



Food and Agriculture
Organization of the
United Nations

Information toolkit on
food biotechnologies
with a focus on
food safety

8

Practical uses and applications



This “Information toolkit on food biotechnologies with a focus on food safety” is a publication consisting of one handbook and ten booklets, referred to as tools. It is strongly recommended to read through the whole set before using the information it contains.

Contents of the information toolkit on food biotechnologies with a focus on food safety

Handbook - Using the information toolkit

Tool 1: Background and guidance

Tool 2: Fundamentals

Tool 3: Rationale for potential benefits

Tool 4: GM food safety assessment

Tool 5: Regulations

Tool 6: Human health

Tool 7: The environment

Tool 8: Practical uses and applications

Tool 9: Current innovations

Tool 10: Public engagement

Introduction



Tool 8 provides some considerations and examples for its users of how the genetically modified (GM) foods have been applied, marketed and cultivated in their areas. It also supports users to showcase concrete examples of the specific characteristics and traits of genetically modified organisms (GMO) such as the pesticide tolerance introduced in a tomato that is being grown in the country. There are five examples in this toolkit, which can be used as a starting point to inform about the practical uses and applications of GMOs. Information in the examples may need to be complemented with country specific information. Following are the five examples.

1. Various types of GM foods have been produced globally.
2. Approved GM foods are available on the market for human consumption in most countries.
3. GMOs are grown on all continents except Antarctica.
4. Genetic modification is used in sectors other than food.
5. GM crops can contribute to a reliable food supply.

The materials produced starting from the examples provided here can be showcased on various platforms such as on government websites and other relevant online platforms and used as educational materials. The circular images alongside the text below can be referred to as quasi-illustrations of how one may present the materials. The illustrations used for the examples are made available as an element source file on the [FAO GM Foods Platform website](#).

Five examples

Various types of GM foods have been produced globally

Many types of GM foods exist at the global level. The example below may help providing this information. Below, the purple circle contains a list of examples of GM foods that have been grown in various places in the world. Users can modify the varieties currently listed so that the text and design show GM foods that are consumed in the country. It should be noted that as the text deals with foods, the image does not include examples of GM commodities that are mostly used for other purposes, such as cotton for clothes and alfalfa for green forage and soil restoration.



Various types of GM foods have been produced globally.

Canola, corn and soybean are the most common GM commodities and are typically used to make food products like cereals, snack chips and vegetable oils.

Apple, papaya, potato, summer squash, brinjal and sugar beet are some of the many other GM varieties produced in different parts of the world.

Approved GM foods are available on the market for human consumption in most countries

In most countries, when GM foods are approved, they become available on the market for human consumption. Users can refer to the example below to provide information that GM foods are available on the market in their country. As popular GM foods may differ from one country to another, the image conveys a generic message to the public. In some countries GM corn may be the most common commodity, whereas in other countries it may be GM soybean. It is also possible for users to showcase some GM varieties that have been newly approved for the market. In such cases, the illustration could be changed from two people to show the GM foods. When using information from this example, it is suggested to use country specific information.

Approved GM foods are available on the market for human consumption in most countries.

Depending on the country, various GM varieties are already on the market.



GMOs are grown on all continents except Antarctica

The example below provides generic global information that GMOs are grown in all continents except Antarctica. Users of this toolkit may also like to provide more country specific information. For such cases, the material can demonstrate whether any GMOs are grown in their countries, and if so, further discussion of those varieties can be added. In countries where no GMO has been grown so far, users may want to produce a material in a similar manner to the example that shows GMOs are grown all over the world. Users can also cite or refer to national legislation on GMO production. It is suggested to use country specific information when using this example.



GMOs are grown on all continents except Antarctica.

GMOs are grown all around the world, in countries such as Australia, Argentina, Brazil, Canada, the Philippines, South Africa, Spain and the United States of America.

The selection of GMOs cultivated such as soybeans, corn, sugar beets, canola and cotton depends on a country's geography, climate, regulation and its population's food preferences.

GMOs are used in sectors other than food

GMOs are used in various sectors such as medicine, research, food and agriculture. The technique can be used on a wide range of plants, animals and microorganisms (basically anything with DNA). The example below has been produced for helping users introduce the sectors other than food where the genetic modification technique has been applied.

Genetic modification is used in sectors other than in food.

Genetic modification has been applied in various fields such as animal feed, medicine, forestry, ornamental plants and of course scientific research.



GM crops can contribute to a reliable food supply

Starting from the example below, users can introduce some examples of genetic modification that are familiar to the local audience. While the example talks about ongoing research aimed at developing GM varieties that could address various agricultural challenges, such as drought, flood and the impacts of climate change, it can be used to introduce examples already in use. Users of this toolkit may also highlight a specific trait introduced to a certain commodity, for example, Bt (*Bacillus thuringiensis*) cotton is a genetically modified pest resistant cotton variety that produces an insecticide to combat bollworm. Users of this toolkit may further explain what Bt means and how it functions as a toxin for a specific pest. It is suggested to use country specific information when using this example.

GM crops can contribute to a reliable food supply.

These traits can lead to increased crop productivity and reduced crop losses.

Researchers are working on developing GM crops that could address various agricultural challenges such as drought, flood and climate change.



References



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Terminology

Biosafety	Set of measures or actions addressing the safety aspects related to the application of biotechnologies and to the release into the environment of transgenic plants and other organisms, particularly microorganisms, that could negatively affect plant genetic resources, plant, animal or human health, or the environment (FAO, 2001).
Biotechnology	Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for a specific use. In this document, the words “food biotechnology” are used when biotechnology is applied to make or modify foods for human consumption (FAO, 2001).
Conventional counterpart	A related organism/variety, its components and/or products for which there is experience of establishing safety based on common use as food (FAO and WHO, 2009).
Deoxyribonucleic acid	Deoxyribonucleic acid (DNA) is a long chain polymer of deoxyribonucleotides. DNA constitutes the genetic material of most known organisms and organelles, and is usually in the form of a double helix, although some viral genomes consist of a single strand of DNA, and others of a single- or a double-stranded ribonucleic acid (RNA) (FAO, 2001).
Gene	The unit of heredity transmitted from generation to generation during sexual or asexual reproduction. More generally, the term is used in relation to the transmission and inheritance of particular identifiable traits. The simplest gene consists of a segment of nucleic acid that encodes an individual protein or RNA (FAO, 2001).
Genome editing	Techniques utilized by scientists to correct or to introduce specific mutations at a particular site (locus) within the DNA of an organism. The techniques used to accomplish these site-specific corrections or directed mutations (base substitution, addition or deletion) include living modified organism (LMO) genome editing and transcription activator-like effector nucleases (TALEN). The term gene editing may be used interchangeably (FAO, 2019).
Genetic modification	Altering the genetic material of cells or organisms with the intention of making them capable of producing new substances or performing new functions (FAO, 2020a). The term genetic engineering may be used interchangeably.
Genetically modified food	Food produced for human consumption and derived from organisms whose genetic material (DNA) has been modified in a way that does not occur naturally, e.g. through introducing a gene from a different organism (FAO, 2020a).
Genetically modified organism	An organism that has been transformed by inserting one or more transgenes (FAO, 2001).
Living modified organism	A living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology. It is a synonym of GMO, but is restricted to organisms that can endanger biological diversity (FAO, 2001).
Modern biotechnology	Application of: i) <i>In vitro</i> nucleic acid techniques, including r-DNA and direct injection of nucleic acid into cells or organelles, or ii) fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombinant barriers and that are not techniques used in traditional breeding and selection (FAO, 2001).

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