

Genetically Modified Crops

In 1996, Genetically Modified (GM) Crops were grown in 6 countries. In 2009, the number of countries using GM crops increased to 25. The year 2019 marks the 24th year of commercialization of biotech crops, and the number of countries using GM crops had increased to 29.

Some examples of GM-modified crops are listed below.

1. Genetically Modified Corn that are resistant to larval pests.
2. Genetically modified soybeans that are resistant to weed-killers like Roundup.
3. Genetically modified maize – used as animal feed, high-fructose corn syrup
4. Genetically modified cotton – This has been approved in India along with 9 other nations.
5. Genetically modified Canola – Used as cooking oil, emulsifier in packaged foods.

Aspirants would find this topic very helpful in the [IAS Exam](#).

How Genetically Modified Crops are Made?

Genetic Modification is a technology that involves inserting DNA into the genome of an organism. To produce a GM plant, new DNA is transferred into cells of a plant. These cells are then grown in tissue culture where they transform into plants. The seeds produced by these plants will have new DNA. The most common way of inserting is using gene guns method. The other genetic engineering techniques are electroporation, microinjection and agrobacterium. There are 3 main types of genetic modifications which are listed below.

1. Transgenic – plants have genes inserted into them that are derived from other species.
2. Cisgenic – plants are made using genes of the same species or closely related.
3. Subgeneric – Alter genetic makeup of a plant without incorporating genes from other plants.

What is the Purpose of Genetically Modified Crops?

The multiple purposes behind genetically modified crops are listed below.

1. Higher yields
2. Enhanced nutritional value
3. Longer shelf life
4. Increase resistance to droughts
5. Increase resistance to insects, pests.
6. Increased resistance to herbicides.

Global GM crop cultivation

- The top five GM growing countries are
 - USA (top producer of biotech crops)

- Brazil (second position)
 - Argentina
 - India
 - Canada
- These countries together account for approximately 90% area of the GM cultivation.
 - Soybean, maize, cotton and canola with herbicide tolerance and insect resistance are the major GM crops grown around the world.

Impact of GM crops

- In the period of 23 years (1996-2018), about 17 million farmers, mostly from developing countries, adopted biotech crops, which in turn improved their socio-economic status.
- Apart from the economic benefits, usage of GM crops has also contributed to food security, sustainable development, and climate change mitigation. Those benefits are:
 - It increased crop productivity by 822 million tons;
 - Conserving biodiversity by saving 231 million hectares of land;
 - Adaptation of GM crops has provided a safer environment by saving 776 million kg of pesticides from being released into the environment;
 - GM crops have been helpful in reducing CO2 emissions by 23 billion kg, equivalent to taking 15.3 million cars off the road for one year (2018); and
 - Also, helping alleviate poverty through uplifting the economic situation of 16-17 million small farmers, and their families, totalling >65 million people (2018).

What are the Advantages of Genetically Modified Crops?

- The benefits experienced by the developed world by usage of GM crops are:
 - Higher crop yields
 - Reduced farm costs
 - Increased farm profit
 - Safer environment
 - More nutritious food
- The features of **first generation crops** such as insect resistance and herbicide tolerance have proven their ability to lower farm-level production costs.
- The features of **second-generation GM crops** include increased nutritional and/or industrial traits. These crops have more direct benefits to consumers.
- Examples of commercialized second generation crops include
 - Non-browning apples
 - Non-bruising and low acrylamide potatoes

- Maize varieties with low phytic acid and increased essential amino acids
- Healthier oils from soybean and canola
- Other GM crops in the research and/or regulatory pipeline include:
 - Rice enriched with iron, vitamin A and E, and lysine
 - Potatoes with higher starch content, and inulin
 - Insect resistant eggplant
 - Edible vaccines in maize, banana, and potatoes
 - Allergen-free nuts

What are the Disadvantages of Genetically Modified Crops?

As per reports, there are various disadvantages of genetically modified crops

1. Allergies, other anti-nutritional factors in foods
2. Resistance to antibiotics
3. Cancer

The above-mentioned disadvantages are not conclusive, and a lot more research is required to throw more light on the same.

GM Crops and the Environment

Environmental benefits

- Dramatic reduction in pesticide use. GM technology has reduced chemical pesticide use by 37 percent.
- Reduction in the release of greenhouse gas emissions from agriculture.

To read more about [greenhouse gases](#) and global warming, check the linked article.

Potential risks

- GM crops may create new weeds through out-crossing with wild relatives, or simply by persisting in the wild themselves.

What is out-crossing?

It is a term which refers to the unintentional breeding of a domestic crop with a related plant.

- The use of Bt crops will lead to the development of insect resistance to Bt.
- It can cause potential risks to other non-target organisms.
- The potential for pests to evolve resistance to the toxins produced by GM crops

