Environment Committee

Using genetically modified plants responsibly to improve food security

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Forum: Environment Committee

Issue: Using genetically modified plants responsibly to improve food security

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Introduction

In a world where food security is threatened by various factors such as climate change and global market dependency, companies and countries look past traditional ways to feed the population. In relation to that, Genetically Modified Organisms (GMOs) have, over the last fifty years, gained significance in the biotechnology sector. GMOs, which involve laboratory-based genetic modifications, create organisms with traits that traditional breeding methods do not produce. This mainly consist of enhanced crop resistance to pests, diseases, and environmental stresses; increased crop yield; enhanced nutritional content of crops through biofortification and shortened breeding times. However, issues such as contamination of national environments and economic burdens on farmers due to increased costs are potential risks. Along the benefits of GMOs go the concerns for reduced biodiversity and the thereby increased vulnerability of agricultural systems. It also increases economic and political power that the GM-crop producers hold.

While national governments have developed a mostly positive view of GMOs, they still face a rather negative public perception.

However, there is an urgent need for synchronized science-based regulations, enhanced methods for long-term risk assessment and inclusive governance models. These models must effectively harmonize innovation with safety requirements and public trust.

Definition of Key Terms

Genetically Modified Organisms (GMOs)

Genetically Modified Organisms are plants, animals or microbes that have a part of their DNA changed using genetic engineering techniques.

Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)

CRISPR is the foundation of modern gene-editing. Scientists are able to locate specific genes and alter them, by swapping the targeted strands with the desired DNA stretches.

Intellectual Property Rights (IPR)

Intellectual Property Rights are legal rights that protect inventions and creations that result from intellectual activity and hereby ensure that creators can control their work and benefit from it.

Safety assessment

A safety assessment is a structured and engineering-based procedure that is designed to identify and manage potential dangers of a product, process or system.

Regulatory frameworks

A regulatory framework is a system of guidelines, rules and standards that is established by governing bodies to oversee specific industries and activities. This approach ensures that compliance and accountability are preserved.

Environmental risk

Environmental risk is the probability an event or series of events might occur that cause negative effects on the environment, biodiversity, natural resources or public health.

Public perception

Public perception is the collective opinion or belief of the general public on a certain matter. This can be influenced by various factors, such as media coverage and personal experiences.

General Overview

Since the first genetically engineered or modified crops were approved for commercial production in 1995, no new GMOs have been shown to be hazardous or cause harm to human consumers. Since the initial commercialization in the mid-1990s, GM-crops have achieved unprecedented adoption rates with over 90 % of global soybean production, 80 % of cotton cultivation, and 30 % of maize farming now utilizing GM varieties across more than 206.3 million hectares of 27 countries and regions worldwide.
There are three types of genetical engineering frequently used for crops, which are approved: RNA interference, retransformation of vegetative varieties and gene insertions that mimic plant breeding (cisgenic plants).
A study determined that the cost of developing and commercializing a new GM-plant was US$ 115 million and 38% of this cost, US$ 43 million, was purely for regulatory risk assessments.

With the rising global demand for GMOs, companies are more keen than ever to dominate the market. Companies that develop genetically modified seeds often patent their innovations in order to secure their exclusive rights to produce and sell them. These Intellectual Property Rights (IPR) provide them the ownership and control of specific GMOs and related technologies, which can lead to significant market power and influence over practices in the field of gene-editing. While some critics of IPRs in the GMO-industry consider them as unnecessary and caution about potential monopolies, proponents of IPRs cite their importance for maintaining innovation.

Significant challenges remain in addressing the knowledge gaps concerning the effect of GMOs. In particular long-term health effects, mutigenerational impacts and potential consequences for the environment may not yet be adequately captured by current risk assessment protocols.

Maintaining public trust through science-based governance approaches that address the general concerns of the population pose an additional challenge.

This has been particularly proven to be true in case of the “golden rice dilemma”. Golden rice is a genetically- engineered variant of rice grain that battles vitamin A deficiency particularly in LEDCs. While golden rice is declared safe to consume and has passed all safety assessments, it has been a target of backlash when Greenpeace launched a campaign against the grain. Alongside that, critics have declared the crop unsafe to consume and rattled anti-GMO demonstrators to destroy fields of the crop. In 2016 more than 100 Nobel prize winners signed a statement urging Greenpeace and governments worldwide to support GMOs and golden rice in particular. They argued that golden rice’s potential to reduce avoidable deaths made its restriction a crime against humanity.

Mayor Parties Involved

European Union (EU)

The European Union is still rather resistant to GMOs, but over the past years there has been a positive shift in the perception of GMOs. However, the European Union maintains the most comprehensive process-based regulatory framework. The EU requires extensive risk assessment protocols and approval timelines to launch a new GMO extend from three to seven years. Despite that more EU-Members are working on the release of GMOs and establishing a EU-wide framework for health and risk assessment. The EU also requires all GMO foods to be labelled to ensure user caution.

United States (US)

The United States employ product-based frameworks that facilitate adoption. In 2016, the US passed the National Bioengineered Food Disclosure Law, with mandatory compliance effective from 2022, which also required disclosure of products that do not use CRISPR but could not be bred without genetic intervention to disclose bioengineered processes. Despite efforts the public still holds a reluctant opinion on GMOs.

Africa

Africa remains deeply divided on the issue of adopting GMOs. While a few countries like South Africa and Nigeria have taken significant steps in adopting GMOs, countries like Kenya and Zambia continue to maintain strict bans on GMOs. This can be traced back cultural, religious and political fear that the use of GMOs will lead to dependance on foreign companies. That could potentially lead to the undermining of local agricultural knowledge and biodiversity. These opposite positions not only present a challenge to agricultural innovation, but also affect regional trade in the African Continental Free Trade Area, as neighboring states often conflict on GMOs on the market.

China

In 2023 China approved 37 genetically modified (GM) corn varieties and 14 GM soybean varieties after a three-year trial. The approval was the first of its kind by China for staple food crops. This is part of a broader effort to increase domestic food production and reduce reliance on global markets.

Timeline of Events

1973 – First recombinant DNA created: The discoveries of Herbert Boyer and Stanley Cohen lays the scientific foundation for genetic modification.

1975 – Asilomar Conference on Recombinant DNA: The conference established the principle that biotechnology should be developed responsibly and with safety regulations.

1994 – (May 18) – First GM food approved (Flavr Savr tomato) by the US

2000 (January 29) – Cartagena Protocol on Biosafety adopted: International agreement under the Convention on Biological Diversity was adopted to regulate the safe transfer and use of GM organisms.

2003 – Codex Alimentarius guidelines for GM food safety: The Food and Agriculture Organization (FAO) and World Health Organization (WHO) release international guidelines to assess the safety of GMOs. These standards helped countries evaluate GMOs consistently and responsibly.

2012 (June) – CRISPR-Cas9 gene-editing breakthrough: Scientists showed that CRISPR-Cas9 is an precise and efficient gene-editing tool. This technology allows targeted crop improvements with fewer unintended changes.

2016 (May 17) – U.S. National Academies report on GM crops: A scientific review concluded that GMOs are generally as safe to eat as conventional crops.

2018 (July 25) – EU court rules gene-edited crops regulated as GMOs: The European Court of Justice rules that CRISPR-edited crops fall under existing GMO laws.

2020s – Climate-resilient GMOs gain importance: With an increase in natural disasters and extreme weather, GM-crops designed to be more resilient have become increasingly important.

Previous attempts to solve the issue

The United Nations has given a forum for international collaboration and coordination in the pursuit of using GMOs responsibly in order to achieve food security by promoting communication among Member States. The previous attempts to resolve the issue that have resulted from this forum have been quite successful. Nevertheless, the technological advancements of the 21st century such as a wide range of methods to transfer genetic information have opened up new risks that need to be accounted for. These previous attempts consist of:

UNGA Food Security Resolutions

Recent UN General Assembly resolution **A/RES/79/276** and related texts emphasize food security, nutrition and sustainable agriculture. The resolution welcomes national strategies including technology assessment, risk management, and equitable access to innovations. The resolution calls to assess agricultural technologies holistically for sustainable development, without singling out GMOs but including tech options.

Cartagena Protocol on Biosafety

This international biosafety agreement, under the Convention on Biological Diversity, governs the safe transfer, handling and use of living modified organisms (LMOs). It allows countries to regulate imports of GMOs according to precautionary principles. It's highly relevant to responsible GMO deployment in food systems due to its focus on ecological and health risk management. While 173 countries are signatories of the Cartagena protocol many have yet to implement its content in national policies and guidelines.

Codex Alimentarius Guidelines

The FAO/WHO Codex Alimentarius Commission developed risk assessment and safety testing guidelines for foods originating from modern biotechnology, including labeling principles and safety analysis. Hereby providing global technical standards used by many countries when regulating GM food safety.

Please keep in mind that previous attempts are invaluable to solving new issues, but ultimately it will be the novel suggestions that strive to solve the issue.

Possible Solutions

Addressing the responsible usage of GMOs is a complex and diverse matter. There are many parties that need to be taken into account, such as GMO-companies, individual countries or international organizations. To address this issue a versatile and including approach is aimed for.

Establishing and implementing legal framework for GMO companies

To address the responsible usage of GMO crops a uniform and comprehensive approach on the innovative and industrial level could be implemented. To reduce the rising costs that accompany countries during risk assessment trials, companies could be provided with an internationally agreed upon framework that they need to comply to in order to be able to launch their respective products. This framework would be a mandatory requirement alongside companies already implemented risk assessments and regularly reviewed by global specialist to make sure all companies on the market fully comply to the framework.

Encourages multilateral sharing of information

Encourages the sharing of food, feed and environmental risk assessment summaries between countries while maintaining national approvals for GM-crops. Hereby maintaining national sovereignty while helping subsequent countries to focus on country specific potential hazards that were not previously addressed by other risk assessments.

Adoption of a global risk assessment

To ensure a unified approach on approving of GMOs, the adoption of one global risk assessment for food, feed and environment that complies to international standards could be recommended. This risk assessment could potentially include health impact assessment evidence, environmental risk assessment outcomes and extended duration and multi-generational studies.

Bibliography

Picture Source: gmos--860x430.jpg (860×430)

Accessed on 26 January 2026, 21:46 CET

“Genetically modified Crops: Balancing safety, sustainability, and global security” – Jose L. Domingo,

Environmental Research, Vol. 286, Part 2, 1 December 2025

Genetically modified Crops: Balancing safety, sustainability, and global security - ScienceDirect

“Trends in the global commercialization of genetically modified crops in 2023” – Xingru Cheng et. al., Journal of Integrative Agriculture, Vol. 23, Issue 12, 3943–3952, December 2024

Trends in the global commercialization of genetically modified crops in 2023 - ScienceDirect

“Advancing transparency, the rule of law and public participation regarding living modified organisms/genetically modified organisms” – United Nations Economic Commission for Europe

Published by United Nations Economic Commission for Europe, 8 February 2024

Advancing transparency, the rule of law and public participation regarding living modified organisms/genetically modified organisms | UNECE

Accessed on 16 January 2026, 13:42 CET

“One risk assessment for genetically modified plants” – Muffy Koch et. al., Bioeng. Biotechnol., 18 July 2025, Sec. Biosafety and Biosecurity, Volume 13, 2025

Frontiers | One risk assessment for genetically modified plants

“Regulating GMOs: Ensuring food security and deterring agro-terrorism” – Shravishtha Ajaykumar, Orfonline.org

Published by Orfonline.org, 30 August 2024

Regulating GMOs: Ensuring food security and deterring agro-terrorism

Accessed on 16 January 2026, 15:38 CET

“China's Genetically Modified Dilemma“ – Asia Society

Published by Asia Society, 23 May 2024

China's Genetically Modified Dilemma | Asia Society

Accessed on 16 January 2026, 15:52 CET

“Governments agree to ease regulation of new-generation GMOs” – Robert Hodgson, Euronews

Published by Euronews, 14 March 2025

Governments agree to ease regulation of new-generation GMOs | Euronews

Accessed on 16 January 2025, 16:08 CET

“A/RES/79/276 – Implementation of the United Nations Decade of Action on Nutrition (2016–2025) ” – UN General Assembly, Distr.: General

Published by docs.un.org, 25 March 2025

Document Viewer

Accessed on 16 January 2026, 16:21 CET

“UN Second Committee spotlights UN Food Systems Summit process in newly adopted resolutions” – UN Food Systems Coordination Hub

Published by UN Food Systems Coordination Hub, 22 November 2023

News detail | UN Food Systems Coordination Hub

Accessed on 16 January 2026, 16:35 CET

“Cartagena Protocol on Biosafety” – Wikipedia

Published by Wikipedia

Cartagena Protocol on Biosafety - Wikipedia

Accessed on 16 January 2026, 17:49 CET

“Biotechnology – CODEX ALIMENTARIUS” – FAO

Published by FAO

Biotechnology | CODEXALIMENTARIUS FAO-WHO

Accessed on 16 January 2026, 17:57 CET

“Chapter 5 - Genetically Modified Crops and Intellectual Property Rights: Indian Scenario” – Manoj Kumar Singh et. al., Policy Issues in Genetically Modified Crops, A Global Perspective, Pages 97-108, 2021

Genetically Modified Crops and Intellectual Property Rights: Indian Scenario - ScienceDirect

"Can GM crops promise food security?" – Stuart Braun, Deutsche Welle

Published by Deutsche Welle, 19 June 2024

Can GM crops promise food security?

Accessed on January 25 2026, 13:22 CET

"The use of genetically modified crops in developing countries" – S. Thomas et. al., FAO, 2003

Published by FAO

The use of genetically modified crops in developing countries

Accessed on 25 January 2026, 14:19 CET

"Global Food Security – The 2050 Challenge" – The Ludgar Center

Published by The Ludgar Center

Our Work: The Lugar Center

Accessed on 25 January 2026, 14:32 CET

"Perceptions of the Governance of the Technological Risks of Food Innovations for Addressing Food Security" – Catherine Nkirote Kunyanga et. al., *Sustainability* 15, no. 15: 11503, 25 July 2023

Perceptions of the Governance of the Technological Risks of Food Innovations for Addressing Food Security | MDPI

"Necessities, environmental impact, and ecological sustainability of genetically modified (GM) crops" – Ngongolo, K. et. al., Vol. 3, article number 29, 2025

Necessities, environmental impact, and ecological sustainability of genetically modified (GM) crops | Discover Agriculture | Springer Nature Link

"Golden rice | Description, GMO, Genetic Engineering, Controversy, history, & Facts" –Britannica

Published by Britannica

Golden rice | Description, GMO, Genetic Engineering, Controversy, History, & Facts | Britannica

Accessed on 25 January 2026, 20:45 CET