

# Research report

BonaMUN

*GA3 – Social, Humanitarian and  
Cultural Committee*



*The question of genetic modification in the farm  
industry*

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## ***Introduction***

A form of genetic modification started about 10 000 years ago in Southwest Asia. At that time it consisted of artificial selection and selective breeding. Agricultural science and technology have since improved and caused an increase in complex DNA modification. Nowadays genetic modification consists of transferring genes from one organism into another, often unrelated, organism. Genetically modified organisms (GMOs) are said to reduce future problems in commercial agriculture. Despite that, problems linked to insect resistance and potential health hazards have threatened its reputation with the public and policymakers. As a consequence certain countries have installed full or partial bans on GMOs. Controversies and public concerns about GM foods and crops usually focus on human and environmental safety, labelling and consumer choice, intellectual property rights, ethics, food security and poverty reduction. With a relatively new way of manipulating genes arises the question: What are the risks of “tampering with Mother Nature?” What are the effects on the environment and are there factual health concerns people should be aware of? In other words what do we actually know about GMOs. <sup>1</sup>

## ***Definition of Key Terms***

GMO – Genetically Modified Organisms

Genetically modified organisms – Organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination.<sup>2</sup>

GM foods – Genetically modified foods. Foods produced from genetically modified plants or animals.

Genome – all the genetic material in an organism

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<sup>1</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5790416/>

<sup>2</sup> [https://www.who.int/foodsafety/areas\\_work/food-technology/faq-genetically-modified-food/en/](https://www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/)

## ***Background***

The global population is growing. The expansion of the population is one of the major contributors to undernourishment around the world. In 2016 the FAO (Food and Agricultural Organization) reported that 795 million people in the world were undernourished, 780 million of them in developing regions. In combination with the growth in global population more people will become undernourished. Advocates in favour of GM food say that it can be used to eradicate undernourishment.<sup>3</sup>

To combat malnourishment a solution could be a greater yield per acre. This can be achieved with conventional breeding, however, that process often takes more than 10 years before actual expression of a desired trait can be assessed. After that it has to be further expanded so it can be commercially useful. There is also a limited genetic variety in organisms as a result of optimization, which causes a limited space for improvement.<sup>4 5</sup>

Genetic modification promises to drastically reduce the development time of new strains of food. As a means to achieve sustainable global food security.

Economically using GM foods is said to be economically beneficial because of increased yield and a decrease in costs due to resistance to pests and weeds. There is also ongoing research to use GM foods as oral vaccines.<sup>6</sup>

Drawbacks of GM foods are usually concerns on the short- and long-lasting health problems that may result from this advanced biotechnology. With concerns over the potential adverse effects of GM foods on human health and environmental safety.<sup>78</sup>

Consumers often have reservations towards GM foods for one or more of the following reasons; The complexity of the biological techniques involved and the lack of a concise explanation thereof; the ethical principles which are inherent in traditional food processing; the doubts with regards to the adequacy of evaluation of the safety of GM foods. The concern people have with the complexity of genetic modification isn't hard to explain. There are still many things about secondary effects and regulatory pathways beyond current comprehension.

Health risks associated with GM foods are: toxicity, allergenicity and genetic hazards. These can be caused by the inserted gene itself, secondary effects of the products and disruption of natural genes existing in the manipulated organism.<sup>9</sup>

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<sup>3</sup> <http://www.fao.org/state-of-food-security-nutrition/en/>

<sup>4</sup> <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0066428>

<sup>5</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6173531/>

<sup>6</sup> <https://www.tandfonline.com/doi/abs/10.3109/07388551.2013.823595>

<sup>7</sup> <http://centaur.reading.ac.uk/36228/1/GM%20Science%20Update%20-%20Report%20to%20CST%20110314.pdf>

<sup>8</sup> <http://www.publish.csiro.au/cp/cp13167>

Allergenicity can occur when a gene from, for example a brazil nut is isolated and put into soybeans. Someone who is allergic to brazil nuts can end up having an allergic reaction to the soybeans. This can be very severe and end in hospitalisation or even death if put on the market without specification. Because it is often unknown where a certain foreign gene is implanted, there is a potential risk that the inserted gene will disrupt the existing information in the genes of the plant. This might lead to an activation of the production of toxins. However, since not all parts of the genome is understood, it's impossible to draw a causal connection between the insertion of a gene and the supposed effect.

Some reasons to genetically modify crops is to make it more resistant to pests or herbicides. This would reduce costs for farmer. It would be less labour intensive and could reduce the use of costly, toxic pesticides. However, it might be only a matter of time before weeds and insects evolve. The residues could also have a negative effect on organisms found in the soil, making the ground less fertile. <sup>1011</sup>

In Europe there are 11 countries that prohibit growing GM foods. In 2012 the only countries to plant GMOs were Portugal, Spain, Romania, Slovakia and the Czech Republic. Most of the genetically modified food is used to feed animals. The European legislation states that food products be labelled if they contain GMOs, except when these account for 0.9 percent or less of the total ingredients. <sup>12</sup>

There is also a danger of resistance to antibiotics. Antibiotics are often used during the process of creating GMOs. It allows one to see whether the inserted genes were introduced successfully. Therefore there's a risk that genes which are resistant are transferred into an otherwise benign bacteria. Bacteria are capable of alternating useful genes between species. That would mean a widespread resistance to antibiotics. <sup>1314</sup>

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<sup>9</sup> <https://link.springer.com/article/10.1007/s13197-012-0899-1>

<sup>10</sup> <https://link.springer.com/article/10.1007/s13197-012-0899-1>

<sup>11</sup> A.A. Snow, P.M. Palma. Commercialization of transgenic plants: potential ecological risks. *Bioscience*, 47 (2) (1997), pp. 86-96

<sup>12</sup> <http://www.ipsnews.net/2013/03/spain-leads-the-eu-in-gm-crops-but-no-one-knows-where-they-are/>

<sup>13</sup> <https://www.annualreviews.org/doi/abs/10.1146/annurev.en.39.010194.000403?journalCode=ento>

<sup>14</sup> <https://www.nature.com/news/case-studies-a-hard-look-at-gm-crops-1.12907>

## ***Member States and NGOs***

### ***China:***

The first country to commercialise GMOs in the form of tobacco in the early 1990s. It's also a country with more lenient laws towards GMOs.

### ***Spain:***

Spain accounts for 42 percent of all field trials of genetically modified crops in the EU. These field trials are not subjected to safety controls. About 88 percent of GM crops grown in Europe are grown in Spain.

### ***United States of America:***

There are several GM foods on the market in the USA, with approval of the FDA (Food and Drug Administration). The first being a GM species of tomato with a property of delayed ripening. Some others are cotton and soybeans resistant to herbicides. The FDA has also approved the first genetically engineered animal, a fast growing salmon, for human consumption in the US after two decades of regulations and testing.<sup>15</sup>

### ***Greenpeace:***

The environmental organisation broke into an experimental farm of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in July 2011 and destroyed their entire crop of genetically modified wheat. They maintain an anti-GMO campaign.

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<sup>15</sup> <https://link.springer.com/article/10.1007/s13197-012-0899-1>

## ***Links***

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5790416/>
2. [https://www.who.int/foodsafety/areas\\_work/food-technology/faq-genetically-modified-food/en/](https://www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/)
3. <http://www.fao.org/state-of-food-security-nutrition/en/>
4. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0066428>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6173531/>
6. <https://www.tandfonline.com/doi/abs/10.3109/07388551.2013.823595>
7. <http://centaur.reading.ac.uk/36228/1/GM%20Science%20Update%20-%20Report%20to%20CST%20110314.pdf>
8. <http://www.publish.csiro.au/cp/cp13167>
9. <https://link.springer.com/article/10.1007/s13197-012-0899-1>
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14. <https://www.nature.com/news/case-studies-a-hard-look-at-gm-crops-1.12907>
15. <https://link.springer.com/article/10.1007/s13197-012-0899-1>