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Revisiting the legal debate on Genetically Modified Organisms (GMOs) in Africa: Which way for Kenya?

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Abstract

This paper examines the status of genetically modified organisms (GMOs) in Africa, with a specific focus on Kenya, and explores the regulatory frameworks and approaches employed in various African countries. It discusses the experimental phase, resistance, and regulatory reforms that have shaped the GMO landscape in Africa. The paper analyzes international and regional treaty instruments, including the Convention on Biological Diversity and the Cartagena Biosafety Protocol, and their implications for GMO regulation. Furthermore, it provides a comparative analysis of GMO approaches in selected African countries, such as Uganda, South Africa, Cameroon, Ghana, and Zambia. The proposed way forward for Kenya's regulation of GMOs is discussed, highlighting the merits of a precautionary approach, the incorporation of socioeconomic considerations, institutional independence, public participation, and the essential role of access to information. This paper offers insights into the complex and evolving field of GMO regulation in Africa, providing a comprehensive overview of key issues and considerations.

Key Words: *Genetically Modified Organisms (GMOs), Africa, Regulatory Frameworks, Kenya*

1. Introduction

The regulation of genetically modified organisms (GMOs) in Africa, particularly in Kenya, has been the subject of intense debate and

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scrutiny. [1] The journey of GMOs in Africa has evolved from experimental introductions to steady proliferation, accompanied by diverse regulatory approaches and legal frameworks. [2] This discussion delves into the status of GMOs in Africa, exploring the experimental phase, resistance and regulatory reform, and the current situation in Kenya. Additionally, it examines the regulatory landscape under international and regional treaty law, highlighting the Convention on Biological Diversity and the Cartagena Biosafety Protocol. Furthermore, a comparative analysis of GMO approaches in selected African countries, such as Uganda, South Africa, Cameroon, Ghana, and Zambia, sheds light on the various legal frameworks and approaches adopted by these nations. Finally, the proposed way forward for Kenya's regulation of GMOs is examined, emphasizing the merits of a precautionary approach, incorporating socioeconomic considerations, institutional independence, public participation, and the essential role of access to information.

The exploration of GMO regulation in Africa reveals a dynamic landscape shaped by scientific advancements, social concerns, and the need for sustainable agricultural practices.[3] The experimentation phase witnessed the introduction of GMOs into African countries, accompanied by both enthusiasm and resistance. While some African nations have embraced GMOs as a potential solution to agricultural challenges, others have expressed concerns about potential risks to human health, biodiversity, and traditional farming systems. In response, regulatory reforms have been implemented, aiming to

[1] Mwasiaji, E., Alaro, L., Muthinja, M., Njuguna, C. (2022). Critical evaluation of genetically modified organisms as an intervention strategy in agribusiness sector in Kenya within the context of climate change. *International Academic Journal of Innovation, Leadership and Entrepreneurship*, 2(3), 391-410.

[2] Ibid

[3] Ibid

address these concerns, establish transparent decision-making processes, and ensure the safety of GMOs.[4]

At the international level, the Convention on Biological Diversity and the Cartagena Biosafety Protocol have played crucial roles in shaping the regulatory framework for GMOs.[5] These treaty instruments emphasize the precautionary approach, advance informed agreement, exchange of information, competent national authorities, and socioeconomic considerations. They provide a basis for harmonizing GMO regulation across countries, facilitating knowledge sharing, and promoting responsible biotechnology practices.[6]

In Africa, selected countries have adopted diverse approaches to GMO regulation. As is discussed in the paper, South Africa's Genetically Modified Organisms Amendment Act (Act 23 of 2006) and permissive approach have facilitated the cultivation of GMOs and commercialization of genetically modified crops. Cameroon's Law No. 2003/006 of 21 April 2003 and restrictive approach reflect a cautious approach, imposing strict regulations on GMO activities. Ghana's Biosafety Act, 2011, and Biosafety (Management of Biotechnology) Regulations, 2019 demonstrate a commitment to biosafety emphasizing risk assessment, public participation, and labeling requirements. Zambia's Biosafety Act, 2007, and subsequent legalization demonstrate a cautious approach to GMOs, with a focus on risk assessment, public participation, and enforcement mechanisms. Uganda's unregulated approach also provides useful insights for the paper.

[4] Ibid
[5] Ibid
[6] Ibid

Considering Kenya's unique context, the way forward for GMO regulation necessitates a holistic approach that addresses the concerns and interests of various stakeholders. [7] Embracing a precautionary approach can ensure rigorous risk assessment, monitoring, and post-market surveillance to minimize potential risks associated with GMOs. Incorporating socioeconomic considerations in the regulatory decision-making process can evaluate the potential impacts of GMOs on farmers, consumers, food security, and local economies. Institutional independence and cooperation are critical to establishing a robust and transparent regulatory framework, fostering public trust, and ensuring effective oversight. Furthermore, public participation and access to information are essential elements for inclusive and informed decision-making, promoting transparency, accountability, and societal acceptance.[8]

The regulation of GMOs in Africa, particularly in Kenya, involves a complex interplay of scientific, social, and legal dimensions. [9] By examining the status of GMOs in Africa, the regulatory landscape at international and regional levels, and the approaches adopted by selected African countries, valuable insights are gained into the diverse perspectives and strategies surrounding GMO regulation. The proposed way forward for Kenya's regulation of GMOs emphasizes the merits of a precautionary approach, socioeconomic considerations, institutional independence, public participation, and access to information. By embracing these principles, Kenya can forge a path towards a responsible, inclusive, and sustainable GMO regulatory framework that addresses societal concerns, fosters

[7] Alliance for Science (2022). Kenya Approves GMOs after ten years Ban. Available at *https://allianceforscience.cornell.edu/blog/2022/10/* accessed 16 June 2023

[8] Ibid

[9] Ibid

agricultural innovation, and ensures the safe and beneficial use of GMOs.[10]

2. The status of GMOs in Africa: From experimental introduction to steady proliferation

2.1 Experimentation and Resistance.

Genetically Modified Organisms (GMOs) have been a subject of intense legal and public debate globally, and in Africa. The introduction of GMOs in Africa began with experimental research conducted by international biotechnology companies and agricultural research institutions. These experiments aimed to assess the potential benefits and risks associated with genetically modified crops in the African context.[11]

Factors contributing to Experimentation

One factor contributing to experimentation is Agricultural productivity. Proponents of GMOs argue that genetically modified crops have the potential to enhance agricultural productivity, reduce post-harvest losses, and address food security challenges in Africa.[12] Another factor is Pest and disease resistance. Genetic engineering techniques have been employed to develop crops with enhanced resistance to pests, diseases, and environmental stressors. This trait is particularly relevant for African farmers who often face significant yield losses due to various biotic and abiotic factors.[13]

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[10] Ibid

[11] Chaudhuri A and Datta A. (2018). Genetically Modified (GM) Crops: A Potential Source to Combat Global Hunger and Malnutrition. *Austin J Nutri Food Sci*. 2018; 6(3): 1106.

[12] Ibid

[13] Ibid

Resistance to GMOs in Africa

Critics of GMOs raise concerns about potential environmental risks associated with genetically modified crops, including gene flow to wild relatives, the development of pesticide-resistant pests, and negative impacts on biodiversity.[14]There are also concerns that the adoption of GMOs may lead to increased dependence on multinational seed companies, loss of traditional farming practices, and marginalization of small-scale farmers.[15]

2.2 Regulatory Reform and Normalization.

Many African countries have undertaken efforts to enhance their regulatory frameworks for GMOs, aiming to ensure the safe and responsible use of these organisms.[16] Robust biosafety regulations are being developed and implemented to assess potential risks associated with GMOs and establish procedures for their safe handling, transport, and release. Regional harmonization and cooperation efforts have been initiated in Africa to facilitate a coordinated approach towards GMO regulation. For instance, COMESA has developed the Harmonized Seed Trade Regulations, including provisions for the regulation of GMOs within member countries.[17]

GMOs have gradually transitioned to commercialization in Africa, with some countries approving the cultivation and commercial release of genetically modified crops.[18] Economic benefits, such as increased yields and reduced production costs, along with the

[14] Ibid

[15] Ibid

[16] Ibid

[17] COMESA Seed Trade Harmonization Regulations, 2014 available at *https://www.aatf-africa.org/wp-content/uploads/2021/02/COMESA-Seed-Trade-Harmonisation-Regulations-English.pd*f accessed 16 June 2023

[18] Chaudhuri A and Datta A. (2018). Genetically Modified (GM) Crops: A Potential Source to Combat Global Hunger and Malnutrition. *Austin J Nutri Food Sci*. 2018; 6(3): 1106.

potential to address agricultural challenges, are driving the adoption of GMOs in Africa. Challenges include varying public perceptions of GMOs, concerns about potential risks to human health and the environment, and limited access to genetically modified seeds and scientific capacity among farmers and regulatory agencies.[19]

2.3 Explicit Legalization and Contested Moratoriums

I. Explicit Legalization: Embracing GMOs

In recent years, several African countries have explicitly legalized the cultivation and commercialization of genetically modified crops, signaling a shift towards acceptance and adoption of GMO technology.[20]These countries have enacted laws and regulations that explicitly permit the cultivation, importation, and commercialization of genetically modified crops. This legal framework provides a clear pathway for GMO research, development, and deployment.[21] The explicit legalization of GMOs is often driven by economic factors. Governments recognize the potential benefits of genetically modified crops in increasing agricultural productivity, improving food security, and enhancing competitiveness in the global market.[22]

II. Contested Moratoriums: Restrictive Measures and Debate

While some African countries have embraced GMOs, others have implemented contested moratoriums, imposing restrictions on the cultivation and importation of genetically modified crops. This has led to ongoing debates and discussions surrounding the regulation and use of GMOs.[23]Supporters of moratoriums argue that the long-term risks and potential environmental and health impacts of GMOs

[19] Ibid
[20] Ibid
[21] Ibid
[22] Ibid
[23] Ibid

are not yet fully understood, necessitating precautionary measures before widespread adoption. The decision to impose moratoriums on GMOs can be influenced by public opinion, concerns about the dominance of multinational corporations, and the desire to protect traditional farming practices and biodiversity. The scientific community is engaged in ongoing debates regarding the safety, efficacy, and long-term implications of GMOs. This contributes to the complexity of the issue and influences the stance of different stakeholders.[24]

2.4 The Current Kenyan Situation

I. Regulatory Framework in Kenya

Kenya has implemented a regulatory framework to govern the assessment, approval, and commercialization of genetically modified organisms (GMOs). In 2009, Kenya enacted the Biosafety Act, which established the National Biosafety Authority (NBA) as the regulatory body responsible for overseeing the safe handling, transportation, and release of GMOs.[25]The NBA is mandated to assess applications for the importation, contained use, and environmental release of GMOs. It conducts risk assessments and ensures compliance with biosafety guidelines and protocols.[26]

II. Approved GMOs and Field Trials

Kenya has approved the cultivation and commercial release of certain genetically modified crops, while also conducting field trials for

[24] Ibid

[25] Biosafety Act 2009 available at *http://kenyalaw.org:8181/exist/kenyalex/actview.xql?actid=No.%202%20of%202020 09* accessed 16 June 2023; section 5 established the Authority

[26] Section 7, Biosafety Act.

research purposes. [27] Kenya has authorized the commercial cultivation of genetically modified cotton, which is resistant to the African bollworm, a devastating pest that affects cotton production.[28] In addition to commercial crops, Kenya has conducted field trials for other genetically modified crops, including maize (corn) with traits such as insect resistance and herbicide tolerance.[29]

III. Adoption and Controversies

The adoption and acceptance of GMOs in Kenya have been met with both support and controversies, reflecting diverse perspectives and concerns. Proponents argue that GMOs can contribute to increased agricultural productivity, reduced post-harvest losses, improved food security, and enhanced farmer income. They believe that biotechnology can address specific challenges, such as pest and disease pressures faced by farmers.[30]

Critics of GMOs raise various concerns, including potential risks to human health, environmental impacts, the dominance of multinational seed companies, potential loss of traditional farming practices, and potential adverse effects on biodiversity.[31]

IV. Public Perception and Engagement

The public perception of GMOs in Kenya remains diverse, with varying levels of awareness, understanding, and acceptance. [32]The Kenyan government and other stakeholders have initiated public

[27] Alliance for Science (2022). Kenya Approves GMOs after ten years Ban. Available at *https://allianceforscience.cornell.edu/blog/2022/10/* accessed 16 June 2023
[28] Ibid
[29] Ibid
[30] Ibid
[31] Ibid
[32] Ibid

awareness campaigns, educational programs, and engagement activities to inform and involve the public in the GMO debate. Ongoing dialogue, scientific research, and evidence-based decision-making are crucial in shaping the future trajectory of GMOs in Kenya. Striking a balance between promoting agricultural innovation and addressing public concerns is essential.[33]

3. Regulation of GMOs under International and Regional Treaty Law

3.1 International Treaty Instruments

3.1.1 Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is a significant international treaty that addresses the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources.[34]

The CBD has three main objectives. First, The CBD aims to promote the conservation and sustainable management of biological diversity, including ecosystems, species, and genetic resources. Secondly, it seeks to promote the sustainable use of biological resources, ensuring that they are utilized in a way that maintains their long-term viability and benefits both present and future generations. Finally, The CBD emphasizes the fair and equitable sharing of benefits arising from the utilization of genetic resources, particularly with regard to access to and transfer of technology.[35]

[33] Ibid
[34] Convention on Biological Diversity available at *https://www.cbd.int/doc/legal/cbd-en.pdf* accessed 16 June 2023
[35] Article 1, Ibid

Parties to the CBD are encouraged to develop national biosafety frameworks and mechanisms that align with the provisions of the convention. They are required to submit reports on their implementation of the convention and undergo periodic reviews to ensure compliance.[36]The CBD recognizes the need for synergy and cooperation with other relevant international agreements and organizations, such as the World Trade Organization (WTO) and the Food and Agriculture Organization (FAO), to address the diverse aspects of biodiversity conservation and sustainable use.[37]

3.1.2 Cartagena Biosafety Protocol

3.1.2.1 Precautionary approach

The Cartagena Protocol on Biosafety is an international treaty under the Convention on Biological Diversity (CBD) that specifically addresses the safe handling, transport, and use of living modified organisms (LMOs), including genetically modified organisms (GMOs).[38] One of the key features of the Cartagena Protocol is its precautionary approach. The precautionary approach is a guiding principle of the Cartagena Protocol. It recognizes the need for precaution in decision-making when dealing with potential risks posed by LMOs.[39]

The precautionary approach acknowledges that scientific understanding of the potential risks associated with LMOs may be incomplete or uncertain. It recognizes that there could be unforeseen

[36] Article 26, Ibid
[37] Preamble, Article 5. Article 18 Ibid
[38]Cartagena Protocol on Biosafety to The Convention on Biological Diversity available at *https://www.cbd.int/doc/legal/cartagena-protocol-en.pdf* accessed 16 June 2023
[39] Preamble. Article 1 Ibid

adverse effects on biodiversity and human health.[40] Under the precautionary approach, when there is a potential risk of significant harm, lack of scientific certainty should not be used as a reason to postpone or avoid taking measures to prevent or minimize those risks.[41]

The Protocol promotes the adoption of proactive measures to prevent or minimize potential risks of LMOs. It encourages countries to implement risk assessment and risk management procedures to evaluate and address potential adverse effects on biodiversity and human health.[42] It also recognizes the importance of considering socioeconomic impacts and the specific needs of developing countries, particularly with regards to their capacity to assess and manage risks associated with LMOs.[43]

In addition, The Protocol emphasizes the importance of information sharing and transparency to enable informed decision-making. It establishes the Biosafety Clearing-House as a mechanism for the exchange of scientific, technical, and regulatory information related to LMOs.[44]The Protocol promotes the concept of "prior informed consent" (PIC)[45] and "advance informed agreement" (AIA)[46]. It requires exporting countries to obtain consent from importing countries before exporting LMOs, ensuring that importing countries are fully informed about the potential risks and can make informed decisions.

[40] Article 15 & 16 Ibid
[41] Article 10 (6); 11 (8) Ibid
[42] Article 15 & 16 Ibid
[43] Article 26 Ibid
[44] Article 20, Ibid
[45] Article 10 Ibid
[46] Article 7 Ibid

3.1.2.2 Advance Informed Agreement

In the context of the Cartagena Protocol on Biosafety, the principle of "Advance Informed Agreement" (AIA) is an important aspect of the protocol. [47] The AIA principle emphasizes the need for communication and cooperation between exporting and importing countries of living modified organisms (LMOs), including genetically modified organisms (GMOs).[48]Under the AIA principle, an exporting country must obtain prior informed consent from an importing country before exporting LMOs. This means that the importing country should have the opportunity to make an informed decision about whether to accept or reject the import of a specific LMO.

To ensure informed decision-making, the exporting country is responsible for providing relevant information about the LMOs to the importing country. This information includes details about the specific LMO, its intended use, potential risks, and any risk management measures in place.[49]The exporting country notifies the designated national authority of the importing country through the Biosafety Clearing-House BCH. The notification includes comprehensive information regarding the LMOs, as well as any documentation required by the importing country.[50]

The importing country reviews the information provided and assesses the potential risks associated with the LMOs. Based on this assessment, the importing country decides whether to grant or deny its consent for the importation of the specific LMOs. The AIA principle also recognizes the right of the importing country to take appropriate measures to manage and regulate the import of LMOs,

[47] Ibid
[48] Ibid
[49] Ibid
[50] Ibid

including the possibility of requesting additional information or imposing specific conditions or restrictions.[51]

AIA promotes cooperation and dialogue between exporting and importing countries, allowing for exchanges of scientific, technical, and regulatory information related to LMOs. This facilitates the sharing of expertise and experiences, helping to enhance the capacity of countries to make informed decisions. By implementing the AIA principle, the Cartagena Protocol aims to ensure that importing countries have the necessary information and the opportunity to assess and manage potential risks associated with the import of LMOs. It promotes transparency, cooperation, and the sharing of information, which are crucial for informed decision-making and the safe handling of LMOs under the protocol.

3.1.2.3 Exchange of Information

In the context of the Cartagena Protocol on Biosafety, the exchange of information is a crucial element to ensure transparency, facilitate informed decision-making, and promote cooperation among countries regarding living modified organisms (LMOs), including genetically modified organisms (GMOs).

The Cartagena Protocol establishes the Biosafety Clearing-House (BCH) as a central mechanism for the exchange of scientific, technical, and regulatory information related to LMOs. The BCH serves as a platform to facilitate the sharing of information among countries and other stakeholders.[52] Under the Cartagena Protocol, Parties have obligations to share information through the BCH. This includes providing information on LMOs, national biosafety frameworks, risk

[51] Ibid

[52] Article 20, Ibid

assessments, and any relevant laws, regulations, and guidelines pertaining to biosafety.[53]

The protocol specifies the types of information that should be shared through the BCH, such as:

a) Identification of the LMOs: Details about the specific LMO, including its characteristics, traits, and intended use.
b) Risk Assessment: Information regarding the potential environmental and human health risks associated with the LMO, as well as any risk management measures in place.
c) Contact Points: Designation of national focal points and competent national authorities responsible for biosafety-related matters.[54]

The BCH ensures that the shared information is widely accessible to Parties and other interested stakeholders. It allows countries to access relevant information, studies, and experiences related to LMOs and biosafety measures, promoting knowledge sharing and capacity building. While promoting transparency, the Cartagena Protocol also recognizes the need to protect confidential information and intellectual property rights. Countries have the option to designate certain information as confidential, subject to specific guidelines and procedures.[55]

Finally, the exchange of information through the BCH is complemented by capacity-building initiatives and technical assistance provided to developing countries. This helps to enhance

[53] Ibid
[54] Ibid
[55] Ibid

their capabilities to generate, assess, and utilize the information related to LMOs.[56]

3.1.2.4 Competent National Authorities

In the context of the Cartagena Protocol on Biosafety, the establishment of competent national authorities is an important aspect of implementing the protocol's provisions. [57] Competent national authorities (CNAs) are designated bodies or institutions within each country that are responsible for carrying out the functions related to the regulation and oversight of living modified organisms (LMOs) under the Cartagena Protocol. CNAs serve as focal points for implementing the protocol's obligations at the national level.[58]

The specific responsibilities of CNAs may vary among countries, but generally, they include:

a) National Coordination: CNAs coordinate and oversee the implementation of the Cartagena Protocol within their respective countries. They serve as the primary contact points for communication and cooperation with other Parties to the protocol.
b) Information Sharing: CNAs are responsible for sharing information related to LMOs through the Biosafety Clearing-House (BCH) as mandated by the protocol. This includes providing information on LMOs, risk assessments, national biosafety frameworks, and any relevant laws and regulations.
c) Risk Assessment and Management: CNAs play a key role in conducting or facilitating the assessment of risks associated

[56] Ibid
[57] Article 19, Ibid
[58] Ibid

with LMOs. They may review and evaluate risk assessment dossiers submitted by applicants and ensure that risk management measures are implemented.[59]

d) Decision-Making Processes: CNAs are involved in the decision-making processes concerning LMOs. They may review applications for the import, export, or domestic release of LMOs and provide recommendations or decisions based on the assessment of risks and compliance with regulatory requirements.

e) Capacity Building and Awareness: CNAs are responsible for building national capacity in biosafety and raising awareness among relevant stakeholders, including regulators, scientists, and the public. They may provide training programs, workshops, and technical assistance to enhance understanding and expertise in biosafety issues.[60]

CNAs are encouraged to cooperate and exchange information with other CNAs at the regional and international levels. This promotes harmonization of approaches, sharing of experiences, and collaboration in areas such as risk assessment methodologies, regulatory practices, and capacity-building initiatives. CNAs often work in collaboration with other national bodies or agencies responsible for specific aspects related to LMOs, such as agriculture, environment, health, trade, or research. Cooperation between CNAs and these bodies helps to ensure effective coordination and integration of biosafety considerations into relevant sectors.[61]

[59] Ibid
[60] Ibid
[61] Ibid

3.1.2.5 Socio-Economic Considerations

The consideration of socio-economic factors is an important component of decision-making processes related to the handling and use of living modified organisms (LMOs), including genetically modified organisms (GMOs). The Cartagena Protocol recognizes the need to take into account socio-economic considerations when assessing the potential risks and benefits associated with LMOs. This includes considering the potential impacts on the economy, trade, livelihoods, and the well-being of individuals and communities.[62]

Countries are encouraged to evaluate the potential socio-economic impacts of LMOs within their specific national contexts. This involves considering factors such as agricultural systems, food security, cultural practices, indigenous and local knowledge, and the social and economic conditions of different sectors of society.[63] When making decisions related to LMOs, Parties are encouraged to take into account the results of the assessment of potential socio-economic impacts. This information helps in weighing the risks and benefits of LMOs, considering the potential consequences for different stakeholders and affected communities.[64]

The Protocol also promotes the involvement of relevant stakeholders, including farmers, indigenous communities, and non-governmental organizations, in decision-making processes related to LMOs. This participatory approach ensures that different perspectives, including socio-economic considerations, are taken into account.[65] The protocol emphasizes the need for capacity building initiatives to strengthen the ability of countries, particularly developing countries, to assess

[62] Article 26, Ibid
[63] Ibid
[64] Ibid
[65] Ibid

and manage the potential socio-economic impacts of LMOs. This includes providing technical assistance, sharing best practices, and enhancing expertise in the analysis of socio-economic factors.[66]

Furthermore, Socio-economic considerations also extend to trade and market access. Countries need to evaluate the potential impacts of LMOs on international trade, including any potential trade disruptions or market reactions that may arise due to the presence of LMOs in agricultural commodities.[67]

3.2 Regional Treaty instruments

3.2.1 Revised African Model Law on Safety in Biotechnology

The Revised African Model Law on Safety in Biotechnology is a regional treaty instrument that has been developed to provide a harmonized framework for the regulation of biotechnology and genetically modified organisms (GMOs) across Africa.[68] The Model Law aims to promote consistency and harmonization in the regulation of biotechnology and GMOs among African countries. It provides a common legal framework that countries can use as a basis for developing or revising their national biosafety laws.[69]

The Model Law applies to the intentional introduction, handling, use, and release of GMOs, including their import and export, within the territory of African countries. It covers various sectors, including agriculture, environment, health, and trade. [70] The Model Law

[66] Ibid
[67] Ibid
[68]The Revised African Model Law on Biosafety and the African Biosafety Strategy available at *https://acbio.org.za/wp-content/uploads/2022/03/AU_Biosafety-brief.pdf* accessed 16 June 2023
[69] Ibid
[70] Ibid

establishes provisions for risk assessment and risk management of GMOs. It requires countries to conduct scientific risk assessments to evaluate the potential risks to human health and the environment posed by GMOs. It also emphasizes the need for risk management measures to minimize or prevent adverse effects.[71]

The Model Law encourages countries to establish a National Biosafety Framework (NBF) to facilitate the implementation of biosafety measures. The NBF includes the establishment of competent authorities responsible for biosafety regulation and decision-making processes. [72] The Model Law recognizes the importance of public participation and access to information in decision-making processes related to GMOs. It encourages countries to promote public awareness, provide opportunities for public input, and ensure transparency in the regulation of GMOs.[73]The Model Law addresses issues of liability and redress related to GMOs. It establishes provisions for civil liability in case of damage resulting from GMOs and outlines mechanisms for seeking compensation and remediation.[74]

The Model Law emphasizes regional cooperation and capacity building among African countries. It encourages countries to share information, experiences, and expertise in the field of biotechnology and biosafety. It also calls for technical and financial support to enhance the capacity of African countries to implement the provisions of the Model Law.[75]

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[71] Ibid
[72] Ibid
[73] Ibid
[74] Ibid
[75] Ibid

3.2.2 African Biosafety Strategy

The African Biosafety Strategy is a regional treaty instrument that provides a comprehensive framework for biosafety management in Africa.[76] It was developed by the African Union in collaboration with other stakeholders to guide African countries in implementing effective biosafety systems. The strategy aims to promote the safe development, transfer, and application of biotechnology and genetically modified organisms (GMOs) in Africa while ensuring the protection of human health and the environment. It seeks to harmonize biosafety regulations, enhance capacity building, and facilitate the sustainable use of modern biotechnology across the continent.[77]

It promotes harmonization of biosafety regulations and guidelines among African countries. It encourages countries to adopt common approaches and standards to facilitate regional cooperation, information sharing, and the exchange of experiences and best practices in biosafety management.[78] The strategy emphasizes the importance of establishing and strengthening national biosafety institutions and regulatory frameworks. It encourages countries to designate competent authorities responsible for biosafety regulation, risk assessment, and decision-making processes. It also highlights the need for effective coordination among relevant national bodies and stakeholders.[79]

In addition, capacity building is a key component of the Strategy. It recognizes the importance of enhancing scientific, technical, and regulatory capacities in African countries to effectively assess and

[76] Ibid
[77] Ibid
[78] Ibid
[79] Ibid

manage biosafety risks associated with GMOs. The strategy promotes training programs, knowledge sharing, and collaboration with regional and international partners to strengthen expertise and skills in biosafety.[80]

The strategy also emphasizes the need for robust risk assessment and risk management frameworks for GMOs. It encourages countries to adopt science-based approaches to assess the potential risks to human health and the environment. It also calls for the implementation of risk management measures to minimize or prevent adverse effects.[81] It also recognizes the importance of public awareness and participation in decision-making processes related to GMOs. It encourages countries to promote public understanding of biotechnology and biosafety issues, engage stakeholders in dialogue, and provide opportunities for public input in policy formulation and decision-making.[82]

Finally, the strategy highlights the importance of monitoring and compliance mechanisms to ensure the effective implementation of biosafety regulations. It calls for the establishment of monitoring systems, data collection, and reporting mechanisms to track the environmental, health, and socioeconomic impacts of GMOs. It also emphasizes the need for enforcement mechanisms and measures to address non-compliance.[83]

[80] Ibid
[81] Ibid
[82] Ibid
[83] Ibid

4. A Comparison of Approaches to GMOs in Selected African Countries

4.1 Uganda

4.1.1 Unregulated Approach

In Uganda, the regulatory approach to genetically modified organisms (GMOs) has been characterized by a period of unregulated or partially regulated use and cultivation. The National Biosafety Act 2017 was passed by Parliament, but not assented to by the President, who asked the Parliamentarians to review the Act citing concerns about containment, impacts on indigenous species, labeling and patents. [84] In 2018, Parliament passed the Genetic Engineering Regulatory Bill after reconsidering the president's proposals. However, in 2019, the President announced his refusal to assent to the Bill for the second time, explicitly mentioning genetically modified mosquitoes and citing several concerns about safeguarding citizens and the ecology stating that 'commercial interests, however, need to be balanced against the need to protect the ordinary Ugandan Citizen from real and potential harm, health and wellbeing rather than profit, must be our primary concern'[85]

[84] Hivos: "Please review the Biosafety Act, Mr. Museveni" (2/2/2018) available at *https://hivos.org/please-review-the-biosafety-act-mr-museveni/* accessed 16 June 2023

[85] The Independent: GMO regulations in the offing – NEMA (2021) available at *https://www.independent.co.ug/gmo-regulations-in-the-offing-nema/* accessed 16 June 2023; Museveni Y. Letter: The Genetic Engineering Regulatory Act, 2018. Addressed to the Speaker, Rt. Hon. Rebecca A. Kadaga. 2019 available at *http://parliamentwatch.ug/wp-content/uploads/2020/08/Motion-for-Reconsideration-of-the-Genetic-Engineering-Regulatory-Bill-2018-as-Returned-By-H.E-the-President-in-Accordance-with-Article-913b-of-the-Constitution-and-Rule-142-of-the-Rules-of-Procedure.pdf.* Accessed 16 June 2023

As a result, GMO research, trials, and field cultivation are still conducted without stringent regulatory oversight.

During this unregulated period, a number of genetically modified crops, particularly insect-resistant and herbicide-tolerant varieties, are developed and field-tested in Uganda. The most notable example is the genetically modified insect-resistant variety of the banana, known as the GM Banana Xanthomonas wilt-resistant (BXW). This GM banana variety was developed to address the devastating impact of the Xanthomonas wilt disease on banana crops in Uganda.[86]

The unregulated approach to GMOs in Uganda has led to a situation where GMO research and trials are conducted without clear guidelines or oversight. This lack of regulation has raised concerns about potential environmental and health risks associated with GMOs and their potential impact on biodiversity, local farming systems, and traditional crops.[87]

4.2 South Africa

4.2.1 Genetically Modified Organisms Amendment Act (Act 23 of 2006)

The Genetically Modified Organisms Amendment Act (Act 23 of 2006) is a significant piece of legislation in South Africa that regulates the import, export, research, production, and release of genetically modified organisms (GMOs) within the country.[88] It establishes a comprehensive regulatory framework for GMOs in South Africa. It amends and supplements the existing Genetically Modified

[86] Ibid
[87] Ibid
[88] Genetically Modified Organisms Amendment Act (Act 23 of 2006)

Organisms Act of 1997 to strengthen the regulation and oversight of GMO activities.[89]

The Act requires anyone involved in the research, development, production, import, or export of GMOs to obtain a permit.[90] The permit application process involves providing comprehensive information on the GMO, its intended use, risk assessments, and risk management plans. Permits may be subject to conditions, including monitoring and reporting requirements. The Act emphasizes a science-based approach to risk assessment and management of GMOs. It requires applicants to conduct thorough risk assessments, considering potential impacts on human health, animal health, and the environment. Risk management plans must be developed and implemented to mitigate identified risks.[91]

4.2.2 Permissive approach

In South Africa, the regulatory approach to genetically modified organisms (GMOs) is often described as a permissive approach.[92] This approach is characterized by a relatively open and permissive regulatory framework that allows for the commercialization, cultivation, and importation of certain GMOs, subject to regulatory oversight and compliance with established procedures. Under the South African GMO regulatory system, the cultivation, importation, and commercialization of GMOs are allowed if certain criteria are met. These criteria typically include a rigorous risk assessment process to evaluate potential impacts on human health, the

[89] Long Title, Ibid
[90] Ibid
[91] Section 4 Ibid
[92] Muzhinji N, Ntuli V. Genetically modified organisms and food security in Southern Africa: conundrum and discourse. GM Crops Food. 2021 Jan 1;12(1):25-35. Available at *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7553747/* accessed 16 June 2023

environment, and biodiversity. The assessment considers factors such as the characteristics of the GMO, potential allergenicity, potential toxicity, and potential ecological impacts.[93]

In South Africa, engaging in activities related to GMOs requires obtaining a permit from the Registrar of Genetically Modified Organisms. To apply for a permit, you need to complete the relevant application form based on the type of activity you seek authorization for. There are certain prerequisites for specific applications, such as conducting field trial activities over three growing seasons before applying for general release. Applications to continue an activity will only be accepted if it was previously authorized.[94]

Once you have completed the application, you submit it along with the required number of copies to the Registrar of GMOs. Additionally, you provide an extra copy of the application that does not include any confidential business information. You pay the prescribed fee, which is adjusted annually. If applicable, you include a report on previous activities conducted and proof of public notifications.[95]

The Registrar of GMOs assesses the application for compliance with the provisions of the GMO Act, 1997. The Advisory Committee evaluates the scientific data submitted and provides a recommendation on the safety of the proposed activity to the Executive Council. Public input is also considered within the specified time period. The Executive Council makes a decision, taking

[93] Ibid
[94] South African Government: GMO Activities. Available at *https://www.gov.za/services/plant-production/gmo-activities* accessed 16 June 2023
[95] Ibid

into account the application, the Advisory Committee's recommendation, public input, and potential impacts on sectors such as agriculture, health, environment, labor, trade, and science and technological development.[96]

If the Executive Council's decision is positive, the Registrar is authorized to issue a permit. All permits are subject to containment conditions. Inspectors from the Department of Agriculture, Forestry, and Fisheries monitor the implementation of the permit conditions.[97] One of the key features of the permissive approach in South Africa is the emphasis on scientific assessment and risk management rather than a blanket prohibition or moratorium on GMOs. This approach allows for a case-by-case evaluation of GMOs, considering their specific characteristics and intended uses. It aims to strike a balance between harnessing the benefits of biotechnology and ensuring the protection of human health, the environment, and biodiversity.[98]

However, while South Africa has a permissive approach to GMO regulation, it still maintains a robust regulatory system with checks and balances in place to safeguard public and environmental safety. The regulatory authority continuously monitors and assesses new developments in GMO technology and adjusts regulations as necessary to address emerging challenges or concerns.[99]

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[96] Ibid

[97] Ibid

[98] Muzhinji N, Ntuli V. Genetically modified organisms and food security in Southern Africa: conundrum and discourse. GM Crops Food. 2021 Jan 1;12(1):25-35. Available at *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7553747/* accessed 16 June 2023

[99] Ibid

4.3 Cameroon

4.3.1 Law No. 2003/006 of 21 April 2003

Law No. 2003/006 of 21 April 2003, also known as the Law on the Environment in Cameroon, encompasses various aspects of environmental protection, including the regulation of GMOs.[100] The law establishes a regulatory framework for GMOs in Cameroon. It stipulates that the import, transit, and release of GMOs into the environment are subject to prior authorization from the competent national administration. This authority is responsible for assessing the potential risks and impacts of GMOs on human health, biodiversity, and the environment.[101]

The law mandates the conduct of risk assessments for GMOs before their release or use in Cameroon. The assessments evaluate potential risks to human health, biodiversity, and the environment. Additionally, the law requires the establishment of monitoring systems to track the potential effects of GMOs on the environment and human health.[102]It also emphasizes the importance of public participation in decision-making processes related to GMOs. It encourages the dissemination of information and public awareness regarding GMOs, their potential impacts, and the decision-making procedures. The law also promotes transparency in the regulatory process and encourages public involvement in environmental decision-making.[103]

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[100] Law No. 2003/006 of 21 April 2003 available at *https://minepded.gov.cm/wp-content/uploads/2020/01/LAW-NO.-2003006-OF-21-APRIL-2003-TO-LAY-DOWN-SAFETY-REGULATIONS-GOVERNING-MODERN-BIOTECHNOLOGY-IN-CAMEROON-1.pdf* accessed 16 June 2023

[101] Article 5 (1) Ibid; Part III, Chapter II Ibid

[102]Part II chapter III & IV Ibid

[103] Part V Ibid

4.3.2 Restrictive Approach

In Cameroon, the regulatory approach to genetically modified organisms (GMOs) is often described as a restrictive approach.[104] This means that the country has adopted a cautious and stringent regulatory framework with regards to the cultivation, importation, and release of GMOs. Under the regulatory framework, any person or entity intending to engage in activities involving GMOs, such as their importation, cultivation, or release, must obtain prior authorization from the competent administrative authority as mentioned above. This authorization process involves a thorough evaluation of the potential risks and impacts associated with GMOs.[105]

Cameroon places a strong emphasis on conducting comprehensive risk assessments of GMOs as also cited hereinabove. These assessments aim to evaluate the potential risks posed by GMOs to human health, biodiversity, and the environment. The assessments take into account factors such as the characteristics of the GMO, potential allergenicity, potential toxicity, and potential ecological impacts.[106]

In addition, the precautionary principle is a key component of Cameroon's approach to GMO regulation.[107] It means that in cases where there is scientific uncertainty regarding the potential risks of GMOs, precautionary measures are taken to protect human health,

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[104] Professor Vincent P.K. Titanji (2012) The Status of Genetically Modified Organisms (GMO) in Cameroon-A mini
Review. *Journal of The Cameroon Academy of Sciences* Vol. 10 No. 1 (2012) available at *file:///C:/Users/KIHALI%20R/Downloads/87058-Article%20Text-215117-1-10-20130403.pdf* accessed 16 June 2023

[105] Ibid

[106] Ibid

[107] Article 18, 19 and 20 of Law No. 2003/006 of 21 April 2003

biodiversity, and the environment. This principle allows for a cautious approach, even in the absence of conclusive scientific evidence of harm.[108]

Cameroon also emphasizes the importance of public participation in decision-making processes related to GMOs. The regulatory framework encourages the involvement of the public, including affected communities, civil society organizations, and stakeholders, in the decision-making process. Public consultations and awareness-raising activities are conducted to gather input and ensure transparency.[109]

Finally, Cameroon recognizes the importance of labeling and traceability of GMOs. The regulatory framework includes provisions for the labeling of GMO products, including food and feed, to provide consumers with information and enable them to make informed choices. Traceability measures are in place to track the movement of GMOs throughout the supply chain.[110]

By adopting a restrictive approach, Cameroon aims to ensure that the cultivation, importation, and release of GMOs are conducted in a manner that prioritizes human health, protects the environment, and safeguards biodiversity. This approach reflects the country's commitment to biosafety and aligns with international principles and agreements.

[108] Ibid
[109] Part V Ibid
[110] Chapter IV Part IX Ibid

4.4 Ghana

4.4.1 Biosafety Act, 2011

The Biosafety Act, 2011 (Act 831) is a significant piece of legislation in Ghana that regulates the safe development, handling, transfer, and use of genetically modified organisms (GMOs) within the country. The Biosafety Act establishes the National Biosafety Authority (NBA) as the regulatory body responsible for the implementation and enforcement of GMO regulations in Ghana. The NBA is responsible for granting permits, conducting risk assessments, monitoring compliance, and ensuring the safe use and handling of GMOs.[111]The Act requires anyone involved in the research, development, importation, exportation, transit, commercial release, and placing on the market of GMOs to obtain permits from the NBA. The permit application process involves providing detailed information on the GMO, including risk assessments, risk management plans, and potential socio-economic considerations.[112]

The Biosafety Act emphasizes the importance of conducting comprehensive risk assessments for GMOs. The risk assessments evaluate potential risks to human health, biodiversity, and the environment. Risk management plans must be developed and implemented to mitigate identified risks and ensure the safe handling and use of GMOs.[113]

The Act also recognizes the significance of public participation in decision-making processes related to GMOs. It requires the NBA to provide opportunities for public input during the permit application process and other relevant procedures. The Act also promotes

[111] Section 3 & 4 of the The Biosafety Act, 2011
[112] Ibid
[113] Fourth schedule, section 19 Ibid

transparency by providing access to information related to GMOs, risk assessments, and regulatory decisions.[114]

Finally, The Act establishes penalties for non-compliance with GMO regulations. It outlines offenses and corresponding penalties, which may include fines, imprisonment, or both, for violations such as conducting GMO activities without a permit, providing false information, or failing to comply with conditions imposed by the NBA.[115]

4.4.2 Biosafety (Management of Biotechnology) Regulations, 2019

The Biosafety (Management of Biotechnology) Regulations, 2019 is a set of regulations in Ghana that complement the Biosafety Act, 2011 (Act 831) in governing the safe handling, transfer, development, and use of genetically modified organisms (GMOs) within the country.

The Regulations classify the Authority as the national focal point responsible for the following: (a) liaising with the Secretariat of the United Nations Convention on Biological Diversity for the performance of the administrative functions required under the Cartagena Protocol on Biosafety; (b) informing other Parties to the Cartagena Protocol on Biosafety of any bilateral, regional or multilateral agreements and arrangements that Ghana has entered into before and after the date of entry into force of the Protocol; (c) the exchange of information and provision of information to other Parties to the Cartagena Protocol and other countries in relation to biosafety and biotechnology; among other functions.[116]

[114] Section 42 Ibid
[115] Section 41 Ibid
[116] Regulation 1 of the Biosafety (Management of Biotechnology) Regulations, 2019

The Institutional biosafety committee is also established. It plays a crucial role in enforcing guidelines and ensuring biosafety compliance. The committee monitors ongoing regulated work within the institution, providing guidance and counseling to proponents on biosafety issues and compliance with the relevant regulations. If any infractions are identified, the committee reports them to the institutional head or the regulatory authority, recommending the cessation of a biosafety activity if it poses a threat to the public, environment, or laboratory personnel.[117]

Additionally, the committee determines additional biosafety measures and develops supplementary terms and conditions tailored to the specific risks and concerns identified. It assists researchers in conducting risk analysis, organizes training programs for institution staff and stakeholders, and provides a platform for researchers and personnel to address questions, disputes, or concerns.[118]

The committee maintains an updated directory of personnel involved in biosafety activities at different levels and ensures proper training on laboratory or field practices, emergency procedures, and equipment operation. It also serves as a conduit for information exchange between the regulatory authority, research teams, and other stakeholders, facilitating the flow of information, ideas, and opinions.[119]

The regulations also emphasize on authorization prior to placing, export and transit of GMOs [120] and the importance of public

[117] Regulation 8 Ibid
[118] Ibid
[119] Ibid
[120] Regulation 15, 16 and 17 Ibid

participation and awareness.[121]The Authority is also responsible for the overall monitoring, risk management and environmental release of genetically modified organisms.[122]The regulations also address other concepts such as food safety.[123]

4.5 Zambia

4.5.1 Biosafety Act, 2007

The Biosafety Act of 2007 is a significant piece of legislation in Zambia that governs the safe handling, use, and transfer of genetically modified organisms (GMOs) within the country.[124] The act provides a regulatory framework for the assessment, regulation, and management of GMOs in order to protect human health, biodiversity, and the environment. It applies to all activities involving GMOs, including research, development, importation, exportation, transit, commercial release, and placing on the market of GMOs in Zambia. It covers both agricultural and non-agricultural GMOs.[125]

The act establishes the National Biosafety Authority (NBA)[126] as the regulatory body responsible for implementing and enforcing biosafety regulations in Zambia. The NBA is responsible for granting permits, conducting risk assessments, monitoring compliance, and ensuring the safe use and handling of GMOs.[127]

The Biosafety Act emphasizes the importance of conducting comprehensive risk assessments for GMOs. It requires applicants to

[121] Regulation 19 Ibid
[122] Regulation 18 Ibid
[123] Regulation 23 Ibid
[124] Long Title, Biosafety Act, 2007
[125] Section 3, Ibid
[126] Section 4, Ibid
[127] Section 5, Ibid

submit data and information on the characteristics of the GMO, potential risks to human health, biodiversity, and the environment, as well as risk management plans to mitigate identified risks.[128] In addition, anyone involved in activities related to GMOs must obtain permits from the NBA. The act sets out the permit application process and specifies the information and documentation required for each category of GMO activity. The NBA evaluates applications based on the potential risks and compliance with biosafety requirements.[129]

The act establishes measures for the containment and control of GMOs to prevent their unintended release into the environment. It specifies requirements for physical and biological containment, monitoring systems, and reporting obligations to the NBA.[130]The Biosafety Act also promotes public participation in decision-making processes concerning GMOs. It requires public consultations during the assessment of permit applications and provides mechanisms for public access to information related to GMOs, risk assessments, and regulatory decisions.[131]

Finally, the act defines offenses and penalties for non-compliance with biosafety regulations. It specifies fines, imprisonment, or both for violations such as conducting GMO activities without authorization, providing false information, or failing to comply with containment measures or reporting requirements.[132]

[128] Part IV & V Ibid
[129] Section 10, 17, 18 Ibid
[130] Section 7 Ibid
[131] Section 14 Ibid
[132] Section 45 Ibid

4.5.2 Subsequent Legalization

In Zambia, subsequent legalization refers to the process of granting legal status or approval for the cultivation, importation, or commercialization of specific genetically modified organisms (GMOs) that were previously under a moratorium or not explicitly authorized.[133] It signifies a shift in the regulatory approach towards GMOs and allows for their regulated use within the country.

Zambia has had a complex history with GMOs. In the early 2000s, Zambia imposed a moratorium on the importation and commercialization of GMOs, particularly genetically modified food aid during a period of food insecurity. The moratorium was implemented due to concerns about the safety and long-term impacts of GMOs on human health and the environment. Over time, as scientific knowledge and understanding of GMOs have evolved, there has been a reevaluation of the regulatory framework surrounding GMOs in Zambia. This has led to a shift from a restrictive approach to a more permissive or regulated approach.[134]

Subsequent legalization involves the issuance of specific authorizations or approvals for the cultivation, importation, or commercialization of certain GMOs. This process typically requires rigorous risk assessments, evaluation of potential environmental and health impacts, and adherence to regulatory protocols. Even with subsequent legalization, there are usually regulatory safeguards in place to ensure the safe handling, monitoring, and containment of GMOs. These may include measures such as labeling requirements,

[133]Emma Broadbent (June 2012) Research-based evidence in African policy debates. Case study 3, The contemporary debate on genetically modified organisms in Zambia. Available at *https://onthinktanks.org/wp-content/uploads/2014/08/9122.pdf* accessed 16 June 2023

[134] Ibid

traceability systems, and post-release monitoring to assess the environmental and socio-economic impacts of GMOs.[135]

Subsequent legalization of GMOs often involves public engagement and consultation to ensure transparency and allow for input from various stakeholders. Public concerns, ethical considerations, and socio-economic implications may be taken into account during the decision-making process.[136]

5 The Proposed Way Forward for Kenya's Regulation of GMOs

5.1 Merits of a Precautionary Approach

The precautionary approach is an important concept in the regulation of genetically modified organisms (GMOs) that advocates for caution in the face of scientific uncertainty and potential risks to human health and the environment.[137] In the context of Kenya's regulation of GMOs, adopting a precautionary approach can have several merits. First, A precautionary approach prioritizes the protection of human health and the environment by taking proactive measures to minimize potential risks associated with GMOs. It acknowledges that scientific knowledge regarding the long-term impacts of GMOs may be incomplete or uncertain, and therefore calls for careful evaluation and risk management before widespread deployment.[138]

Secondly, by adopting a precautionary approach, Kenya can proactively assess the potential risks of GMOs before they are introduced into the environment or reach the market. This allows for

[135] Ibid
[136] Ibid
[137] Muchiri, Josphat & Mutui, Theophilus M. & Ogoyi, Dorington. (2020). Kenya—A Review of Regulation of Genetically Modified Organisms (GMOs)—Case Study of Kenya. 10.1007/978-3-030-53183-6_23.
[138] Ibid

the early detection and prevention of any potential adverse effects, minimizing the chances of irreversible harm to ecosystems, biodiversity, and human health.[139]

Thirdly, the precautionary approach recognizes the ethical considerations surrounding GMOs, such as the right of individuals and communities to be informed and make choices regarding the food they consume and the environment they inhabit. It supports transparency, public participation, and informed decision-making, allowing for a more inclusive and democratic regulatory process.[140] In addition, A precautionary approach aligns with principles of sustainability by promoting the responsible and sustainable use of GMOs. It encourages comprehensive risk assessments, monitoring systems, and the consideration of socio-economic impacts, ensuring that GMOs are introduced in a manner that does not compromise the long-term sustainability of agricultural systems, ecosystems, and livelihoods.[141]

Finally, many international agreements and frameworks emphasize the importance of a precautionary approach in GMO regulation. By adopting this approach, Kenya can align its regulatory system with international standards, enhancing its credibility and facilitating trade relationships with countries that have similar precautionary principles.[142]

Important to note, the precautionary approach should be balanced with the need for scientific progress, innovation, and the potential benefits that GMOs can offer, such as increased crop yields and

[139] Ibid
[140] Ibid
[141] Ibid
[142] Ibid

enhanced nutritional content. Striking a balance between precaution and the potential benefits of GMOs requires careful evaluation, continuous monitoring, and adaptive management approaches.[143]

As Kenya considers the way forward for the regulation of GMOs, carefully weighing the merits of a precautionary approach can contribute to the development of a robust and science-based regulatory framework that protects human health, the environment, and the interests of all stakeholders involved.

5.2 Benefits of Incorporating Socioeconomic Considerations

Incorporating socioeconomic considerations into the regulation of GMOs in Kenya can bring several benefits. By taking into account the broader social and economic impacts of GMOs, the regulatory framework can better address the needs and interests of various stakeholders.

Socioeconomic considerations allow for an evaluation of the potential contributions of GMOs to food security and agricultural productivity.[144] By assessing the economic benefits and potential risks associated with GMOs, regulatory decisions can be made in a manner that supports sustainable agricultural practices, enhances crop yields, improves food availability, and contributes to overall food security. Incorporating socioeconomic considerations also helps to safeguard the interests of small-scale farmers and rural communities. It allows for an examination of the potential effects of GMOs on rural livelihoods, local economies, and traditional farming

[143] Ibid

[144] Mmbando GS. The legal aspect of the current use of genetically modified organisms in Kenya, Tanzania, and Uganda. GM Crops Food. 2023 Dec 31;14(1):1-12. doi: 10.1080/21645698.2023.2208999. PMID: 37158150; PMCID: PMC10171133.

practices. This consideration can help ensure that GMO regulations do not disproportionately favor large-scale commercial agriculture but also support the needs and sustainability of small-scale farmers.[145]

Furthermore, a comprehensive assessment of socioeconomic considerations can help identify the potential economic benefits and opportunities associated with GMOs. It allows for an analysis of the impacts on various sectors, such as agribusiness, biotechnology research and development, and technology transfer. By considering economic development and innovation, regulatory frameworks can encourage investment, job creation, and the growth of a knowledge-based economy.[146]

Taking socioeconomic considerations into account also facilitates trade and market access for Kenyan agricultural products. Many countries and regions have specific requirements regarding GMOs, and understanding the socioeconomic implications can help ensure that Kenyan products meet international standards and regulations. This consideration enables the country to participate in global markets and maximize trade opportunities.[147]

Finally, addressing socioeconomic considerations also recognizes the importance of public perception and acceptance of GMOs. By considering social and economic impacts, regulatory frameworks can promote transparency, public engagement, and informed decision-making. This can help build public trust, enhance dialogue between

[145] Ibid
[146] Ibid
[147] Ibid

stakeholders, and foster a more inclusive and participatory regulatory process.[148]

Incorporating socioeconomic considerations in GMO regulation is crucial for making well-informed decisions that go beyond the scientific aspects of GMOs. It acknowledges that GMOs can have far-reaching effects on society, economy, and the livelihoods of individuals and communities. By taking a holistic approach, Kenya can develop a regulatory framework that balances the potential benefits and risks of GMOs while ensuring socioeconomic welfare, sustainability, and equitable access to the benefits of modern biotechnology.

5.3 Institutional Independence and Cooperation

Institutional independence and cooperation play a vital role in the effective regulation of genetically modified organisms (GMOs) in Kenya. These factors are essential for establishing a robust and transparent regulatory framework. Institutional independence refers to regulatory bodies having the autonomy to make decisions based on scientific evidence and objective analysis without undue influence from political or commercial interests.[149] It ensures that regulatory decisions are made in the best interest of public health, safety, and environmental protection. This has several benefits. First, Institutional independence fosters public trust in the regulatory process, as it demonstrates that decisions are made impartially and without bias. Secondly, Independent regulatory bodies are better equipped to evaluate scientific evidence objectively, ensuring that GMO assessments are based on rigorous scientific principles. Thirdly,

[148] Ibid

[149] Gebre Kedisso E, Barro N, Chimphepo L, Elagib T, Gidado R, Mbabazi R, Oloo B, Maredia K. Crop biotechnology and smallholder Farmers in Africa. *Genet Modif Plants Beyond*. 2022; 107:27.

Independent regulatory bodies enhance the credibility of the regulatory process, both nationally and internationally, leading to increased confidence in the safety and reliability of GMOs.[150]

Cooperation among relevant institutions and stakeholders is essential for effective GMO regulation. This includes collaboration between regulatory agencies, research institutions, industry, civil society organizations, and the public.[151]Cooperation enables the sharing of scientific research, data, and expertise, fostering a better understanding of GMOs and their potential impacts. Collaborative efforts can facilitate the harmonization of regulatory standards and practices, promoting consistency and coherence in GMO regulation across different sectors and jurisdictions. Cooperation also allows for a multidisciplinary approach to risk assessment, integrating scientific, environmental, health, and socioeconomic expertise to make well-informed decisions. Furthermore, Cooperation encourages active involvement and engagement of stakeholders, ensuring that diverse perspectives and concerns are taken into account in the decision-making process.[152]

Moreover, Institutional independence and cooperation also necessitate the development of adequate capacity within regulatory bodies. This involves providing training, resources, and technical support to regulatory agencies to strengthen their ability to assess and manage GMOs effectively. [153] Capacity building empowers regulatory institutions with the necessary knowledge and skills to conduct comprehensive risk assessments, monitor compliance, and enforce regulations. Strengthened capacities also enable regulatory

[150] Ibid
[151] Ibid
[152] Ibid
[153] Ibid

bodies to carry out their functions more efficiently, leading to timely decision-making and effective oversight of GMO activities. Finally, Continuous capacity building ensures that regulatory bodies keep pace with advancements in biotechnology and are equipped to address emerging challenges and opportunities.[154]

5.4 Necessity of Public Participation in GMO Governance

Public participation is crucial in the governance of GMOs in Kenya. Involving the public in decision-making processes related to GMO regulation ensures transparency, inclusivity, and accountability.

Public participation promotes democratic principles by allowing individuals and communities to have a say in matters that directly impact their lives, health, and environment. It recognizes that decisions on GMOs should not be made solely by regulatory authorities or industry stakeholders but should involve the broader public. [155] Engaging the public provides an opportunity to share information, knowledge, and scientific evidence related to GMOs. It enables citizens to understand the potential benefits, risks, and socio-economic implications of GMOs, facilitating more informed decision-making by regulatory authorities.[156]

In addition, public participation allows for the identification and consideration of diverse perspectives, values, and concerns related to GMOs. It provides a platform for individuals and communities to express their views, raise questions, and seek clarifications. This open dialogue helps build trust between regulators, industry, and the

[154] Ibid

[155] Zhang C, Wohlhueter R, Zhang H. Genetically modified foods: a critical review of their promise and problems. *Food Sci Hum Wellness*. 2016; 5:116–23. doi: 10.1016/j.fshw.2016.04.002

[156] Ibid

public, creating a more inclusive and responsive regulatory system. [157] Public participation also ensures that socio-economic considerations, such as impacts on farmers, local communities, and food security, are taken into account during decision-making processes. It allows for the evaluation of potential benefits and risks from a broader societal perspective, promoting a balanced approach to GMO governance.[158]

Furthermore, Public participation lends legitimacy to GMO governance processes and outcomes. When people are given the opportunity to participate and influence decisions, they are more likely to accept and support the resulting regulations. This can lead to increased public acceptance of GMOs, facilitating their responsible and sustainable use. [159] Engaging the public in GMO governance fosters capacity building and awareness-raising efforts. It provides opportunities for education, dialogue, and the sharing of knowledge related to biotechnology, GMO safety, and regulatory processes. This empowers individuals and communities to make informed choices and actively participate in discussions around GMOs.[160]

To ensure effective public participation, it is essential to create accessible and inclusive platforms, use clear and understandable language, and provide sufficient time for engagement. Additionally, efforts should be made to reach marginalized and vulnerable groups who may be disproportionately affected by GMO decisions. [161] By incorporating public participation in GMO governance, Kenya can benefit from diverse perspectives, build public trust, and develop

[157] Ibid
[158] Ibid
[159] Ibid
[160] Ibid
[161] Ibid

regulations that reflect societal values, while effectively managing the risks and potential benefits of GMOs.

5.5 Essential Role of Access to Information

Access to information plays an essential role in the regulation of GMOs in Kenya. It ensures transparency, empowers stakeholders, and facilitates informed decision-making. Access to information promotes transparency in GMO regulation by making relevant data, scientific studies, risk assessments, and regulatory processes available to the public. This transparency holds regulatory authorities accountable for their decisions, ensuring that they are based on sound scientific evidence and rigorous evaluation.[162]

Access to information empowers stakeholders, including the public, farmers, consumers, and civil society organizations, to make informed decisions about GMOs. By providing comprehensive and accurate information about the potential benefits, risks, and socio-economic implications of GMOs, stakeholders can actively engage in discussions and contribute to the decision-making process.[163]

Transparent access to information builds public confidence and trust in GMO regulation. When stakeholders have access to relevant information, they are more likely to trust the regulatory system and perceive it as fair, reliable, and responsive to their concerns. This trust is crucial for the acceptance and responsible use of GMOs.[164]

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[162] Mabaya E, Fulton J, Simiyu-Wafukho S, Nang'ayo F. Factors influencing adoption of genetically modified crops in Africa. *Dev South Afr*. 2015; 32:577–91. doi: 10.1080/0376835X.2015.1044078.

[163] Ibid

[164] Ibid

Access to information also enables effective risk communication between regulatory authorities, scientists, industry, and the public. It allows for the dissemination of information about the potential risks, mitigation measures, and monitoring plans associated with GMOs. This communication helps address concerns, clarify misconceptions, and foster a constructive dialogue between different stakeholders.[165] In addition, Access to information fosters scientific understanding of GMOs and their impacts. Researchers, scientists, and academic institutions can access data and research findings, which can contribute to a better understanding of the potential benefits and risks of GMOs. This knowledge supports evidence-based decision-making and the advancement of scientific research.[166]

Finally, Access to information empowers farmers and consumers to make informed choices about GMOs. Farmers can access information about GMO seeds, their cultivation practices, and potential impacts on their livelihoods. Consumers can access information about GMO labeling, product ingredients, and safety assessments, allowing them to make choices aligned with their preferences and values.[167]

To ensure effective access to information, regulatory authorities should establish clear mechanisms for information disclosure, including public databases, websites, public consultations, and stakeholder engagement processes. Efforts should also be made to promote information dissemination in local languages and target marginalized communities to ensure inclusivity.[168] By prioritizing access to information, Kenya can build a transparent and inclusive GMO regulatory framework that empowers stakeholders, fosters

[165] Ibid
[166] Ibid
[167] Ibid
[168] Ibid

trust, and facilitates informed decision-making for the responsible use of GMOs in agriculture and food production.

Conclusion

The discussion on the status of GMOs in Africa, with a particular focus on Kenya, has shed light on the evolving regulatory landscape, the role of international and regional treaty instruments, and a comparative analysis of GMO approaches in selected African countries. Through this examination, several key themes and considerations have emerged.

Firstly, the introduction of GMOs in Africa has transitioned from an experimental phase to steady proliferation, accompanied by both enthusiasm and resistance. This has prompted regulatory reforms aimed at addressing concerns, ensuring transparency, and safeguarding the environment, biodiversity, and human health.

International and regional treaty instruments, such as the Convention on Biological Diversity and the Cartagena Biosafety Protocol, have played pivotal roles in shaping the regulatory framework for GMOs. These instruments emphasize the precautionary approach, advance informed agreement, exchange of information, competent national authorities, and socioeconomic considerations. They provide a foundation for harmonizing GMO regulation, fostering knowledge sharing, and promoting responsible biotechnology practices across nations.

The comparative analysis of GMO approaches in selected African countries has highlighted the diversity of regulatory frameworks. Countries like South Africa have embraced GMOs, implementing comprehensive legislation to regulate their cultivation, commercialization, and safety assessments. Cameroon and Ghana

have taken more cautious approaches, imposing strict regulations and emphasizing risk assessment, public participation, and labeling requirements. Zambia's cautious approach, reflected in its Biosafety Act, 2007, demonstrates the importance of rigorous risk assessment, public participation, and enforcement mechanisms.

Looking ahead, the proposed way forward for Kenya's GMO regulation involves key considerations. The merits of a precautionary approach have been emphasized to ensure thorough risk assessment, monitoring, and post-market surveillance. Incorporating socioeconomic considerations is crucial to evaluate the impacts of GMOs on farmers, consumers, food security, and local economies. Institutional independence and cooperation are essential for establishing a transparent and robust regulatory framework. Additionally, public participation and access to information are vital elements that foster transparency, inclusivity, and informed decision-making.

The regulation of GMOs in Africa, including Kenya, necessitates a balanced and adaptive approach that addresses societal concerns, promotes scientific rigor, and facilitates sustainable agricultural practices. By adopting principles such as the precautionary approach, socioeconomic considerations, institutional independence, public participation, and access to information, African nations can develop effective GMO regulatory frameworks. These frameworks can ensure responsible GMO use, safeguard human health and the environment, and foster public trust and acceptance. Ultimately, an informed and inclusive approach will allow Africa to navigate the complexities of GMO regulation and harness the potential benefits of biotechnology in a manner that aligns with local contexts and priorities.

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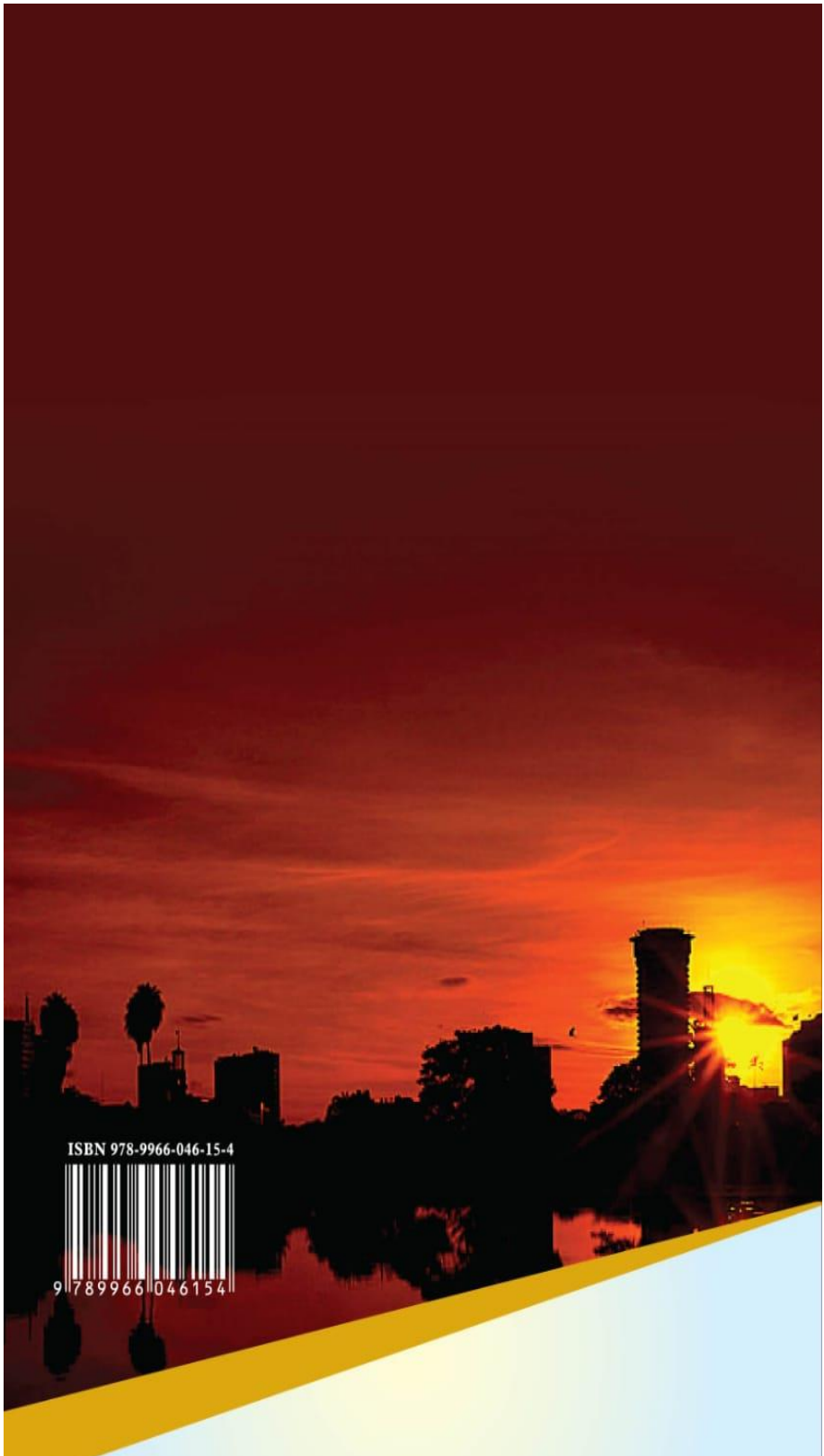

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