

INTRODUCTION

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The whole world has experienced a series of global and local crises since 2019, and Kenya has been no exception. Before the COVID-19 pandemic and the Russian invasion of Ukraine, poverty and food poverty rates in the country had been declining steadily, falling from 52.3 percent to 36.1 percent and from 38.3 percent to 26.7 percent, respectively, between 1997 and 2016 (KNBS 2007, 2018). Income inequality also declined in the period from 1994 to 2015/16 (KNBS 2020).¹ Estimates suggest that, since then, progress in poverty reduction has reversed, as a result of COVID-19 (Nafula et al. 2020), and that the impacts of the Ukraine and global crises have further increased poverty levels and the number of people unable to afford a healthy diet (Breisinger et al. 2022). In addition, ongoing droughts in the arid and semiarid areas of Kenya meant that an estimated 3.5 million people were in need of assistance in May 2022 (UNICEF 2022).

Even before these crises, macroeconomic trends and acute economic disruptions had put the Kenyan economy under enormous pressure in recent years. Kenya is experiencing rapid urbanization and population growth: the urban population is projected to make up nearly 50 percent of the population by

1 Income inequality remains high in Kenya, with the Gini coefficient at 0.404; however, long-term trends point toward a decrease in income inequality over time (Bigsten et al. 2016; KNBS 2020). Some concerns have been raised over economic growth being driven by infrastructure development and growth in the information and communications technology (ICT) sector (particularly in fintech), which may be contributing to increased income inequality and replicating patterns of uneven development, particularly between rural and urban areas (Bernards 2022). However, nationwide data have not validated these concerns, and evidence from cross-country studies on African inequality point toward ICT investment lessening, not increasing, income inequality (Nchake and Shuaibu 2022; Njangang et al. 2022). Further, the widespread use of mobile money (through M-Pesa) may be a source of increased financial inclusion and reduced poverty (leading ultimately to reduced inequality)—although the empirical results for such effects from mobile money are mixed (Suri and Jack 2016; van Hove and Dubus 2019).

2050, and in absolute terms this amounts to over 40 million people (UNDESA 2018). These trends are leading to increased urban food demand, longer supply chains, and greater rural inequality (IFAD 2021). How to feed and support a growing and changing population under tumultuous climatic and market conditions is perhaps the greatest challenge facing Kenya today.

Gender inequalities are contributing to the underperformance of the economy and the agriculture sector specifically. Women represent over half of the agricultural labor force in Africa south of the Sahara (Palacios-Lopez, Christiaensen, and Kilic 2017). Their substantive contribution to agriculture and their vital role in ensuring family food security have been widely documented. However, gender-based inequalities in access to and control of productive and financial resources inhibit agricultural productivity and undermine resilience and sustainability efforts. Gender productivity gaps in the region range from about 11 percent to 28 percent, with Kenya at around 18 percent (World Bank 2012; UN Women, UNDP, and UNEP 2018). Substantial gender gaps in productivity have arisen not because women are less efficient farmers but because they have inequitable access to land and to agricultural inputs (Rodgers and Akram-Lodhi 2019). Such unbalanced distribution frequently stems from and is bolstered by deeply entrenched socio-cultural norms and traditional expectations of gender roles.

In order to address these challenges, the Government of Kenya has made food security one of the key pillars of its national development strategy, Vision 2030, through the Medium Term Plan III and the Big Four Agenda, with the aim of achieving 100 percent food and nutrition security by 2022. Specifically, this is to be achieved through the construction of large-scale multipurpose dams and smaller dams for irrigation projects and of food storage facilities, and the implementation of high-impact nutritional interventions (Kenya, National Treasury and Planning 2018).

Despite these commitments, and the important role that agriculture plays in the Kenyan economy and jobs, public expenditure is lacking. Agriculture contributes 22.7 percent of gross domestic product (GDP) directly to Kenya's economy, and the broader food system contributes 33.8 percent (Chapter 2). The sector employs more than 43.3 percent of the total population (Chapter 2) and more than 70 percent of Kenya's rural people (IFAD 2019). However, public expenditure on the agriculture sector remained around 2 percent in the 2021/22 fiscal year, well below the Malabo commitments of 10 percent and below the spending of its peers in Africa south of the Sahara (AUC 2014; Kenya Parliamentary Service Commission 2021; Pernechele et al. 2021). These low levels of expenditure translate into weakened policy implementation: the

agriculture, water, and environment sectors together have 216 stalled government projects—more than any other sector (Kenya Parliamentary Service Commission 2021). However, increasing spending does not automatically translate into better outcomes: quality of spending matters. There is a need to prioritize investments and to target spending strategically to make it possible to achieve the desired impacts most effectively (Fan 2008).

At the international level, the UN has coined this decade the “Decade of Action,” as countries work toward reaching the Sustainable Development Goals (SDGs) by 2030 (UNSDG 2020). However, longstanding structural challenges and the ongoing crises mean that, like many countries, Kenya is not on track to achieve the SDGs. The country also risks not achieving its national goal of becoming a middle-income country by 2030, laid out in its Vision 2030 (World Bank 2020; Sachs et al. 2021). Action is urgently needed.

A promising avenue for fostering change toward achieving Kenya’s national development and the SDGs is to focus policies and investments on *food systems-led transformation*. Transformation in food systems is more than just economic and agricultural transformation. It involves changes to all facets of food systems, including the supply and consumption of food as well as institutional support. On the supply side, transformation involves moving labor and other productive assets from low- to high-production activities as well as improving productivity within each value chain (UN-Habitat 2016). Such changes can come through the reprioritization of value chains and through on-farm developments or improvements in upstream and downstream supply chains. On the demand side, transformation involves changing consumption behavior and improving access to and availability of food. Policies, institutions, and research should facilitate these changes with the objectives of building nutritious, productive, resilient, sustainable, and inclusive food systems (IFPRI 2021).

The next sections provide a brief overview of the evolution of economic development thought, from an initial focus on agricultural productivity to a more market-oriented value chain approach to the current focus on food systems.

A new opportunity for development: From agriculture- to food systems-led transformation

Understanding the historical context of frameworks for food policy and rural development is critical to understanding why there is a need today for a food systems approach, and how this differs from previous initiatives. While

every country's food policy follows its own path, there are undeniably global trends that underlie local policy decisions. These global trends are even more important when there is external financing of large portions of public agriculture-related budgets, as is the case in Kenya. In the 1960s, the Green Revolution led to a global effort to intensify agriculture and boost productivity through the uptake of improved varieties and chemical fertilizers, particularly for staple foods. In Kenya, after some initial success, the Green Revolution for staple foods has stalled since the 1980s (De Groot et al. 2005). With the Green Revolution generating mixed success, global trends in food policy then shifted toward value chain development at the start of the 21st century, and they are now moving toward food systems approaches (as seen in the 2021 UN Food Systems Summit). The brief discussion of the evolution of global trends in policy approaches that follows sets the stage for the presentation of the food systems framework.

The traditional Green Revolution approach

The approach to understanding economic transformation has evolved over the past decades from a narrow focus on improving on-farm productivity to a broader one on transforming food systems. This evolution in economic thought is reflective of historical transformations in agriculture, growing evidence on effective and ineffective approaches to food sector development, and changing policy strategies and goals.

Previous agricultural revolutions have been driven by the development and dramatic uptake of on-farm production technologies. The British Agricultural Revolution, taking place from the 18th century to the 19th century, for example, saw the uptake of improved practices such as crop rotation, the introduction of new crops from global trade, and the use of machinery such as seed drills to make farming more efficient. To enable these transformations, the government pursued policies of land consolidation (for example, the Enclosure Acts), market development, and physical infrastructure construction. More efficient, market-oriented farms led to undeniably transformative results: labor and capital shifted from the agriculture sector to industry, leading to the Second Industrial Revolution (O'Brien 1977). This process of increasing within-sector productivity and reallocating labor and capital from less efficient to more efficient sectors is known as structural transformation, and has been identified as a key process in achieving economic development (Breisinger and Diao 2008).

By the mid-20th century, the world was facing an impending food crisis: rapidly increasing populations threatened to outstrip food supply. Scientists

searched for a way to increase food production to avoid a global, Malthusian catastrophe—and the Green Revolution was born. Cereals, particularly maize, wheat, and rice, were the focus of the Green Revolution because of their ability to provide calories *en masse*. The development of chemical fertilizers, high-yielding varieties, improved irrigation, and farm machinery proliferated on farms and allowed previously low-yield areas to become important food producers (Pingali 2012). Mexico transformed from a net importer of maize to a net exporter in under two decades (Sonnenfeld 1992). India’s grain deficit turned into a surplus (Rahman 2015). Numerous other countries, notably in Southeast Asia, saw similar results and were able not only to transform their agriculture sectors but also to set the stage for industrialization and structural transformation (Hazell 2009). As in the British Agricultural Revolution before, policies enabling land consolidation and market and infrastructure development helped pave the way for the Green Revolution.

Broadly speaking, most economies in Africa south of the Sahara—including Kenya—have not seen the transformative effects of the Green Revolution. Until recently, much of the research on the African food sector has been dedicated to understanding how to replicate the results from the Green Revolution in the region, in the assumption that increasing on-farm productivity will make it possible to meet the conditions for structural transformation and spur economic transformation.

However, the results of this “traditional” approach have not been sufficiently transformative. For example, in Kenya, per hectare maize yields have not increased in 30 years (FAOSTAT 2022), food insecurity is still a major issue (Sachs et al. 2021), uptake of inputs and machinery is low (Chapter 9), and the agriculture sector still absorbs most of the labor force (World Bank 2021). Subsistence agriculture, as opposed to market-oriented production, still plays a large role in Kenyan agriculture and hinders the ability of farmers to enhance production through input use and land consolidation (Muthini, Nzuma, and Qaim 2020; Gollin, Kirchberger, and Lagakos 2021). As such, Kenya is in the process of transitioning from traditional to modern rural systems (IFAD 2021).

Market development and the value chain approach

Because market development has played a crucial enabling role in past agricultural transformations, policymakers have increasingly turned toward inclusive value chain development to transform African food sectors (Barrett et al. 2020). Value chains encapsulate the process of creating a product and delivering it to end consumers (Reardon and Timmer 2012). In Kenya, inefficiencies and uneven distribution of profits (or of the value created) often characterize

agricultural value chains, and market access for farmers remains poor in many areas (Chamberlin and Jayne 2013). As such, the development of value chains to enhance the production of food and streamline the process of distributing food to end consumers has been a much-needed policy focus. Undergoing these value chain transformations in an inclusive manner has also been critical. This ensures that small or marginalized farmers (for example, women) and value chain actors (for example, processors, transporters, and retailers) can benefit from the value chain development, and existing inequalities are not exacerbated (Donovan, Stoian, and Lundy 2016). Such an approach builds on the failings of the Green Revolution, which placed little importance on inclusivity and often pushed marginalized actors out of the sector altogether (Hazell 2009). However, this approach to transforming the food sector still often remains supply-centric, and does not address the environmental issues associated with Green Revolution technologies, which are becoming increasingly important in the context of climate change.

Toward new transformative frameworks

In order to address the weaknesses of previous approaches, frameworks must not focus only on improving food supply. Demand-side dynamics and institutional arrangements play vital roles in the food sector; to drive transformation, it will be key to address constraints in these areas alongside those facing farmers. Second, frameworks must recognize that on-farm productivity is only one outcome, and it cannot be pursued at the expense of other desirable outcomes, such as sustainability. During the Green Revolution, overuse of fertilizers, pesticides, and other chemical inputs led to land degradation, the pollution of water sources, and other detrimental environmental outcomes (Hazell 2009). In the face of a growing climate crisis, it is critical to pursue the objectives of sustainability and resilience jointly with increasing productivity. Frameworks that explicitly address these issues are needed. Such frameworks should not ignore the importance of improving productivity: yields in Kenya and other countries in Africa south of the Sahara are still low, and stagnating production is a major issue currently facing the Kenyan food system that rightfully deserves policy attention (Chapter 7). However, this should not come at the price of creating further problems down the road.

The following section provides an overview of food systems frameworks and then proposes a framework for food system transformation in Kenya.

The food systems framework for Kenya

The food systems² framework has been proposed as a holistic framework to guide policy to meet the various needs of a modern food sector. More generally, systems thinking “involves exploring the characteristics of components within a system . . . and how they interconnect to improve understanding of how outcomes emerge from these interactions” (McNab et al. 2020). In the context of food systems, this requires identifying the proper components, or actors, and understanding how such actors interact with one another to either promote or hinder desired food system outcomes. Once an understanding of the various actors, interactions, opportunities, and constraints of a food system is attained, the policy approach to facilitating food system transformation flows naturally.

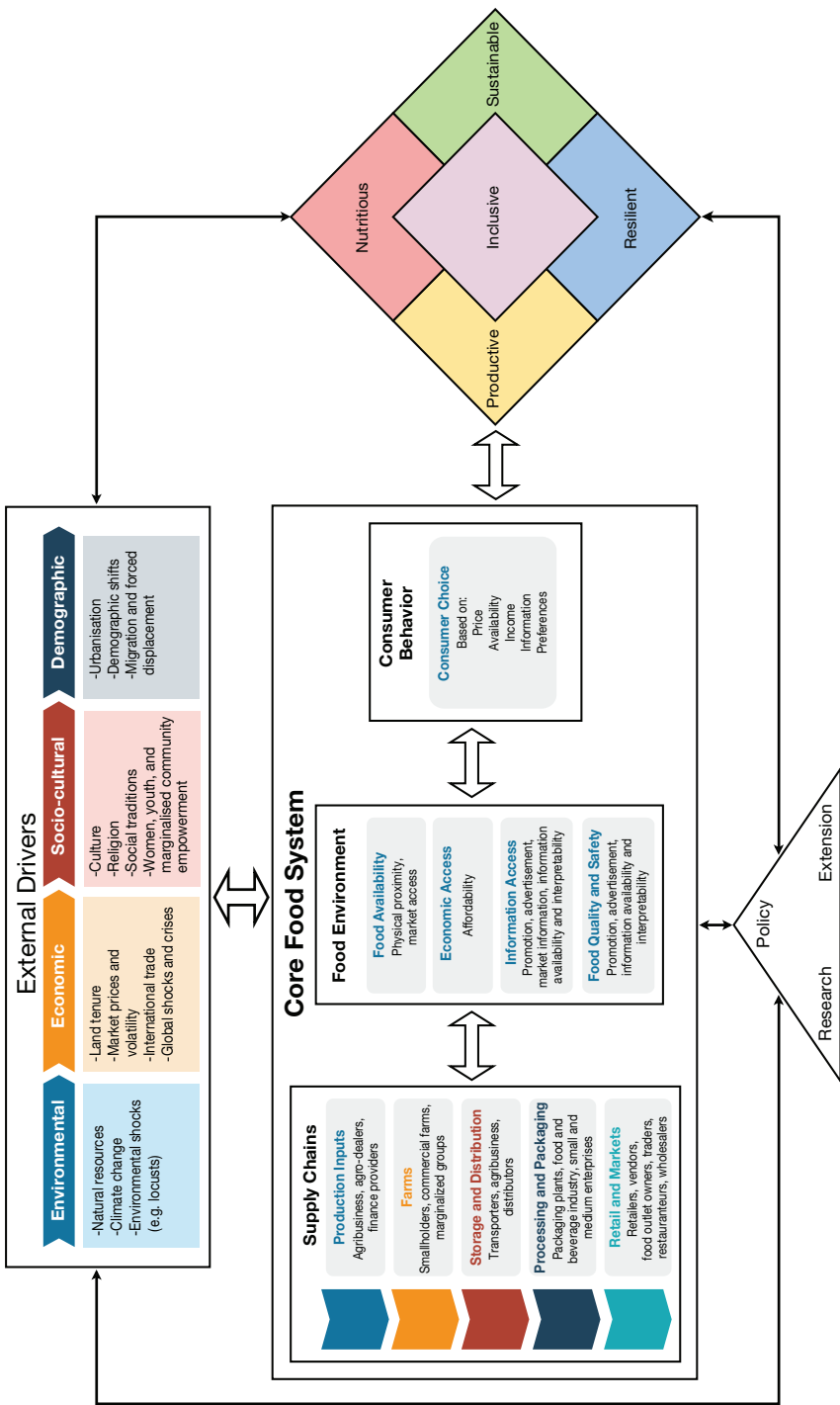
Defining food systems, understanding what the goals of transformation should be, and identifying the key levers by means of which transformation can occur are precursors to creating an enabling and coordinated policy for the food sector. “A food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes” (HLPE 2017). This complex web of actors and activities can be divided into five broad components: food supply chains, the food environment, consumer behavior, external drivers, and outcomes (shown in Figure 1.1).

Food supply chains concern the production and distribution of food and are conceptually similar to value chains, discussed above. These supply chains include upstream actors (input providers, agricultural services, and extension), farmers, and downstream actors (aggregators, processors, distributors, wholesalers, and retailers). Parallel streams, such as financial services providers and research and development, also play important roles in food supply chains (Reardon et al. 2019). Development of supply chains has been the focus of much agricultural policy in recent years, as inclusive value chain development has become an increasingly popular policy tool (Barrett et al. 2020).

The **food environment** is the context in which consumers obtain, prepare, and consume food (HLPE 2017). Physical, economic, political, and sociocultural factors affect this context—respectively, consumers’ physical proximity

2 The food system is also sometimes referred to as the agrifood system, and the terms are often used interchangeably. To ensure consistency with the food systems framework laid out in this book, we use the term “food system” throughout. This choice of wording also relates to the fact that the nonfood part is of minor relevance for the topics covered in this book. The only exception is Chapter 2, which lays out an accounting framework that explicitly captures food and nonfood items across all value chains.

FIGURE 1.1 The food system framework



Source: Adapted from HLPE (2017), de Brauw et al. (2019), Njuki et al. (2021).

to markets, food affordability, regulations, and cultural beliefs about food have impacts on the food environment. Further, how food is marketed and promoted to consumers makes up a key component of the food environment.

Consumer behavior is the set of choices consumers make about what food to obtain, prepare, and eat (HLPE 2017). Such behavior occurs at both the household level and the individual level and encapsulates intrahousehold decisions on food allocation. Preferences, income, location, cultural beliefs, and the food environment can all shape how consumers make decisions. Placing consumers as a central component of the food system builds upon previous policy and research approaches that have placed a much larger emphasis on the supply side.

The three central components—the food supply chain, the food environment, and consumer behavior—are all shaped by external factors. Such factors include broader economic conditions, the natural environment, socio-cultural traits, demographic characteristics, and policy. Each central component responds to these factors to affect the outcomes. In the food systems framework, policy is depicted as a component distinct from other external factors because governments and other institutions can directly create policy to affect the rest of the food system. The next section discusses how to enable food system transformation through effective policy.

The food system produces more than just food: it has environmental, health, economic, and cultural outcomes. Further, overall food system results affect food supply, the food environment, and consumer behavior, creating a positive feedback loop. Early work on food systems frameworks placed a greater emphasis on nutrition and environmental outcomes (HLPE 2017; de Brauw et al. 2019); more recent work has stressed the role of gender in every aspect of food systems (Njuki et al. 2021).

The results of food systems can be categorized along five dimensions: productivity, resilience, sustainability, health, and inclusivity (IFPRI 2021). Productivity refers to the ability of food systems to efficiently produce enough food to feed a growing population. However, food supply is subject to environmental factors (for example, the increasingly volatile rainfall patterns across East Africa and the proliferation of pests such as locusts) and market risk (for example, increasing international fertilizer and fuel prices). Food systems must be designed to withstand such shocks to make it possible to avoid acute food crises. The role of food production in environmental degradation is an issue that is moving to the forefront of international policy discussions, and food systems must be able to function sustainably without ruining the most important asset for food production—the environment—for future

generations. Further, food systems need to ensure that the food produced meets the nutritional needs of consumers. Safe, balanced diets with sufficient macro- and micronutrients are needed to promote health. Finally, these systems should achieve productivity, resilience, sustainability, and health for all communities and groups of people. Inclusivity is needed to prevent further marginalization, to create more equal societies, and to leverage the vast knowledge and experiences of diverse populations to transform food systems. Inclusivity is often discussed in terms of empowering female and youth populations but it also includes economically and geographically marginalized communities, such as residents of urban slums or remote rural areas.

The interactions of the food supply chain, the food environment, consumer behavior, external drivers, and food system outcomes are what make the food system run. The entire system is an interrelated web of actors and activities. Changes in one area of the food system will have ripple effects that extend beyond the immediate outcomes. For example, a policy promoting the growth of a more suitable crop in semiarid areas will immediately affect the farmers and more broadly the food supply chain. This in turn will affect the food environment, consumer behavior, and eventually food system outcomes. These outcomes are then fed back through the system, creating a cycle of change. Having this broad view of the food system can help researchers and policymakers understand the full effects of interventions, economic and environmental conditions, and policies. Such learning can translate into effective policy.

Research-based, policy-driven food system transformation

This concept of food system transformation has received much attention internationally as well as in many countries, including Kenya. The year 2021 marked an important milestone in international food policy: the UN Food Systems Summit brought together delegates from around the world to discuss a new approach to economic development. Over 100 countries—including Kenya—developed national pathways to transform their food systems. The Food Systems Summit identified five action tracks, analogous to the five key food system outcomes, for governments to focus on: ensuring safe and nutritious food for all; shifting to sustainable consumption patterns; boosting nature-positive production; advancing equitable livelihoods; and building resilience to vulnerabilities, shocks, and stress. Further, the Summit outlined four levers of change that can cut across the action tracks and drive food systems transformation: gender, human rights, finance, and innovation (Herrero et al. 2021).

However, although the Food Systems Summit placed food systems thinking and its objectives front and center for the international community and national governments, it provided less practical guidance on how policy could transform food systems. The action tracks help in policy goal setting and the levers identify areas on which governments should focus to drive change. However, setting goals is not enough. Effective policy needs research-based development and implementation to meet policy goals (Cerna 2013).

An economic lens is particularly useful in understanding the complex nature of food systems, for several reasons, according to Fan and colleagues (2021). First, economics is concerned with scarcity and choice, and resources in food systems are often scarce: producers are constrained in their ability to engage in intensive farming systems, consumers face tight budgets, and institutional actors are limited in their capacity to enable the system. Economic analysis is able to give insights across these different levels of actors. Second, economics is able to analyze the trade-offs between different food system outcomes—productivity, resilience, sustainability, health, and inclusivity. Sometimes, meeting objectives along one of these dimensions may come at the cost of another, and evidence is needed to understand these costs and benefits (de Brauw et al. 2019). Third, economics can provide analysis for individual actors (microeconomics), markets (mesoeconomics), and the economy as a whole (macroeconomics). Therefore, economic analysis can sufficiently address both the feasibility and the results of both bottom-up and top-down interventions. A fourth aspect of economic analysis is also crucial for food system analysis: the quantitative, data-driven nature of modern economics. Rigorous economic analysis relies on large sample sizes and state of the art statistical methods that can meet the objectives of data-driven policy (AUC 2014).

An overview of this book

This book takes a critical look at the Kenyan food system, where it has been, and where it can go. It brings together a mix of Kenyan and international experts from CGIAR, academia, and nongovernmental organizations, resulting in a collaborative work that offers an in-depth discussion of food systems and presents various case studies across different value chains and areas of the food system. Bringing together a diverse range of rigorous research with both a bird's-eye view of Kenyan food systems and in-depth analyses of specific components of food systems allows for a unique perspective into the policies needed to enable transformation. Reflecting this approach, the book recommends broad policy themes

and specific policy recommendations that can position Kenya as a global leader in tackling the challenges of the Decade of Action.

This book presents economic studies across the food system using a variety of research methods. Some chapters present reviews and syntheses of scientific evidence on certain topics, whereas others present original, individual studies. The analysis is carried out at different levels, with some chapters looking at broader food system dynamics and other chapters zooming in on individual areas and value chains within the Kenyan food system. Chapters rely on both qualitative and quantitative methods using cutting-edge methodologies, such as randomized controlled trials, simulation modeling, and nationally representative household analysis. Taken as a whole, the varied methodological approach highlights the importance of data-driven learning, the use of mixed methods to more comprehensively understand topics, and the scale and scope of research needed to understand Kenya's food system and assess food policy. It further suggests that there is no cookie-cutter approach to rigorous research: different approaches to research are needed for different questions. In other words, as far as research methodology goes, "The gold standard is the best method for the question at hand" (Ravallion 2018).

The book is divided into six parts. The first part gives an overview of food and livestock systems in Kenya. This is followed by five parts that correspond to the five food system outcomes: health, productivity, resilience, inclusivity, and sustainability. Part 2 (health) presents research on Kenyan diets and food safety in the country. Part 3 contains four chapters related to food production, which analyze, respectively, agricultural productivity trends in general, the role of inputs in agriculture, maize intensification, and mechanization. Part 4 relates to food system resilience and presents research on overall production resilience, climate insurance, and risk contingent credit. Part 5 discusses the inclusivity of the food system with respect to gender, youth, and small farmers. This is followed by Part 6, which presents research related to the environmental and financial sustainability of transformation in the context of postharvest management and digital solutions, respectively. The book concludes with a discussion on overall policy approaches and specific policy recommendations to drive food system transformation. While the chapters are categorized based on the most relevant food system outcome, many of their insights cut across outcomes. The components, actors, and outcomes of food systems do not exist in isolation; consequently, the corresponding research must acknowledge this interconnectivity. This book demonstrates the breadth and depth needed in food systems research to inform transformative policy.

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