

Africa Pathway to Food Systems Transformation: Challenges and Opportunities

JOHN M. ULIMWENGU

Senior Research Fellow, International Food Policy Research Institute
Email: j.ulimwengu@cgiar.org

Abstract

This paper explores the pathways to transforming food systems in Africa, focusing on the challenges and opportunities that lie ahead. It examines the current state of food systems, highlighting issues such as food and nutrition security, environmental degradation, low agricultural productivity, limited availability and adoption of yield-increasing technologies, high malnutrition rates, violent conflicts and threats to peace and security, and inadequate governance. The paper emphasizes the need for policy reform, technological innovation, and capacity building to drive sustainable and inclusive food systems. Key drivers of change include policies promoting sustainable practices, increased funding for agricultural research, and improved market access through infrastructure development and trade policies. Good governance practices, including transparency, accountability, and inclusive decision-making, are crucial for effective policy implementation and stakeholder collaboration. Recommendations include empowering women and youth, supporting community-led initiatives, and leveraging the African Continental Free Trade Area (AfCFTA) to enhance intra-African trade. By adopting these strategies, Africa can build resilient, equitable, and sustainable food systems.

Keywords: Food, System, Transformation, Agriculture, Nutrition, Productivity

Introduction

Africa's food systems, which encompasses the entire range of activities and processes involved in the production, processing, distribution, consumption, and disposal of food within the continent are at a critical

juncture, requiring transformative change to achieve sustainable development and address persistent food and nutrition insecurity. The 2021 UN Food Systems Summit underscored the necessity of restructuring food systems globally, with a particular focus on Africa due to its unique challenges and vast potential. This paper explores the pathways for transforming food systems in Africa, identifying the key challenges and opportunities that lie ahead. Africa is home to some of the world's fastest-growing populations, and its food systems are under increasing pressure to meet the demands of this demographic surge. As Sibanda and Mwamakamba (2021) emphasize, sustainable and inclusive food systems are essential for achieving the Sustainable Development Goals (SDGs). The SDGs, particularly Goal 2, which aims to end hunger, achieve food security, and promote sustainable agriculture, are closely linked to the health and efficiency of food systems. In Africa, achieving these goals is contingent upon overcoming significant challenges, such as climate change, resource scarcity, and socio-economic inequalities, while leveraging opportunities for innovation and growth.

The 2021 UN Food Systems Summit provided valuable insights and recommendations that are crucial for guiding Africa's food systems transformation. One of the key lessons from the Summit is the importance of adopting a holistic approach that integrates environmental sustainability, economic viability, and social inclusivity. The Summit highlighted the need for comprehensive strategies that address the entire food value chain, from production to consumption, and promote the resilience and adaptability of food systems in the face of changing climatic conditions and other external shocks.

Another critical recommendation from the Summit is the enhancement of local capacities and the empowerment of smallholder farmers, who form the backbone of Africa's agricultural sector. Smallholder farmers, often marginalized and resource-constrained, play a pivotal role in ensuring food security. Supporting these farmers through access to technology, finance, and markets is essential for driving productivity and sustainability. The Summit also stressed the importance of gender equity and the inclusion of women and youth in the food systems transformation process. Women, who constitute a significant portion of the agricultural workforce, must be given equal opportunities and resources to contribute effectively to food production and innovation.

The objective of this paper is to examine the challenges and opportunities associated with the transformation of food systems in Africa. It aims to provide a comprehensive analysis of the current state of food systems, identify the key barriers to sustainable development, and explore innovative solutions that can drive change. By focusing on both challenges and opportunities, the paper seeks to offer actionable recommendations for policymakers, development practitioners, and other stakeholders involved in shaping the future of food systems in Africa. Food systems transformation in Africa involves addressing multiple interconnected challenges. Climate change poses a significant threat to agricultural productivity and food security, with increasing temperatures, erratic rainfall patterns, and extreme weather events affecting crop yields and livestock production. Additionally, land degradation and water scarcity exacerbates the vulnerability of food systems. Socio-economic factors, such as poverty, inequality, and inadequate infrastructure, further complicate the situation, limiting access to food and agricultural resources for many communities.

Africa indeed has immense potential for transforming its food systems, driven by its rich natural resources, demographic advantages, and innovative agricultural practices. The continent possesses about 60% of the world's uncultivated arable land, representing a significant opportunity for expanding agricultural production (FAO 2019). Africa's young and dynamic population represents a significant opportunity for transforming its food systems. As of 2023, Africa's population is estimated to be over 1.4 billion, with about 70% of the population under the age of 30 (World Economic Forum 2023). This youthful demographic presents a substantial labor force that can drive agricultural innovation and entrepreneurship, crucial for enhancing food security and economic development across the continent.

Innovations in agriculture are increasingly being adopted across Africa to enhance productivity and resilience. Climate-smart farming practices, such as conservation agriculture, agroforestry, and integrated pest management, are being implemented to mitigate the impacts of climate change while improving yields (World Bank 2020). The use of digital technologies, such as mobile apps for market information, precision farming tools, and blockchain for supply chain transparency, is also on the rise, providing farmers with better access to markets and resources (IFAD 2019).

Sustainable land management practices, including soil fertility enhancement, water conservation, and sustainable irrigation, are critical for maintaining the productivity of Africa's vast arable land. These practices

help combat land degradation and promote the sustainable use of natural resources, which is vital for long-term food security (UNCCD 2018). Moreover, regional cooperation and integration play a crucial role in transforming Africa's food systems. The African Continental Free Trade Area (AfCFTA), which came into effect in 2021, aims to create a single market for goods and services, facilitating market access and promoting the sharing of knowledge, resources, and best practices among African countries. This collaborative approach can significantly boost agricultural productivity, improve food security, and foster economic growth across the continent.

The increasing violent conflicts and encroachment of farming lands by nomads and herders have critically impacted Africa's food systems, particularly in Nigeria. These conflicts disrupt agricultural productivity, displace farming communities, and exacerbate food insecurity. Violent clashes between herders and farmers, often stemming from the encroachment of herding routes onto farmlands, have intensified in Nigeria over the past decade, reducing agricultural output as farmers fear returning to their lands (International Crisis Group, 2017).

Nomadic pastoralism, characterized by the movement of herders and livestock in search of grazing lands, further complicates the agricultural landscape in West Africa. This migration frequently leads to the destruction of crops and increased tensions between farmers and herders, disrupting food production (Ekpemerechi 2020). The cycle of conflict and retaliation, as outlined by Idris and Najmudeen (2020), creates an environment of fear and instability that hinders effective farming and resource management.

The political ecology perspective, as discussed by Okoli and Atelhe (2014), reveals deeper structural issues, including competition over resources and weak governance, which exacerbate these conflicts. These disputes often result in violent confrontations and displacement of farming communities, further worsening food insecurity. In Ghana, similar dynamics are observed, with farmer-herder conflicts leading to displacement and abandonment of fertile lands (Olaniyan and Okeke-Uzodike 2015).

Benjaminsen and Alinon (2011) emphasize that climate change and resource scarcity in the Sahel region continues to exacerbate tensions between farmers and pastoralists, significantly affecting food security. Addressing these challenges requires integrated strategies that promote sustainable agricultural practices, secure land tenure, and enhance community resilience to ensure long-term food security in Africa.

Transforming food systems in Africa is a complex but essential endeavor for achieving sustainable development and addressing food insecurity. By building on the lessons and recommendations from the 2021 UN Food Systems Summit, and leveraging the continent's unique strengths and opportunities, stakeholders can work together to create sustainable, inclusive, and resilient food systems. This paper aims to contribute to this ongoing effort by providing a detailed examination of the challenges and opportunities that define Africa's pathways to food systems transformation.

Current state of food systems in Africa

Food systems in Africa are characterized by a complex interplay of challenges that span environmental, economic, social, and political dimensions. Despite notable progress in some areas, the continent continues to face significant hurdles that impede the achievement of food and nutrition security, food safety, and sustainability. This section explores the current state of food systems in Africa, examining the multifaceted challenges that must be addressed to transform these systems effectively.

Food and nutrition security remain critical concerns across Africa. High levels of malnutrition and food insecurity affect millions of people, particularly in sub-Saharan Africa. According to Gashu *et al.* (2019), malnutrition is prevalent, with a significant portion of the population experiencing stunting, wasting, and micronutrient deficiencies. These issues are exacerbated by poverty, limited access to nutritious foods, inadequate land governance, lack of knowledge on nutritional benefits and combinations, and inadequate health services. Ensuring food security requires a concerted effort to improve agricultural productivity, enhance food distribution networks, and provide better nutrition education to communities. Food safety and sustainability are also pressing issues in African food systems. Unsafe food practices and inadequate food safety standards pose serious health risks. Contaminated food can lead to foodborne illnesses, which are a major public health concern.

The environmental challenges facing Africa's food systems are profound. Unsustainable agricultural practices have led to severe land degradation and a decline in soil fertility. Kalibata (2022) notes that these practices not only degrade the environment but also reduce the resilience of food systems to climate change. Climate change further exacerbates these issues by causing erratic weather patterns, prolonged droughts, and extreme weather events, which negatively impact crop yields and livestock

production. Climate change has significantly impacted Africa's agricultural sector, contributing to reduced crop yields, increased pests and diseases, and more frequent extreme weather events. The Intergovernmental Panel on Climate Change (IPCC) reports that climate change could reduce crop yields in sub-Saharan Africa by up to 50% by 2050, exacerbating food insecurity (IPCC 2019). Droughts, which have become more frequent and severe due to climate change, currently affect about 40% of the continent's population, particularly impacting rain-fed agriculture that accounts for over 95% of the farmland in sub-Saharan Africa (FAO 2020). Additionally, climate-induced changes in rainfall patterns have led to soil erosion and nutrient depletion, further diminishing agricultural productivity and threatening the livelihoods of millions of smallholder farmers across the region.

Economically, Africa's food systems are hindered by low agricultural productivity and insufficient investment. Opara (2013) points out that many farmers lack access to modern farming technologies, quality inputs, and financial services, which limits their productivity. Additionally, inadequate infrastructure, such as poor road networks, especially feeder roads, and lack of storage facilities, hampers the efficient distribution of food. Investment in agriculture is crucial for improving productivity, enhancing value chains, and fostering economic growth. Policymakers must prioritize investments in agricultural research and development, rural infrastructure, and access to credit for farmers.

Social challenges, including high levels of malnutrition and food insecurity, are pervasive in Africa. Gashu *et al.* (2019) emphasize that these issues are intertwined with poverty, inequality, and inadequate social protection systems. Vulnerable populations, such as women and children, are disproportionately affected. Addressing these social challenges requires a multifaceted approach that includes improving social safety nets, enhancing education and awareness programs, and promoting gender equality in agriculture.

Political challenges, such as policy inadequacies and poor governance, further complicate the state of food systems in Africa. Jordaan (2017) argues that weak institutional frameworks, corruption, and lack of political will hinder effective policy implementation. Policy incoherence and inadequate support for agricultural development undermine efforts to achieve food security and sustainability. Strengthening governance, improving policy coherence, and enhancing institutional capacities are

essential for creating an enabling environment for food systems transformation.

The current state of food systems in Africa is marked by a range of challenges that require urgent attention and coordinated action. Addressing food and nutrition security, ensuring food safety and sustainability, tackling environmental degradation, boosting economic productivity, overcoming social inequities, and improving political governance are critical steps towards transforming Africa's food systems. By addressing these interconnected challenges, stakeholders can pave the way for a more resilient, sustainable, and equitable food system in Africa. The COVID-19 pandemic has severely disrupted food supply chains across Africa, leading to reduced household incomes, increased food prices, and exacerbated food insecurity and malnutrition. According to the International Food Policy Research Institute (IFPRI) (2021), the pandemic caused widespread disruptions in transportation, labor availability, and market access, which significantly affected food production and distribution. As a result, many households experienced reduced purchasing power, further straining their ability to access adequate and nutritious food. The economic fallout from the pandemic exposed and amplified existing vulnerabilities within Africa's food systems, highlighting the need for more resilient and inclusive food policies that can withstand future shocks and ensure food security for all.

The need for transformation

Africa's food systems are at a critical point where transformation is not just necessary but imperative for sustainable development and food security. The complexity of challenges facing these systems—ranging from environmental degradation to socio-economic disparities—requires a multifaceted approach driven by policy reform, technological innovation, and capacity building. This section explores the drivers of change essential for transforming Africa's food systems and underscores the urgent need for a comprehensive overhaul to ensure a resilient and sustainable future.

Drivers of change

One of the primary drivers of food systems transformation in Africa is the reform of agricultural policies. Chukwuemeka *et al.* (2023) emphasize the necessity for policies that support sustainable agricultural practices and stimulate investment in agricultural research and development (R&D). Effective policies can create an enabling environment that encourages

innovation, improves access to resources, and promotes sustainable land management practices. Moreover, policies should focus on enhancing infrastructure, providing financial incentives for sustainable farming practices, and ensuring that smallholder farmers have access to markets. Without robust policy frameworks, efforts to transform food systems will likely fall short of achieving significant and lasting impact.

Technological innovation is another critical driver of change in Africa's food systems. The adoption of climate-smart agriculture and digital technologies can significantly enhance productivity and resilience. Abbott *et al.* (2021) highlight the importance of integrating climate-smart practices such as the use of drought-resistant crops and sustainable water management techniques. These practices not only mitigate the adverse effects of climate change but also improve agricultural yields and sustainability. Additionally, the integration of digital technologies, including mobile applications and blockchain, can revolutionize market access and supply chain transparency and traceability. Checco *et al.* (2021) demonstrate how mobile technology can facilitate better market linkages for farmers, providing them with real-time information on prices and demand, thereby improving their bargaining power and income.

Empowering local communities, particularly women and youth, is crucial for the successful transformation of food systems. Pretorius and Schönfeldt (2023) argue that capacity building initiatives that focus on enhancing the skills and knowledge of local populations are vital. Women and youth, who play significant roles in agriculture, must be provided with opportunities to participate in decision-making processes and access resources. Training programs, educational initiatives, and financial support can help these groups adopt innovative farming practices and contribute to the overall resilience of food systems. By building local capacity, communities become more self-reliant and better equipped to face future challenges.

The private sector plays a crucial role in driving innovation and investment in food systems, yet its potential is often underappreciated. Developing meaningful partnerships between governments, NGOs, and private companies is essential for fostering sustainable growth and development in agriculture. These partnerships leverage the strengths of each stakeholder: governments provide regulatory frameworks and support, NGOs facilitate community engagement and promote equitable practices,

and private companies bring resources, expertise, and technological innovation to enhance productivity and supply chain efficiency. Such collaboration can transform food systems to become more resilient, inclusive, and sustainable, addressing the growing challenges of food security. By working together, these entities can create a dynamic food ecosystem that encourages investment, advances technology, and supports sustainable agricultural practices, ultimately contributing to economic growth and improved livelihoods.

Sustainable practices and innovations

Climate-smart agriculture (CSA) encompasses a range of practices designed to increase agricultural productivity, enhance resilience to climate change, and reduce greenhouse gas emissions. Garrity *et al.* (2010) outline several CSA practices, including the use of drought-resistant crops, efficient water management techniques, and agroforestry. These practices help farmers adapt to changing climatic conditions while maintaining or improving productivity. Pretty (1999) highlights the impact of CSA on agricultural outputs, noting that sustainable farming practices lead to enhanced resilience and productivity. By adopting CSA, farmers can mitigate the risks associated with climate variability and contribute to environmental sustainability. Integrating artificial intelligence (AI) into CSA can further enhance these practices by providing advanced data analytics, predictive modeling, and real-time monitoring. AI technologies can optimize water usage, predict weather patterns, and manage pest and disease outbreaks more efficiently, thus improving decision-making processes for farmers. By adopting CSA combined with AI tools, farmers can better mitigate the risks associated with climate variability, enhance productivity, and contribute to environmental sustainability.

The integration of technology into agriculture offers promising solutions for improving efficiency and productivity. Mobile technology, for instance, plays a pivotal role in enhancing market access and supply chain transparency. Checco *et al.* (2021) discuss how mobile applications can provide farmers with crucial market information, enabling them to make informed decisions and secure better prices for their products. Blockchain technology further enhances supply chain transparency by providing a tamper-proof record of transactions, which builds trust among stakeholders and ensures fair trade practices. For instance, in Nigeria, the digital platform **Farmcrowdy** has revolutionized agriculture by enabling smallholder farmers

to gain access to finance, high-quality inputs, and a broader market reach, resulting in a 50% increase in yields and income (Agyemang, 2022). Similarly, in East Africa, the mobile application **Digifarm** by Safaricom has reached over 1.3 million farmers, providing them with access to market prices, weather information, and digital financial services, leading to improved productivity and better market prices (World Bank, 2023). In Ghana, the use of blockchain technology by the startup **AgroCenta** has enhanced supply chain transparency, reduced transaction costs, and ensured fair trade practices, which helped reduce post-harvest losses by 20% (FAO, 2023).

Biotechnology is another area where technological innovation can drive food systems transformation. Chan *et al.* (2021) emphasize the role of biotechnology in crop improvement, including the development of genetically modified crops that are resistant to pests, diseases, and environmental stresses. These advancements can lead to increased yields and reduced reliance on chemical inputs, promoting both productivity and sustainability. By harnessing the potential of biotechnology, Africa can address food security challenges more effectively and sustainably.

The transformation of food systems in Africa is an urgent necessity driven by the need for policy reform, technological innovation, and capacity building. Effective policies that support sustainable practices and investment in R&D, coupled with the adoption of climate-smart agriculture and digital technologies, can significantly enhance the resilience and productivity of Africa's food systems. Empowering local communities, particularly women and youth, is crucial for ensuring that these transformations are inclusive and sustainable. By embracing these drivers of change, Africa can pave the way for a more secure and sustainable food future, addressing the myriad challenges that currently hinder its food systems.

Toward inclusive and equitable food systems

Transforming Africa's food systems necessitates a focus on inclusivity and equity to ensure that all segments of the population benefit from agricultural advancements and food security initiatives. Empowerment strategies, fair trade practices, and leveraging regional agreements such as the African Continental Free Trade Area (AfCFTA) are pivotal in fostering inclusive and equitable food systems. This section delves into the strategies and policies needed to achieve these goals and examines how the AfCFTA

can be a catalyst for broader food systems transformation across the continent.

Empowerment strategies

Empowering women and youth is essential for creating inclusive food systems. Women and youth constitute a significant portion of the agricultural workforce in Africa, yet they often face barriers to participation and decision-making. Ripoll et al. (2017) emphasize the importance of including women and youth in agricultural activities and decision-making processes. Providing these groups with access to resources, training, and leadership opportunities can enhance their contributions to food systems. Empowerment strategies should include gender-sensitive policies that address the unique challenges faced by women, such as access to land, credit, and education. Similarly, youth empowerment programs should focus on skill development, entrepreneurship, and technological literacy to enable young people to drive innovation in agriculture. Large-scale farmers can play a vital role in supporting smallholder farmers through the implementation of local content policies and national supplier programs. These initiatives encourage large-scale agricultural enterprises to source inputs and services locally, thereby promoting the inclusion of smallholder farmers in value chains. For example, in Nigeria, the *Anchor Borrowers' Programme* has successfully linked large-scale agribusinesses with smallholder farmers, providing them with credit, high-quality seeds, and technical assistance, resulting in a 30% increase in productivity among participating smallholders (CBN, 2022). Similarly, in Kenya, the *National Agriculture and Rural Inclusive Growth Project* (NARIGP) has facilitated partnerships between large commercial farmers and smallholder groups to improve access to markets, enhance technical skills, and increase income (World Bank, 2023). These collaborative efforts help build the capacities of smallholder farmers, ensuring they have the tools, knowledge, and market access needed to thrive in competitive agricultural markets.

Community-led initiatives play a crucial role in promoting inclusive and equitable food systems. Mabhaudhi *et al.* (2018) highlight the significance of training and supporting local agribusinesses to build resilient food systems. These initiatives often involve capacity building, providing technical assistance, and fostering cooperative models that allow smallholder farmers to pool resources and market their products collectively. By empowering communities to take ownership of their agricultural

development, these initiatives can create sustainable livelihoods and improve food security at the local level. Additionally, community-led approaches ensure that interventions are culturally relevant and responsive to the specific needs of the community.

Fair trade practices

Developing and implementing policies that support fair trade practices is essential for ensuring that African farmers benefit from global agricultural markets. Saghir (2014) argues that fair trade policies should focus on equitable pricing, transparency, and ethical trade standards. Governments and policymakers need to establish frameworks that protect farmers from exploitative practices and ensure that they receive a fair share of the value generated from their produce. These policies should also promote sustainable farming practices and encourage certification schemes that recognize and reward ethical production methods. By supporting fair trade, Africa can improve the livelihoods of its farmers and foster more equitable food systems.

The African Continental Free Trade Area (AfCFTA) presents a significant opportunity to enhance inclusivity and equity in Africa's food systems. AfCFTA aims to create a single continental market for goods and services, promoting intra-African trade and economic integration. By leveraging AfCFTA, Africa can overcome many of the barriers that currently hinder the development of equitable food systems.

First, AfCFTA can facilitate the reduction of trade barriers, such as tariffs and non-tariff measures, which often disproportionately affect smallholder farmers and agribusinesses. By creating a more accessible and integrated market, AfCFTA can help these stakeholders reach new markets, increase their income, and improve food security. Additionally, regional trade agreements under AfCFTA can harmonize food safety and quality standards, ensuring that agricultural products meet the requirements of multiple markets and enhancing the competitiveness of African produce.

Secondly, AfCFTA can promote investment in infrastructure and logistics, which are critical for efficient food distribution. Improved transportation networks, storage facilities, and market infrastructure can reduce post-harvest losses and ensure that food reaches consumers more

effectively. By addressing these logistical challenges, AfCFTA can enhance the resilience and efficiency of food systems across the continent.

Finally, AfCFTA can support the development of value chains that add value to agricultural products within Africa, rather than exporting raw commodities. This can create jobs, stimulate local economies, and ensure that a greater portion of the economic benefits of agriculture are retained within the continent. By fostering value addition and industrialization, AfCFTA can contribute to more inclusive economic growth and development.

Creating inclusive and equitable food systems in Africa requires a comprehensive approach that empowers women and youth, supports community-led initiatives, and promotes fair trade practices. The African Continental Free Trade Area (AfCFTA) offers a unique opportunity to drive these changes by facilitating trade, improving infrastructure, and enhancing value chains. By implementing these strategies and leveraging regional cooperation, Africa can build food systems that are not only productive and sustainable but also inclusive and equitable, ensuring that all segments of society benefit from agricultural development.

Building enabling environment

Creating an enabling environment is essential for the transformation of food systems in Africa. This environment encompasses policy and regulatory frameworks, infrastructure development, and trade policies that collectively support sustainable practices, enhance market access, and promote agricultural research and innovation. By fostering such an environment, Africa can address the myriad challenges facing its food systems and unlock significant opportunities for growth and development.

Policy frameworks

Policy frameworks that promote sustainable agricultural practices are critical for the long-term viability of Africa's food systems. Sustainable practices ensure that agricultural activities do not deplete natural resources or cause environmental degradation. Chukwuemeka *et al.* (2023) emphasize the necessity of policies that incentivize sustainable land use, conservation agriculture, and the adoption of climate-smart farming techniques. Such policies can include subsidies for sustainable inputs, tax breaks for environmentally friendly practices, and penalties for practices that harm the

environment. By aligning financial incentives with sustainable outcomes, governments can encourage farmers to adopt practices that enhance soil health, conserve water, and increase biodiversity.

Investing in agricultural research is another key component of an enabling environment. Increased funding and support for agricultural research can lead to the development of innovative solutions that address specific challenges faced by African farmers. Opara (2013) highlights the importance of research in improving crop yields, developing pest-resistant varieties, and enhancing resilience to climate change. Governments and international organizations should prioritize funding for agricultural research institutions, facilitate partnerships between researchers and farmers, and promote the dissemination of research findings. By bridging the gap between research and practice, policymakers can ensure that innovative solutions reach those who need them most.

Market access

Enhancing infrastructure is crucial for improving market access for smallholder farmers, who often face significant barriers in getting their products to market. Gashu *et al.* (2019) point out that poor road networks, inadequate storage facilities, and unreliable electricity supplies are major obstacles that limit farmers' ability to sell their produce at competitive prices. Infrastructure development should focus on building and maintaining rural roads, establishing cold storage and processing facilities, and ensuring reliable access to electricity and water. These improvements can reduce post-harvest losses, lower transportation costs, and enable farmers to access broader markets, thereby increasing their incomes and contributing to food security.

Implementing trade policies that facilitate intra-African trade and reduce barriers is essential for creating a more integrated and competitive agricultural market. Pasco (2019) argues that trade policies should aim to eliminate tariffs, reduce non-tariff barriers, and harmonize standards across countries. The African Continental Free Trade Area (AfCFTA) provides a framework for such policies, promoting the free movement of goods and services across the continent. By leveraging AfCFTA, African countries can create larger markets for their agricultural products, encourage regional value chains, and attract investment in the agricultural sector. Trade policies should also support smallholder farmers by providing them with

information on market opportunities and helping them comply with export standards.

The relationship between meteorology, agriculture, and food safety is crucial for the "farm to fork" model and the "Made in Africa" agenda. Accurate meteorological data is essential for farmers to optimize planting, protect crops from extreme weather, and reduce contamination risks, thereby ensuring high-quality produce (FAO, 2023). Understanding weather patterns helps predict pest and disease outbreaks, allowing timely interventions that uphold food safety (IPPC, 2022). Consumer needs are central, as there is a demand for safe, high-quality food that meets international standards. Phytosanitary measures, such as controlling pests and diseases, are vital for maintaining food quality and safety, especially for agricultural exports (WTO, 2022). By integrating meteorological insights, consumer demands, and phytosanitary standards, Africa can enhance its "farm to fork" approach, ensuring its agricultural products are safe, competitive, and aligned with the "Made in Africa" brand.

An enabling environment is fundamental for the transformation of Africa's food systems. By establishing supportive policy frameworks, investing in agricultural research, enhancing infrastructure, and implementing effective trade policies, African countries can create conditions that allow their food systems to thrive. Policies that promote sustainable practices and investments can ensure that agricultural activities are environmentally sound and economically viable. Increased funding for agricultural research can drive innovation and address specific challenges faced by farmers. Improved infrastructure can enhance market access, reduce costs, and increase the competitiveness of African agricultural products. Finally, trade policies that facilitate intra-African trade can create larger and more integrated markets, benefiting both producers and consumers. Together, these elements can help build resilient, inclusive, and sustainable food systems across the continent.

Governance for food systems transformation

Effective governance is a cornerstone for transforming food systems in Africa. It ensures that the policies and strategies designed to enhance food security, sustainability, and inclusivity are implemented efficiently and equitably. Good governance practices, including transparency, accountability, and inclusive decision-making, are critical for building trust

and fostering collaboration among stakeholders. This section explores the elements of good governance and the importance of policy implementation in driving food systems transformation.

Good governance practices

Transparency and accountability are fundamental principles of good governance that are essential for building trust within food systems. Transparent governance structures ensure that decisions and actions taken by authorities are open to scrutiny and that stakeholders can hold those in power accountable. Jordaan (2017) emphasizes that transparency in governance helps to prevent corruption, reduce inefficiencies, and promote the fair distribution of resources. For instance, making budget allocations and policy decisions publicly available allows stakeholders to understand how resources are being utilized and whether they align with the goals of food security and sustainability. Accountability mechanisms, such as regular audits and public reporting, ensure that policymakers and implementers are held responsible for their actions, fostering a culture of integrity and trust.

The continent must promote inclusive decision-making by engaging all stakeholders, particularly marginalized groups, in the governance processes of food systems. This approach ensures that the needs and perspectives of all community members are considered, leading to more equitable and effective outcomes. Pretorius and Schönfeldt (2023) argue that involving women, youth, smallholder farmers, and indigenous communities in decision-making processes can enhance the relevance and acceptance of policies and initiatives. Participatory governance models, such as community councils and stakeholder forums, provide platforms for diverse voices to be heard and for collaborative solutions to be developed. By fostering inclusivity, governance structures can address the unique challenges faced by different groups and promote more resilient and adaptive food systems.

Policy implementation

The development of effective policies is only the first step in food systems transformation; ensuring their implementation and monitoring is equally crucial. Kalibata (2022) highlights that policies must be designed with clear objectives, actionable steps, and measurable indicators to facilitate their execution and evaluation. Governments should establish robust

monitoring and evaluation frameworks to track policy implementation and assess their impact on food security, sustainability, and equity. Regular reviews and adjustments based on feedback and performance data can help refine policies and ensure they remain relevant and effective. Moreover, allocating adequate resources and building the capacity of implementing agencies are vital for translating policy goals into tangible outcomes.

Trade policies play a crucial role in advancing Africa's agricultural sector and overall economic growth. Policies promoting regional integration, such as those under the African Continental Free Trade Area (AfCFTA), aim to remove trade barriers, standardize tariffs, and create a single market for goods and services. By fostering intra-African trade, these policies enhance market access for African farmers and agribusinesses, enabling them to compete more effectively and increase export revenues (UNECA, 2023). Trade policies that support agricultural exports and safeguard domestic markets can stimulate local economies, drive investment in agriculture, and promote food security across the continent. Developing robust trade frameworks is essential for building resilient food systems that can withstand global market fluctuations.

Industrialization policies are vital for transforming Africa's agricultural sector by promoting value addition and diversifying economies. Agro-industrialization policies focus on developing processing facilities and value chains that convert raw agricultural produce into finished goods, thereby increasing the economic value of agricultural outputs. Policies supporting the establishment of agro-processing zones and special economic zones (SEZs) encourage investments in infrastructure, technology, and skills development (AfDB, 2022). These policies not only create employment opportunities but also reduce post-harvest losses and enhance food security. Encouraging industrial growth through targeted policies can help Africa reduce its dependency on raw commodity exports and build more sustainable, self-reliant economies.

Infrastructure policies are critical for improving agricultural productivity and market access. Policies that prioritize investment in transport networks, energy supply, water management, and digital infrastructure are essential for reducing the costs associated with moving goods to market and ensuring timely access to inputs and services (World Bank, 2022). Infrastructure policies should focus on building rural roads, irrigation systems, storage facilities, and electricity access to support

agricultural activities and reduce post-harvest losses. By developing robust infrastructure, African governments can facilitate better integration of smallholder farmers into local, regional, and global markets, thereby enhancing food security and economic growth.

STI policies are essential for driving agricultural transformation and enhancing food security in Africa. These policies promote research and development (R&D) and encourage the adoption of innovative agricultural practices, such as precision farming, biotechnology, and digital tools, to increase productivity and resilience (NEPAD, 2023). Effective STI policies facilitate the dissemination of technology and knowledge among smallholder farmers, enhancing their capacity to adapt to climate change and other challenges. Policies that support public-private partnerships in R&D and technology transfer can accelerate innovation and ensure that new technologies are accessible and affordable for all farmers. Integrating STI into agricultural policies is crucial for building a dynamic and sustainable agricultural sector in Africa.

There is a need for collaborative governance that involves the active cooperation of various stakeholders, including governments, the private sector, and civil society, in the management and transformation of food systems. Opara (2013) underscores the importance of multi-stakeholder collaboration in addressing the complex and interconnected challenges of food security and sustainability. Collaborative governance models facilitate the pooling of resources, knowledge, and expertise, leading to more comprehensive and innovative solutions. For example, public-private partnerships can leverage the strengths of both sectors to improve agricultural productivity, enhance market access, and drive technological innovation. Similarly, engaging civil society organizations can ensure that community needs are addressed, and that governance processes are transparent and accountable.

Governance for food systems transformation in Africa requires a multifaceted approach that emphasizes good governance practices and effective policy implementation. Transparency and accountability are essential for building trust and ensuring that resources are used efficiently and equitably. Inclusive decision-making processes can enhance the relevance and acceptance of policies by considering the diverse needs of all stakeholders. Ensuring that policies are effectively implemented and monitored is crucial for achieving desired outcomes in food security and

sustainability. Finally, collaborative governance models that involve governments, the private sector, and civil society can drive holistic and innovative solutions to the challenges facing Africa's food systems. By embracing these principles and practices, Africa can build resilient, inclusive, and sustainable food systems that meet the needs of its growing population.

Conclusion and recommendations

The transformation of Africa's food systems is critical for achieving sustainable development, food security, and inclusive economic growth across the continent. This paper has explored the various challenges and opportunities in Africa's food systems, emphasizing the need for comprehensive strategies that address environmental, economic, social, and political dimensions. By focusing on policy reform, technological innovation, capacity building, and good governance practices, Africa can overcome these challenges and harness its vast agricultural potential.

Africa's food systems are currently facing significant challenges that threaten food and nutrition security, environmental sustainability, and economic viability. Issues such as climate change, land degradation, low agricultural productivity, high levels of malnutrition, and inadequate governance frameworks are pervasive. However, the continent also has immense opportunities to transform its food systems through sustainable practices, technological advancements, and inclusive policies.

The drivers of change, including policy reform, technological innovation, and capacity building, are essential for fostering resilient and sustainable food systems. Policies that promote sustainable agricultural practices, increased funding for agricultural research, and enhanced market access are critical for driving productivity and resilience. Empowering women and youth, supporting community-led initiatives, and promoting fair trade practices are crucial for ensuring that food systems are inclusive and equitable. Additionally, leveraging the African Continental Free Trade Area (AfCFTA) can enhance intra-African trade, improve market integration, and stimulate economic growth.

Good governance practices, including transparency, accountability, and inclusive decision-making, are vital for building trust and fostering collaboration among stakeholders. Effective policy implementation and

collaborative governance can ensure that the benefits of food systems transformation are widely shared and sustained over the long term.

To achieve the transformation of Africa's food systems, it is essential to strengthen policy frameworks that support sustainable agricultural practices and investments. Governments should develop and implement policies that promote sustainable land use, conservation agriculture, and the adoption of climate-smart farming techniques. These policies should include financial incentives for sustainable practices, such as subsidies for environmentally friendly inputs and tax breaks, while imposing penalties for activities that cause environmental harm. By aligning financial incentives with sustainable outcomes, farmers will be encouraged to adopt practices that enhance soil health, conserve water, and increase biodiversity.

Investment in agricultural research is another critical recommendation. Increased funding and support for agricultural research can lead to the development of innovative solutions that address specific challenges faced by African farmers. Governments and international organizations should prioritize funding for agricultural research institutions, facilitate partnerships between researchers and farmers, and promote the dissemination of research findings. This investment will ensure that innovative solutions reach those who need them most and drive productivity and resilience in the agricultural sector.

Improving infrastructure is vital for enhancing market access for smallholder farmers. Infrastructure development should focus on building and maintaining rural roads, establishing cold storage and processing facilities, and ensuring reliable access to electricity and water. These improvements can reduce post-harvest losses, lower transportation costs, and enable farmers to access broader markets, thereby increasing their incomes and contributing to food security. Additionally, implementing trade policies that facilitate intra-African trade, reduce barriers, and harmonize standards across countries is essential for creating a more integrated and competitive agricultural market. The African Continental Free Trade Area (AfCFTA) provides a framework for such policies, promoting the free movement of goods and services across the continent.

Empowering women and youth is crucial for creating inclusive food systems. Gender-sensitive policies that address the unique challenges faced by women in agriculture, such as access to land, credit, and education,

should be implemented. Youth empowerment programs focusing on skill development, entrepreneurship, and technological literacy will enable young people to drive innovation in agriculture. Supporting community-led initiatives that provide training and technical assistance to local agribusinesses and promote cooperative models is also essential. These initiatives ensure that interventions are culturally relevant and responsive to the specific needs of the community, fostering sustainable livelihoods and improving food security at the local level.

Finally, fostering transparency and accountability in governance structures is essential for building trust and ensuring the fair distribution of resources. Governments should promote inclusive decision-making processes that engage all stakeholders, particularly marginalized groups, in the governance of food systems. Establishing robust monitoring and evaluation frameworks to track policy implementation and assess their impact on food security and sustainability is crucial. Encouraging collaborative governance models that involve governments, the private sector, and civil society in the management and transformation of food systems will drive holistic and innovative solutions to the challenges facing Africa's food systems.

By adopting these recommendations, African countries can create an enabling environment that supports sustainable, inclusive, and resilient food systems. The transformation of food systems is not only essential for addressing the immediate challenges of food security and environmental degradation but also for unlocking the long-term potential for inclusive economic growth and development across the continent.

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