CHAPTER 6

A Paradigm Shift in Food Safety for Africa

Amare Ayalew, Fatima Olanike Kareem, and Delia Grace

Introduction

Food safety systems globally, and more so in Africa, have not kept pace with the complexity of food safety challenges. In Africa, these challenges include, inter alia, fragmented food safety management and mandate, and poor investment and budgetary finances on sanitary and phytosanitary (SPS)–related quality infrastructures (Jaffee and Henson 2004; Czubala, Shepherd, and Wilson 2009; PAQI 2020). The challenges are further aggravated by the poor food safety culture in the continent. These challenges of unsafe food have undermined the pace and state of food system transformation in the continent. This is because unsafe foods adversely impact public health but also thwart efforts at boosting trade in food and agricultural commodities and reduce agricultural trade (Jaffee et al. 2019; Kareem, Martínez-Zarzoso, and Brümmer 2022), thereby leading to loss of earnings and income (Kareem, Martínez-Zarzoso, and Brümmer 2022; Kareem and Martínez-Zarzoso 2020). In addition, unsafe food undermines the potential and actual gains in improving food security and nutrition.

Food safety is crucial to the attainment of the continent's Comprehensive African Agriculture Development Programme Malabo Declaration Commitments on accelerated agricultural growth and transformation for shared prosperity and improved livelihood, especially the commitments that hinge on ending hunger, poverty reduction, and tripling intra-African trade in agricultural commodities by 2025. In addition, it is germane to the attainment of many of the United Nations Sustainable Development Goals, especially those that relate to well-being.

With the Malabo Declaration coming to an end in 2025, the post-Malabo policy choices that Africa makes will be critical for implementation of the United Nations Food Systems Summit recommendations, the common African position for this, and to achieve sustainable food systems transformation in the continent. The increasing evidence on burden of unsafe foods indicates that poor food safety is a key factor leading to food systems underperformance, and in particular the ability of food systems to deliver nutrition and health outcomes. Africa and the world at large have long ignored food safety as an important driver of food and nutrition security and economic empowerment. While the recent prioritization of food safety is encouraging, there is a need for transformative ideas to fully integrate food safety into food systems transformation efforts and avoid costly delays and setbacks.

As this volume of ATOR aims to contribute to the knowledge base to inform discussions around the post-Malabo phase and therefore to inform the policy direction for the successor of the Malabo Declaration for agricultural and food systems transformation in Africa, this chapter provides background information and practical considerations related to the food safety context in Africa. Food safety is a good example of the complexity of the challenges facing food systems transformation that can be addressed effectively only through systems approaches with multisectoral and multidisciplinary measures. It is in this context that we examine the continuing progress and dramatic changes needed to attain food safety for all in Africa.

The chapter reveals that Africa has made some progress in its food safety system and management, particularly some of its policy practices and legal policies. These are particularly related to the emergence of its continental food safety policy agendas, which seek to improve coordination among the different drivers and actors of food safety systems, while moving from fragmented food safety management. However, significant gaps exist that need to be bridged to enable the emergence of an improved food system capable of ensuring safe and sustainable food system transformation for the continent. These gaps are in respect to a food safety investment framework, poor generation of credible evidence and data for state-of-the-art risk assessments, and food safety management, as well as poor food safety culture and norms, and others.

The chapter begins with background about the health and economic impact of unsafe food as well as the changing situations and trends shaping the food safety landscape; it briefly introduces basic concepts in global best practices and attempts to put that into the context of the food safety situation in Africa. The third section takes stock of continental policies and initiatives of relevance to raise food safety levels in Africa. The missing links/priorities in the fourth section depict critical items for consideration to achieve a paradigm shift in food safety within the continent; the section ends with a focus on key elements of the paradigm shift. The last section concludes with recommended policy directions.

Background, Context, and African Food Safety Landscape

Global best practices to address the complex challenge of food safety through farm-to-table approaches are well established. Given the large investments required to elevate food safety levels, countries (whether developed or developing) need to follow evidence-based and risk-based food controls in allocating

resources to where there is the biggest potential for impact. General principles for strengthening food safety systems include integrating food safety into nutrition and food security policies and programs and fostering closer collaboration between the various sectors involved (agriculture, human health, animal health, trade, tourism, etc.). Also, in the spirit of the World Health Organization (WHO) Global Strategy for Food Safety launched in 2022, we must become better connected and collaborate to ensure that the right food safety knowledge, risk management methods, and interventions are successfully applied across the global food supply chain. There is also a need to address emerging food safety challenges and make use of advanced tools to improve food safety. Important background information and basic concepts are highlighted below.

Burden of Foodborne Illness

Ten years ago, food safety was not considered among the most important public health problems. This changed with the publication of the first estimates of the global burden of foodborne diseases (FBD) by the Foodborne Disease Epidemiology Group (FERG) of WHO in 2015. At the time of assessment, 35 of the most important FBD were together responsible for a health burden of 600 million illnesses; 476,000 deaths; and 42 million lost disability-adjusted life years (DALYs) annually, similar to the numbers caused by malaria or tuberculosis (Havelaar et al. 2015; Gibb et al. 2019).

The health burden was also estimated for each WHO region, and Africa south of the Sahara was the region with the highest per capita burden. Extrapolating from the FERG studies to account for population increase, it was conservatively estimated that in Africa (including northern Africa), 160 million FBD episodes and 210,000 FBD deaths, or 20 million lost DALYs, will occur in 2023—most of which are preventable.

The WHO (2015) burden of disease report showed that FBD are an important cause of morbidity and mortality and a significant impediment to socioeconomic development worldwide. The most frequent causes of foodborne illness were diarrheal disease agents, particularly norovirus and *Campylobacter spp.,* which accounted for 55 percent of deaths due to foodborne illness. Other major causes of foodborne deaths were *Salmonella typhi, Taenia solium,* hepatitis A virus, and aflatoxin.

WHO (2015) acknowledges data gaps were the major hurdle in estimating the FBD burden in national studies, and the global and regional estimates provided by FERG offer an *interim solution,* until improved surveillance and laboratory capacity are developed. The global report's coverage of chemical contaminants is particularly modest, and the report indicates that the burden of the four chemical agents estimated "should be considered the tip of the iceberg in terms of foodborne chemicals and their impact on the global burden of disease" (WHO 2015, 89). For other health links to food safety, such as aflatoxin as causes of malnutrition and stunting and dioxin and immune effects or cancer, data were not available to allow disease burden estimates (WHO 2015).

Despite its data gaps and assumptions, the WHO study presents the first ever estimates of the global burden of FBD and should serve as an important resource to focus activities that will reduce this burden. The estimates will be invaluable for countries where local data gaps prevent the development of a complete picture of FBD. Obtaining a clear view of the global impacts of unsafe food is a very complex undertaking. What is clear, however, is that even the latest global data are likely to be an underestimate; few countries routinely collect surveillance data, and available data depend on affected individuals' coming forward for treatment and being correctly diagnosed (Crean and Ayalew 2016). It appears the full extent and burden of unsafe food, especially the burden arising from chemical and parasitic contaminants, is not well known.

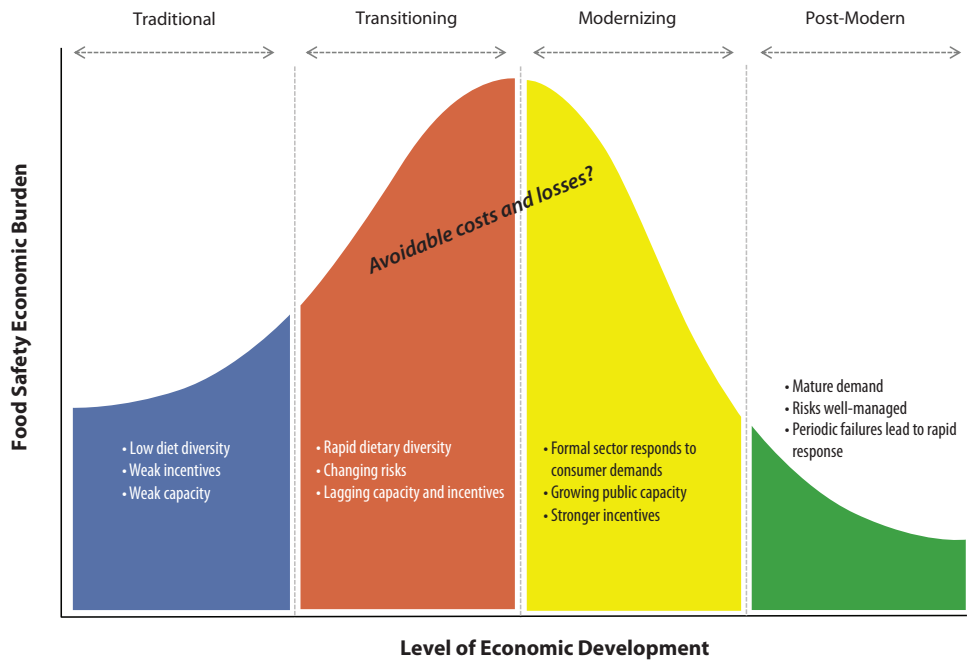
In addition to the public health burden, precise information about the socioeconomic impact of unsafe food is foundational to prioritize food safety and to allocate meager resources where there is potential for biggest return. Focker and van der Fels-Klerx (2020) distinguish between the impact of FBD on society and on the agrifood industry. The impact of FBD on society includes the costs related to loss of quality of life and mortality, loss of productivity and medical care expenses, and costs for meeting food safety requirements. Based on the FBD burden reported by WHO (2015) and gross national income per capita, Jaffee and colleagues (2019) estimated the economic burden from foodborne illness to low- and middle-income countries at around $110 billion in 2016 dollars[1]. Their estimate aggregates the domestic cost of unsafe food in terms of the cost of FBD on the basis of productivity losses and the cost of treating foodborne illnesses. The productivity losses alone for Africa south of the Sahara are

1 All dollars are US dollars.

estimated at $16.5 billion (Jaffee et al. 2019), that is, 17 percent of the total loss for low- and middle-income countries. This lower financial impact from productivity losses in Africa despite its tragically high burden of FBD is because the DALY valuation method depends on income per capita. It is not clear, though, if Jaffee and colleagues (2019) focused on DALYs lost in the working-age population because it is assumed productivity loss is based on losses in product or income per worker.

Comprehensive global estimates of the cost of lost trade or lost domestic market related to food safety are not available so far. However, the value of rejections of high-value food exports from low- and middle-income countries to the EU is about $2 billion per year (Jaffee et al. 2019). It is well established that noncompliance with food safety standards can cost the agrifood sector in contamination tracing, product recalls, suspension of production and clean up, and loss of market share because of brand reputation damage. The *Listeria* outbreak in South Africa in 2017–2018 led to losses in productivity attributed to listeriosis from lost days at work, which together with export value losses for food processors were in excess of $15 million (Olanya et al. 2019). The difficulty of sourcing safe raw materials and even the low food safety culture in the workforce make a country less attractive for investments in agro-processing and the agrifood sector.

FIGURE 6.1—THE FOOD SAFETY LIFE CYCLE



Source: Jaffee et al. (2019).

To inform their food safety policies and actions with the right evidence and effectively contribute to global estimates, African countries need to greatly improve their capacity for generating quality FBD data, which requires investments in their disease surveillance capacity—this includes health regulation (putting in place official reporting requirements), diagnostics capacity, data management, and public awareness.

The Food Safety Life Cycle and Food Safety in Food Systems under Transition

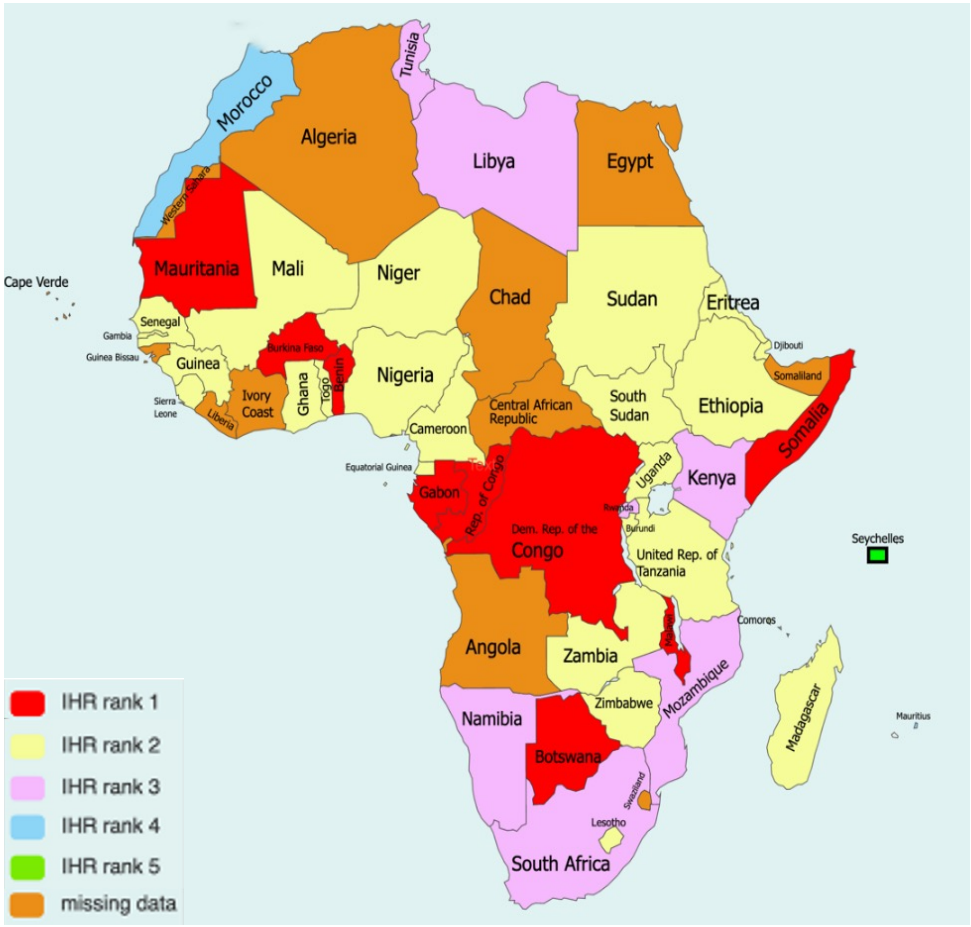
Levels of FBD and incentives for enhancing food safety management capacity vary systematically both with the level of economic development and with the stage of urbanization within a country (Jaffee et al. 2019). In the poorest countries and in remote areas of richer countries, most food is produced within the household or locally, and only small amounts of risky foods are consumed (fresh produce and animal-source foods). As countries become richer and in urban areas where the poor live (slums), food safety problems rapidly increase as larger amounts of risky foods are consumed; as supply chains become longer and more complex, they create additional opportunities for microbial growth and cross-contamination (Grace 2015). With further development, or in the value chains serving the urban rich, demand for food safety increases, as do both public and private food safety controls, and thus food safety improves. Finally, in high-income countries, food safety is generally high (Figure 6.1). This pathway or food safety risk cycle has the important implication that much of the African food system is in the critical transitioning zone where food control capacity is not keeping pace with challenges and where food safety is likely to deteriorate before it gets better. On the other hand, this suggests we are at a moment of opportunity where appropriate actions can preclude health and financial loss.

Food Control Systems: Performance of African Countries in International Health Regulations and Performance of Veterinary Services

National food control systems comprise the competent authorities and the resources, structures, arrangements, and procedures set up in a member state to ensure that official controls are performed in accordance with the food safety regulations of the country (FAO and WHO 2019). Until the recent African Union (AU) initiative (highlighted in the "AU Policies and Strategies Addressing Food Safety" section) to undertake food control assessments using international tools, only a few African countries have had systematic assessments of food safety capacity. However, some data sources give insights. First, situational analyses conducted by the International Livestock Research Institute (ILRI) in 2010 and 2020 in 15 African countries identified the following problems: lack of a national food safety policy, unreliable data on food safety, fragmented responsibilities, redundancies, a focus on hazard rather than risk, and weaker food safety regulatory oversight for domestic markets than exports. The studies recommended incremental formalization and accreditation/certification mechanisms as well as stronger coordination and more and better laboratory testing (Jabbar and Grace 2012; Kang'ethe et al. 2021).

In addition, WHO international health regulations (IHR) provide an overarching legal framework that defines countries' rights and obligations in handling public health events and emergencies that have the potential to cross borders. Countries report to WHO each year on their capacity to handle these events, and this includes their capacity for FBD surveillance and response; 47 African countries have inadequate IHR ratings of 1 or 2 (Figure 6.2).

FIGURE 6.2—NATIONAL FOOD SAFETY CAPACITY DERIVED FROM WORLD HEALTH ORGANIZATION INTERNATIONAL HEALTH REGULATIONS (IHR)



Source: Authors' analysis.

Furthermore, a useful tool for gauging the capacity of national food safety management with a focus on animal-source foods is the result of the assessments by the World Organisation for Animal Health (WOAH) of performance of veterinary services (PVS) in various countries. Performance is assessed across four critical dimensions: human, physical, and financial resources; technical authority and capability; interaction with interested parties; and measures to ensure market access. The most recent version of the PVS assessment tool covers 38 critical competencies, with experts' ratings of each capacity on a 5-point scale from *little or no capacity* scoring 1 to *a high level of competence or application of best international practice* scoring 5. Jaffee and colleagues (2019) developed an Index of Animal Sourced Food Safety Capacity based on 18 criteria from PVS. The study found a close association between high member state capacity and low burden of disease and vice versa. This is some of the strongest

evidence that building member state capacity in food safety will reduce the burden of FBD.

Food Safety Actors, Stage of Development, Needs, and Governance

To facilitate governance of food safety in Africa, Member States are at the forefront of food control functions with some support from Regional Economic Communities (RECs) and AU. At the national level, food safety management in several Member States is highly fragmented as they are managed by multiple bodies such as designated ministries, departments, and competent authorities and agencies, although we are witnessing a number of Member States setting up single-agency food control systems such as the establishment of the Gambia Food Safety and Quality Authority and the National Food Safety Authority of Egypt, among others.

As fragmentation leads to suboptimal use of scarce resources (Jaffee et al. 2019), the emergence of the AU food safety policy agenda aims to improve coordination based on the notions of shared responsibilities. Thus, as a departure from the "old order," management of food safety would be based on the notion of "shared responsibilities" coupled with sensitivity to the African context and its informal food markets, as contained in the continent's new food safety strategy (AU 2022). Shared responsibilities in food safety system management mean that food safety risks would be managed by three major players: (1) government, which has oversight and implementation functions; (2) the food business sector, which is primarily responsible for ensuring food safety; and (3) consumers, who manage risks at the household level/consumption phase. Here, the government encompasses all agencies, ministries, and departments that are engaged in official food control functions as well as government-controlled research institutions, public academia, and the media. The food business sector includes business owners; those in control of food businesses such as farmers, processors, distributors, producers, retailers, wholesalers, food consulting firms, private media, and private research institutions; and others (AU 2022).

These stakeholders currently assume a limited role in food safety governance in Africa, although they are unequivocally important in the emergence of an efficient and strong food safety system. For instance, academia and research are crucial to strengthening science-based governance of food safety, promoting innovation and technology diffusion, conducting research and development, and bringing forth evidence-based policy solutions for the realization of modern food systems. In addition, the informal food system is rarely at play when it comes to governance or management of the food system. This is despite Africa's food system being largely informal, playing a huge role in the production and marketing of food to consumers, and constituting about 85–95 percent of the food sector in Africa south of the Sahara (Tschirley et al. 2015). In addition, one important required shift is the change in focus to include civil society organizations and other local nongovernmental organizations as well as consumers in the governance of the food system by strengthening civil society and consumer organizations to empower and engage in evidence-based advocacy, while also raising consumers' awareness and consciousness about safe food culture, and empowering them to demand safe food. Thus, we hope that governance based on shared responsibilities will bring a paradigm shift to the current food safety landscape management.

Emerging Trends in Food Safety

New food safety challenges will continue to emerge because of increased food imports, long food supply chains, climate change, intensification of production systems, the introduction of novel foods and novel processing and handling systems, and technological advances. The latter would help in enhancing the detection of foodborne hazards and improved diagnoses of foodborne illness and thus would play a crucial role in addressing these challenges. Such emerging issues have been covered in preceding sections. There are emerging trends in food safety that will influence how effectively and smartly African countries will be in addressing food safety challenges and becoming competitive in the continental and global food trade.

There is increasing use of technologies in food safety with promising success: blockchain with application so far limited in traceability (Jin et al. 2020); use of advanced testing methods such as whole genome sequencing for outbreak management, with practical application observed in the 2017–2018 *Listeria* outbreak in South Africa (Smith et al. 2019); the Internet of Things—the interconnection of all things (such as sensors, devices, machines, computing devices) via internet or a communication medium—with main applications observed in supply chains to trace food products, followed by monitoring of food safety and quality in high-valued food (Bouzembrak et al. 2019); and big data technologies being used to provide predictive insights in several steps in the food supply chain, including the design of monitoring and sampling strategies (Jin et al. 2020). The

application of big data generated from smartphones, social media, Internet of Things, and multimedia in food safety remains in its infancy, but it is influencing the entire food supply chain (Jin et al. 2020). The application of blockchain in food safety is quite promising and is expected to bring safer and transparent food chains in the near future, although issues related to data integrity and overcoming its complexity still need attention (Jin et al. 2020). Most of these technologies are interrelated. Blockchain, for instance, is likely to play a role in big data applications. Another emerging trend in food safety that has been ongoing for some time is finding practical models of food control such as co-regulation, which works through public-private partnerships; a big data–based co-regulation model for food safety governance has also appeared (Tao et al. 2018). Moreover, addressing food safety in the one-health approach has gained momentum to sustainably balance and optimize the health of humans, animals, plants, and the environment (more information under the "Food Safety and One Health" section).

African countries should proactively avoid the technological divide in food safety and should invest not only in technology infrastructure and data analytic capacity but also in what Jin and colleagues (2020), in relation to food safety, described as data fairness (that is, findability, accessibility, interoperability, and reusability [FAIR]): data quality and the standardization of communication protocols to benefit from the features that big data tools and other technologies can offer to improve food safety systems. Embracing the One Health approach will also enable African countries to strengthen coordination, collaboration, and leverage capacities across all sectors responsible for addressing health concerns at the human-animal-plant-environment interface.

Stocktaking of AU Policy Tools and Continental Initiatives for Food Safety in Africa

Africa's food safety landscape has historically been characterized by weak coordination and fragmentation. However, recent policy decisions have led to the emergence of harmonized policy agendas aimed to efficiently maneuver and manage its food system for an enhanced continental food safety system that aligns with international best practices and local conditions. This section thus highlights continental policy tools and initiatives with the view of showing available resources, promoting complementarity and synergies, and reducing duplication of efforts.

AU Policies and Strategies Addressing Food Safety

AU's SPS Policy Framework has been developed by the African Union Commission (AUC) Department of Agriculture, Rural Development, Blue Economy and Sustainable Environment. The framework provides an overarching road map for a modern, harmonized, and coordinated SPS system that is in line with the World Trade Organization (WTO) SPS agreement and the SPS International Standard Setting Bodies. It aims to facilitate accelerated agricultural development and transformation and improve public health, food security, and intra- and extra-Africa trade. The continental framework was developed to combat the numerous SPS challenges in the continent (AU 2019). The SPS Policy Framework at the AU level was developed to support implementation of the SPS Annex of the Africa Continental Free Trade Area (AfCFTA). The policy framework provides a road map to facilitate the harmonization of SPS policies and a guide to the operationalization of Annex 7 of the AfCFTA (WTO 2018; AU 2019), which is expected to be coordinated by the AfCFTA Secretariat. In addition, the framework aims to strengthen SPS systems in the continent while addressing the challenges that have made fraught Africa's food system in relation to plant, animal, and human health for enhanced safe trade. The framework's main purpose is to coordinate the continent toward a coherent, modern, and integrated continental SPS system that is in support of shared prosperity, food security, and health for all.

Aligned to the SPS Policy Framework, the AU has the Food Safety Strategy for Africa (FSSA). The FSSA complements the Plant Health Strategy for Africa and the Animal Health Strategy for Africa. Endorsed by the AU in February 2022 during its 35th Ordinary Summit of the Assembly of AU Heads of State and Government, the FSSA provides a harmonized structure for improving food safety systems to ensure that access to safe and nutritious food is guaranteed for all in Africa (AU 2022). The FSSA adopted the concept of shared responsibilities in the management of food safety risks.

The FSSA was developed through an inclusive process, reflecting the needs and interests of different stakeholders. The FSSA aims to promote food safety culture among the African people, advocacy for safe food, and a focus on evidence-based information while strengthening research and innovation as well as technology transfer and development (AU 2022). The strategy puts emphasis on creating an innovative policy and regulatory environment that facilitates bridging food safety capacity gaps in informal food markets, which is a shift from

the decades of focus on the export trade and high-value formal market. This will help to manage food safety threats and reduce the burden of the current FBD that afflict the continent. Food safety and competitiveness in export trade will continue to be important, especially with the implementation of the AfCFTA, but since the effects are not known to trickle to domestic food safety, the emphasis of the FSSA is a proactive direction. The 15-year time frame for the FSSA does not seem to take into account the dynamic nature of food safety issues and may call for early revision, particularly with the anticipated changes in continental coordination through the future Africa Food Safety Agency.

The AU has also developed strategies addressing priority food safety hazards. The Strategic Framework for Scaling Holistic Aflatoxin Control in Africa is a synthesis of the model, tools, and templates developed by the Partnership for Aflatoxin Control in Africa working with six AU Member States and RECs (AU 2020). It is essentially a country-led, evidence-based approach for holistic, coordinated, and sustainable aflatoxin control. The 36th Ordinary Session of the AU Executive Council endorsed it in February 2020 for use in all 55 AU Member States as part of Comprehensive African Agriculture Development Programme implementation. The strategic approach puts the country government in the driver's seat and prepares the country for sustainable control of aflatoxins involving partnerships. The countries that tested the model have developed and included evidence-based, stakeholder-aligned aflatoxin control plans in long-term strategies and government systems; have put in place coordinating steering committees and technical working groups; and have succeeded, though to varying degrees, in financing their plans.

The country-led, country-planning approach can be applied to broader food safety, and the AU is promoting development of evidence-based national food safety action plans. AUC, in collaboration with the United Nations Food and Agriculture Organization (FAO), Bill & Melinda Gates Foundation, United States Agency for International Aid, and European Commission, has been supporting 18 Member States to undertake food control assessment using international tools (the 2019 FAO/WHO Food Control Assessment Tool) and develop national food safety plans to address identified gaps. The collaboration with FAO and the European Commission to support Member States in the Common Market for Eastern and Southern Africa region is at its final stages, and most of the countries engaged have validated their costed national food safety plans. There is interest in expanding this support toward evidence-based food safety and reaching many more Member States. Moreover, countries are showing readiness to undertake self-assessment of their food control system. The ultimate goal of these assessments should be developing a common vision around a national food safety plan, identifying priorities, developing cost estimates, increasing investments, and uplifting food safety levels in AU Member States.

The African Union Development Agency, working with the African Organization for Standardization and other partners, has developed Guidelines for Harmonizing Food Safety Standards and Legislation (AUC 2020). The guidelines were developed through scoping missions to some RECs (Common Market for Eastern and Southern Africa, Economic Community of Central African States, Economic Community of West Africa States, and Southern African Development Community) and Member States, online surveys, food safety workshops with stakeholders, and review of documents. Further work is needed to promote harmonization of food safety standards, which will play key roles in the implementation of the AfCFTA. The AfCFTA agreement provides a framework for the continent's food safety management and scope. The AfCFTA's guiding principle in relation to food safety management in the continent hinges on its Annex 7, which specifies provisions and clauses regarding SPS measures and procedures in the continent.

In addition to policies and strategies, the need to improve food safety coordination in the continent has been recognized over the years. The initiative by the AU to establish an Africa Food Safety Agency has undergone stakeholder consultation and is under final consideration by AU policy organs. The AUC should expedite the operationalization of the agency. The AUC, in collaboration with the National Food Safety Agency of Egypt, launched the African Food Regulatory Authorities Forum in October 2023, recognizing that collaboration between food-competent authorities and across stakeholders is imperative to address an increasingly complex and interdependent health, food production, and food trade environment.

Benchmarks for Food Safety Curriculum

Well-trained food safety manpower is a critical component of ensuring food safety. The Inter-University Council for East Africa (IUCEA) is a strategic institution of the East African Community (EAC) responsible for the development and

coordination of higher education and research in the region. In 2006, IUCEA initiated a process of setting regional higher education benchmarks: quality standards based on internationally recognized frameworks. To date, IUCEA has issued 11 sets of curriculum benchmarks, the latest being for a bachelor of science in food safety. This was developed through a consultative process involving experts from universities, industry, and government agencies, among other partners, and was approved by the Executive Committee on July 4, 2022 (IUCEA and ILRI 2022). Another accomplishment is the ongoing development of benchmarks for a master of science course in One Health in EAC. Such benchmarks are pacesetting and also contribute to the harmonization of One Health programs/curricula in EAC's higher education institutions. In addition, the efforts are expected to stimulate a paradigm shift by other higher education institutions to incorporate food safety curricula into their programs. The benchmarks will help ensure that the several hundred higher education institutes teaching food safety in EAC do so to a uniform, high standard and that curriculum content reflects the needs of EAC, including food safety in the informal sector.

Food Safety and One Health

In the last few decades, One Health has emerged as the gold standard for addressing health problems at the interface of human, animal, plant, and ecosystem health. FBD are a quintessential One Health problem. First, they occur at the interface of human health, animal health, and ecosystems. Second, the most important FBD are zoonotic, managed by multiple sectors (typically including health, veterinary, trade, and tourism). Last, many FBD are associated with the types of food whose production has profound impacts on ecosystems and biodiversity (livestock and cereals). The Quadripartite, an initiative led by FAO, the United Nations Environment Programme (UNEP), WHO, and WOAH, has been spearheading international One Health and considers FBD one of its four priority areas (along with emerging zoonoses, neglected zoonoses and tropical diseases, and antimicrobial resistance) (FAO, UNEP, WHO, and WOAH 2022). In Africa, several One Health initiatives cover food safety. These include Afrohun and the One Health Centre for Africa, which aims to improve the health of humans, animals, and ecosystems through capacity building; strengthening of local, regional, and global networks; and provision of evidence-based policy advice on One Health in Africa south of the Sahara (ILRI OHRECA n.d.).

Africa Food Safety Index

Genesis and Nature of Africa Food Safety Index

Critical analysis by technical experts supporting the AU Biennial Review (BR) on agricultural transformation in Africa as well as AU Member State focal persons recognized that the omission of food safety in the first BR report produced in 2017 was one of the major gaps in the BR. This recognition led to stakeholder consultations and approval by policy organs that led to the development of the Africa Food Safety Index (AFSI) for reporting on food safety since the second cycle of the AU BR mechanism.

The AFSI is a composite index, developed by the AUC with a number of partners, comprising three indicators with a number of parameters. These indicators are the Food Safety System Indicator (FSSI), which is a *capacity indicator* that assesses whether rules, laws, regulations, and institutions governing the food safety system are in place in each Member State, and two *outcome indicators,* namely on public health—Food Safety Health Indicator (FSHI)—and on trade—Food Safety Trade Indicator (FSTI). The AFSI commits AU Member States to using these three indicators to track whether they have the necessary components of a functional food safety system and are on the path to reducing FBD by 50 percent and reducing trade rejections due to food safety hazards by 50 percent by 2025. The index, using data available in the countries, provides a useful benchmarking tool.

The AFSI is replaced by the SPS Index as of the current cycle of the BR (to be reported in 2024), and there have been discussions at technical experts' level to move the SPS Index to the Malabo Declaration Commitment on Intra-Africa Trade. We attempt to highlight the food safety situation of AU Member States in 2018 and 2020, as measured using the three indicators with a number of parameters. We will also reflect how best to reconcile the desire to track the impact of SPS matters without affecting the focus on food safety whether for trade or for the domestic market.

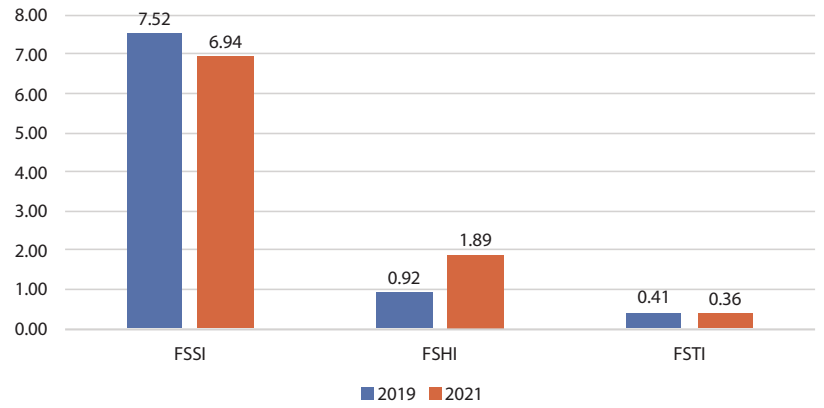
Performance of AU Member States and the AFSI Metric

In general, AU Member States have developed most components of a food safety system, but that does not translate into improved public health and improved trade related to food safety (Figure 6.3). To be on target toward achieving the food safety target by 2025 as stipulated in the AFSI, in 2021, Member States are

expected to achieve at least a score of 5 (that is, 50 percent) out of a maximum score of 10. Those with scores that are greater than or equal to 5 are deemed to be on track in achieving their food safety target of improving public health, food safety, and trade in safe food; otherwise, they are not on track. With trade indicator scores of less than 0.5 (indicating less than 5 percent improvement since 2015 in export reduction rates) and the health indicator in 2021 being at less than 2 (indicating less than 20 percent improvement in key health and disease outcomes), Member States need strategies to make use of the positive components of their food safety systems, which in 2021 stand at 70 percent of the requirement, to minimize the adverse effects of unsafe food on public health and trade.

The categories of performance for each food safety indicator in Figure 6.4 also show that the number of countries (41 in 2018 and 46 in 2020) that have high-performing or reasonably performing food safety systems is encouraging, but that has yet to be reflected in improved public health and trade outcomes. These figures should be seen with caution for two reasons: (1) the limited number of countries that reported on the health indicator and particularly the trade indicator constrains meaningful analysis, and (2) data quality leaves much to be desired. BR reporting considers "no data" as "0" data.

FIGURE 6.3—AVERAGE SCORE OF AU MEMBER STATES IN THE THREE AFRICA FOOD SAFETY INDEX INDICATORS IN 2019 AND 2021



Source: Authors' analysis.

Note: FSSI = Food Safety System Indicator, FSHI = Food Safety Health Indicator, FSTI = Food Safety Trade Indicator. FSSI scores are measured on a scale from 1 to 10, with 10 indicating complete presence of a set of key elements of a functional food safety system. FSHI and FSTI scores indicate percentage rates of improvement in the indicators over the baseline of 2015.

Perspectives on Food Safety Tracking in the AU

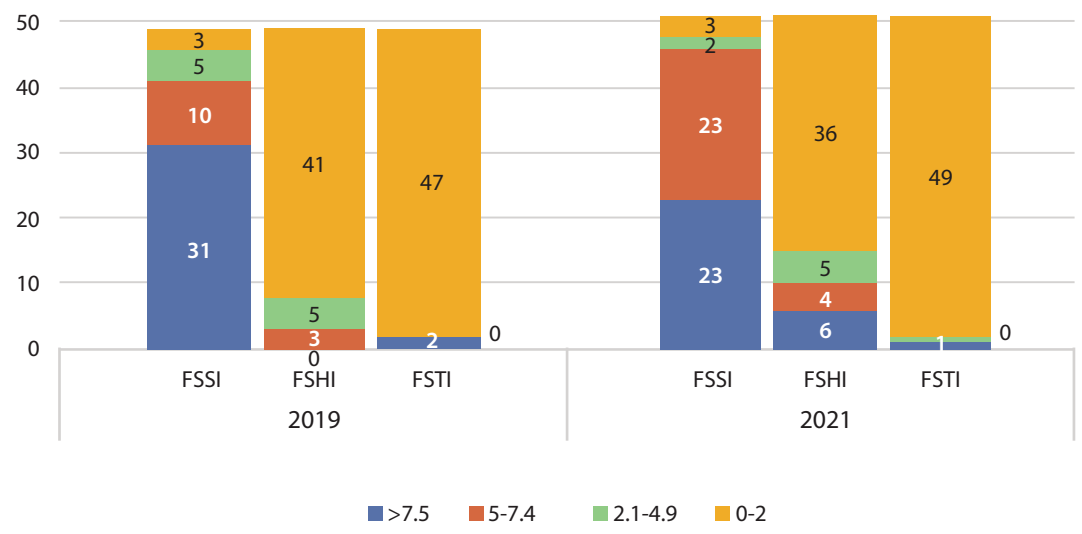
The AFSI is an innovative metric to track food safety and has a potential for long-term use to generate data and inform policies and actions in a rapidly changing food safety landscape. The evaluation of AFSI by AUC and ILRI (2022) showed the value of AFSI and areas for improvement. There are global efforts to emulate the AFSI to track food safety in the world, with even discussions held to include food safety indicators in the Sustainable Development Goals. In the AU BR, the shift to the SPS Index replacing the AFSI clearly will not address food safety adequately but will merely expand SPS beyond its scope. The One Health approach described under the "Food Safety and One Health" section is being adopted as a more comprehensive approach to address human, animal, plant, and environmental health.

WTO's Standards and Trade Development Facility (STDF 2010) advised distinguishing SPS indicators from other initiatives to develop and/or apply sector-specific indicators for food safety as well as animal and plant health systems. SPS indicators should go beyond sectoral indicators and serve as comprehensive, crosscutting indicators for a national SPS system as a whole.

If post-Malabo consultations come up with a mechanism similar to the BR, it is important to consider reinstating AFSI with the systems and health indicators while developing the trade indicator as a measure of impact of SPS issues on trade. It is important that the AUC provide unambiguous leadership and avoid introducing data collection requirements that are not supported by country-level setups. A national SPS system relies on the relevant competent authorities for food safety, animal health, plant health, and/or trade, and the focus of a national SPS system is export-oriented supply chains (STDF 2010). No country has the setup to address the entirety of food safety, plant health, and animal health issues under its SPS system.

The AfCFTA SPS Annex requires that AU Member States have in place a functioning SPS system. The full SPS capacity assessment and capacity building are in the realm of mandates of the AfCFTA Secretariat, which are broader than the BR or a comparable post-Malabo mechanism on agriculture and related sectors. It is noteworthy that the Malabo Declaration emphasizes input supply,

FIGURE 6.4—STATUS OF AU MEMBER STATES AS SCORED BY FOOD SAFETY INDICATORS IN 2018 AND 2020



Source: Authors' analysis.

Note: FSSI = Food Safety System Indicator, FSHI = Food Safety Health Indicator, FSTI = Food Safety Trade Indicator

mechanization, and postharvest reduction to boost productivity and is silent about reducing the impact of pests. Plant health and animal health factors that affect productivity should be emphasized in any post-Malabo continental direction as they are major contributors to the underproductivity of African agricultural and livestock systems. Further development of SPS capacity at the AfCFTA Secretariat is also expected to address continentally coordinated SPS benchmarking.

Missing Links/Priorities for Food Safety Management in Africa

Based on the foregoing and an assessment of established knowledge about capacities and competences to have mature food safety systems in place, this section addresses, without trying to be exhaustive, crucial missing links and priorities to achieve paradigm shift in food safety management in Africa.

Investment Framework

In recent years, food safety increasingly has been seen as a shared responsibility. Governments need to play effective vision-setting and convening roles, provide reliable information to other stakeholders, and effectively deploy a wide set of policy instruments to involve, incentivize, and leverage the actions of farmers, food business operators, and consumers (Jaffee et al. 2019). Recent studies on food safety in Africa made a range of largely aligned recommendations (Jaffee et al. 2019; Grace et al. 2019). The highest-priority recommendations were the following:

- More investment in food safety (by African governments, donors, and the private sector) is needed to ensure Africans have safe food.
- Member states should develop a unified, risk-based, food safety strategy that defines priorities and responsibilities, guides the coordination of measures by government and private entities, and establishes funding needs.
- The role of government should be less about finding and penalizing noncompliance and more about facilitating compliance via the provision of information, advice, incentives, and interventions to motivate and leverage investments and actions by value chain actors.
- Rather than strict enforcement, which is unworkable, an approach of gradual and continuous enhancements in food hygiene practices is more likely to secure the ongoing viability of the informal food sector, which is critical for food security in Africa.
- Consumers need awareness and tools to become partners in food safety through their own actions and through incentivizing and otherwise motivating food suppliers.
- Training programs, information campaigns, and other interventions should incorporate the science of behavior change including incentives and nudges.

Generation of Credible Evidence for Risk Assessment Constraining Food Safety Management

Risk Ranking—What Are the Priority Hazards and Food Matrices?

Hundreds or thousands of hazards can cause FBD. The aforementioned analysis of FERG looked at a few dozen of the most important, for which there was sufficient evidence to develop regional and global estimates. This found that 82 percent of the known burden of FBD in Africa is associated with microbial pathogens, in particular *Salmonella* species, toxigenic *Escherichia coli,* norovirus, and *Campylobacter* species (Havelaar et al. 2015; Gibb et al. 2019). Next in importance were heavy metals, especially lead, accounting for 8 percent of the burden. Among chemical hazards, aflatoxins have attracted much public attention, policy focus, and development assistance in recent times. Aflatoxins, naturally occurring toxins produced by fungi, can contaminate a wide variety of food crops including maize, sorghum, cassava, groundnuts, sesame, chili, and others. A large body of research in Africa and elsewhere has found causative links between aflatoxin levels in the diet and cancer. Aflatoxin has also been found to be a growth retardant in animals and is suspected of being a contributing factor to child stunting. Cyanide from cassava is a chemical hazard for which the associated health burden falls entirely on Africa.

Only in the last decade has good evidence on the burden of FBD started to emerge, and attribution to different food sources is even less clear. Animal-source foods and fresh vegetables are reported to be the most risky products (Hoffmann et al. 2017). However, as food safety risks are context specific, thorough studies that take into account the predominant diets of consumers in Africa are still needed. Consumers of street foods, ready-to-eat foods, foods eaten raw, and complementary foods are also especially vulnerable to acquiring FBD (Grace et al. 2019).

Role of National Burden of FBD Studies, Updating Database on FBD

WHO has initiated a follow-up study to revise the 2015 global burden of FBD report (WHO 2021). The next global report will be as good as the improvements made since 2010 (the base year for the 2015 report) in availability of adequate data and sufficient information on foodborne hazards and illness at the country level. Not only are national burden of FBD studies important inputs to global burden estimates, but they also allow the country more efficient allocation of resources to prevention, intervention, and control measures. They are an essential component of efforts to rank risks of FBD and establish food safety priorities. WHO (2021) has published guidance on assessing the burden of FBD with a focus on microbiological agents commonly transmitted through foods, which gives a complete picture of the data and resource requirements, the steps in the process including computation methods, and interpretation and communication of results. WHO (2021) also aims to foster harmonization of methodologies for estimating FBD burden across countries so that experiences can be shared, estimates compared, and food safety policy improved.

Estimation of the burden of disease caused by chemical hazards requires different data and methods than that of microbial hazards (WHO 2021). The incidence and hazard-based approach is considered the gold standard for estimating the burden of foodborne hazards, including foodborne chemicals (WHO 2021). However, WHO (2021) focuses on microbial hazards, and there is a need for global efforts to improve the database and methodology for assessing the burden of disease from chemicals. We hope the WHO reports have raised awareness among AU Member States planning their own foodborne burden of disease assessments to consider natural and anthropogenic chemicals.

Role of National Food Consumption Studies/Surveys

National dietary surveys or studies provide baseline information on individual-level food consumption patterns. Such studies are an important ingredient to national disease burden studies and serve a number of other purposes in evidence-based policymaking for food security and nutrition interventions. A number of methods are used in food consumption surveys, including 24-hour dietary recall. Harmonizing food consumption data including nutrient intake and food composition data will go a long way continentally and globally to achieve consistency and comparability.

Food Safety Culture and Norms: Measuring Culture, Changing Culture

Food safety culture is most commonly defined as the totality of the prevailing, relatively constant, learned, shared attitudes, values and beliefs contributing to the hygiene behaviors used within a particular food handling environment (Samuel, Evans, and Redmond 2019). As such, food safety culture is the sum

of an organization's attitudes, beliefs, and values on food safety. Although most commonly applied to food businesses, food safety cultures must be inculcated in public-sector organizations, nongovernmental organizations, and households, an extension first developed in the context of Zimbabwe (Nyarugwe et al. 2016).

Behavior change communication plays a key role in promoting food safety culture. Distinguishing between risk perception by the general public and actual risks so that scarce resources are spent on managing major problems (Grace 2015), the use of effective risk communication that relies not just on passing information but on messages with emotional resonance, and building trust in the risk communicator (Reynolds 2011) are some of the key considerations.

The Informal Food Sector

For many years, food safety has been on the development agenda primarily as a trade and market access issue. Little attention was given to domestic markets, and within domestic markets, national control systems focused on the easier-to-inspect formal sector (Kang'ethe et al. 2021). A marked departure is the new AU FSSA, which emphasizes the importance of informal food markets to food security, livelihoods, and equity (AU 2022). While the modern food retail sector comprises supermarkets, convenience stores, and high-end restaurants, the traditional or informal sector comprises public markets with dozens or hundreds of vendors, which supply both customers and the owners of small shops or kiosks; mobile vendors of fresh or cooked foods; and informal restaurants or eateries. Both formal and traditional retail sectors mainly source fruit and vegetables from wholesalers and meat from local abattoirs, although significant quantities of poultry and fish are imported from outside Africa. Surveys in different countries in Africa find that 85–100 percent of food is obtained from informal markets (Hoffmann et al. 2017; Hannah et al. 2022). Overall, in Africa, around 20–30 percent of food is produced in households, around 20 percent in the formal sector, and 50–60 percent in the traditional sector. Although the formal sector is growing, the traditional sector will remain a major supplier of food for decades to come (Tschirley et al. 2010).

Food Fraud, Adulteration, Quality Issues

Food crime covers a wide range of immoral and illegal activities. These include adulterating food for economic gain, contaminating food for ideological reasons, and stealing food secrets. Food fraud can negatively impact health and nutrition security directly through reducing availability of food and indirectly by damaging the agrifood sector and hence access to food. Globally, food fraud costs $30–$40 billion a year (Schoolderman et al. 2015). Perspectives derived from criminology imply motivation, opportunity, and lack of adequate control systems predispose to food fraud and market. Economic, cultural, and individual risk factors for food crime have also been identified. Complex and rapidly transforming food systems are especially vulnerable to food fraud. In Tanzania, more than 50 percent of all imported goods, including food, are believed to be fake; a study of processed meat in South Africa found 68 percent contained undeclared animal and/or plant protein (Cawthorn, Steinman, and Hoffman 2013); and in Nigeria, 100 percent of bread samples contained potassium bromide (a banned chemical) (Ifiora et al. 2015).

Mainstreaming Gender into Food Safety

Women are important but underrecognized risk managers in the realms of food production, processing, selling, preparation, and consumption. Understanding the influence of gender on risk exposure and management is essential for improving food safety in informal markets (Grace et al. 2015). The role of women in the production, handling, and marketing of perishable foods such as milk, vegetables, and fruit, while ensuring safety through farm hygiene is well recognized. Women also play a key role in grain value chains such as groundnut shelling and marketing. Reduced access to resources is a barrier to technology adoption by women, and gender-sensitive food safety interventions are recommended (Garsow et al. 2022). Knowledge-based efforts are needed to meaningfully integrate gender into food safety initiatives. The AUC, in collaboration with the Impacting Gender and Nutrition through Innovative Technical Exchange in Agriculture mechanism of Tanager, an ACDI/VOCA affiliate, has undertaken gender analysis in 12 AU Member States to generate empirical data and systematically examine differences in the barriers and opportunities of male and female farmers and traders, specifically in relation to food safety and women's involvement in the food system. The reports will be released before the end of 2023.

Implementation Capacity: Food Safety Workforce, and Budget, Infrastructure (Food Safety Testing)

Africa is characterized by poor regulatory capacity to formulate and implement food safety regulations. This weak regulatory capacity has resulted from poor-quality infrastructure in the continent (including accreditation, metrology, testing, standardization, and measurements), with about 43 percent of AU Member States still below the required level of quality infrastructure needed to protect humans and the environment and to support trade (PAQI 2020). This also impacts the ability to enact standards based on scientific risk assessment as well as to implement certification and testing procedures and other enforcement capacities (Kareem, Martínez-Zarzoso, and Brümmer 2022). Furthermore, the poor implementation capacity in many African countries is propelled by the high investment costs of SPS-related facilities, which are enormous (UNIDO 2015) and could be more than the developmental budget of some countries, and the poor budgetary allocations to implement an efficient food safety system.

A survey carried out by AUC (2022) showed the limited staff capacity in food safety data generation and more so in risk assessment (Figure 6.5). The situation of food inspectors and regulators is also expected to be at least as insufficient.

The FSSA recognizes the importance of finance for an enhanced food safety system, with one of its seven implementation elements for an enhanced food system being "considerations about budgetary and investment." Member States are expected to allocate sufficient budget to improve their food safety systems.

The Paradigm Shift in Focus

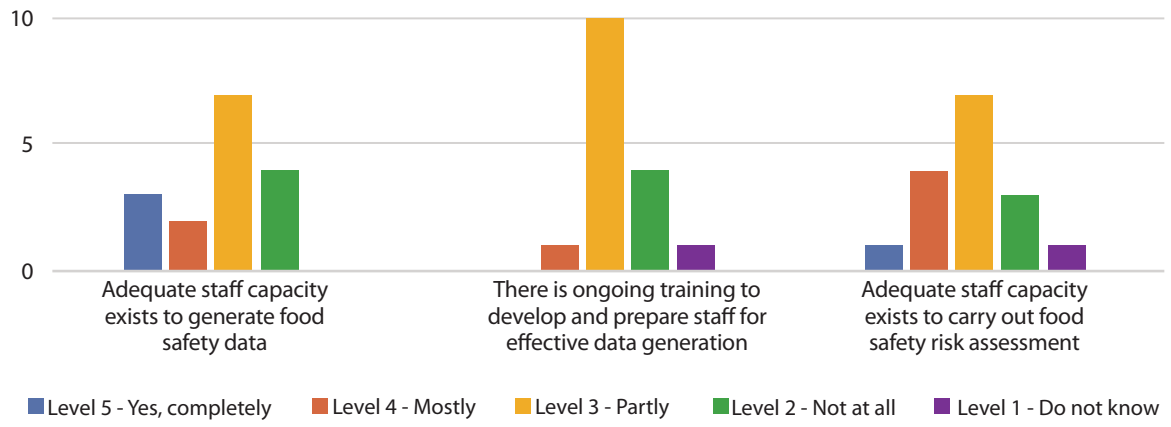
It is vital to focus attention on the recent changes in the food safety landscape that have the potential for biggest impact with limited resources. We hope the recent trend of food safety governance based on shared responsibilities will bring a paradigm shift to the current food safety landscape simply because there is no single entity that can solve the complex challenges of food safety. This trend should be institutionalized, and the policies and strategies of recent years that focus on evidence-based approaches such as the FSSA are believed to contribute to this shift. The strategies call for partnerships and collaboration to fully implement them and achieve the desired changes.

Any initiative to improve food safety data, such as the AU effort to develop a food safety data hub for Africa, allowing it to undertake sound risk assessment, is a move in the right direction. This should be complemented with country-level capacity building and investments in generating, sharing, and using credible food safety data.

The recommendation to shift from decades of focus on the export trade and high-value formal market to the informal food sector is at the heart of future improvements in food safety levels in domestic markets, as well as improvements to the competitiveness of the agrifood sector in international trade. The AUC is working to develop and test innovative models for regulating the informal food sector by Member States, which by definition have remained outside food regulatory schemes.

To address one of the fundamental root causes of poor food safety management, efforts are underway to strengthen food safety manpower in the continent.

FIGURE 6.5—SITUATION OF STAFF CAPACITY IN AU MEMBER STATES (16 RESPONDED) FOR FOOD SAFETY DATA GENERATION AND RISK ASSESSMENT



Source: AUC (2022).

Efforts of curriculum benchmarking that began in the EAC should be replicated in different regions of the continent, with the aim of producing the food safety workforce that the continent is in dire need of.

Coupled with risk-based approaches to prioritize food safety issues in which to invest meager resources, the overall increased recognition of the importance of finance for an enhanced food safety system is expected to improve food safety levels in Africa, if commitments made are delivered on. Sustainable financing of food safety is a mark of mature food safety governance in a country. A paradigm shift in the financing landscape, most of which should come from Member States themselves, would enable RECs and Member States to build technical capacities to comply with, enact, and enforce measures as well as pool investments to improve their food safety systems in line with international benchmarks.

Conclusion and Recommendations

Food safety is a complex developmental issue that straddles public health, agriculture, trade, tourism, and other sectors of the economy. Unsafe foods are a major cause of underperformance and a leverage point to fix inefficiencies in the food systems. Africa bears the burden of disproportionate FBD, and it is high time the continent prioritize food safety and sustain its goals of using safe food for enhancing the transformation of its agricultural food sector, driving domestic and regional markets, and attaining food security and improved public health. Effective and efficient food safety systems require state-of-the-art, risk-based, and safe and sustainable farm-to-table approaches that encompass shared responsibilities among all stakeholders in the food supply chain. While the present legal policies and policy practices of the African food safety system are being improved, significant room for improvement exists for an improved food safety system capable of ensuring a safe and sustainable food system transformation for the continent. Thus, the following recommendations stand out to further improve food safety systems in Africa.

1. Expediting the establishment of the Africa Food Safety Agency by the AUC, which is long overdue, to improve food safety coordination in the continent
2. Undertaking country situational analysis and food control assessment with a view to developing a unified risk-based food safety strategy that defines priorities, responsibilities, and emerging trends; guides the coordination of measures by governments and private entities; establishes funding needs; and emphasizes the integration of food safety in nutrition and related longer-term programs
3. Implementing the continental and regional strategies and frameworks with relevance to food safety, which were developed in recent years
4. Fostering sectoral and disciplinary collaboration while ensuring clarity of mandate—avoiding confusions between SPS, One Health, and sectoral capacities will be crucial to sustaining focus and avoiding episodic initiatives
5. Investing in developing estimates of FBD and economic burden for AU Member States (using harmonized methodologies) as most of the existing estimates are currently based on global studies
6. Improving methodologies and data for estimating the burden of chemical and parasitic hazards to respond to concerns that are underestimated
7. Taking proactive measures to prevent a technological divide in food safety, with a focus on investments in infrastructure and manpower so as to benefit from the features that Big Data tools, blockchain, whole genome sequencing, and future developments can offer to improve food safety and supply chains
8. Advancing the integration of gender in food safety initiatives by generating examples and methods
9. Advancing food safety culture and norms as fast as possible through programs that incorporate the science of behavior change including incentives and nudges
10. Supporting the Coalition for Action for Safe Food for All arising from the United Nations Food Systems Summit process, where food safety is featured as a crucial element of the Summit's Action Track 1