

## Common Questions and Answers about Genetically Engineered (GM/GMO) Plants



### **Q. What are GMO foods?**

A. GMO foods are foods made from GM (genetically modified)/GE (genetically engineered) crops or crop products. GM crops have a new gene (DNA) added by genetic engineering that confers a useful trait (such as insect or disease resistance). The added gene is from another plant or organism. Many opportunities exist for adding traits like drought resistance, nitrogen fixing, nutrition and flavor.

### **Q. Which crops are genetically engineered (GM/GMO)?**

A. Soybeans, corn, cotton, canola, sugar beets, alfalfa, and papaya. 94% of soybean and cotton acreage and 92% of corn acreage planted in the U.S. were GM varieties in 2015 (ISAAA, 2016).

### **Q. Why do farmers grow GM crops?**

A. Farmers use GM crops to protect against crop losses from insects, diseases and weeds.  
1. For higher returns per acre through reduced losses to pests and improved crop quality from fewer impurities. 2. Reduced pesticide use, carbon footprint, and costs resulting from reduced labor costs to apply pesticides; reduced fuel costs; reduced equipment needs and maintenance; and reduced crop insurance costs. 3. Ease of production resulting from less time spent on spraying pesticides or cultivating fields and reduced time and labor scouting fields for pests.

### **Q. What has been the impact of GM crops on pesticide use?**

A. Pesticide use has decreased due to GM crops: Worldwide reduction in insecticide use (bug spray) due to GM crops, from 1996 to 2014: Bt (insect resistant) corn provided a 52% reduction amounting to 11.15 million lb. less active ingredient used on U.S. corn. Bt (insect resistant) cotton provided a 28% reduction amounting to 6.16 and 12.36 million lb. less active ingredient in U.S. and China cotton, respectively. (Brookes and Barfoot, 2016). There is also a reduced need for insecticide sprays on nearby non-Bt fields because of the reduction in pests on GM planted fields. Herbicide resistant GM corn and soybeans allow farmers to spray fields with glyphosate (Round-up) to kill all weeds without harming the corn or soybean plants, making weed control much easier. So Round-up use increased following the introduction of glyphosate-tolerant GM crops but it replaced the use of a number of other more toxic herbicides (weed killer) resulting in a parallel decrease in these herbicides. As has occurred with other herbicides, some weeds have developed resistance to glyphosate, resulting in the need to rotate crops and herbicides applied to fields.

### **Q. What are genes? What is DNA?**

A. Anything that is alive or has lived has genes. So most everything we eat has genes. Genes are made of DNA (Deoxyribonucleic Acid), which is a sequence of repeating units called nucleotides. There are four nitrogen bases found in nucleotides represented by the letters A, C, G, and T that make up the coding system. The order, or sequence, of these bases determines what biological instructions are contained in a strand of DNA. For example, the sequence ATCGTT might instruct for blue eyes, while ATCGCT might instruct for brown.  
(<https://www.genome.gov/25520880/>). A typical plant has 20,000 – 40,000 genes.

### **Q. What happens to DNA/genes when we eat plants and animals?**

A. When we eat DNA (or an animal we eat, eats DNA) the DNA strands are broken down by the digestive system along with other food components (e.g., proteins, carbohydrates).

**Q. Have plants and animals been genetically modified before genetic engineering (GE/GMO) became possible?**

A. Virtually all plants and animals we eat have been genetically changed/modified by humans throughout our history. Conventional breeding has been used for years to create new strains of plants and animals. Sometimes this involves simply picking the best individuals and mating them and picking their best offspring or crossing different compatible strains to increase variation and then select the best. The difference between conventionally bred crops and GM crops has to do with the source of genes, the control of the amount of change or what gene(s) are changed, and the amount of knowledge we have about the gene(s) that will be changed. This can be summarized:

Comparison of methods →	Conventionally bred crops	GM crops
Source of genes	Crop or related species	Any organism*
Amount of change	Many changes, 100s of genes	1 or very few genes
What we know about the genes	Virtually nothing	Exactly what they do

**Q. What concerns are there about GM/GMO plants?**

A. \*Because genes or DNA is being incorporated into plants from other organisms, GM crops are regulated by FDA, USDA, and EPA to ensure safety. Safety tests and regulatory reviews cost \$5-10 million/crop gene combination. All GM crops on the market with genes introduced from another organism have undergone food safety evaluation by the FDA.

**Q. ARE GM FOODS SAFE TO EAT? Who thinks so?**

A. National Academies of Science USA – 2016. Based on more than 1,000 published research studies, 80 information-gathering meetings and 700 public comments “...found no substantiated evidence of a difference in risks to human health between current commercially available genetically engineered (GE) crops and conventionally bred crops”  
International Council for Science, 2005 (comprised of 111 National Academies of Science and 29 scientific unions) “Currently available genetically modified foods are safe to eat”  
“This view is shared by several intergovernmental agencies including FAO/WHO Codex Alimentarius Commission on Food Safety which has 162 member countries...”  
International Council for Science. “Food safety evaluation must be undertaken on a case by case basis. The extent of risk evaluation should be proportionate to the possible risks involved”

**Q. What is Gene Editing?**

A. A new technique, called gene editing (CRISPR/Cas9), functions as a biological version of a computer's “find and replace” to replace a less desired gene variant with a more desired variant for the same trait/gene (i.e., horns vs. no horns in cattle). In many cases this technique can be utilized without adding foreign DNA since the DNA/variant already exists in the plant or animal.

**Some resources for questions about GM food**

World Health Organization

[http://www.who.int/foodsafety/areas\\_work/food-technology/faq-genetically-modified-food/en/](http://www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/)

US Food and Drug Administration (FDA)

<https://www.fda.gov/food/ingredientpackaginglabeling/geplants/ucm346030.htm>

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