CEUB
EDUCAÇÃO SUPERIOR
ISSN 2237-1036

REVISTA DE DIREITO INTERNACIONAL
BRAZILIAN JOURNAL OF INTERNATIONAL LAW

Legal challenges in international trade of genetically modified food for developing countries: navigating a fragmented landscape

Desafios jurídicos no comércio internacional de alimentos geneticamente modificados para países em desenvolvimento: navegando em um cenário fragmentado

Thao Thi Thu Nguyen

Duong Thi Thuy Tran

VOLUME 21 • N. 3 • 2024
INTERNATIONAL FOOD LAW

Sumário

doi: 10.5102/rdi.v21i3.9688

Legal challenges in international trade of genetically modified food for developing countries: navigating a fragmented landscape*

Desafios jurídicos no comércio internacional de alimentos geneticamente modificados para países em desenvolvimento: navegando em um cenário fragmentado

Thao Thi Thu Nguyen**
Duong Thi Thuy Tran***

* Recebido em: 01/06/2024
Aprovado em: 28/01/2025

** Tran Thi Thuy Duong graduated with honors from the University of Aix-Marseille III, France after successfully defending her doctorat thesis in the field of international commercial law in 2007. She also graduated with a bachelor's degree in English from Ho Chi Minh City University of Education in 1997. Ms. Tran Thi Thuy Duong has worked at Ho Chi Minh City University of Law since 1998. In 2014, she was appointed Associate Professor. In 2017, she was appointed Senior Lecturer. Currently, she focuses on research and teaching on topics related to international commercial law, international investment law and international commercial dispute resolution. Since 2008, she has also worked as Deputy Editor-in-Chief at Vietnam Journal of Legal Science. Besides working at Ho Chi Minh City University of Law, from 1998 to 2000 she was a lawyer for the Ho Chi Minh City Bar Association. Currently, she is a legal advisor to a number of private companies operating in the field of service delivery.
E-mail: nttthao02@hcmulaw.edu.vn

*** Ms. Nguyen Thi Thu Thao holds a Doctor of Philosophy (PhD) in law from the Ho Chi Minh City University of Law. She is currently researching and working at the Faculty of International Law, Ho Chi Minh City University of Law. Here, he undertook to teach subjects specializing in international trade law such as International trade law, WTO law, Food safety Law, Cosumer Protection Law, WTO law on non-tariff barriers, Dispute resolution within WTO, Settlement of disputes in international trade contracts, International commercial arbitration law, Trade remedies legislation. She completed the course "Skills to apply WTO rules to Vietnam" Under the MUTRAP III project funded by the European Union and the Ministry of Industry and Trade of Vietnam, and the International Humanitarian Law Course organized by the International Red Cross (ICRC) in Philippines. She has many articles on international trade law, WTO law, technical barriers in international trade, food safety law, Vienna Convention 1980 on International contract for the sale of goods (CISG 1980), international contract law,... She co-authored some of the chapters in International Trade Law Part I and Part II (Hong Duc Publishing House). She also co-authored the book "Understanding WTO Law through a number of subsidy cases" (Assoc. Prof. Dr. Tran Thi Thuy Duong, Hong Duc Publishing House) (2014).
E-mail : tttduong@hcmulaw.edu.vn

Abstract

In the context of increasing globalization and technological advancements in food production, the legal landscape surrounding genetically modified (GM) foods has become a focal point of international debate. This paper aims to analyze the complex interplay between international human rights law, international environmental law, international trade law, and the rights of developing countries to food sovereignty. Given this background, the authors highlight developing countries' multifaceted challenges in navigating this fragmented legal terrain. While employing a qualitative methodology, the authors examine the core international human rights treaties, pivotal environmental agreements, and the World Trade Organization's agreements to shed light on the significant challenges developing countries face in the global trade of GM foods. In response to these challenges, the authors propose some solutions. In particular, they advocate for increased public participation and a strengthened promotion of consumers' right to information. This research contributes to the ongoing discourse on regulating GM foods by exploring critical issues and offering helpful insights for policymakers, academics, and civil society organizations.

Keywords: GMO; genetically modified food; developing countries; sovereignty; fragmentation of international law.

Resumo

No contexto da crescente globalização e dos avanços tecnológicos na produção de alimentos, o cenário jurídico em torno dos alimentos geneticamente modificados (GM) tornou-se um ponto central no debate internacional. Este artigo busca analisar a complexa interação entre o direito internacional dos direitos humanos, o direito ambiental internacional, o direito do comércio internacional e o direito dos países em desenvolvimento à soberania alimentar. Diante desse panorama, os autores destacam os múltiplos desafios enfrentados pelos países em desenvolvimento ao navegar nesse am-

biente jurídico fragmentado. Utilizando uma metodologia qualitativa, o estudo examina os principais tratados internacionais de direitos humanos, acordos ambientais fundamentais e os tratados da Organização Mundial do Comércio (OMC), a fim de esclarecer os desafios significativos que os países em desenvolvimento enfrentam no comércio global de alimentos geneticamente modificados. Em resposta a essas dificuldades, os autores propõem algumas soluções, defendendo, em particular, uma maior participação pública e o fortalecimento do direito dos consumidores à informação. Esta pesquisa contribui para o debate contínuo sobre a regulamentação dos alimentos geneticamente modificados, explorando questões críticas e oferecendo insights valiosos para formuladores de políticas, acadêmicos e organizações da sociedade civil.

Palavras-chave: OGM; alimentos geneticamente modificados; países em desenvolvimento; soberania; fragmentação do direito internacional

been accompanied by complex questions surrounding the regulatory frameworks governing GM food trade.

Developing countries have to struggle with hunger, poverty, and environmental degradation. Limited scientific infrastructure and financial resources complicate their efforts to achieve sustainable development while tackling the complex issues surrounding GM foods. As a result, developing countries face significant challenges while navigating GM technology's potential benefits and risks.

This article examines the multifaceted legal landscape surrounding the international trade of GM food (section 1). It focuses on the challenges developing countries face and their concerns regarding GM food commercialization. The authors argue that while science plays a crucial role in ensuring the safety of GM technologies, strong public participation and an effective promotion of consumers' right to information are essential for fostering sustainable food systems (section 2).

1 Introduction

Food is the foundation of human life. Food nourishes our bodies and shapes our economies, societies, and cultural identities. The production and consumption of food are intricately linked to our well-being and the planet's sustainability.

In the context of globalization and technological advancements, how we produce food is undergoing profound transformations. Genetically modified (GM) foods have emerged as a controversial yet potentially transformative force in global food systems. Over the past 25 years, GM crops have seen a 100-fold increase in production.[1] However, this rapid advancement has

2 The Legal Landscape of Genetically Modified Food Trade

The trade of genetically modified organisms (GMOs) raises complex legal issues that intersect several branches of international law (international human rights law, international environmental law, and international trade law) and concerns related to food sovereignty. Understanding how these branches of international law interact is crucial for navigating the complex world of GMOs. This section will explore the relevant rules within each branch and analyze their interactions.

2.1 International Human Rights Law and Genetically Modified Food Trade

The Universal Declaration of Human Rights (UDHR), adopted in 1948, is an essential legal instrument for human rights protection. Created by representatives from diverse legal and cultural backgrounds, the UDHR sets out fundamental human rights to be universally protected. It has inspired the adoption of over

[1] MATHUR, Vartika *et al*. World cultivation of genetically modified crops: opportunities and risks. *In*: LICHTFOUSE, Eric (ed.). *Sustainable agriculture reviews*. Cham: Springer, 2017. v. 25. p. 45-87.
ISAAA. *ISAAA Brief 55-2019*: executive summary: Biotech crops drive socio-economic development and sustainable environment in the new frontier. [*S.l.*]: ISAAA, 2019. Available at: https://www.isaaa.org/resources/publications/briefs/55/executivesummary/default.asp. Access on: 28 May 2024.
ISAAA. Pocket K no. 16: Biothec crop highlights in 2019. *ISAAA*, [2019?]. Available at: https://www.isaaa.org/resources/publications/pocketk/16/#:~:text=The%20most%20planted%20biotech%20crops,crops%20or%2091.9%20million%20hectares. Access on: 28 May 2024.
ISAAA. GM approval database. *ISAAA*, [2024?]. Available at: https://www.isaaa.org/gmapprovaldatabase/default.asp. Access on: 28 May 2024.

70 human rights treaties, which are applied globally and regionally.[2]

In the context of GM foods, some provisions of the UDHR are of particular pertinence: Article 19 on the right "to seek, receive, and impart information" and Article 25 on the right "to the standard of living adequate for the health and well-being (of himself and his family), including food". These articles highlight the right to food, the right to an adequate standard of living, and the right to information. These rights are further detailed in the 1966 International Covenant on Economic, Social and Cultural Rights (ICESCR) and the 1966 International Covenant on Civil and Political Rights (ICCPR).

a. The Right to Food and Genetically Modified Foods

The right to food, enshrined in Article 11 of the ICESCR, is a fundamental human right. It guarantees everyone access to "an adequate standard of living for himself and his family, including adequate food," and the "fundamental right of everyone to be free from hunger". To implement this right, States Parties make full use of technical and scientific knowledge to "achieve the most efficient development and utilization of natural resources" to "improve methods of food production, conservation, and distribution". The right to food represents a vision of a world without hunger, where people can feed themselves with dignity.[3]

However, this vision extends beyond simply preventing starvation. The ICESCR and the World Health Organization's Alma-Ata Declaration emphasize that the "right to food" requires access to "safe and nutritious" food.[4] Thus, the right to food has two dimensions: (i) quantity (having enough food to meet the body's needs consistently) and (ii) quality (consuming food that is not only filling but also contributes to your health and well-being). The right to food goes beyond just filling bellies: it encompasses the right to access food that nourishes and sustains a healthy life.[5]

In this context, how GMOs contribute to the right to food may be a topic of debate. Quantitatively, we may argue that the production and distribution of GM foods contribute to enhancing the right to food. GMOs can be engineered for higher yields, pest and disease resistance, herbicide tolerance, and increased nutritional value. This can help to address the food demands of the global growing population with a more nutritious and affordable food supply. However, qualitatively, the long-term health effects of GM foods are not fully understood. One may raise the following questions: Are there risks to physical health linked to GM food production and consumption? Do GM foods truly contribute to people's long-term health and well-being? In today's context, should we accord priority to food quantity or quality? Those are difficult questions, especially for developing countries, whose choices are limited due to their lack of resources.

b. The Right to an Adequate Standard of Living and Genetically Modified Foods

Article 11 of the ICESCR emphasizes the right to "the continuous improvement of living conditions." Article 12 of the same covenant acknowledges the right to enjoy "the highest attainable standard of physical and mental health". To this end, states must take necessary steps to "improve all aspects of environmental and industrial hygiene" and "prevent, treat, and control epidemic, endemic, occupational, and other diseases."

These provisions can support and oppose GM foods' production and distribution.

On one hand, proponents of GM foods may argue that GMOs contribute to environmental protection by reducing the need for pesticides and herbicides. Thus, the right to environmental hygiene may be better protected. Besides, GMOs can offer economic benefits: they increase profitability for farmers and reduce food prices for consumers. In that way, they contribute to an adequate standard of living.

[2] UNITED NATIONS. *Universal Declaration of Human Rights*. Paris: UN, 1948. Available at: https://www.un.org/en/about-us/universal-declaration-of-human-rights. Access on: 28 May 2024.

[3] FAO. *The right to adequate food*. Geneva: FAO, 2010. Available at: https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf. Access on: 28 May 2024.

[4] WHO. *Declaration of Alma-Ata*. Geneva: WHO, 1978. Available at: https://cdn.who.int/media/docs/default-source/documents/almaata-declaration-en.pdf?sfvrsn=7b3c2167_2. Access on: 3 Feb. 2025. art. VII.

[5] WFP. *What is food security?* Available at: https://www.wfp.org/node/359289. Accessed on: 28 May 2024.
NAMIBIA. Ministry of Higher Education, Training and Employment Creation; FAO. *Food & nutrition*: a handbook for Namibian volunteer leaders. Windhoek: FAO, 2004. Available at: https://www.fao.org/4/a0104e/a0104e00.htm#Contents. Access on: 28 May 2024.

On the other hand, critics of GMOs may raise concerns about the risk of GMO crops cross-breeding with wild plants. This process risks creating "superweeds" and reducing genetic diversity. As a consequence, crops may become more vulnerable to pests and diseases in the long term. This risk could undermine the right to a healthy environment and living conditions. Moreover, while dominating the GMO seed market, large corporations control the food supply. An increased dependence on these corporations may affect the farmers' right to an adequate standard of living.

In summary, the same human rights provisions regarding an adequate standard of living can be invoked to support and oppose GM foods.

c. The Right to Information and Genetically Modified Foods

The right to information plays a crucial role in the context of GM foods commercialization. Article 19 of the ICCPR echoes the UDHR in guaranteeing "the right to seek, receive and impart information and ideas of all kinds, regardless of frontiers."

Food is essential for human health and life. Therefore, the right to information arguably translates to a consumer's right to information about their food. By understanding the characteristics of their food, including whether it contains GMOs, consumers can make better choices and protect themselves from potential hazards.[6] Consumers' right to information regarding GMOs is recognized globally, particularly in the United Nations Guidelines on Consumer Protection (UNGCP) of 1985.[7] These guidelines are non-binding. Nevertheless, some countries, such as Australia, Korea, and Malaysia, acknowledge them as setting minimum international standards for consumer rights.[8]

Food labeling is a key tool for implementing the right to information. Labels inform consumers about various food attributes, including the presence of GMOs. However, simply reading labels does not provide an adequate understanding of issues related to GM foods, which are technically complex. For this reason, the right to information should encompass access to updated scientific information on the associated benefits and risks of consuming GM foods. However, guaranteeing this access remains challenging, especially for developing countries.[9] GMO producers often maintain secrecy regarding information that could raise health or environmental concerns. Consequently, public dissemination of this information is usually limited. Meanwhile, organizations skeptical of GMOs, such as NGOs and some governments, often have limited resources to conduct independent research. The lack of universal traceability and labeling mechanisms further complicates the issue.

2.2 International Environmental Law and Genetically Modified Food Trade

The Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CPB), adopted in 2000, is the key international environmental instrument regulating GMOs. This Protocol is primarily an environmental agreement. However, due to its focus on the international movement of GMOs, its impact on the GMO trade is significant.[10]

The core provision of the CPB is the Advance Informed Agreement (AIA) procedure. According to this procedure, exporters shall obtain the importing country's consent before the first shipment of living--modified organisms (LMOs).[11] A party wishing to export LMOs for "intentional introduction into the environment" must notify the potential recipient country of its intention through the AIA procedure.[12] The potential importing country must then decide whether to

[6] BUMBLAUSKAS, Daniel *et al.* A blockchain use case in food distribution: Do you know where your food has been? *International Journal of Information Management*, [*s.l.*], v. 52, p.ini 1-10, Jun. 2020. DOI 10.1016/j.ijinfomgt.2019.09.004. Available at: https://www.sciencedirect.com/science/article/pii/S026840121930461X?via%3Dihub. Access on: 3 Feb. 2025.

[7] UNCTAD. *United Nations Guidelines for consumer protection*. Geneva: UN, 2016.

[8] SINAI, Deutch. Are consumer rights human rights? *Osgoode Hall Law Journal*, [*s.l.*], v. 32, n. 3, p. 537- 578, 1994.

[9] DUFOUR, Geneviève. Les OGM à l'OMC : resume critique du rapport du groupe special dans l'affaire CE : produits biotechnologiques. *Revue Quebecoise de Droit International*, [*s.l.*], p. 281-311, Apr. 2007. Numéro hors-série. DOI 10.7202/1069053ar. Available at: https://id.erudit.org/iderudit/1069053ar. Access on: 3 Feb. 2025.

[10] TERENCE, Stewart; DAVID, Johanson. A nexus of trade and the environment: the relationship between the cartagena protocol on biosafety and the SPS Agreement of the World Trade Organization. *Colorado Journal of International Environmental Law and Policy*, [*s.l.*], v. 14, n. 1, p. 1-52, 2003.

[11] CBD. *Convetion on biological diversity*. Montreal: CBD, 1993. art. 7-10, 12.

[12] CBD. *Convetion on biological diversity*. Montreal: CBD, 1993. art. 7(1), 8.

authorize the import of the LMO. This decision shall be based on risk assessment conducted in a "scientifically sound manner".[13] The importing country may also require the exporter to conduct its risk assessment.[14]

The CPB allows importing countries to take preventive measures based on potential environmental risks. In revanche, exporting countries can challenge these measures if new scientific evidence emerges. However, unless the exporter requests it, there is no obligation for continuous review.[15] During the whole process, socio-economic concerns related to "the conservation and sustainable use of biological diversity" can be taken into consideration.[16]

It is necessary to note that, the CPB's applicability to LMOs intended for direct food use remains a topic of debate. The Protocol applies to LMOs that may adversely affect the environment, "taking also into account risks to human health" (Article 4 of the CPB). Interpretations of this provision differ among member states.[17] The United States argues that the Protocol doesn't apply to food safety, while the EU maintains that it does.[18]

In any case, science plays a decisive role within the international environmental law framework for GM foods, particularly in the context of the CPB. Importing countries can approve or deny LMO imports based on a "scientifically sound" risk assessment. Exporters may be required to conduct their risk management procedures, based on scientific research. Furthermore, they can leverage "scientific evidence" to challenge restrictions imposed by importing nations.

2.3 International Trade Law and Genetically Modified Food Trade

The World Trade Organization (WTO) legal framework is the principal multilateral regime governing international trade law. The WTO agreements emphasize, among other things, the principle of non-discrimination, according to which similar traded products shall receive equal treatment.[19] Trade liberalization is achieved through the reduction of tariff barriers and the elimination of non-tariff barriers. Nevertheless, the General Agreement on Tariffs and Trade (GATT) Article XX allows measures to protect human health and the environment. These measures shall satisfy conditions prescribed by this article and strictly interpreted by the WTO dispute settlement body.[20] The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement) were adopted to clarify Article XX.[21]

The SPS Agreement outlines rules that WTO members shall respect when applying food safety, as well as animal and plant health standards.[22] These include basing SPS measures on science and avoiding their use as disguised trade barriers. Measures aligned with international standards are presumed "necessary to protect human, animal or plant life or health".[23] However, WTO members can impose stricter measures if justified by a sufficient scientific basis.[24] This justification requires a risk assessment to evaluate potential adverse effects. When scientific evidence is insufficient, the SPS Agreement allows for temporary measures based on available information. However, in this situation, related mem-

13 CBD. *Convetion on biological diversity*. Montreal: CBD, 1993. art. 15(1).

14 CBD. *Convetion on biological diversity*. Montreal: CBD, 1993. art. 15(2).

15 EGGERS, Barbara; MACKENZIE, Ruth. The Cartagena Protocol on Biosafety. *Journal of International Economic Law*, [*s.l.*], p. 525-543, 2000.

16 CBD. *Convetion on biological diversity*. Montreal: CBD, 1993. art. 26.

17 TERENCE, Stewart; DAVID, Johanson. A nexus of trade and the environment: the relationship between the cartagena protocol on biosafety and the SPS Agreement of the World Trade Organization. *Colorado Journal of International Environmental Law and Policy*, [*s.l.*], v. 14, n. 1, p. 1-52, 2003.

18 LMO-FFPs currently make up 90% of trade in GM products. EGGERS, Barbara; MACKENZIE, Ruth. The Cartagena Protocol on Biosafety. *Journal of International Economic Law*, [*s.l.*], p. 525-543, 2000. p. 530.

19 WTO. *General Agreement on Tariffs and Trade (GATT 1947)*. Genebra: WTO, 1947. Available at: https://www.wto.org/english/docs_e/legal_e/gatt47_e.htm. Access on: 3 Feb. 2025.

20 KENNEDY, Kevin C. The GATT-WTO System at Fifty. *Wisconsin International Law Journal*, [*s.l.*], v. 16, n. 2, p. 421-528, 1998.

21 OSTROVSKY, Aaron A. The European Commission's regulations for genetically modified organisms and the current WTO dispute: human health or environmental measures? Why the deliberate release directive is more appropriately adjudicated in the WTO under the TBT agreement. *Colorado Journal of International Environmental Law and Policy*, v. 15, n. 2, p. 209-244, 2004.

22 MC DONALD, Michelle K. International Trade Law and the US-EU GMO Debate: can Africa weather this atorm? *Georgia Journal of International and Comparative Law*, [*s.l.*], v. 32, p. 503-538, 2004.

23 WTO. *Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)*. Genebra: WTO, 1995. art. 3.2.

24 WTO. *Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)*. Genebra: WTO, 1995. art. 3.3.

bers shall "collect the additional information necessary to assess the risk more objectively and consider. SPS appropriate measures within a reasonable period of time".[25] This "reasonable period of time" must be established on a "case-by-case basis."[26]

The TBT Agreement encompasses standards and "technical regulations that focus on non-safety related attributes of all products, such as characteristics of how a product is manufactured."[27] Generally, the risk assessment requirements of the TBT Agreement are considered "much less stringent" than the requirements of the SPS Agreement.[28] Therefore, one may ask if a WTO member can justify non-SPS aspects of its regulations based on the less stringent requirements of the TBT Agreement.

The *European Communities – Measures Affecting the Approval and Marketing of Biotech Products* dispute ("*Biotech* dispute"), opposing the European Communities (EC) on one side and the United States (US), Canada, and Argentina on the other, plays an important role in clarifying trade rules related to GM foods. The dispute centered on the EC approach towards GMOs and its compatibility with the WTO law. The applicants argued that the EC regulations were overly restrictive and violated the SPS Agreement. They criticized the EC's "precautionary" approach, which, like that of many other countries,[29] emphasized potential risks despite scientific uncertainty.

In this case, the dispute settlement Panel contributed to interpreting some details of WTO rules related to GMO trade. Firstly, concerning the relationship between the SPS Agreement and the TBT Agreement, it recognized that a measure could fall under both agreements if it addressed both SPS concerns and technical aspects.[30] Secondly, the dispute also brought the precautionary principle to the forefront. The EC argued that the precautionary principle was a general principle of international law.[31] However, the Panel, acknowledging the ambiguity surrounding this concept, refrained from taking a definitive position.[32] Thirdly, the Panel specified its opinion on WTO members' right to establish their human and animal health protection levels. To defend its approach, the EC cited, among other things, Article 5.7 of the SPS Agreement, which allowed for temporary measures, and highlighted WTO members' right to establish their protection levels.[33] However, the Panel rejected this argument, stating that the level of protection chosen by a member was not relevant to determining the adequacy of scientific evidence.[34] The Panel concluded that due to the absence of a proper risk assessment, the EC's measures violated Article 5.1 and Article 2.2 of the SPS Agreement.

Some experts have criticized the Panel's above-mentioned opinion. According to them, by not recognizing the right of members to establish their protection levels, the Panel undermined the SPS Agreement. Concurrently, many respected scientists questioned the vali-

[25] EGGERS, Barbara; MACKENZIE, Ruth. The Cartagena Protocol on Biosafety. *Journal of International Economic Law*, [*s.l.*], p. 525-543, 2000. p. 538.

[26] WTO. *WT/DS76/AB/R, 22 Feb. 1999*. Japan: measures affecting agricultural products: AB-1998-8. Genebra: WTO, 1998.

[27] SHELDON, Ian M. Regulation of biotechnology: will we ever "freely" trade GMOs? *European Review of Agricultural Economics*, [*s.l.*], v. 29, n. 1, p. 155-176, 2002.

[28] COVELLI, Nick; HOHOTS, Viktor. The Health Regulation of Biotech Foods Under the WTO Agreements. *Journal of International Economic Law*, [*s.l.*], vol. 6, n. 4, p. 773-795, 2003.

[29] The Australian Gene Technology Act was enacted in December 2000 along with the Gene Technology (License Fees) Act 2000 to regulate all "transactions" with GMOs (e.g. research, production, trade and import). China has initially embraced the environmental and commercial approval of GM crops. However, the approval process has been significantly reduced since 2000 and strict regulations have been implemented for GMO imports. Several other Asian countries have also made efforts to control the import of GMOs. The Korean Ministry of Agriculture and Forestry required mandatory labelling for certain GM ingredients, including GM soybeans, corn, and bean sprouts from March 1, 2001, and GM potatoes from March 1. March 2002; In 2001, Thailand banned all genetically modified plant experiments and restricted GM imports (See BAUMÜLLER, Heike. domestic import regulations for genetically modified organisms and their compatibility with WTO Rules. *Asian Biotechnology Development Review*, [*s.l.*], v. 6, n. 3, p. 33-42, Jul. 2004.).

[30] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 7.147.

[31] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 7.78.

[32] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 7.87.

[33] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 4.600 - 603. (First Written Submission of the European Communities).

[34] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 7.3235-7.3237.

dity of evidence regarding GMO safety.[35] Some others praised the EU's approach. DUFOUR, for example, pointed out that the EU sought to gather additional information for a more objective risk assessment and revise its measures accordingly. According to her, this approach was in conformity with Article 5.7 of the SPS Agreement. In addition, it allowed for the reevaluation of scientific evidence and evolving scientific knowledge while considering public concerns and recognizing cultural differences.[36]

The dispute also raised questions related to food sovereignty. This concept covers the rights of people and communities to control their food systems by making decisions related to food production, distribution, and consumption. Food sovereignty may also be defined as the right of people to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, as well as their right to determine their own food and agriculture systems.[37]

With that in mind, one may wonder if the liberalization of GM food trade risks undermining food sovereignty.[38] GMOs are developed and promoted principally by a few large multinational corporations. Therefore, these corporations exercise control over the global food supply. Maintaining food sovereignty is challenging, with peoples, communities, and states increasingly dependent on those corporations.

Each sovereign state shall have the right to control and regulate food production and consumption within its borders.[39] This right enables them to establish their level of human, animal, and plant health and life protection. Not empowering the WTO members' rights to develop their protection level may undermine states' food sovereignty. As risks to physical health linked to GM food consumption are not identified clearly, states' right to decide whether or not to open their market for GM foods shall be recognized. Only in that case can they maintain their food sovereignty.

2.4 Navigating the Intersection: International Law and the Regulation of Genetically Modified Food Trade

The regulation of GMOs presents a complex challenge at the intersection of three branches of international law: human rights law, environmental law, and

[35] See, for example, COT, Jean-Pierre. Le principe de précaution en droit européen et international *In*: WALINE, Jean. *Gouverner, administrer, juger*: liber amicorum Jean Waline. Paris: Dalloz, 2002. p. 159-184.
DEGLISE, Fabien. Un spécialiste des OGM met en garde le Canada contre le saumon transgénique. *Ledevoir*, [*s.l.*], 25 Oct. 2005. Available at: https://www.ledevoir.com/societe/sante/93411/un-specialiste-des-ogm-met-en-garde-le-canada-contre-le-saumon-transgenique. Access on: 3 Feb. 2025.
SERALINI, Gilles-Eric. *Génétiquement incorrect*. Paris: Flammarion, 2005.
BERLAN, Jean-Pierre. *La guerre au vivant*: organismes génétiquement modifiés et autres mystifications scientifiques. Marseille: Agone, 2001.
Some researchers demonstrate a link between the consumption of GM food and serious mental and physical health in rats, field mouses and mouses. See KEMPF, Hervé. L'expertise confidentielle sur un inquiétant maïs transgénique. *Le Monde*, 23 April 2004.
GREENPEACE. MON863, *Le maïs de Monsanto : impropre aux rats, impropre aux humains (Document d'information)*, 6/2005. DUFOUR, Geneviève. Les OGM à l'OMC : resume critique du rapport du groupe special dans l'affaire CE : produits biotechnologiques. *Revue Quebecoise de Droit International*, [*s.l.*], p. 281-311, Apr. 2007. Numéro hors-série. DOI 10.7202/1069053ar. Available at: https://id.erudit.org/iderudit/1069053ar. Access on: 3 Feb. 2025.
PRESCOTT, Vanessa E. *et al*. Transgenic expression of bean α-amylase inhibitor in peas results in altered structure and immunogenicity. *Journal of Agricultural and Food Chemistry*, [*s.l.*], v. 53, n. 23, p. 9023–9030, 2005. DOI 10.1021/jf050594v. Available at: https://pubs.acs.org/doi/10.1021/jf050594v#. Access on: 4 Feb. 2025.
EWEN, S. W.; PUSZTAI, A. Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine. *Lancet*, [*s.l.*], Oct. 1999. DOI 10.1016/S0140-6736(98)05860-7. Available at: https://pubmed.ncbi.nlm.nih.gov/10533866/. Access on: 3 Feb. 2025.
MALATESTA, Manuela. Reversibility of hepatocyte nuclear modifications in mice fed on genetically modified soybean. *European Journal of Histochemistry*, [*s.l.*], v. 49, n. 3, p. 237-242, 2005.
TRAAVIK, Terje. The 35S CaMV plant virus promoter is active in human enterocyte-like cells. *European food research and technology*, [*s.l.*], v. 222, n. 1, p. 185-193, 2006.

[36] DUFOUR, Geneviève. Les OGM à l'OMC : resume critique du rapport du groupe special dans l'affaire CE : produits biotechnologiques. *Revue Quebecoise de Droit International*, [*s.l.*], p. 281-311, Apr. 2007. Numéro hors-série. DOI 10.7202/1069053ar. Available at: https://id.erudit.org/iderudit/1069053ar. Accessed on: 3 Feb. 2025. For more analyses, see also FABRI, Hélène Ruiz; GRANDONI, Lorenzo. L'affaire des OGM devant le juge de l'OMC: science et précaution sans principes. *Diritto del Commercio Internazionale*: Pratica Internazionale e Diritto, [*s.l.*], v. 21, n. 3, p. 641-664, 2007.

[37] TOKAR, Brian. The GMO Threat to Food Sovereignty: Science, Resistance, and Transformation. *In*: SCHANBACHER, William D. (ed.). *The global food system*: issues and solutions. New York: Praeger, 2014. cap. 9, p. 173-190.

[38] TOKAR, Brian. The GMO Threat to Food Sovereignty: Science, Resistance, and Transformation. *In*: SCHANBACHER, William D. (ed.). *The global food system*: issues and solutions. New York: Praeger, 2014. cap. 9, p. 173-190.

[39] LOPEZ, Miguel Ángel Martín. A study on the application of food sovereignty in international law. *Groningen Journal of International Law*, [*s.l.*], v. 4, n. 2, p. 14-31, 2016, DOI: 10.21827/59db67f29999e. Available at: https://ugp.rug.nl/GROJIL/article/view/29519. Access on: 3 Feb 2025.

trade law. It is noteworthy that international law is fragmented by nature. This fragmentation enables the consideration of different priorities.[40] However, the independence of international law branches may hamper legal security and a coherent regulation of GMOs. The question is how to address the challenges caused by this fragmentation. In particular, can treaties of one branch of international law be considered while interpreting treaties of another branch? If yes, in which case?

The Vienna Convention on the Law of Treaties' Article 31.3.c mandates consideration of "any relevant rules of international law applicable in the relations between the parties" during treaty interpretation. However, the scope of "relevant rules of international law" remains debatable. Some experts argue for an interpretation encompassing all relevant international legal rules binding parties to the dispute. According to COTTIER and OESCH, "to the extent that all parties in a dispute are both signatories to a multilateral environmental agreement and WTO members, the interfacing of different agreements can be readily achieved under the rules of the Vienna Convention, in particular its Article 31.3(c)".[41] However, while examining the *Biotech* dispute, the Panel adopted a narrower view.[42] It suggested that the WTO dispute settlement body may only consider relevant rules of international law embodied in treaties applicable to all WTO members. It is worth pointing out that the near universality of WTO membership renders this scenario highly improbable. Thus, this interpretation risks compartmentalizing WTO law from other international law branches.[43]

It is crucial to highlight that human rights, environmental, and trade law recognize the vital role of scientific assessments to varying degrees. Human rights law may evaluate the potential impact of GM foods on the right to health through assessments of allergenicity and nutritional content. Environmental law may focus on scientific data on ecological risks associated with GM crops, such as potential harm to non-target organisms or increased herbicide resistance. Trade law may consider scientific evidence related to the safety of GM foods to ensure they meet specific standards and do not threaten human or animal health. Science occupies a crucial position in the international legal framework governing GM foods.

3 Developing countries and genetically modified foods

3.1 Balancing Short-term Gains and Long-term Risks

In general, many developing countries still struggle to secure their population's food and nutritional requirements.[44] Therefore, they are essential potential markets for the GMO industry in developed countries. Consequently, they are often under pressure from both industry and developed countries to adopt GM foods. Food aid programs have even been cited as a potential tool to promote GMO acceptance in developing countries.[45] The case of Zimbabwe serves as a relevant

[40] DUONG, T.T.T. International law: from fragmentation to integration? An analysis of the relationship between international trade law and international labor law in multilateral and regional trade law frameworks. *Asia Europe Journal*, [*s.l.*], v. 22, p. 293–311, 2024. DOI 10.1007/s10308-024-00701-4.

[41] COTTIER, Thomas; OESCH, Matthias; FISCHER, Thomas M. *International trade regulation:* law and policy in the WTO, the European Union and Switzerland: cases, materials and comments. London: Staempfli Publishers, 2005.

[42] WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006. § 7.68.

[43] DUFOUR, Geneviève. Les OGM à l'OMC : resume critique du rapport du groupe special dans l'affaire CE : produits biotechnologiques. *Revue Quebecoise de Droit International*, [*s.l.*], p. 281-311, Apr. 2007. Numéro hors-série. DOI 10.7202/1069053ar. Available at: https://id.erudit.org/iderudit/1069053ar. Access on: 3 Feb. 2025. p. 308.

[44] BASE, Renato Lagapa. A conceptual paper on the policy-framework that mirrors the dynamic link between human security, social protection and safety nets, and food and nutritional security: the case of the "gulayan sa paaralan program", the Philippines. *Revista de Direito Internacional*, Brasília, v. 15, n. 3, p. 477-489, 2018. DOI 10.5102/rdi.v15i3.5924. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/5924. Access on: 3 Feb. 2025. For details on Brazil's successful experience in fighting hunger and eradicating poverty, see GIARDI, Mariana Werlang. Policy coherence in the implementation of the 2030 agenda for the sustainable development: the brazilian school feeding programme case study. *Revista de Direito Internacional*, [*s.l.*], v. 15, n. 3, p. 505-530, 2018. DOI 10.5102/rdi.v15i3.5945. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/5945. Access on: 3 Feb. 2025.

[45] FOOD aid or hidden dumping? Separating wheat fram chaff. *Oxfam Briefing Paper*, [*s.l.*], n. 71, p. 1-36, Mar. 2005. Available at: https://policy-practice.oxfam.org/resources/food-aid-or-hidden-dumping-separating-wheat-from-chaff-114492/. Access on: 28 May 2024.

example.[46] In view of the above, developing countries must consider carefully the complex issue of GM foods with economic, social, and environmental dimensions.

From an economic perspective, agriculture remains a cornerstone of many developing economies. Proponents of GM technology argue that GMOs' inherent benefits, such as increased yields, pest and disease resistance, and tolerance to extreme weather conditions, can contribute to poverty alleviation. Farmers may benefit from reduced pesticide use, saving costs and increasing productivity. Support from pro-GMO countries and companies can provide economic advantages. However, long-term concerns remain. The reliance on GM technology could erode developing countries' comparative advantage in traditional agriculture. Importing GM foods might threaten the competitiveness and livelihoods of local farmers. Furthermore, with limited budgets, developing countries and their local populations can be affected by multinational corporations.[47] The dominance of multinational corporations in the biotech seed market raises concerns about dependency and potential exploitation. This situation could lead to a loss of control over seed production, increasing the vulnerability of developing countries and eroding their food sovereignty.

From a social standpoint, GM technology may contribute to alleviating hunger and malnutrition, especially in food-insecure regions. However, long-term food safety remains a major concern. The potential health impacts of consuming GM foods require further study. Additionally, increased reliance on biotech seeds could aggravate food security and sovereignty issues instead of resolving them. The dominance of multinational corporations in the seed market could also threaten the preservation of traditional farming practices, which hold significant cultural and social value in many developing countries.

Through an environmental lens, reduced reliance on chemical pesticides due to pest and disease-resistant GM crops can offer environmental benefits. However, concerns remain regarding the long-term environmental impacts of GM technology. These impacts include potential loss of biodiversity due to the dominance of GM crops, the development of superweeds, or harm to non-target species.

The debate surrounding GM foods, with its interplay of short-term benefits versus long-term risks, is complex. Therefore, careful analysis and a balanced approach to the GM food trade are paramount.

3.2 Towards a Balanced Approach to the Genetically Modified Food Trade

a. Investment in Science while Acknowledging its Limitations and the Value of Precaution

Scientific evidence plays a central role in regulating biotechnology. It enables states to shape the legal framework that balances economic, social, and environmental considerations.[48] Logically and legally, all regulations concerning GMO production, commercialization, and consumption should be grounded in scientific evidence and risk assessments. Scientists and laboratories can contribute to various aspects of GMO research, including toxicological assessments (identifying potential toxins produced by GMOs that could harm humans or animals); allergenicity testing (evaluating the risk of allergic reactions associated with GMO consumption); nutritional analyses (examining the nutritional profile of GMOs); ecological studies (assessing potential environmental impacts of GMOs on non-target species and biodiversity); gene flow analysis (evaluating the risk of transgenes from GMOs spreading to wild relatives or non-GMO crops)… Therefore, developing countries must prioritize scientific research and expertise when elaborating policies and regulations regarding GM foods.

However, it is crucial to acknowledge the limitations of scientific knowledge and risk assessment outcomes.

Firstly, scientific knowledge is inherently growing. As new data, technologies, and methods emerge, established theories are constantly reevaluated. In the context of GMOs, which have the potential to impact global health and the environment, relying solely on the ever-evolving nature of science for law-making can be imprudent.

[46] *See* SCOONES, Ian; KEELEY, James. Contexts for regulation: GMOs in Zimbabwe. *IDS Working Paper*, [*s.l.*], n. 190, 2003.

[47] PAMPLONA, Danielle Anne; EBERT, Franz Christian. Business and human rights: taking stock of trends in international governance and domestic litigation. *Revista de Direito Internacional*, Brasília, v. 16, n. 3, p. 2-9, 2019. Editorial. DOI 10.5102/rdi.v16i3.6612. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/6612/. Access on: 28 May 2024.

[48] SCOONES, Ian; KEELEY, James. Contexts for regulation: GMOs in Zimbabwe. *IDS Working Paper*, [*s.l.*], n. 190, 2003.

Secondly, scientific research outcomes in the GMO field can be hampered by resource limitations, especially in developing countries. Due to limited resources, risk assessments are based on a narrow range of criteria, neglecting complex factors. As a consequence, these assessments may only consider short-term impacts. In addition, current risk assessment procedures used for GMOs are often developed primarily by molecular biologists. Thus, more comprehensive ecological considerations may be neglected. Scientific debates surrounding risk assessment tend to be fragmented across different scientific disciplines.

Thirdly, the potential for bias in scientific research due to unequal access to technical assistance complicates the use of science in GMO regulation. The biotechnology industry and exporting states have interests in promoting GMOs. As a consequence, their research funding may raise concerns about objectivity. Biotech corporations may prioritize their economic interests rather than the public good when assisting developing countries. Technical assistance can also be influenced by the donor's stance on GMOs.[49] For example, the United States prioritizes GMO research and development, while the EU underscores biosafety programs.[50] Additionally, exporting countries and the biotechnology industry can use food aid to influence decision-makers: accepting aid sometimes requires permissive GMO policies.[51]

With that in mind, a precautionary approach is essential to address the complex issues surrounding GM foods. This approach requires rigorous approval processes, risk management strategies, as well as strong monitoring and surveillance mechanisms. Before commercialization, GM foods should undergo a thorough approval process. During this process, scientific evaluations and public consultations play a crucial role. Solid scientific evidence demonstrating safety shall be provided before a GMO is approved for market entry. In the face of scientific uncertainty, risk management necessitates taking preventive actions. Monitoring and surveillance are critical for identifying and managing any unforeseen adverse effects. Implementing this comprehensive precautionary approach is challenging for developing countries.

b. Democratizing Genetically Modified Food Regulation by Enhancing Public Participation

Current practices in GM food regulation often compartmentalize scientific risk assessment and public engagement.[52] Scientists conduct risk assessments that inform decision-making, followed by public dissemination of these findings.[53] This approach assumes that scientific expertise alone can identify, assess, and control all potential risks associated with GMOs. The public is only invited to participate after scientific value judgments have already been made. As a result, public participation becomes a mere "technical input"[54] to a science-based decision-making process.

Several elements justify increased public participation in GM food regulation in this context. Firstly, public participation helps to address local impacts and needs efficiently. It can contribute to a more comprehensive review of GMO impacts, which vary geographically. As a result, lawmakers can tailor regulations to local concerns and needs. Secondly, public participation can enhance citizens' capacity to manage the effects of GMOs more effectively. Thirdly, public participation can help developing countries resist the pressure of benefit donors. Hence, it enables these countries to maintain their food sovereignty while preserving their control over food production and consumption inside their territories. Fourthly, public participation is the best way to solve hunger problems effectively. Addressing the challenge of food security for a growing global population while protecting the environment requires a combination of many approaches: traditional livestock

[49] TERENCE, Stewart; DAVID, Johanson. A nexus of trade and the environment: the relationship between the cartagena protocol on biosafety and the SPS Agreement of the World Trade Organization. *Colorado Journal of International Environmental Law and Policy*, [*s.l.*], v. 14, n. 1, p. 1-52, 2003. p. 44.

[50] LARSON, Alan P. *Remarks at the Commodity Club of Washington. D.C., Apr. 10, 2002*. Available at: http://www.state.gov/e/rls/rm/2002/9307.htm. Access on: 28 May 2024.

[51] FOOD aid or hidden dumping? Separating wheat fram chaff. *Oxfam Briefing Paper*, [*s.l.*], n. 71, p. 1-36, Mar. 2005. Available at: https://policy-practice.oxfam.org/resources/food-aid-or-hidden-dumping-separating-wheat-from-chaff-114492/. Access on: 28 May 2024.

[52] FOOD aid or hidden dumping? Separating wheat fram chaff. *Oxfam Briefing Paper*, [*s.l.*], n. 71, p. 1-36, Mar. 2005. Available at: https://policy-practice.oxfam.org/resources/food-aid-or-hidden-dumping-separating-wheat-from-chaff-114492/. Access on: 28 May 2024. p.4.

[53] NEWELL, Peter; GLOVER, Dominic. Business and biotechnology: regulation and the politics of influence. *IDS Working Paper*, [*s.l.*], n. 192, 2003. p. 6.

[54] NEWELL, Peter; GLOVER, Dominic. Business and biotechnology: regulation and the politics of influence. *IDS Working Paper*, [*s.l.*], n. 192, 2003. p.7.

production, organic farming, reasonable and balanced consumption, and technologies. Each approach has the potential to address specific problems and needs. Reducing hunger cannot rely solely on technology.

c. Promoting the Right to Information

Consumers have the right to be informed about the food they consume. Labeling regulations help consumers make choices based on their preferences and concerns regarding GM foods (i). Alongside labeling, public awareness campaigns are critical. These campaigns enable informed decision-making by educating consumers about GMOs and their potential benefits and risks (ii).

(i) Right to Information and the Role of Labeling

Ideally, consumers' knowledge of potential food safety risks would enable them to make informed choices about food purchases. These choices drive producers to improve the food quality to meet consumer preferences.[55] In this regard, labeling is a crucial communication tool between producers and consumers. Its principal purpose is to help consumers identify products that align with their preferences and dietary needs. Codex Alimentarius, a global food standards organization, has established guidelines for food labeling. Even if these guidelines are intended for international application, significant variations exist in national labeling policies regarding scope, detail, and enforcement. This situation leads to inconsistencies in the information reaching consumers. Generally, food labels include information on product identification, manufacturer details, quantity statements, ingredients list, nutritional information, allergen information, production and expiry dates, and coding systems.

With the development of GMOs, consumers deserve full access to information regarding GM foods.[56] However, their right to know the origin of their food may be obscured by some GMO producers.[57] The Codex Alimentarius Commission attempted to establish international guidelines for labeling GMO products in 2007.[58] Nevertheless, a lack of consensus among stakeholders from various countries prevented the development of these guidelines. Despite this setback, many countries have implemented their national labeling regulations, with varying degrees of detail related to GMOs.[59]

GMO labeling is among the most frequently requested actions in the debate surrounding GM products. However, the effectiveness of labeling can be undermined by inadequate monitoring systems. In some cases, producers disrespect labeling regulations when using GMO ingredients in manufacturing processed foods. Vietnam exemplifies this challenge. While regulations include labeling requirements (e.g., mandatory labeling for products containing at least 5% GMO ingredients),[60] it is reported that many large Vietnamese enterprises import and utilize GMO ingredients in food products without proper labeling.[61]

(ii) Right to Information and Consumer Education

Even with access to labeled information, due to limited knowledge, consumers cannot always make entirely rational choices.[62] Therefore, the right to information extends beyond simply requiring labels on foods. It necessitates the consumers' ability to comprehend the

[55] SEGERSON, Kathleen. Mandatory vs. Voluntary Approaches to Food Safety. *Agribusiness*, vol. 15, n. 1, pp. 53-70, 1999.
MITCHELI Lorraine. Economic theory and conceptual relationships between food safety and international trade. *In*: BUZBY, Jean C. *International Trade and Food Safety*: economic theory and case studies, agricultural economic report n. 828. Washington D.C: USDA Economic Research Service, 2003. p. 12.

[56] MATHUR, Vartika *et al*. World cultivation of genetically modified crops: opportunities and risks. *In*: LICHTFOUSE, Eric (ed.). *Sustainable agriculture reviews*. Cham: Springer, 2017. v. 25. p. 45-87.

[57] KRIMSKY, Sheldon; GRUBER, Jeremy. *The GMO deception*: what you need to know about the food, corporations, and government agencies putting our families and our environment at risk. New York: Skyhorse, 2014.

[58] WHO; FAO. *Food labelling*. 5th. Rome: FAO, 2007. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/341fd763-bc1c-49c7-b6bf-424733f37b04/content. Accessed on: 3 Feb. 2025.

[59] GRUERE, G. P.; RAO, S. R. A review of international labeling policies of genetically modified food to evaluate India's proposed rule. *AgBioForum*, [*s.l.*], v. 10, n. 1, p. 51–64, 2007.
PHILLIPS, P. W. B; MCNEILL, H. A survey of national labeling policies for GM Foods. *AgBioForum*, [*s.l.*], v. 3, n. 4, p. 219–224, 2000.

[60] VIETNAM. *Decree No. 69/2010/ND-CP of June 21, 2010*. On biosafety for genetically modified organisms, genetic specimens and products of genetically modified organisms. Honoi: The Government, 2010.
VIETNAM. *Decree No. 43/2017/ND-CP of April 14, 2017*. On goods labeling. Honoi: The Government, 2017.
VIETNAM. *Decree No.* 15/2018/ND-CP *of February 02, 2018*. Elaboration of some articles of the law of food safety. Honoi: The Government, 2018.

[61] THIẾU minh bạch sử dụng nguyên liệu và thực phẩm biến đổi gene. *Mattran*, 17 out. 2023. Available at: http://mattran.org.vn/thu-vien-video/thieu-minh-bach-su-dung-nguyen-lieu-va-thuc-pham-bien-doi-gene-52693.html. Access on: 22 May 2024.

[62] OGUS, Anthony I. *Regulation*: legal form and economic theory. Oxford: Bloomsbury, 2004. p. 41.

information provided by labels and the potential advantages and risks associated with consuming GM foods.

Against this backdrop, effective public education initiatives are crucial. These initiatives should provide balanced information about the benefits and risks of GM foods, presented in clear and straightforward language accessible to a broad audience. A multifaceted approach utilizing various platforms is essential. Those platforms may include online resources (websites, blogs, and social media posts can share reliable information about GM foods); workshops and seminars (local events led by experts who can provide in-depth explanations and answer questions about GM foods); educational materials (pamphlets, infographics, and videos can explain the benefits and risks of GM foods in a user-friendly format). Besides, community engagement should be encouraged. Initiatives such as public forums and meetings (providing opportunities for open discussions), and school programs (integrating lessons about GMOs, including theory, interactive activities, and discussions to educate younger generations) should be promoted. Moreover, expert knowledge should be leveraged. Experts, including scientists, nutritionists, and farmers, can share their knowledge and experiences with GM foods. Case studies demonstrating both successful outcomes and challenges associated with GMO use can provide valuable insights. Beyond economic and environmental considerations, the conversations should encompass GMOs' cultural and ethical implications.

Most importantly, individuals should be equipped to critically evaluate information sources and differentiate between scientifically backed data and misinformation. It is only then that they can make informed and rational choices to protect themselves and their communities.

4 Conclusion

The international legal framework regulating GM food trade remains fragmented. The interplay between international human rights law, international environmental law, and international trade law is limited. Developing countries face numerous challenges in navigating this complex framework. Potential external pressures from developed countries and biotechnology exacerbate these challenges. Those actors influence decision-making through mechanisms like technical assistance and food aid. All these elements may erode developing countries' food sovereignty.

While science plays a critical role in ensuring the safety of GM foods, a science-centric approach is insufficient. Developing countries must prioritize public participation in the decision-making process. Additionally, they should uphold the fundamental right to information and facilitate informed public discourse regarding GM food technologies.

Ultimately, GM food is not an end goal but a potential tool within a broader sustainable development framework. Achieving food security and sovereignty, mitigating environmental degradation, and reducing poverty require collaborative efforts among governments, scientific institutions, farmers, and consumers. Only by working together can we develop comprehensive regulatory frameworks that address the complex challenges facing developing countries. This cooperation will pave the way for us to foster a future where nations can navigate their food systems with or without GMOs while prioritizing sustainable and equitable solutions.

References

BASE, Renato Lagapa. A conceptual paper on the policy-framework that mirrors the dynamic link between human security, social protection and safety nets, and food and nutritional security: the case of the "gulayan sa paaralan program", the Philippines. *Revista de Direito Internacional*, Brasília, v. 15, n. 3, p. 477-489, 2018. DOI 10.5102/rdi.v15i3.5924. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/5924. Access on: 3 Feb. 2025.

BAUMÜLLER, Heike. domestic import regulations for genetically modified organisms and their compatibility with WTO Rules. *Asian Biotechnology Development Review*, [*s.l.*], v. 6, n. 3, p. 33-42, Jul. 2004.

BERLAN, Jean-Pierre. *La guerre au vivant*: organismes génétiquement modifiés et autres mystifications scientifiques. Marseille: Agone, 2001.

BUMBLAUSKAS, Daniel *et al.* A blockchain use case in food distribution: Do you know where your food has been? *International Journal of Information Management*, [*s.l.*], v. 52, p.ini 1-10, Jun. 2020. DOI 10.1016/j.ijinfomgt.2019.09.004. Available at:

https://www.sciencedirect.com/science/article/pii/S026840121930461X?via%3Dihub. Access on: 3 Feb. 2025.

CBD. *Convetion on biological diversity*. Montreal: CBD, 1993.

COT, Jean-Pierre. Le principe de précaution en droit européen et international *In*: WALINE, Jean. *Gouverner, administrer, juger*: liber amicorum Jean Waline. Paris: Dalloz, 2002. p. 159-184.

COTTIER, Thomas; OESCH, Matthias; FISCHER, Thomas M. *International trade regulation:* law and policy in the WTO, the European Union and Switzerland: cases, materials and comments. London: Staempfli Publishers, 2005.

COVELLI, Nick; HOHOTS, Viktor. The Health Regulation of Biotech Foods Under the WTO Agreements. *Journal of International Economic Law*, [*s.l.*], vol. 6, n. 4, p. 773-795, 2003.

DEGLISE, Fabien. Un spécialiste des OGM met en garde le Canada contre le saumon transgénique. *Ledevoir*, [*s.l.*], 25 Oct. 2005. Available at: https://www.ledevoir.com/societe/sante/93411/un-specialiste-des-ogm-met-en-garde-le-canada-contre-le-saumon-transgenique. Access on: 3 Feb. 2025.

DUFOUR, Geneviève. Les OGM à l'OMC : resume critique du rapport du groupe special dans l'affaire CE : produits biotechnologiques. *Revue Quebecoise de Droit International*, [*s.l.*], p. 281-311, Apr. 2007. Numéro hors-série. DOI 10.7202/1069053ar. Available at: https://id.erudit.org/iderudit/1069053ar. Access on: 3 Feb. 2025.

DUONG, T.T.T. International law: from fragmentation to integration? An analysis of the relationship between international trade law and international labor law in multilateral and regional trade law frameworks. *Asia Europe Journal*, [*s.l.*], v. 22, p. 293–311, 2024. DOI 10.1007/s10308-024-00701-4.

EGGERS, Barbara; MACKENZIE, Ruth. The Cartagena Protocol on Biosafety. *Journal of International Economic Law*, [*s.l.*], p. 525-543, 2000.

EWEN, S. W.; PUSZTAI, A. Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine. *Lancet*, [*s.l.*], Oct. 1999. DOI 10.1016/S0140-6736(98)05860-7. Available at: https://pubmed.ncbi.nlm.nih.gov/10533866/. Access on: 3 Feb. 2025.

FABRI, Hélène Ruiz; GRANDONI, Lorenzo. L'affaire des OGM devant le juge de l'OMC: science et précaution sans principes. *Diritto del Commercio Internazionale*: Pratica Internazionale e Diritto, [*s.l.*], v. 21, n. 3, p. 641-664, 2007.

FAO. *The right to adequate food*. Geneva: FAO, 2010. Available at: https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf. Access on: 28 May 2024.

FOOD aid or hidden dumping? Separating wheat fram chaff. *Oxfam Briefing Paper*, [*s.l.*], n. 71, p. 1-36, Mar. 2005. Available at: https://policy-practice.oxfam.org/resources/food-aid-or-hidden-dumping-separating-wheat-from-chaff-114492/. Access on: 28 May 2024.

GIARDI, Mariana Werlang. Policy coherence in the implementation of the 2030 agenda for the sustainable development: the brazilian school feeding programme case study. *Revista de Direito Internacional*, [*s.l.*], v. 15, n. 3, p. 505-530, 2018. DOI 10.5102/rdi.v15i3.5945. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/5945. Access on: 3 Feb. 2025.

GREENPEACE. *MON863*: le maïs de Monsanto: impropre aux rats, impropre aux humains (Document d'information), 6/2005.

GRUERE, G. P.; RAO, S. R. A review of international labeling policies of genetically modified food to evaluate India's proposed rule. *AgBioForum*, [*s.l.*], v. 10, n. 1, p. 51–64, 2007.

ISAAA. GM approval database. *ISAAA*, [2024?]. Available at: https://www.isaaa.org/gmapprovaldatabase/default.asp. Access on: 28 May 2024.

ISAAA. *ISAAA Brief 55-2019*: executive summary: Biotech crops drive socio-economic development and sustainable environment in the new frontier. [*S.l.*]: ISAAA, 2019. Available at: https://www.isaaa.org/resources/publications/briefs/55/executivesummary/default.asp. Access on: 28 May 2024.

ISAAA. Pocket K no. 16: Biothec crop highlights in 2019. *ISAAA*, [2019?]. Available at: https://www.isaaa.org/resources/publications/pocketk/16/#:~:text=The%20most%20planted%20biotech%20crops,crops%20or%2091.9%20million%20hectares. Access on: 28 May 2024.

KENNEDY, Kevin C. The GATT-WTO System at Fifty. *Wisconsin International Law Journal*, [*s.l.*], v. 16, n. 2, p. 421-528, 1998.

KRIMSKY, Sheldon; GRUBER, Jeremy. *The GMO deception*: what you need to know about the food, corporations, and government agencies putting our families and our environment at risk. New York: Skyhorse, 2014.

LARSON, Alan P. *Remarks at the Commodity Club of Washington. D.C., Apr. 10, 2002*. Available at: http://www.state.gov/e/rls/rm/2002/9307.htm. Access on: 28 May 2024.

L'EXPERTISE confidentielle sur un inquiétant maïs transgénique. *Le Monde*, 22 Apr. 2004. Available at: https://www.isaaa.org/gmapprovaldatabase/default.asp. Access on: 3 Feb. 2025.

LOPEZ, Miguel Ángel Martín. A study on the application of food sovereignty in international law. *Groningen Journal of International Law*, [*s.l.*], v. 4, n. 2, p. 14-31, 2016, DOI: 10.21827/59db67f29999e. Available at: https://ugp.rug.nl/GROJIL/article/view/29519. Access on: 3 Feb 2025.

MALATESTA, Manuela. Reversibility of hepatocyte nuclear modifications in mice fed on genetically modified soybean. *European Journal of Histochemistry*, [*s.l.*], v. 49, n. 3, p. 237-242, 2005.

MATHUR, Vartika *et al.* World cultivation of genetically modified crops: opportunities and risks. *In*: LICHTFOUSE, Eric (ed.). *Sustainable agriculture reviews*. Cham: Springer, 2017. v. 25. p. 45-87.

MC DONALD, Michelle K. International Trade Law and the US-EU GMO Debate: can Africa weather this atorm? *Georgia Journal of International and Comparative Law*, [*s.l.*], v. 32, p. 503-538, 2004.

MITCHELI Lorraine. Economic theory and conceptual relationships between food safety and international trade. *In*: BUZBY, Jean C. *International Trade and Food Safety*: economic theory and case studies, agricultural economic report n. 828. Washington D.C: USDA Economic Research Service, 2003.

NAMIBIA. Ministry of Higher Education, Training and Employment Creation; FAO. *Food & nutrition*: a handbook for Namibian volunteer leaders. Windhoek: FAO, 2004. Available at: https://www.fao.org/4/a0104e/a0104e00.htm#Contents. Access on: 28 May 2024.

NEWELL, Peter; GLOVER, Dominic. Business and biotechnology: regulation and the politics of influence. *IDS Working Paper*, [*s.l.*], n. 192, 2003.

OGUS, Anthony I. *Regulation*: legal form and economic theory. Oxford: Bloomsbury, 2004.

OSTROVSKY, Aaron A. The European Commission's regulations for genetically modified organisms and the current WTO dispute: human health or environmental measures? Why the deliberate release directive is more appropriately adjudicated in the WTO under the TBT agreement. *Colorado Journal of International Environmental Law and Policy*, v. 15, n. 2, p. 209-244, 2004.

PAMPLONA, Danielle Anne; EBERT, Franz Christian. Business and human rights: taking stock of trends in international governance and domestic litigation. *Revista de Direito Internacional*, Brasília, v. 16, n. 3, p. 2-9, 2019. Editorial. DOI 10.5102/rdi.v16i3.6612. Available at: https://www.publicacoes.uniceub.br/rdi/article/view/6612/. Access on: 28 May 2024.

PHILLIPS, P. W. B; MCNEILL, H. A survey of national labeling policies for GM Foods. *AgBioForum*, [*s.l.*], v. 3, n. 4, p. 219–224, 2000.

PRESCOTT, Vanessa E. *et al.* Transgenic expression of bean α-amylase inhibitor in peas results in altered structure and immunogenicity. *Journal of Agricultural and Food Chemistry*, [*s.l.*], v. 53, n. 23, p. 9023–9030, 2005. DOI 10.1021/jf050594v. Available at: https://pubs.acs.org/doi/10.1021/jf050594v#. Access on: 4 Feb. 2025.

SCOONES, Ian; KEELEY, James. Contexts for regulation: GMOs in Zimbabwe. *IDS Working Paper*, [*s.l.*], n. 190, 2003.

SEGERSON, Kathleen. Mandatory vs. voluntary approaches to food safety. *Agribusiness*, [*s.l.*], v. 15, n. 1, p. 53-70, 1999.

SERALINI, Gilles-Eric. *Génétiquement incorrect*. Paris: Flammarion, 2005.

SHELDON, Ian M. Regulation of biotechnology: will we ever "freely" trade GMOs? *European Review of Agricultural Economics*, [*s.l.*], v. 29, n. 1, p. 155-176, 2002.

SINAI, Deutch. Are consumer rights human rights? *Osgoode Hall Law Journal*, [*s.l.*], v. 32, n. 3, p. 537- 578, 1994.

TERENCE, Stewart; DAVID, Johanson. A nexus of trade and the environment: the relationship between the cartagena protocol on biosafety and the SPS Agreement of the World Trade Organization. *Colorado Journal of International Environmental Law and Policy*, [*s.l.*], v. 14, n. 1, p. 1-52, 2003.

THIẾU minh bạch sử dụng nguyên liệu và thực phẩm biến đổi gene. *Mattran*, 17 out. 2023. Available at: http://mattran.org.vn/thu-vien-video/thieu-minh-bach-su-dung-nguyen-lieu-va-thuc-pham-bien-doi-gene-52693.html. Access on: 22 May 2024.

TOKAR, Brian. The GMO Threat to Food Sovereignty: Science, Resistance, and Transformation. *In*: SCHANBACHER, William D. (ed.). *The global food system*: issues and solutions. New York: Praeger, 2014. cap. 9, p. 173-190.

TRAAVIK, Terje. The 35S CaMV plant virus promoter is active in human enterocyte-like cells. *European food research and technology*, [*s.l.*], v. 222, n. 1, p. 185-193, 2006.

UNCTAD. *United Nations Guidelines for consumer protection*. Geneva: UN, 2016.

UNITED NATIONS. *Universal Declaration of Human Rights*. Paris: UN, 1948. Available at: https://www.un.org/en/about-us/universal-declaration-of-human-rights. Access on: 28 May 2024.

VIETNAM. *Decree No.* 15/2018/ND-CP *of February 02, 2018*. Elaboration of some articles of the law of food safety. Honoi: The Government, 2018.

VIETNAM. *Decree No. 43/2017/ND-CP of April 14, 2017*. On goods labeling. Honoi: The Government, 2017.

VIETNAM. *Decree No. 69/2010/ND-CP of June 21, 2010*. On biosafety for genetically modified organisms, genetic specimens and products of genetically modified organisms. Honoi: The Government, 2010.

WFP. *What is food security?* Available at: https://www.wfp.org/node/359289. Access on: 28 May 2024.

WHO. *Declaration of Alma-Ata*. Geneva: WHO, 1978. Available at: https://cdn.who.int/media/docs/default-source/documents/almaata-declaration-en.pdf?sfvrsn=7b3c2167_2. Access on: 3 Feb. 2025.

WHO; FAO. *Food labelling*. 5th. Rome: FAO, 2007. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/341fd763-bc1c-49c7-b6bf-424733f37b04/content. Access on: 3 Feb. 2025.

WTO. *Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)*. Genebra: WTO, 1995.

WTO. *General Agreement on Tariffs and Trade (GATT 1947)*. Genebra: WTO, 1947. Available at: https://www.wto.org/english/docs_e/legal_e/gatt47_e.htm. Access on: 3 Feb. 2025.

WTO. *WT/DS291/R, WT/DS292/R, WT/DS293/R, 29 Sept. 2006*. European communities – measures affecting: the approval and marketing: of biotech products: reports of the panel. Genebra: WTO, 2006.

WTO. *WT/DS76/AB/R, 22 Feb. 1999*. Japan: measures affecting agricultural products: AB-1998-8. Genebra: WTO, 1998.

Para publicar na Revista de Direito Internacional, acesse o endereço eletrônico www.rdi.uniceub.br ou www.brazilianjournal.org.
Observe as normas de publicação, para facilitar e agilizar o trabalho de edição.