



## What Are GMOs?

***GMO stands for genetically modified organism and is sometimes referred to as genetically engineered (GE), bioengineered (BE) or genetically modified (GM).***

A genetically modified organism, or GMO, is a plant, animal, or other organism that has had a gene from another organism transferred into it as an addition or a replacement. The goal of the new gene is to produce a helpful trait or characteristic in the modified organism, such as disease resistance, drought tolerance, or improved nutritional value. Conventional breeding lacks this kind of precise control.

### What foods are considered GMOs?

By 2019, federal regulators had approved 11 GMO crops for sale in the United States.



- ◆ **Corn (field and sweet)**
- ◆ **Soybeans**
- ◆ **Cotton**
- ◆ **Alfalfa**
- ◆ **Sugar beets**
- ◆ **Canola**
- ◆ **Papaya**
- ◆ **Summer squash**
- ◆ **Innate potatoes**
- ◆ **Pink pineapple**
- ◆ **Non-browning Arctic apples**



(Note: Most soybeans, field and sweet corn grown in the U.S. are genetically modified. Only a few varieties of the other crops on the list are genetically modified.)



*In 2018, the USDA passed the National Bioengineered Food Disclosure Standard to establish a standard for labeling GMO products. Beginning in 2020, these foods must be labeled with text, a symbol, an electronic link or a phone number for more information as mandated by the USDA.*



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*“MSU Extension supports consumer choice in the marketplace. We work with food production systems to meet consumer preference and demand. Additionally, MSU Extension provides Michigan residents with science-based research addressing the issues and challenges they may face, providing that information in a way that can be readily adapted into their lives and businesses.”*

*Ron Bates, Director - Agriculture, Agri-Business Institute 2019*



### **Authors**

- Charity Goeckeritz, Graduate Research Assistant, Department of Horticulture, MSU
- Ted Ferris, Professor and Dairy Specialist (retired), Department of Animal Science, MSU
- Ron Goldy, Senior Educator in Vegetable Crops, Environmental Quality, and Food and Animal Systems, MSU Extension
- Sarah Rautio, Educator in Health and Nutrition Programming, MSU Extension
- Sheilah Hebert, Educator in Health and Nutrition Programming, MSU Extension
- Erika Garner, Program Training Developer, MSU Extension
- Joe Bixler, Educator in Community, Food and Environment Programming, MSU Extension

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Middle Left Photo: Apple Basket by Larisa-K, pixabay.com

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## Are GMOs Safe to Eat?

Scientific research currently shows that there are no hazards associated with eating GMOs. All GMOs available to consumers have obtained Food and Drug Administration (FDA) approval. The World Health Organization (WHO), the American Medical Association, and the National Academy of Science have stated that GMOs are not likely to present risks to human health.

### Regulated...

The FDA regulates the safety of GMOs like any other food, but they recognize that this technology may pose unique risks. So, the FDA created the Plant Biotechnology Consultation Program, which is a set of voluntary guidelines GMO developers may meet to confidently gain FDA approval that their product is safe. All commercially available GMOs in the US have been through this consultation process and received FDA approval.



### ...Safety Tested

It is unlawful for anyone to market unsafe food, whether it is genetically modified or not. The USDA, FDA, and U.S. Environmental Protection Agency are jointly responsible for ensuring the safety of GMO foods. For example, the FDA recommends that GMO crops are tested at several times during the development process, specifically looking at the whether the modifications produce any proteins that are know allergens (for example, peanut proteins).



The World Health Organization wrote in response to concerns from WHO member state governments:

“[Genetically modified] foods currently available on the international market have passed safety assessments and are not likely to present risks for human health. In addition, no effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved.” (2014)

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## Why Use GMOs?

### • **Farmers & Environment**

Genetic engineering technology is a method to genetically improve crops, providing a tool to address some of the challenges farmers face, to make their farms more environmentally and economically sustainable. GM crop varieties also help:

- \* Increase Ease of Production, Cost Savings, and Improved Crop Quality
  - \* These benefits occur for large and small farms that may struggle to maintain their businesses and meet local and global food demands.
- \* Lower Production Costs and Reduce Carbon Footprints
  - \* These benefits happen through reductions in fuel, equipment, and labor demands and costs.
- \* Reduce Crop Losses
  - \* These losses maybe due to factors such as pests, weeds, mold, disease poor weather and climate change.
- \* Reduce the Need for More Toxic Pesticides
  - \* Plants can be genetically modified to become resistant one or more pests, reducing or even eliminating the need to apply a pesticide. Plants can also be modified to tolerate a pesticide or herbicide, which makes pest and weed control simpler.
- \* Improve Ground Water Quality, Soil Quality, and Carbon Storage
  - \* Farmers can apply herbicides to GMO herbicide-resistant crops after the crops begin to grow, which reduces the need to till fields to control weeds. Less tilling preserves the soil structure, reduces chemical run-off and increases long-term storage of carbon dioxide.



### • **Consumers**

- \* Improved Insulin Production
  - \* The insulin needed by people with diabetes used to be extracted from pig and cattle pancreas glands. It caused allergic reactions and didn't always work well. Today, about 90% of the insulin needed by people with diabetes is produced by genetically modified bacteria in a variety of safer and more effective formulations.
- \* Enhanced Nutritional Value
  - \* GMO technology can add extra vitamins to foods, which increases the foods' nutritional value. Currently, nutritional GMOs are not produced as frequently as farm-related GMOs.
- \* Increased Food Availability
  - \* As the human population grows and the planet's climate changes, productive farmland is becoming scarcer. GMO technology may help us maintain or even increase food production on fewer acres.
- \* Increased Food Marketability
  - \* Some genetically modified varieties of apples and potatoes don't turn brown when they're bruised or sliced, making them more appealing to consumers. These varieties' longer shelf life and increased consumer appeal can help reduce food waste.

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Top Right Photo: Tractor Harvesting Corn by Schanin, pixabay.com



# GMO Quick Facts

## Insulin Was the First GMO Product

In 1982, insulin produced by genetically modified bacteria became the first GMO product released to the public. This method of producing insulin for people with diabetes replaced the older method of extracting it from the pancreas glands of cattle and pigs. Animal-derived insulin, sometimes caused allergic reactions and didn't always work well. The synthetic insulin is produced in a variety of safer and more effective formulations.

*Did you know...*

## Golden Rice

Scientists developed golden rice – a deep yellow variety that is genetically modified to produce beta carotene – to help fight the epidemic of vitamin A deficiency in developing nations. When people eat golden rice, their bodies convert the beta carotene in it into vitamin A. Golden rice has not been widely adopted due to societal barriers, skepticism about GMO foods, concerns about project costs, and the availability of other nutritional supplements. GMO foods like golden rice have the potential to help fight global malnutrition.



*Did you know...*

## The Difference between “Organic” & “GMO”

Under U.S. Department of Agriculture regulations, organic crops can only be grown using products and materials derived from natural sources (with a very few exceptions). For example, one common organic fertilizer is animal manure, and two common active ingredients in natural pesticides are microorganisms and plant extracts. The use of genetically modified products such as seeds and animal feed is prohibited in organic farming.

GMO and non-GMO seeds, animal feed, and other products, as well as synthetic and natural fertilizers and pesticides, are acceptable in conventional farming. As of 2019, USDA had approved GMO varieties of 11 crops for sale in the U.S.

## GMO Technology Saved Hawaiian Papayas

The Hawaiian papaya crop was in danger of being wiped out by a plant virus in 1992 until scientists created a disease-resistant papaya plant using GMO technology.



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