Toward Harmonized Global Governance of GMOs: A Comparative Analysis of Regulatory Fragmentation Across Kenya, the United States, and India

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Abstract

Genetically modified organisms (GMOs) now play an important role in global agriculture, but the rules that govern how they are developed, traded, and controlled remain separated. Most countries follow two main international systems, the WTO's trade-focused framework and the Cartagena Protocol's precautionary biosafety approach. Because these systems do not fully align, governments often face unclear or conflicting expectations when they try to regulate GM technologies. This paper examines these weaknesses through three case studies: Kenya's reversal of a long GMO ban during a climate-driven food crisis, the United States' repeated contamination incidents involving GM and non-GM crops, and India's dependence on Bt cotton, along with hindered regulatory progress and export contamination cases. Three case studies show that ununified governance increases suspicion, creates ecological and economic risks, and slows down the potential benefits that GMOs could provide for climate adaptation and food security. The challenges identified in the cases, including gene flow, resistance, and cross-border contamination, are transnational and cannot be addressed effectively by individual countries acting alone. For the reasons above, this paper argues that a unified international biosafety institution is needed to set minimum standards, coordinate responses to contamination, and provide clearer expectations around coexistence and liability. Such an institution would not remove national control but would help create a more predictable and coordinated global system for GMO governance.

Keywords

Genetically Modified Organisms (GMOs), Global GMO Governance, International Biosafety, Regulatory Fragmentation, Cross-border Contamination

Introduction

GMOs have been the center of recent biological advancements that change the nature of the organisms that humanity knows. The relatively rapid and recent nature of these developments, along with the complexities of how GMOs interact with their environment, also means that creating consensus on their use and developing effective standards of regulation remains challenging. While recognizing the benefits of GMOs, to ensure the safety of the environment, governments around the world have decided to create protocols to regulate GMOs. Two different international treaties for GMO regulations were established: The WTO's regulation and the Cartagena Protocol. This overlap in the regulation caused confusion and inefficiency in GMO trade and development. This paper's literature review explores the current difficulties created by reliance on the Cartagena Protocol and the WTO's Protocol, and the focus of the research is case studies on aspects of GMO regulation and the experiences of Kenya, the US, and India to inform understanding of how to improve the current system of regulation.

Thesis

This paper argues that the current global system for regulating GMOs is fragmented and does not match the cross-border nature of GMO-related risks. The WTO rules and the Cartagena Protocol create different and sometimes conflicting expectations for countries, which contributes to confusion, delays, and inconsistent policies. By analyzing the cases of Kenya, the United States, and India, this paper shows how these inconsistencies create real problems such as contamination incidents, sudden policy changes, and long periods with no regulatory progress. Because these issues repeat across different countries, the paper argues that a unified international body, or a much stronger coordinated framework, is needed to provide minimum standards, clearer monitoring systems, and consistent expectations for liability and coexistence. This type of institution would not remove national control but would help create a more stable and predictable global system.

Literature Review

This literature review will look into the inefficiency of the current regulation protocols of GMOs and bring up alternative proposals for regulating GMO trade. “Finalized in Nairobi in May 1992 and opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janerio on 5 June 1992,” (CPB page 1), the Cartagena Protocol on Biosafety aims to ensure the protection of biodiversity and maximizing the “benefit from the potential that biotechnology has to offer.” The Cartagena protocol seeks to safeguard biological diversity and human health by regulating the international transfer, management, and use of living modified organisms produced through modern biotechnology. It emphasizes preventing potential harm, particularly in situations involving their movement across national borders.

Separate from the Cartagena Protocol, the WTO also passed its law for the regulation of GMO products. The Law on Genetically Modified Organisms has its focus on regulating the trading procedures of the GMOs and states that designated federal authority will evaluate whether the conditions have been met by reviewing the application and the report from the relevant organization, and will then decide whether to authorize the contained use, production release, or market placement of genetically modified organisms and their derived products.

On the Cartagena protocol, Robert Falkner and Aarti Gupta point out,“ the absence of a uniform global approach to GMO regulation, combined with disunity among leading agricultural trading partners in Europe has the effect of widening the space for autonomous decision-making in developing countries struggling with the challenges of domestic biosafety regulation.” (The Cartagena Protocol on Biosafety and Domestic Implementation) They also argue for a unified regulation of GMOs. Ultimately, however, Gupta and Falkner have contrasting views on the WTO’s regulation and support the Cartagena protocol for its allowance of more nationally tailored GMO regulation for each country.

Odong argues that the conflict between the WTO and the Cartagena Protocol “would be more pronounced” upon implementation of the Biosafety Protocol. States would necessarily have to put into practice their interpretation of the ambiguity created by the differences in the regulation. To avoid conflict between the two regimes, states could give priority to the trade-restrictive provisions of the Biosafety Protocol and further developments based on the protocol, making them exceptions to GATT/WTO rules and the chapeau to Article XX of the GATT. (Reconciling the Incongruence between the Cartagena Protocol on Biosafety and the GATT/WTO Rules). Robert suggests that GMOs should be regulated through the Sanitary and Phytosanitary Agreement: “As science is currently incapable of providing definite answers to the potential benefits and hazards of GMOs”, priority should be given to the precautionary principle, especially with emerging international standards on GMOs, like the Codex Standards and the Cartagena Protocol (The ABC of GMOs, SPS & the WTO: An analysis of the application of the SPS Agreement to genetically modified organisms).

Researchers recognize that both the WTO and Cartagena's protocols offer valuable structure and guidance as foundation for the regulation of GMOs. Unregulated trading of GMOs poses significant potential threats that include but are not limited to the environment, human health, trust in international trade and biodiversity. Odong argues strongly for harmonization of WTO and GMO rules when regulating GMOs. As he argues, the inconsistent regulation of GMOs potentially causes inefficiency in the innovation and makes it harder to manifest the benefits that GMOs can undoubtedly offer in daily life. As for the problem of the application of GMOs, Robert argues that SPS's agreement states that regulations and restrictions should be restrictive as necessary but this area is an important failure of both the WTO and the Cartagena Protocol. Scholars argue that the Cartagena Protocol's list of GMO registration is insufficient. Others argue that the WTO is insufficient in its containment policy and is focused too much in facilitating trade. Both views fail to offer substantive alternatives that address these issues. Currently, the proposed solutions focus on one aspect of the application of GMOs, which is its role in SDG and climate change. This paper will attempt to contribute to filling the gap in the literature.

Methodology

This research uses legal analysis and three case studies to understand how the WTO rules and the Cartagena Protocol influence GMO regulation. The legal analysis identifies where the two treaties overlap, conflict, or leave important questions unanswered. The case studies show how these issues appear in real situations.

Kenya, the United States, and India were chosen because each country represents a different approach to GMOs. Kenya shows how policy can quickly change during a food security crisis. The United States shows the results of a permissive coexistence model that has experienced several contamination incidents. India shows how long delays in approving new GM crops create resistance problems and trade-related disputes. Together, these cases offer a broad look at how countries operate inside the fragmented global system.

The information used for the case studies comes from national laws, government statements, academic articles, and major contamination or policy events reported in the media.

Hypothesis

The main hypothesis is that the combination of WTO rules and the Cartagena Protocol creates a fragmented global system that does not match the transboundary risks associated with GMOs. Three expectations follow from this. First, different rules across countries increase the chances of contamination and resistance. Second, countries under pressure, such as drought or export problems, tend to make short-term and inconsistent decisions. Third, a unified international body with clearer standards could reduce these problems and make GMO governance more predictable. The case studies are used to examine whether these expectations match what happens in real situations.

Case Studies

1. Kenya's U-Turn on GMOs to Prevent Food Security Collapse

In November 2012, the Kenyan government imposed a moratorium on genetically modified organisms (GMOs), motivated by reports that GM maize caused cancer in rats (Joseph Maina, 2022). The Biosafety Act 2009 had established a regulatory framework for GMOs, but the cabinet's ban effectively prevented the commercialization of GM crops. However, in 2022, the Kenyan government was forced into a reversal on the commercialization of GMOs due to an unprecedented drought that threatened food security in the

country. Although safety concerns had limited the adoption of biotechnology, the drought created environmental and population pressures that forced the government to allow the commercialization of GM crops after a decade of falling behind regional competitors.

During the moratorium, Kenyan scientists were limited to conducting confined trials and research on GMOs while lobbying the government for a change in the regulatory policy (Langat, 2022). During this period, South Africa, Nigeria, Sudan, and Burkina Faso moved forward with GM crop commercialization, creating a competitive advantage over Kenya in a relatively short space of time. With regional competitors benefiting from the development of GMOs and the perception that GMOs could increase food security during the drought, on October 3, 2022, Kenya's Cabinet formally lifted the decade-old GMO ban. In a special Cabinet meeting convened to address a worsening food crisis caused by climate change-induced environmental crisis, the Cabinet allowed the "open cultivation of genetically modified crops and the importation of food crops and animal feeds produced through biotechnology innovations" (Reuters, 2022). In practical terms, the Cabinet's 2022 decision nullified the 2012 moratorium and reinstated Kenya's pre-2012 regulatory regime under the Biosafety Act, 2009.

Before the ban on GMOs was lifted, due to the severe drought, four million Kenyans were facing acute food insecurity (Reuters, 2022). The national staple maize was in short supply, to the point where Kenya "consistently had an annual deficit of 10 million bags of the maize staple" (Duncan Miriri, 2022). The president, citing the need to stabilize food supply, allowed drought-tolerant and pest-resistant crops, and aligned the country's GM policy with scientific evidence. The policy change used GM crops to effectively counter the high levels of food insecurity that could have led to political and social instability.

This case proves the need for international GMO regulation, in which countries are free to use GM crops to address issues such as environmental and food insecurity. The case of Kenya shows that poorly informed domestic policy makers can damage development and would benefit from internationally agreed standards and data that can guide domestic decision-making. With a united international organization to regulate GMOs, countries can implement GM crops faster and with confidence to address potentially destabilizing threats such as climate change-related food insecurity.

With the practical need for GM crop adoption made clear by cases such as Kenya, the lack of standardized international regulation becomes a pressing issue, because policy differences can lead to cross-border contamination regardless of a state's desire to adopt genetic crops or not. The lack of regulation makes contamination more likely, as shown by the United States and India.

2. Cross-Contamination of GM Crops with Non-GM Crops in the US

Since the commercialization of GM crops in the United States, there have been high-profile cases of cross-contamination of various GM strains with non-GM strains. In the early 2000s, Starlink Corn was developed through genetic modification to create high levels of resistance to specific pests. The pesticidal protein carried potential allergy risks with human consumption, so the Environmental Protection Agency limited the use of the crop to animal feed. Tests on products in the human food supply chain, in products such as tacos, later found the presence of the protein, indicating the GM crop planted only for animal consumption had contaminated the non-GM form of the crop planted for human consumption (Jack Bobo, 2024). In another case of contamination, in 2006, a genetically modified rice developed by Liberty Link was found in the U.S. supply chain of rice for human consumption despite the company not receiving a federal license to grow commercial rice. (Plaintiff's Executive Committee, 2024) The owners of Liberty Link, Bayer CropScience, paid $750 million to settle claims against them (Plaintiff's Executive Committee, 2024).

Despite these high-profile cases, GM contamination of non-GM crops has been found extensively, including in rice, maize, soya, and rapeseed internationally (Becky Price & Janet Cotter, 2014). Unlike in the European Union, the United States has limited regulation on the prevention of cross-contamination of GM and non-GM crops. The U.S. has avoided specific legal provisions targeting producers. Instead, "segregation is achieved by those who pay the premium, with the implementation of locator maps, planting

and buffer zones, third-party certification, cooperative exchanges…"(Rebecca Grumet, 2024). The approach in the U.S. can be defined as a "fence out" rule, which "imposes a segregation obligation on growers of organic, non-GM, and other crops that receive a premium" (Rebecca Grumet, 2024). This approach treats GM and non-GM crops equally, so there is no limit on the planting of approved GM crops or attempts by federal or local governments to limit contamination. Instead, "growers are obliged to ensure that GM pollen is excluded from their growing areas to guarantee that the crops they produce meet product quality requirements" (Rebecca Grumet, 2024).

In addition to the lack of control over cross-contamination of GM varieties created for non-human consumption with varieties created for human consumption, the extent of cross-contamination in the United States raises legal issues regarding the use of patented GM technologies. As the burden is placed on the non-GM farmer to prevent contamination, if contamination happens and the farmer, unaware, grows GM crops that have been patented, the farmer could be liable for use of the intellectual property, and biotechnology firms that develop, patent, and use GM crops have a track record of pursuing these claims in the courts (Food and Water Watch, 2015).

As GM and non-GM crops are traded extensively internationally, the potential for inadvertent cross-contamination and consumption is high when the regulatory system places the burden for preventing the contamination on the non-GM growers. As non-GM growers cannot efficiently trace the source of contamination, it is expensive and highly challenging to prevent it from happening. On the other hand, if the burden is placed on the GM crop grower, preventing "leaks" in a system designed to contain GM crops can be more easily enforced, as the technology will have a unique signature that can be traced to its source.

To achieve the higher level of safety and predictability associated with placing the burden on the GM producer, the U.S. could follow the E.U. and Japan in creating legislative frameworks that "mandate strict segregation measures for the cultivation of GM crops" (Rebecca Grumet, 2024). These frameworks created "systems for notification, segregation, labelling, delineation of planting areas, public registration, traceability, and compensation for damage" related to GM crops (Rebecca Grumet, 2024). The development of this framework in the E.U. has limited the use of certain types of GM crops that have a high risk for cross-contamination, such as insect-resistant maize (Rebecca Grumet, 2024).

Despite the constant threat of contamination of non-GM crops with GM varieties, the economic and environmental motivations for using GM remain powerful. The case of India shows how, despite concerns about cross-contamination and the development of disease resistance, when farmers have the choice, they overwhelmingly begin to rely on GM crops for their benefits.

In 2002, a GM cotton known as Bt cotton was introduced in India. Bt cotton effectively produces a pesticide, protecting it from pests known to cause significant damage to crop if not treated with environmentally damaging pesticides (Ian Plewis, 2021). A recent study shows that although there was an initial reduction in the use of pesticides after the introduction of Bt cotton, the GM modified plant has only continued to effectively repress one pest, while others have developed significant levels of resistance to the GM plant's pesticidal protein (K. R. Kranthi & Glenn Davis Stone, 2020). Furthermore, some researchers argue that the emergence of pesticide resistance caused by the introduction of Bt cotton means that cotton farmers are now spending more on pesticides than they were before the introduction of Bt cotton in 2002 (K. R. Kranthi & Glenn Davis Stone, 2020).

Since the commercialization of GM crops internationally, India's Genetic Engineering Appraisal Committee (GEAC) of the Ministry of Environment, Forest, and Climate Change has only authorized the use of Bt cotton. No other GM crops have been authorised for commercial use (PIB Delhi, 2024). Over 96% of cotton planted in India is now Bt cotton (PIB Delhi, 2024). Despite research showing that the introduction of Bt cotton may have created challenging pesticide resistance, in 2025, Indian researchers are demanding that the Indian government and Supreme Court develop more effective regulation and legislation to guide more widespread approval and use of GM crops. The principles for the development of new overarching regulation are listed as: "independent, evidence-based regulation; transparency and open data; structured

public engagement; post-approval oversight; public investment in research; and a policy that protects organic and traditional farming, while giving farmers access to GM options without coercion." (Rohini Sreevathsa, 2025). The motivation behind the development of this legal framework will be a green revolution in agriculture that allows India to adapt effectively to rapid climate change (Rohini Sreevathsa, 2025).

The lack of regulation in India regarding commercialization and cross-contamination has led to disruption in supply chains, for example, rice. GM rice from field trials in India was found in rice exported to markets where no GM rice is permitted in products for human consumption, such as the E.U. (Claire Robinson, 2021). Due to such contamination events, significant concern has arisen over permission for the environmental release of GM mustard crops in India. Although the permission does not allow commercialization, the environmental release will create the potential for cross-contamination with non-GM mustard crops (GRAIN, 2023). Examples of this cross-contamination in the United States and with Indian GM rice have created the need for rapid development of a legal framework that preserves the choice of Indian farmers to use non-GM crops. Such a principle suggests that India will follow the EU and Japan in creating a legal system in which the burden is on GM crop producers to prevent contamination rather than following the U.S. approach in which non-GM producers face the burden of proving that their crops have not been contaminated.

Cross-Case Analysis

The case studies show the need for international cooperation on the creation of an international body to regulate and standardize certain aspects of the development and use of GMOs. Although market-driven competition for the use of GMOs has fueled innovation and value, the risks associated with cross-contamination with non-GMOs and disease/pest resistance require a comprehensive framework for international cooperation. The case studies show that although there are significant benefits to be gained from the development and use of GMOs, such as the initial reduction of pest threat in India and the ability to respond effectively to climate change-driven extreme weather events, such as drought in Kenya, the variation in regulation between jurisdictions risks creating mistrust and damage. In the case of India, the inadvertent export of GM crops to the EU market epitomizes how a lack of consistent regulation regarding cross-contamination can create tension and mistrust in trade relationships. The examples of cross-contamination within the US market show that financial damage can also be high when ineffective strategies for preventing cross-contamination are relied upon. As cross-contamination and the development of disease/pest resistance are inherently transnational, the only way to create an effective response to these downsides of the adoption of GMOs is through transnational cooperation. The US approach of "ring fencing" non-GMOs with the burden on non-GMO producers seems to ignore the real-world experience of cross-contamination and the potential effects of GMOs on the natural environment. One of the most significant concerns is the contamination of human food sources with GMOs that have been approved for non-human consumption, as shown by the examples in the US case study.

Recommendations

Based on the findings of this paper, the recommendation is for the creation of an international body that sets minimum standards for GM crop adoption. Membership of the body should be encouraged by offering shared expertise and other benefits within the group and cooperation to exclude non-members from trade and markets on the basis that their approach to GMOs does not meet the internationally agreed-upon standard. The body would first develop uniform rules that prevent confusion in the regulation process. Standardization of regulation will contribute to addressing issues such as cross-contamination and disease resistance. The body should also focus on an international standard for responses to inadvertent contamination to avoid export and market shocks. Such responses could include a clearly defined escalation of steps, with the final step being a comprehensive block of all exports when contamination is found and not addressed. The predictability of this type of approach will give companies clear guidelines

and direction, which will create higher levels of stability in markets and confidence in consumers and governments.

Research Limitations

This study has several limitations that should be kept in mind for future studies. First of all, it lacks an adequate sample size to represent the whole world. In this paper, due to lack of time and resources, three case studies were analyzed: Kenya, the United States, and India. These countries represent different distinctive regulatory approaches, but they do not fully represent the other 190 countries. Thus, the findings should not be treated as complete or fully global.

Another limitation is that the research relies solely on publicly accessible sources such as national laws, academic articles, policy papers, and news reports. These sources provide useful information about rules and well-known events, but they sometimes do not reflect recent or unpublished policy discussions.

The third limitation is methodological limitation. The analysis is mostly qualitative, not quantitative. It focuses on legal frameworks, political decisions, and documented events rather than quantitative measurements of yields, scientific long-term impacts on nature, or the economic costs of contamination. As a result, the paper cannot make inarguable connections between regulatory choices and their environmental or market effects.

These limitations do not weaken the main suggestion that ununified international governance creates problems for effective GMO governance. However, they show that future research would benefit from a broader set of country cases, more quantitative data, and closer examination of how international policies are implemented in practice.

Conclusion

The case studies in this paper show that the main problem in GMO regulation is not whether countries use precaution or support trade. The real issue is that there is no unified system that governs the scientific and practical aspects of GMOs. Kenya's lifting its GMO ban during a severe drought, the United States' repeated contamination incidents, and India's pest control issues and slow approval times all demonstrate that gene flow and trait movement do not stop at the national borders. When countries follow different rules, the result is inconsistent policies and slow decision-making that does not keep up with advancements in biotechnology.

The comparison between the WTO system and the Cartagena Protocol shows clear limitations. Each framework focuses on a different priority, and neither provides complete regulations on contamination, coexistence, or the movement of unapproved GM traits through trade. Because of this disparity, farmers, traders, and governments face more uncertainties. They also increase the risk of market disruptions and damage credibility.

For these reasons, the paper argues that a consistent international biosafety institution is indeed needed. A global body with a clear mandate could help coordinate risk assessment, monitoring, and responses to contamination. It could also provide shared data, clearer standards, and more predictable expectations for liability. This would support innovative bio-tech advancements by giving countries and producers a more stable system while also improving safety for non-GM or organic product supporters.

Without stronger global coordination, countries will continue to rely on their own rules, and the same problems seen in the three case studies will continue to appear. As biotechnology spreads larger, the gap between reality and regulatory rules will only grow. Establishing a more coherent and concise global governance structure is truly essential for enabling GMOs to contribute to climate adaptation, food security, and sustainability in a responsible way.

References

Aarti Gupta and Robert Falkner. “The Cartagena Protocol on Biosafety and Domestic Implementation: Comparing Mexico, China and South Africa.” Chatham House, Mar. 2006, p. 16, https://www.chathamhouse.org/sites/default/files/public/Research/Energy%2C%20Environment%20and%20Development/bp0306cartagena.pdf?utm_source=chatgpt.com.

Analysis of International Coexistence Management of Genetically Modified and Non-Genetically Modified Crops.https://www.mdpi.com/2223-7747/14/6/895#B13-plants-14-00895. Accessed 6 Aug. 2025.

“ CredSpark.” CredSpark,https://app.credspark.com/assessments/copy-5ebc5436534e6-42ed6691-e693-4375-a04b-c4d7a602641d/assessment_responses/new. Accessed 30 July 2025.

Cultivation of Genetically Modified Crops.https://www.pib.gov.in/www.pib.gov.in/Pressreleaseshare.aspx?PRID=2042234. Accessed 6 Aug. 2025.

Cunningham, Robert. The ABC of GMOs, SPS & the WTO: An Analysis of the Application of The.

Editor2. Did Illegal GMO Rice Contamination Come from Indian GMO Field Trials? 18 Sept. 2021,https://www.gmwatch.org/en/main-menu/news-menu-title/archive/101-2021/19881-did-illegal-gmo-rice-contamination-come-from-indian-gmo-field-trials.

Entine, Jon, et al. “Regulatory Approaches for Genome Edited Agricultural Plants in Select Countries and Jurisdictions around the World.” Transgenic Research, vol. 30, no. 4, 2021, pp. 551–84. PubMed Central,https://doi.org/10.1007/s11248-021-00257-8.

Frontiers | Molecular Farming Navigates a Complex Regulatory Landscape.https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2024.1411943/full. Accessed 6 Aug. 2025.

Genetically Modified Cotton: How Has It Changed India?https://researchoutreach.org/articles/genetically-modified-cotton-how-changed-india/. Accessed 6 Aug. 2025.

GRAIN | GM Mustard in India: Thousands of Years of Cultural Heritage under Threat.https://grain.org/en/article/6944-gm-mustard-in-india-thousands-of-years-of-cultural-heritage-under-threat. Accessed 6 Aug. 2025.

“ Kenya Approves GMOs after 10-Year Ban.” Alliance for Science,https://allianceforscience.org/blog/2022/10/kenya-approves-gmos-after-10-year-ban/. Accessed 2 Aug. 2025.

“ Kenya Lifts Ban on Genetically Modified Crops in Response to Drought.” Reuters, 4 Oct. 2022. www.reuters.com,https://www.reuters.com/world/africa/kenya-lifts-ban-genetically-modified-crops-response-drought-2022-10-04/.

“Liberty Link Genetically Modified Rice.” Seeger Weiss LLP,https://www.seegerweiss.com/environmental-litigation/llrice-genetically-modified-rice/. Accessed 6 Aug. 2025.

Long-Term Impacts of Bt Cotton in India | Nature Plants.https://www.nature.com/articles/s41477-020-0615-5. Accessed 6 Aug. 2025.

Miriri, Duncan. “Kenya’s GMO Maize Push Sowing Trouble for Food Sector, Farmers Warn.” Reuters, 17 Dec. 2022. www.reuters.com,https://www.reuters.com/world/africa/kenyas-gmo-maize-push-sowing-trouble-food-sector-farmers-warn-2022-12-15/.

Mmbando, Gideon Sadikiel. “The Legal Aspect of the Current Use of Genetically Modified Organisms in Kenya, Tanzania, and Uganda.” GM Crops & Food, vol. 14, no. 1, pp. 1–12. PubMed Central,https://doi.org/10.1080/21645698.2023.2208999. Accessed 2 Aug. 2025.

October 2022, Anthony Langat // 12. “Kenya Lifts Ban on Genetically Modified Foods despite Strong Opposition.” Devex, 12 Oct. 2022,https://www.devex.com/news/sponsored/kenya-lifts-ban-on-genetically-modified-foods-despite-strong-opposition-104170.

Price, Becky, and Janet Cotter. “The GM Contamination Register: A Review of Recorded Contamination Incidents Associated with Genetically Modified Organisms (GMOs), 1997–2013.” International Journal of Food Contamination, vol. 1, no. 1, 1, Dec. 2014, pp. 1–13. foodsafetyandrisk.biomedcentral.com,https://doi.org/10.1186/s40550-014-0005-8.

“Reconciling the Incongruence between the Cartagena Protocol on Biosafety to the Convention on Biological Diversity and the GATT/WTO Rules.” ResearchGate. www.researchgate.net,https://doi.org/10.1007/s10784-024-09649-7. Accessed 31 July 2025.

The Law on Genetically Modified Organisms. WTO, June 2020,https://www.wto.org/english/thewto_e/acc_e/cgr_e/wtacccgr9_leg_3.pdf.

United Nations Treaty Collection.https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-8-a&chapter=27&clang=_en. Accessed 30 July 2025.

Weinzapfel, Daniel M. “The Economic Argument for Expanding GMO Regulation in America.” Inquiries Journal, vol. 9, no. 02, 2017. www.inquiriesjournal.com,http://www.inquiriesjournal.com/articles/1537/the-economic-argument-for-expanding-gmo-regulation-in-america.