that are engineered to be disease-resistant. Two types of virus-resistant papaya were engineered to be resistant to the “papaya ringspot virus” and saved the Hawaiian papaya industry (Smith).

## **GENETICALLY MODIFIED FOOD CONCERNS**

Although the benefits of many GM crops and foods are clear, there is still a great deal of opposition to the introduction of such products. It is most often that people resist change because they do not understand the changes. While there are certainly a number of concerns to be addressed with regards to GM foods and crops, the USDA is prepared to confront these issues and provide the public with the assurance that the products on the market are no more dangerous than those that we have consumed all our lives. Such concerns include:

- **Invasive Species**  
A concern among many environmentalists is that the spread of these newly engineered crops throughout the local environments will contaminate the ecosystem. It is believed by some, that these new products will cause imbalance in the system among natural crops, along with the variety of species that depend upon them. It is believed that such an invasion of the new crops could cause catastrophic long-term effects upon the environment, in the same manner as ecological imperialism.
- **New Food Allergies**  
It is believed the introduction of new crop and food species will lead to the development of new allergies among people and even other animals. These new allergies to the GM foods may be unpredictable and very threatening to any one of us.
- **Environmental and Public Health**  
There is a chance, if these modified foods become integrated in even a small number of locations through invasion upon other species and mutation among themselves, they can threaten the current state of health in our environment and consequently our own public health. New diseases may arise, which we have no immunities to, and organisms from the modified foods may find their way into other products and resources that were not foreseen.

## **PLANS FOR THE FUTURE**

The level of research that is being used to develop new transgenic plants is very thorough and will provide an extreme level of safety to the environment and those who consume or use them. Already, a great number of GM foods have been rejected for introduction to the market because of ill effects caused by the engineering, such as a form of soy developed with a Brazil nut for increased protein, but cause allergic reactions and, thus, did not proceed to commercialization (Food Facts). In over 10,000 field tests conducted since 1987, only 61 products have been approved by the USDA, and fewer than ten of which are in wide use in the U.S. market.

The USDA has been criticized for focusing their concerns heavily on those of the farmers and the food industries. There has been a shift in priorities within the department recently, in light of the new technology and the public's demand for assurance in the safety of their foods. In 2002, a report by the National Research Council, which advises the federal government on science issues, proposed such an adjustment of the USDA's priorities, and it has been answered by monitoring the effects of altered organisms' effects on the environment and human health (Kilman).

The secretary to the Department of Agriculture states that “[the] science of biotechnology is continually evolving... So we must ensure that our regulatory framework remains robust by anticipating and keeping pace with those changes.” So with an increased focus on the effects of new GM crops on public health and the environment, a new tiered–system approach to regulation is expected within the department. This system would ensure that transgenic foods and other foods modified to contain pharmaceutical or industrial chemicals will be much more heavily regulated than the crops engineered to contain herbicide and insect resistant traits, with which the USDA is much more familiar (Weise).

## **CONCLUSION**

It is certain there are far too many benefits available through genetically engineered foods to overlook how the science may play a strong role in the way we produce food in the future. While there are obstacles to overcome in terms of the process by which the crops are produced and in our understanding of how such crops may effect the environment and the people, we must continue to pursue our knowledge of such possibilities. It is clear that many farmers can benefit from GM crops, and their interest in the possibilities has grown over the past decade. Farmers are not the only people who can benefit from genetically engineering our foods. Benefits such as hormones from animals for our prescription drugs, boosted nutritional value of our foods, increased production yields in hostile environments to feed developing countries, and vaccinations for animals and people through genetic engineering should be pursued further through proper regulation. As we learn more about how these new crops may effect our environment and people, we will find more ways to satisfy both farmers and consumers, while keeping our environment safe.

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