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Biodiversity Mainstreaming for Food and Nutrition Security in Kenya

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Abstract

The United Nations Sustainable Development Goals aims to not only achieve biodiversity conservation but to also mainstream such measures into efforts towards achieving food and nutrition security. This is due to the important role that biodiversity plays in achieving food and nutrition security. This paper makes a case for some of the ways that Kenya can mainstream biodiversity conservation debates into measures geared towards achieving food and nutritional security.

1. Introduction

The global population is predicted to reach 8.6 billion by 2030, necessitating the protection of a finite and diminishing quantity of natural resources, since the livelihoods of billions of people employed in the agricultural value chain are at risk.[1]

Providing enough, safe, and nutritious food to all people has always been a major worldwide challenge, even in the twenty-first century, where food availability, access to food, food use/utilization, and food stability are the four elements that most people think of when they think of food security.[2] The Food and Agriculture Organization of the United Nations (FAO) describes food security in following terms: "Food security exists when all people, at all times, have physical, social and economic access to sufficient,

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[1] 'Innovations for Sustainable Food Systems' (*Farming First*) <*https://farmingfirst.org/food-systems/*> accessed 21 December 2021.

[2] Anand S, 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030'.

safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".[3]

The Constitution of Kenya guarantees the right of every person to be free from hunger and thirst: Every person has the right— (c) to be free from hunger, and to have adequate food of acceptable quality; (d) to clean and safe water in adequate quantities.[4] Conservation of biodiversity for securing food and nutrition security in Kenya thus becomes an important step towards guaranteeing human rights of all.

Biological diversity affects agricultural and livestock output, as well as the structure and function of agroecosystems, in both good and negative ways.[5] The Convention on Biological Diversity (CBD) of 1992, for example, recognized the link between biodiversity, agriculture, and nutrition, and has called for greater mainstreaming of agricultural biodiversity into policies and practices aimed at food and nutrition security, as well as increased coordination between the environment, agriculture, and nutrition sectors, as far back as 2006 CBD, COP 8 Decision VIII/23.[6] The second and third objectives of the Convention on the sustainable use of biodiversity and its components, as well as the fair and equitable sharing of the benefits emerging from the use of genetic resources, for example, contain various pertinent clauses. Articles 6 (b), 10 (a) (c), 14, 11, 7 (c), and 8(l) of the Convention further call for biodiversity to be mainstreamed.[7] COP 26 side activities on November 3, 2021, for example, underlined that feeding humanity required a systemic transformation to build climate change

[3] Brief, FAO Policy. "June 2006." *Food security issue* 2 (2017): 1.
[4] Article 43, Constitution of Kenya 2010.
[5] Karl S Zimmerer, 'Biological Diversity in Agriculture and Global Change' (2010) 35 Annual Review of Environment and Resources 137 <*https://www.annualreviews.org/doi/10.1146/annurev-environ-040309-113840*> accessed 21 December 2021.
[6] Beltrame, D., Gee, E., Guner, B., Lauridsen, N., Samarasinghe, W.L.G., Wasike, V., Hunter, D. and Borelli, T., 'Mainstreaming Biodiversity for Food and Nutrition into Policies and Practices: Methodologies and Lessons Learned from Four Countries' (2019) 29 ANADOLU Ege Tarımsal Araştırma Enstitüsü Dergisi 25, at 25.
[7] Unit B, 'Biodiversity Mainstreaming' (16 November 2021) <*https://www.cbd.int/mainstreaming/*> accessed 21 December 2021.

resilience and safeguard soils, water, ecosystems, and farmers, which is fundamentally different from the "green revolution." [8] Innovative technologies and approaches being developed and applied around the world will be critical in making our food systems more sustainable. These technologies must generate cash and create jobs in order to be economically viable. They must include impoverished and vulnerable communities and lower hunger and malnutrition levels in order to be socially sustainable. They must help us protect water, soil, and air quality while reducing greenhouse gas emissions, food loss, and waste in order to be environmentally sustainable.[9]

This paper critically discusses the place of biodiversity mainstreaming in achieving food and nutrition security for the people of Kenya, in line with the aforementioned sustainability goals.

2. Place of Biodiversity in Achieving Food and Nutrition Security: International and Domestic Regulatory Framework

The link between biodiversity and food security can be seen in a variety of ways, from genes to species, landscapes, and biomes, making biodiversity a valuable resource for humanity.[10]

Biodiversity in food and agriculture refers to the diversity of living species that contribute to food and agriculture, as well as the forestry and fisheries industries. [11] Many of the adaption techniques required in food and

[8] Hub ISK, 'COP 26 Events Aim to Support Negotiations on Food Systems | News | SDG Knowledge Hub | IISD' <*https://sdg.iisd.org:443/news/cop-26-events-aim-to-support-negotiations-on-food-systems/*> accessed 21 December 2021.

[9] 'Innovations for Sustainable Food Systems - Farming First' <*https://farmingfirst.org/food-systems#home*> accessed 21 December 2021.

[10] Cramer, W., Egea, E., Fischer, J., Lux, A., Salles, J.M., Settele, J. and Tichit, M., 'Biodiversity and Food Security: From Trade-Offs to Synergies' (2017) 5 Regional Environmental Change 1257, at 1257.

[11] FAO, 'Climate Change and Biodiversity for Food and Agriculture,' Technical Background DocumentFrom The Expert Consultation Held on 13 to 14 February 2 008, p.1. Available at *http://www.fao.org/uploads/media/FAO_2008a_climate_change_and_biodiversity_02.pdf*

agriculture will be based on the sustainable use of genetic resources for food and agriculture.

Plants and animals that are crucial for food security may need to adapt to abiotic changes such as heat, drought, floods, and salinity in order to adapt to climate change.[12]

Local communities, breeders, and researchers employ genetic resources to adapt to shifting socioeconomic requirements and environmental problems. Maintaining and utilizing a diverse genetic pool in the face of climate change is regarded as a critical insurance policy for the food and agriculture industries.[13] Indeed, this is so important that during COP 26, the UN Food and Agriculture Organization hosted a number of side events aimed at assisting countries in climate negotiations, particularly through boosting action linked to food and agriculture, ecosystems, and biodiversity, as well as working with countries to secure climate finance.[14]

Crop genetic diversity is regarded as a source of ongoing improvements in yield, pest resistance, and quality, and it is commonly believed that increased varietal and species diversity will enable agricultural systems to maintain output under a variety of conditions.[15] It has been stated that maintaining and improving crop genetic variety is becoming increasingly important to ensure the resilience of food crop supply, especially in light of climate change issues.[16]

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[12] *Ibid*.
[13] *Ibid*, p.3.
[14] Hub ISK, 'COP 26 Events Aim to Support Negotiations on Food Systems | News | SDG Knowledge Hub | IISD' <*https://sdg.iisd.org:443/news/cop-26-events-aim-to-support-negotiations-on-food-systems/*> accessed 21 December 2021.
[15] Carpenter, Janet E., "Impact of GM crops on biodiversity," *GM crops* 2, no. 1 (2011): 7-23, p.7.
[16] *Ibid*, P.7.

2.1. International Convention on Protection of New Plant Varieties

The *International Convention on Protection of New Plant Varieties* [17] established the International Union for the Protection of New Varieties of Plants (UPOV) as an intergovernmental organization with headquarters in Geneva (Switzerland), to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society. [18] The UPOV Convention encourages and rewards the ingenuity and creativeness of breeders developing new varieties of plants.[19] The UPOV system establishes basic legal principles of protection by providing the breeders exclusive rights to their plant invention for a specific period of time, while making available the genetic material to others to use in their breeding programs.[20]

2.2. Convention on International Trade in Endangered Species of Wild Fauna and Flora

The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) [21] was adopted in March 1973 to regulate worldwide commercial trade in wild animal and plant species in order to ensure that international trade does not threaten the survival of any species.[22] CITES is a legally binding Convention on state parties to the convention, which are obliged to adopt their own domestic legislation to implement its goals.[23] CITES assigns each protected species to one of three lists namely;

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[17] International Union for the Protection of New Varieties of Plants, *International Convention for the Protection of New Varieties of Plants of December 2, 1961*, as Revised at Geneva on November 10, 1972, on October 23, 1978, and on March 19, 1991, UPOV Publication no: 221(E).

[18] 'International Union for the Protection of New Varieties of Plants (UPOV)' <*https://www.upov.int/portal/index.html.en*> accessed 5 June 2021.

[19] 'International Convention for the Protection of New Varieties of Plants (UPOV)' <*https://www.uspto.gov/ip-policy/patent-policy/international-convention-protection-new-varieties-plants-upov*> accessed 5 June 2021.

[20] *Ibid*.

[21] United Nations, *Convention* on *International Trade* in *Endangered Species* of *Wild Fauna* and *Flora*, March 3rd, 1973, 993 U.N.T.S. 243.

[22] 'Convention on International Trade in Endangered Species | Description, Members, & Provisions' (*Encyclopedia Britannica*) <*https://www.britannica.com/topic/Convention-on-International-Trade-in-Endangered-Species*> accessed 6 June 2021.

[23] *Ibid*.

Appendix I lists endangered species that are at risk of extinction and these species require both import and export permits approved by the "management authority and scientific authority" of the nations involved; Appendix II species are those that are not threatened with extinction but that might suffer a serious decline in number if trade is not restricted and their trade is thus regulated by permit; and Appendix III species are protected in at least one country that is a CITES member and that has petitioned others for help in controlling international trade in that species.[24]

2.3. International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

The *International Treaty on Plant Genetic Resources for Food and Agriculture*[25] was adopted in 2001 with the objectives of conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.[26] The sustainable use of plant genetic resources for food and agriculture may include such measures as, *inter alia*: strengthening research which enhances and conserves biological diversity by maximizing intra- and inter-specific variation for the benefit of farmers, especially those who generate and use their own varieties and apply ecological principles in maintaining soil fertility and in combating diseases, weeds and pests; and supporting, as appropriate, the wider use of diversity of varieties and species in on-farm management, conservation and sustainable use of crops and creating strong links to plant breeding and agricultural development in order to reduce crop vulnerability and genetic erosion, and promote

[24] Kathryn A Saterson, 'Government Legislation and Regulations in the United States' in Simon A Levin (ed), *Encyclopedia of Biodiversity (Second Edition)* (Academic Press 2013) <*https://www.sciencedirect.com/science/article/pii/B9780123847195001866*> accessed 6 June 2021; 'Convention on International Trade in Endangered Species | Description, Members, & Provisions' (*Encyclopedia Britannica*) <*https://www.britannica.com/topic/Convention-on-International-Trade-in-Endangered-Species*> accessed 6 June 2021.

[25] United Nations, International Treaty on Plant Genetic Resources for Food and Agriculture, Food and Agriculture Organization of the United Nations 13 December 2006, 2400 (p.303).

[26] *Ibid*, Article 1.1.

increased world food production compatible with sustainable development.[27]

There is a need for countries to use this Treaty in crop production for food security, as applied genetics mixed with practical plant breeding is a potent instrument in agricultural development and food security, and biodiversity provides the foundation for effective use of these genomic techniques.[28]

2.4. COP 10 Decision X/2, Strategic Plan for Biodiversity 2011-2020

The *COP 10 Decision X/2, Strategic Plan for Biodiversity 2011-2020*[29], with its *Aichi Targets*[30], were adopted by the United Nations where Parties and other Governments, with the support of intergovernmental and other organizations, as appropriate, were urged to implement the Strategic Plan for Biodiversity 2011-2020 whose main mission is to: "take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach."[31]

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[27] *Ibid*, Article 6.2 (b)(f).

[28] Louwaars, N.P., Thörn, E., Esquinas-Alcázar, J., Wang, S., Demissie, A. and Stannard, C., 'Access to Plant Genetic Resources for Genomic Research for the Poor: From Global Policies to Target-Oriented Rules' (2006) 4 Plant Genetic Resources 54 <*https://www.cambridge.org/core/journals/plant-genetic-resources/article/abs/access-to-plant-genetic-resources-for-genomic-research-for-the-poor-from-global-policies-to-targetoriented-rules/DC2B65BA1B3230D9A6BFFA9C6CD6A3C4*> accessed 21 December 2021.

[29] 'The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets' <https://www.cbd.int/kb/record/decision/12268> accessed 3 June 2021.

[30] Biosafety Unit, 'Aichi Biodiversity Targets' (18 September 2020) <*https://www.cbd.int/sp/targets/*> accessed 3 June 2021.

[31] *Ibid*.

The Plan was meant to provide an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system and all other partners engaged in biodiversity management and policy development.[32]

2.5. COP 8 Decision VIII/23, Agricultural biodiversity: Cross-cutting initiative on biodiversity for food and nutrition

The *COP 8 Decision VIII/23 on Agricultural biodiversity*[33], urged Parties and other Governments to integrate biodiversity, food and nutrition considerations into their national biodiversity strategies and action plans and other national plans and activities, including national plans of action for nutrition and strategies for achievement of the Millennium Development Goals.[34]

As an Annexture, it provided for a *Proposed Framework For A Cross-Cutting Initiative On Biodiversity For Food And Nutrition*, whose overall aim was to promote and improve the sustainable use of biodiversity in programmes contributing to food security and human nutrition, as a contribution to the achievement of Millennium Development Goal 1, Goal 7 and related goals and targets and, thereby, to raise awareness of the importance of biodiversity, its conservation and sustainable use.[35]

In promoting integration of biodiversity, food and nutrition issues into research and policy instruments, Element 2 thereof called for mainstreaming of the conservation and sustainable use of biodiversity into agendas, programmes and policies related to nutrition, health, agriculture and hunger and poverty reduction.[36]

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[32] Biosafety Unit, 'Strategic Plan for Biodiversity 2011-2020, Including Aichi Biodiversity Targets' (21 January 2020) <https://www.cbd.int/sp/> accessed 3 June 2021.

[33] United Nations, "COP 8 Decision VIII/23, Agricultural biodiversity: Cross-cutting initiative on biodiversity for food and nutrition", *Decision Adopted by The Conference of the Parties to The Convention On Biological Diversity at Its Eighth Meeting*, UNEP/CBD/COP/DEC/VIII/23, 15 June 2006.

[34] Ibid, Preamble, para. 5.

[35] Ibid, Annex, para. 2.

[36] Ibid, Element 2.

2.6. A/RES/70/1 - Transforming our world: the 2030 Agenda for Sustainable Development

The 2030 Agenda for Sustainable Development, under Goal 2, aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture:-

By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round; By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment; By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality; By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed; increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

2.7. Aichi Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

2.8. The Crops Act 2013

Under Section 8 of the Crops Act 2013, the Authority is to: in consultation with the National Biosafety Authority, advise the government on the introduction, safe transfer, handling and use of genetically modified species of plants and organisms in the country; establish experimental stations and seed farms for the development of varieties suitable to the agro-climatic conditions of the area and markets that will provide greatest value added to scheduled crops.

The Genetic Resources Research Institute (GeRRI), under the Kenya Agricultural and Livestock Research Act of 2013, and a semi-autonomous research Institute, is responsible for conserving plant genetic resources, animal and microbial genetic resources.

Under the Food Security Bill, 2015, the National and county governments shall to the extent of their constitutional mandate promote the physical and economic access to adequate food of acceptable quality; in ensuring that, the National government fulfils its obligations under subsection (l), the Authority shall promote traditional and other practices and technologies of food production that ensure the conservation of biodiversity. Notably, the structure of the food economy as a whole, as well as its components including agricultural output, technology, food processing diversity, markets, and consumption, all have an impact on food system resilience.[37]

The functions of the Authority shall be to-promote measures to improve security and access to land and water resources and the optimum and sustainable utilization of these resources promote diversification and the use of alternative methods of agriculture and livestock Systems and the production of diverse food crops to mitigate against drought and other climatic conditions that negatively impact food production;

The functions of a county food security committee shall be to initiate, undertake and participate in the collection, preparation, production and dissemination of data and information on food security and nutrition in the county.

[37] Brief, FAO Policy. "June 2006." *Food security issue* 2 (2017): 1.

2.9. National Food and Nutrition Security Policy, 2011

The government policy objective is to increase the quantity and quality of food available and accessible in order to ensure that all Kenyans have an adequate, diverse and healthy diet. This will be achieved by working towards sustainable production increases for food that is diversified, affordable and helps meet basic nutrition requirements.

2.10. National Horticulture Policy, 2012

Over the last few decades, horticulture has emerged as one of the leading sub-sectors in the agricultural sector in terms of foreign exchange earnings, food security, employment creation, and poverty alleviation. The importance of this policy in enhancing agriculture's contribution towards the projected economic growth of 10 percent per annum over the next 20 years, as stipulated in the Kenya Vision 2030, cannot be over-emphasised.

2.11. Agriculture and Food Authority (AFA) 2016-2021 Strategic Plan

This strategic plan is a blueprint against which the strategic direction of AFA is documented. It is premised on the context introduced by the AFA Act 2013 and Crops Act 2013 and the operating environment that the Authority operates.

It takes into account the institutional frameworks, economic indicators, government policies and agriculture sub sector performances that are likely to impact on the Authority's future operations.

It also takes cognisance of the fact that a wide range of investors are involved in the agricultural sector and policies should aim at increasing private investment in agriculture as well as ensuring that investments are sustainable. AFA aims at ensuring that policies, laws and regulations are well designed and effectively implemented to ensure that such investments bring both economic and social benefits to the country while guaranteeing a sustainable use of natural resources.

This strategic plan also takes into account the relationship between policies and productivity and sustainability outcomes and seeks to provide a platform where such issues such as innovation, structural change, and access to and

impact on natural resources and climate change as key drivers of productivity growth and sustainability are addressed.

2.12. Constitution of Kenya 2010

The Constitution of Kenya 2010[38] took bolder steps than its predecessor to not only incorporate environmental conservation and sustainable development issues as a stand-alone chapter but also notably puts emphasis on a rights-based approaches to conservation which require such conservation measures to also focus on the livelihoods and rights aspects of projects, programmes, and activities.[39] It has been argued that adopting rights-based approaches to conservation serves to ensure that the protection of rights and biodiversity conservation are mutually reinforcing.[40] These rights are both procedural and substantive.[41]

The Constitution outlines favourable legislative protection of biodiversity as envisaged in Chapter Five on Land and the Environment, where there is the emphasis on sustainable use of land and other natural resources, including biodiversity as a key principle.[42]

Article 69 of the Constitution is relevant in the quest for biodiversity conservation especially in relation to the obligations of the State in respect of the environment and natural resources management.[43] The provisions of Article 69(1) are notably comprehensive, addressing a number of cross-

[38] The Constitution of Kenya, 2010.
[39] See Preamble; Article 10; and Chapter Five of the Constitution of Kenya 2010.
[40] 'Rights-Based Approaches to Conservation' (*IUCN*, 14 December 2015) *<https://www.iucn.org/theme/governance-and-rights/about/our-work/governance-and-rights-based-approaches/rights-based-approaches-conservation>* accessed 4 June 2021.
[41] Joshua Gellers and Chris Jeffords, 'Procedural Environmental Rights and Environmental Justice: Assessing the Impact of Environmental Constitutionalism' [2015] SSRN Electronic Journal; Dinah Shelton, 'Developing Substantive Environmental Rights' (2010) 1 Journal of Human Rights and the Environment 89; UN Environment, 'What Are Environmental Rights?' (*UNEP - UN Environment Programme*, 2 March 2018) *<http://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/advancing-environmental-rights/what>* accessed 7 June 2021.
[42] The Constitution of Kenya 2010, Article 60, 69.
[43] The Constitution of Kenya 2010, Article 69(1).

sectoral biodiversity concerns outlined by the CBD including issues of benefit sharing, traditional knowledge, elimination of activities harmful to biodiversity and the role of the community in conservation and sustainable use of biodiversity.[44] However, it is worth pointing out that 'every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources'.[45]

The Constitution also altered the legal landscape in Kenya by introducing a devolved system of governance in Kenya, with authority, roles and responsibilities split between the national government and the 47 county governments.[46] Regarding the environment and biodiversity conservation, the National Government is charged with: use of international waters and water resources; protection of the environment and natural resources with a view to establishing a durable and sustainable system of development, including, in particular-(a) fishing, hunting and gathering; (b) protection of animals and wildlife; (c) water protection, securing sufficient residual water, hydraulic engineering and the safety of dams; and (d) energy policy; agricultural policy; and capacity building and technical assistance to the counties.[47]

As for the county governments, they are charged with: Agriculture, including—(a) crop and animal husbandry; (b) livestock sale yards; (c) county abattoirs; (d) plant and animal disease control; and (e) fisheries; control of air pollution, noise pollution, other public nuisances and outdoor advertising; implementation of specific national government policies on natural resources and environmental conservation, including-- (a) soil and water conservation; and (b) forestry; and ensuring and coordinating the participation of communities and locations in governance at the local level and assisting communities and locations to develop the administrative capacity for the effective exercise of the functions and powers and

[44] *Ibid*.
[45] Article 69 (2), Constitution of Kenya, 2010.
[46] Fourth Schedule to the Constitution of Kenya 2010 on Distribution of functions between National and the county governments.
[47] Fourth Schedule, Part 1, Constitution of Kenya, 2010.

participation in governance at the local level.[48] However, Counties may perform other functions assigned through an Act of Parliament. Notably, some of the functions related to environmental conservation fall within the shared jurisdiction of both national and county levels of government and should, therefore, be performed in a cooperative way.[49]

2.13. Kenya's Vision 2030

The Vision 2030[50] was launched in 2008 as a long-term development blue print for the country, with the goal of transforming Kenya into "a newly-industrialised, middle-income country providing a high quality of life to all its citizens in a clean and secure environment".[51] The Vision 2030 is grounded on three development pillars namely: economic, social and political pillars.[52] The development blueprint acknowledges the environment and all its aspect as an important part of achieving sustainable development and calls for conservation and sustainable use of these resources. The Vision 2030 acknowledges that invasive alien species and lack of a biodiversity inventory and inadequate procedures for access and benefit-sharing for biodiversity resources remain key challenges for the country.[53]

The Social Pillar of the Vision 2030 seeks to invest in the people where it has been pointed out that 'Kenya's journey towards widespread prosperity also involves the building of a just and cohesive society that enjoys equitable social development in a clean and secure environment'.[54] Notably, the Political pillar of Vision 2030 also envisions "a democratic political system that is issue based , people-centred, result-oriented and accountable to the

[48] Fourth Schedule, Part 2, Constitution of Kenya, 2010 on distribution of functions between National and the county governments; see also Section 5 of the County Governments Act (2012) which outlines the functions of County Governments.
[49] Article 186, 189, Constitution of Kenya.
[50] Sessional Paper 10 of 2012 on Kenya Vision 2030, Government of Kenya.
[51] Sessional Paper 10 of 2012 on Kenya Vision 2030, Government of Kenya, Office of the Prime Minister
Ministry of State for Planning, National Development and Vision 2030.
[52] 'About Vision 2030 | Kenya Vision *2030' <http://vision2030.go.ke/about-vision-2030/>* accessed 1 May 2021.
[53] Chapter 4.6, Vision 2030.
[54] 'Social Pillar | Kenya Vision 2030' *<http://vision2030.go.ke/social-pillar/>* accessed 1 May 2021.

public" and 'a country with a democratic system reflecting the aspirations and expectations of its people, in which equality is entrenched, irrespective of one's race, ethnicity, religion, gender or socio-economic status; a nation that not only respects but also harnesses the diversity of its people's values, traditions and aspirations for the benefit of all'.[55]

2.14. Seeds and Plant Varieties Act, Cap 326

This is an Act of Parliament to confer power to regulate transactions in seeds, including provision for the testing and certification of seeds, for the establishment of an index of names of plant varieties, to empower the imposition of restriction on the introduction of new varieties, to control the importation of seeds, to authorize measures to prevent injurious cross-pollination, to provide for the grant of proprietary rights to persons breeding or discovering and developing new varieties, to establish a national centre for plant genetic resources and to establish a Tribunal to hear appeals and other proceedings and for connected purposes.[56]

This Act establishes a National Plant Genetic Resources Centre which shall be responsible for the conservation and sustainable utilization of plant biodiversity in Kenya.

2.15. Biosafety Act, 2009

Biosafety Act, 2009[57] is an Act of Parliament to regulate activities in genetically modified organisms, to establish the National Biosafety Authority, and for connected purposes.

The objectives of this Act include to facilitate responsible research into and minimize the risks that may be posed by genetically modified organisms; to ensure an adequate level of protection for the safe transfer, handling and use of genetically modified organisms that may have an adverse effect on the health of the people and the environment and to establish a transparent, science-based and predictable process for reviewing and making decisions

[55] 'Foundation for The Pillars | Kenya Vision 2030' *<https://vision2030.go.ke/enablers-and-macros/>* accessed 1 May 2021.
[56] Preamble, Seeds and Plant Varieties Act, Cap 326, Laws of Kenya.
[57] Biosafety Act (No. 2 of 2009), Laws of Kenya.

on the transfer, handling and use of genetically modified organisms and related activities.[58]

2.16. Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, And Access to Genetic Resources and Benefits Sharing) Regulations, 2006

The *Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, And Access to Genetic Resources and Benefits Sharing) Regulations, 2006*[59] are to apply to access to genetic resources or parts of genetic resources, whether naturally occurring or naturalised, including genetic resources bred for or intended for commercial purposes within Kenya or for export, whether in in-situ conditions or ex-situ conditions.[60] The Regulations shall, however, not apply to- the exchange of genetic resources, their derivative products, or the intangible components associated with them, carried out by members of any local Kenyan community amongst themselves and for their own consumption; access to genetic resources derived from plant breeders in accordance with the Seeds and Plant Varieties Act, Cap 326; human genetic resources; and approved research activities intended for educational purposes within recognized

[58] See also United Nations, *Cartagena Protocol on Biosafety to the Convention on Biological Diversity*, Montreal, 29 January 2000, United Nations, *Treaty Series*, vol. 2226, p. 208. Article 1 thereof outlines the objective of the Protocol as follows:

> *In accordance with the precautionary approach contained in Principle 15 of the Rio Declaration on Environment and Development, the objective of this Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements.*

[59] Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, and Access to Genetic Resources and Benefits Sharing) Regulations, Legal Notice No. 160 of 2006, Laws of Kenya.

[60] 'National Environment Management Authority (NEMA) - Biodiversity Regulations' *<https://www.nema.go.ke/index.php?option=com_content&view=article&id=30&Itemid=170>* accessed 3 June 202.

Kenyan academic and research institutions, which are governed by relevant intellectual property laws.[61]

The Regulations require Environmental Impact Assessment for activities that may: have an adverse impact on any ecosystem; lead to the introduction of any exotic species; or lead to unsustainable use of natural resources.[62] The Regulations also require the National Environment Management Authority (NEMA), in consultation with the relevant lead agencies, to impose bans, restrictions or similar measures on the access and use of any threatened species in order to ensure its regeneration and maximum sustainable yield as a way to conserve threatened species.[63] NEMA is also tasked with, in consultation with the relevant lead agencies, to identity and prepare an inventory of biological diversity of Kenya, which should include threatened, endangered, or rare species.[64]

2.17. Kenya Plant Health Inspectorate Service Act, 2012

The Kenya Plant Health Inspectorate Service Act[65] is an Act of Parliament to establish the Kenya Plant Health Inspectorate Service as a regulatory body for the protection of plants, seeds and plant varieties and agricultural produce, to be responsible for administering several other written laws and for matters incidental thereto or connected therewith.

3. Challenges in Biodiversity Mainstreaming for Food and Nutrition Security

Food security is threatened by interacting changes in biodiversity and its inherent biophysical structures and processes with changes in biodiversity and its inherent biophysical structures and processes, as has been correctly pointed out. Thus, solutions for reconciling biodiversity and food security

[61] Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, and Access to Genetic Resources and Benefits Sharing) Regulations, 2006, sec. 3.
[62] *Ibid*, Regulation 4(1).
[63] *Ibid*, Regulation 5.
[64] *Ibid*, Regulation 6.
[65] Kenya Plant Health Inspectorate Service Act, No. 54 of 2012, Laws of Kenya.

require more than just controlling the environmental footprint of food production.[66]

Biodiversity conservation in developing countries is affected by several challenges which include, *inter alia*, slow economic development, high levels of poverty, unequal land distribution, a highly segmented society, high population increase as well as commercial interests in natural resource extraction. [67] Kenya's National Environment Management Authority (NEMA) highlights *drivers of biodiversity loss* as including *both direct and indirect causes* where direct threat includes land use change, habitat destruction, and introduction of invasive alien species, among others, while indirect threats are economic system and policy of the country; unsustainable exploitation of resources and weak management system; gaps in spatial information, and lack of public awareness, to mention but a few (Emphasis added).[68]

This is also highlighted in the country's Sixth national report to the Convention on Biological Diversity[69] dated January 2021 which points out that 'while the Government of Kenya has been making efforts towards biodiversity conservation, land degradation and ecosystem destruction are still witnessed through increasing siltation of water bodies and rivers, waste management, air and water pollution in most of our urban centers mostly due to rapid population growth and urbanization. [70] Efforts to improve the management and conservation of environment and natural resources are affected by impacts of climate change, increasing population, as well as

[66] Cramer, W., Egea, E., Fischer, J., Lux, A., Salles, J.M., Settele, J. and Tichit, M., 'Biodiversity and Food Security: From Trade-Offs to Synergies' (2017) 5 Regional Environmental Change 1257, at 1258.

[67] Regina Birner and others, 'Prospects and Challenges for Biodiversity Conservation in Guatemala' [2005] Valuation and Conservation of Biodiversity: Interdisciplinary Perspectives on the Convention on Biological Diversity 285.

[68] NEMA, 'Threats to Biodiversity – Biodiversity Clearing House Mechanism' <*http://meas.nema.go.ke/cbdchm/major-threats/*> accessed 31 July 2021.

[69] Government of the Republic of Kenya, *Kenya Sixth national report to the Convention on Biological Diversity*, Ministry of Environment and Forestry, 2020 < *www.environment.go.ke/wp-content/uploads/2021/01/FINAL-REPORT-MOEF-CBD-SIXTH-NATIONAL-REPORT-January-2021.docx*> accessed 31 July 2021.

[70] *Ibid*, p. 15.

expansion of agriculture and settlements into fragile and water towers ecosystems.[71]

It is, therefore, arguable that unless these challenges are addressed, any efforts towards sustainable use of environmental resources for biodiversity conservation will remain a mirage.

4. Promoting Biodiversity Mainstreaming for Food and Nutrition Security

Biodiversity mainstreaming is defined as ensuring that biodiversity and the services it offers are correctly and adequately included into policies and practices that rely on and affect it.[72]

4.1. Adoption of Climate-Smart Agriculture

Plant productivity varies due to variances in inherent soil fertility, climate and weather, and chemical inputs and agricultural methods, resulting in patterns of biological diversity linked to the agricultural component of economic productivity.[73]

One of the ways of promoting food security in the face of climate change is adoption of climate smart agriculture. FAO defines Climate-Smart Agriculture (CSA) as an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate.[74] CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. CSA is an approach for developing agricultural strategies to secure sustainable

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[71] *Ibid*, p. 15.

[72] Unit B, 'Biodiversity Mainstreaming' (16 November 2021) <*https://www.cbd.int/mainstreaming/*> accessed 21 December 2021.

[73] Michael Huston, 'Biological Diversity, Soils, and Economics' (1993) 262 Science 1676 <https://www.science.org/doi/abs/10.1126/science.262.5140.1676> accessed 21 December 2021.

[74] 'Climate-Smart Agriculture | Food and Agriculture Organization of the United Nations' <*http://www.fao.org/climate-smart-agriculture/en/*> accessed 7 June 2021.

food security under climate change. CSA provides the means to help stakeholders from local to national and international levels identify agricultural strategies suitable to their local conditions.[75]

4.2. Protection of Pollinators

Pollinators are an important part of the food supply chain and must be protected. Climate change, according to experts, will have a significant impact on insects' physiology (how they live and reproduce), behavior, and morphological characteristics, as well as their connections with other species (like host plants and natural enemies).[76] As a result, huge changes in insect population dynamics, abundance, and geographic distribution are expected. In terms of vulnerability to insect-transmitted diseases and availability of key services supplied by insects such as pollination and pest regulation, these changes will have both beneficial and negative consequences for people, livestock, and crops.[77] Thus, this must form part of the wider debate in the quest for food and nutrition security.

4.3. Embracing Production and Consumption of Traditional and Indigenous Food Varieties

To face the problem of feeding the world's population of about nine billion people by 2050, it has been suggested that we should consider not just producing enough food responsibly, but also working toward diverse nutrition, which implies providing a good diet for everyone.[78] Traditional dietary patterns are being phased out, which is having significant nutritional effects for rural Indigenous peoples, who are already suffering from nutritional deficiencies and excesses. Traditional food consumption and

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[75] FAO, "Climate-Smart Agriculture," available at *http://www.fao.org/climate-smart-agriculture/en/*

[76] 'Insects and Climate Change | Icipe - International Centre of Insect Physiology and Ecology' <*http://www.icipe.org/news/insects-and-climate-change*> accessed 7 June 2021.

[77] International Centre of Insect Physiology and Ecology *(icipe), 'Insects and Climate Change,'* available at http://www.icipe.org/news/insects-and-climate-change Accessed on 6/06/2021.

[78] 'New Agricultural Biodiversity Project to Improve Nutrition and Food Security Worldwide | GEF' <*https://www.thegef.org/newsroom/press-releases/new-agricultural-biodiversity-project-improve-nutrition-and-food-security*> accessed 21 December 2021.

production practices can help to increase nutritional security by smoothing out dietary transitions, supplying nutrients, and increasing agricultural resilience.[79] Traditional agriculture practices assist healthy ecosystems by restoring biodiversity.[80]

Native foods are thought to have untapped potential to help the 26% of Kenyan children who suffer from chronic undernutrition (which impairs development and growth), as well as the 4.1 percent who are overweight or obese, mostly in urban areas.[81] A lack of established market channels, poor agronomic practices, and limited information about the production, consumption, and marketing of traditional plants have also been reported as hurdles to increasing nutrition status, food security, and overall wellbeing in Kenyan families.[82] As a result, a grassroots strategy is required in Kenya, where stakeholders can perform cooperative plant research and coordinate school, policymaker, and farmer meetings in order to boost productivity and establish an enabling policy and market environment for underutilized crops.[83]

Projects like the Biodiversity for Food and Nutrition Project, which is funded by the Global Environment Facility and led by the UN Environment Programme and the UN Food and Agriculture Organization, are taking steps in the right direction to promote traditional foods in Kenyan homes and schools, and they should be supported and expanded especially within the rural areas.[84]

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[79] Deaconu, A., Mercille, G. and Batal, M., 'Promoting Traditional Foods for Human and Environmental Health: Lessons from Agroecology and Indigenous Communities in Ecuador' (2021) 7 BMC Nutrition 1.

[80] Ibid.

[81] Beltrame, D., Gee, E., Guner, B., Lauridsen, N., Samarasinghe, W.L.G., Wasike, V., Hunter, D. and Borelli, T., 'Mainstreaming Biodiversity for Food and Nutrition into Policies and Practices: Methodologies and Lessons Learned from Four Countries' (2019) 29 ANADOLU Ege Tarımsal Araştırma Enstitüsü Dergisi 25, at 29.

[82] Ibid, 29.

[83] Ibid, 29.

[84] 'Root Vegetables: Kenyan Schools Embrace Indigenous Foods' (UNEP, 18 November 2020) <*http://www.unep.org/news-and-stories/story/root-vegetables-kenyan-schools-embrace-indigenous-foods*> accessed 21 December 2021; see also

4.4. Promoting Biological Pest Control Approaches

Biological control is a part of a comprehensive pest management plan. It is described as the use of natural enemies to reduce pest populations, and it usually involves human involvement.[85] In terms of the quantity of species and agricultural uses, agricultural habitats and landscapes serve as a diversity reservoir (pollination, recycling of organic matter, amongst others). Agricultural intensification, on the other hand, puts this variety in jeopardy.[86] The use of mineral fertilisers and synthetic pesticides, as well as the "simplification" of agricultural landscapes due to a decline in the diversity of production systems, are said to have contributed to an increase in cultivated area productivity.[87] Agricultural intensification has thus been cited as one of the key drivers of global biodiversity decrease, despite the fact that it has helped humanity to feed a growing global population.[88]

Mineral fertilizers and pesticides can degrade habitat quality at the local-field level, while the conversion of perennial habitats (grassland) to arable fields, as well as the destruction of field boundaries and hedges, results in the loss of semi-natural habitats and simplification at the landscape level, including changes in the distribution and supply of resources for many species and the food webs that depend on them.[89] Biodiversity is valued at

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'New Agricultural Biodiversity Project to Improve Nutrition and Food Security Worldwide | GEF' <*https://www.thegef.org/newsroom/press-releases/new-agricultural-biodiversity-project-improve-nutrition-and-food-security*> accessed 21 December 2021.

[85] 'What Is Biological Control?' <*https://biocontrol.entomology.cornell.edu/what.php*> accessed 21 December 2021.

[86] Le Roux, X., R. Barbault, J. Baudry, F. Burel, I. Doussan, E. Garnier, F. Herzog et al. "Agriculture and biodiversity: benefiting from synergies. Multidisciplinary Scientific Assessment." *Synthesis Report, INRA (France)* (2008), p.1.

[87] Ibid, p.2.

[88] Kleijn, D., F. Kohler, A. Báldi, P. Batáry, E. D. Concepción, Y. Clough, M. Díaz et al. "On the relationship between farmland biodiversity and land-use intensity in Europe." *Proceedings of the Royal Society of London B: Biological Sciences* 276, no. 1658 (2009): 903-909, p.903.

[89] Thies, Carsten, Sebastian Haenke, Christoph Scherber, Janne Bengtsson, Riccardo Bommarco, Lars W. Clement, Piotr Ceryngier et al., "The relationship between agricultural intensification and biological control: experimental tests across Europe." *Ecological Applications* 21, no. 6 (2011): 2187-2196, p. 2187.

all scales of the agricultural landscape, from soil bacteria that assist cycle nutrients and decompose organic matter, to wasps and bats that help decrease crop pests, to birds and insects that pollinate high-value crops.[90] Not only does maintaining biodiversity aid crop productivity, but many organisms and species have evolved to rely on specific agricultural environments for their very survival. Agriculture, in other words, both supports and is supported by biodiversity preservation.[91] To this end, biological pest control in arable fields is a vital ecosystem service given by high-diversity landscapes and species-rich enemy populations, but it is vulnerable to agricultural intensification.[92]

5. Conclusion

Law and regulations are key tools in the conservation of environmental and biological resources because they define rights and responsibilities and function as a deterrent to individuals who would engage in actions that harm these resources.[93] The law establishes the required framework within which all stakeholders can collaborate in the conservation of natural resources, both for the sake of the environment and to meet human needs. The international and regional legal instruments on biodiversity conservation recognize biodiversity's potential to aid in the achievement of various Sustainable

[90] GRACE Communications Foundation, Biodiversity, available at *http://www.sustainabletable.org/268/biodiversity*.

[91] Ibid.

[92] Thies, Carsten, Sebastian Haenke, Christoph Scherber, Janne Bengtsson, Riccardo Bommarco, Lars W. Clement, Piotr Ceryngier et al., "The relationship between agricultural intensification and biological control: experimental tests across Europe." *Ecological Applications* 21, no. 6 (2011): 2187-2196, p. 2187.

[93] Richardson BJ and Wood S, 'Environmental Law for Sustainability'; Prip C, 'The Convention on Biological Diversity as a Legal Framework for Safeguarding Ecosystem Services' (2018) 29 Ecosystem Services 199; Van Dyke F (ed), 'The Legal Foundations of Conservation Biology', *Conservation Biology: Foundations, Concepts, Applications* (Springer Netherlands 2008) <https://doi.org/10.1007/978-1-4020-6891-1_3> accessed 15 September 2021; Fischer F, 'The Importance of Law Enforcement for Protected Areas: Don't Step Back! Be Honest - Protect!' (2008) 17 GAIA - Ecological Perspectives for Science and Society 101; McDonald, J., McCormack, P.C., Dunlop, M., Farrier, D., Feehely, J., Gilfedder, L., Hobday, A.J. and Reside, A.E., 'Adaptation Pathways for Conservation Law and Policy' (2019) 10 Wiley Interdisciplinary Reviews: Climate Change e555; de Klemm, C. and Shine, C. (1993), *Biological Diversity Conservation and the Law*, IUCN, Gland, Switzerland and Cambridge, UK. xix + 292 pp.

Development Goals (SDGs), particularly those related to food systems, as it is clear that global food production improvements are failing to meet human nutrition needs and feed the planet in a healthy, sustainable, and environmentally friendly manner.[94]

This paper explored ways in which countries can embark on mainstreaming biodiversity conservation issues as part of their response to food and nutrition security challenges. The preservation of biodiversity is a prerequisite for attaining long-term development. As a result, it must be mainstreamed into all sectors and across sectors.[95]

Dietary diversity, which is based on a variety of farming techniques, results in better nutrition and health, as well as benefits to human productivity and livelihoods.[96] It is imperative that the focus on food security also shifts to biodiversity conservation and exploring the link between the two areas as part of enhancing the mutual benefits that arise from this approach. Biodiversity is mainstreamed to ensure that meeting development demands and safeguarding the environment are not mutually exclusive, but that development is accompanied by the sustainable use of natural resources.[97]

Investing in research and innovation as well as diversification and embracing traditional foods for enhancing dietary needs of communities in Kenya are bold steps that would move the country closer to achieving SDGs on food

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[94] Beltrame, D., Gee, E., Guner, B., Lauridsen, N., Samarasinghe, W.L.G., Wasike, V., Hunter, D. and Borelli, T., 'Mainstreaming Biodiversity for Food and Nutrition into Policies and Practices: Methodologies and Lessons Learned from Four Countries' (2019) 29 ANADOLU Ege Tarımsal Araştırma Enstitüsü Dergisi 25, at 25.

[95] 'Mainstreaming Biodiversity' (*IUCN*, 8 February 2016) <*https://www.iucn.org/theme/global-policy/our-work/mainstreaming-biodiversity*> accessed 21 December 2021.

[96] 'New Agricultural Biodiversity Project to Improve Nutrition and Food Security Worldwide | GEF' <*https://www.thegef.org/newsroom/press-releases/new-agricultural-biodiversity-project-improve-nutrition-and-food-security*> accessed 21 December 2021.

[97] 'Mainstreaming Biodiversity' (*SANBI*) <*https://www.sanbi.org/biodiversity/science-into-policy-action/mainstreaming-biodiversity/*> accessed 21 December 2021.

and nutritional security as well as biodiversity conservation for the sake of present and future generations.

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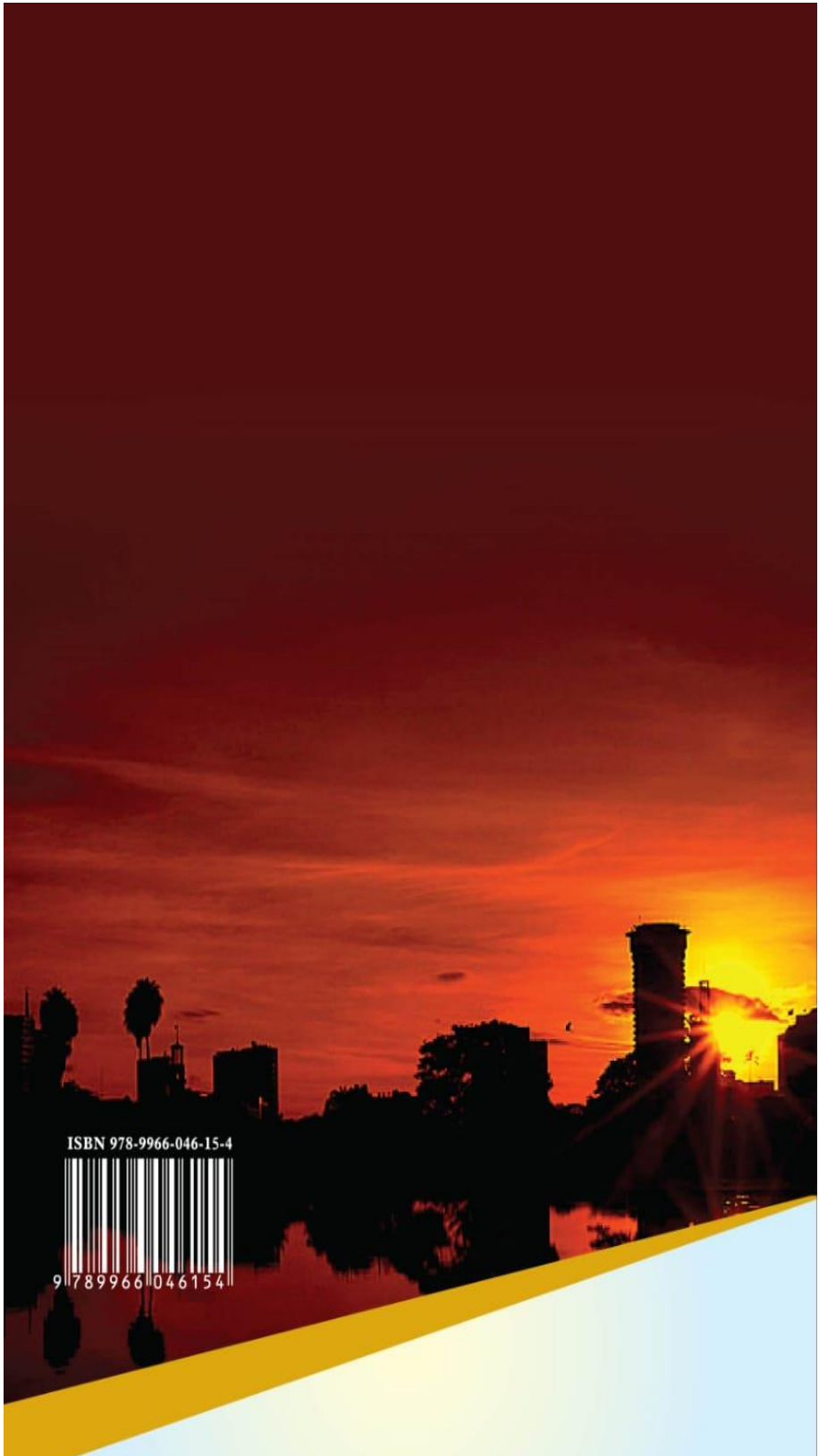
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