CHAPTER 11

Data Challenges and Opportunities for Food Systems Transformation in Africa

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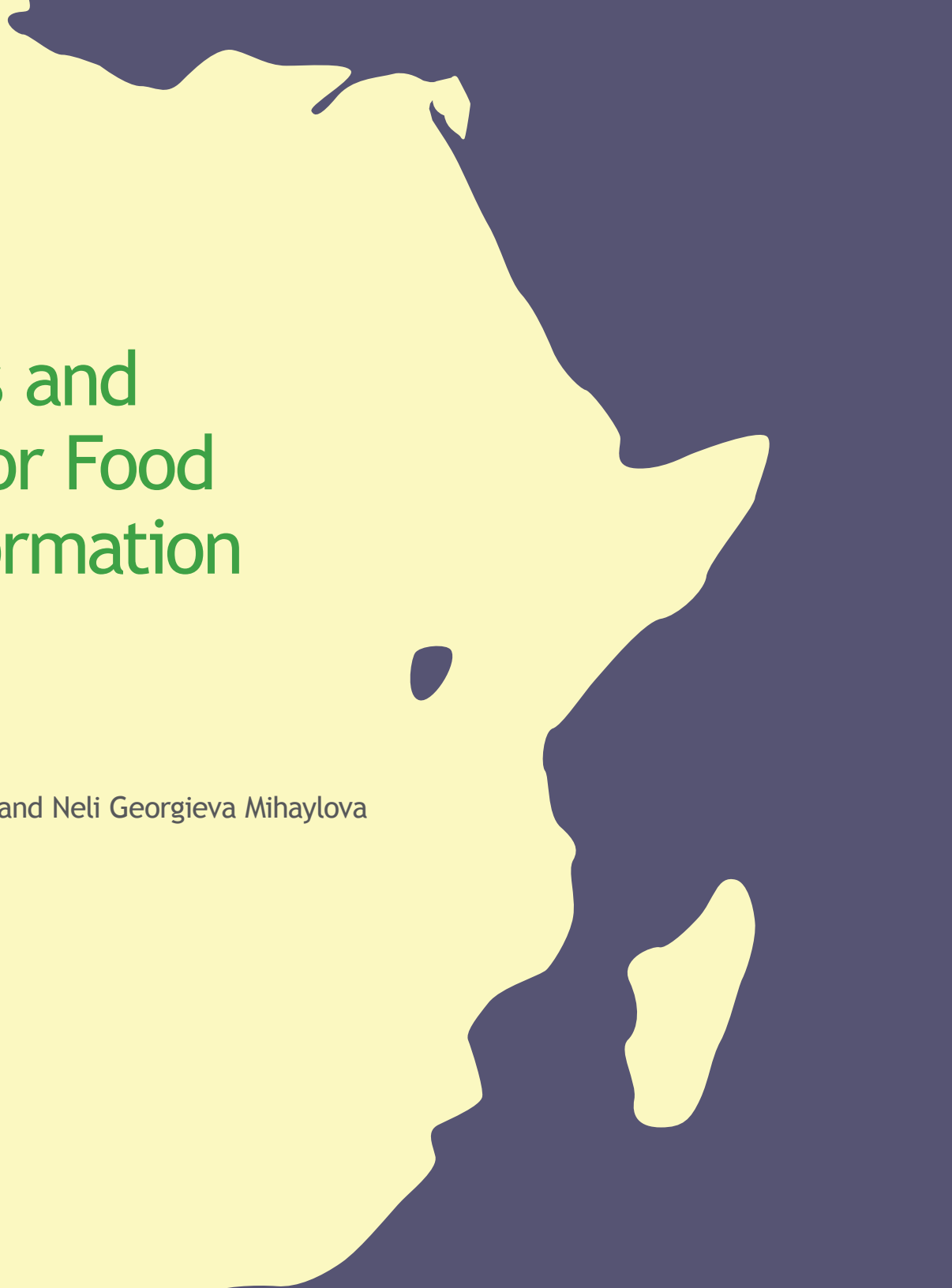

Introduction

African food systems began to transform during the last decade in response to higher agricultural productivity growth, rising per capita incomes, a growing middle class, and rapid urbanization. Africa's emerging food systems transformation was also driven by changes in food consumption patterns (dietary transformation) and the growth of small and medium enterprises operating in downstream and midstream segments of food supply chains such as processing and distribution (Tschirley, Haggblade, and Reardon 2014; Reardon et al. 2015). These changes have contributed to greater availability and consumption of highly processed and high-calorie foods, which have been significant drivers of the growth in overweight and obesity and related noncommunicable diseases on the continent (Ecker and Fang 2016), as well as having far-reaching implications for nutrition and the sustainability of African food systems as a whole.

Today, the evolution of African food systems is being shaped by various exogenous shocks and challenges that range from extreme weather events and more frequent and damaging effects of climate change to recurrent pests and disease outbreaks, a growing number of conflicts, global economic and health shocks, and natural resource and environmental degradation. The COVID-19 pandemic and the Russia-Ukraine war have further laid bare the fragility and vulnerability of Africa's food systems through disruptions in global supply chains and trade, higher food prices, losses in incomes and jobs, and declines in dietary diversity that have exacerbated food insecurity and poverty (McDermott and Swinnen 2022; Badiane, Fofana, and Sall 2022). In 2022, the number of people experiencing hunger in Africa rose to about 282 million, which is almost 57 million more since the start of the pandemic (FAO et al. 2023). Africa as a whole is not on track to meet the Malabo Declaration's agricultural transformation goals by 2025 and the UN Sustainable Development Goal (SDG) 2 on ending hunger by 2030. Furthermore, progress toward food systems transformation has also been hampered by limited representation of indigenous and traditional knowledge systems, gender inequality, gaps in knowledge on the interactions among food system activities and components, incoherent policies, divergent interests and values among different food system actors, and the low prioritization of sustainability issues (von Braun et al. 2023; Singh et al. 2021).

Sustainably transforming Africa's food systems will not only require urgently addressing the above shocks and challenges but also harnessing the opportunities brought on by rising incomes, a growing middle class, dietary changes, an increasing youth population, and advances in digital technologies and technical innovation. Understanding what is meant by both food systems and food systems transformation is therefore critical to realizing this transformation. Food systems are defined as the range of all actors and interactions along the food value chain—from input supply and production to transportation, processing, retail, wholesale, preparation, consumption, and disposal of foods, as well as the enabling policy environments and cultural norms pertaining to food (IFPRI 2023). Furthermore, food systems transformation entails moving food system outcomes from a suboptimal state to a more optimal state by having food system actors adapt their activities in response to changing policy signals (Ingram and Thornton 2022) and thus help to ensure sustainable and resilient livelihoods and healthy, safe, nutritious, and affordable diets.

Transforming food systems requires a change in the mindsets and behavior of food system actors as they adapt their activities and assess (or reassess) food system policies. Likewise, the transformation of food systems will need to be buttressed by making data and analytics available and accessible to drive innovation and guide decision-making by food system actors across all food system activities, components, sectors, policies, and outcome areas (Nguyen 2018). More specifically, sustainable food systems transformation demands timely, high-quality, and reliable data and analytics that span the entire food system to (1) inform adaptation of food system activities by food system actors; (2) guide shared agendas, goals, and performance indicators around food systems; (3) enable evidence-based design, coherence, coordination, implementation, assessment, and reform of food system policies; and (4) guide review, dialogue, learning, monitoring, mutual accountability processes, and performance assessments of the transformation, including progress toward attaining desired outcomes.

Data and analytics are also critical for bridging knowledge gaps in food systems transformation, and science-policy interfaces (SPIs)[1] can play a critical

1 Science–policy interfaces (SPIs) are defined as social processes that include relationships between scientists and other actors in the policy process, and allow for exchange and co-development of knowledge with the aim of enriching decision-making (Van Den Hove 2007).

role therein. Singh and colleagues (2021) call for more efficient SPIs that (1) generate, collect, and integrate knowledge; (2) support forward-looking forecasting, modeling, and scenario building to support multistakeholder dialogues; (3) facilitate transferable lessons across food systems; and (4) spur global and local institutional capacity building. In turn, these SPIs should be anchored by the key principles of having credible data, peer review and reporting, a legitimate and inclusive process, the active participation of all stakeholders, and a focus on achieving multiple benefits (Singh et al. 2021). In light of the complexity of food systems, ensuring sustainable transformation will require not only available, accessible, and usable data but also SPIs that are well coordinated and coherent to guide activities, interactions, policies, trade-offs, and synergies across the food system.

However, the extent of data availability and gaps in data to inform food systems transformation remains an understudied area. Given the urgency of sustainably transforming food systems and the undeniable need for timely, transparent, and high-quality data to inform decision-making around the transformation process, this chapter assesses the data requirements for food systems transformation (that is, data demand) as well as key existing data initiatives and databases (that is, data supply) that can inform food systems transformation. More specifically, the chapter seeks to (1) highlight the importance of timely and high-quality data; (2) examine main data needs; (3) assess selected current data efforts; (4) highlight data gaps, challenges, and opportunities; and (5) provide recommendations for closing data gaps, addressing challenges, and harnessing opportunities in order to improve data for decision-making in food systems transformation.

Data Requirements for Food Systems Transformation

This section highlights the minimum data needed to effectively transform African food systems. This discussion is important for identifying gaps between the data required to transform food systems and the data that are currently available.

As highlighted in the introductory section, the concept of food systems transformation refers to transforming food system outcomes by way of food system actors adapting their activities in response to ever-changing signals and policymakers reassessing how policies are affecting signals that influence the behavior of food system actors (Ingram and Thornton 2022). Thus, food systems transformation is about fundamental changes that occur at various nodes or components of the food system as a result of several factors, including urbanization and population pressures as well as changes in incomes (Tschirley, Haggblade, and Reardon 2014). Data and analytics are needed to understand important food system dynamics including (1) changes in urban populations and per capita incomes; (2) large changes in consumption patterns and diets; (3) rapid changes in midstream and downstream segments of food supply chains such as processing, marketing, and regulating agrifood trade; (4) growth in rural factor markets, especially for agricultural services; and (5) changes in agricultural technology and in the size distribution of farms (Reardon 2013; Tschirley, Haggblade, and Reardon 2014).

Better data and analytics can also be useful in understanding any changes in the four pillars of the food system, namely: (1) food security, nutrition, and health; (2) socioeconomic factors; (3) environment; and (4) territorial balance and equity (see David-Benz et al. 2022). At a very basic level, therefore, a drive to transform food systems necessitates gathering data and undertaking analytics to track and examine the activities along the food value chain, from inputs to consumption, as well as how they interrelate.

This implies that understanding the food systems transformation requires specific data to assess various aspects of the food system, as well as what should transform, why it should transform, who should transform it, and how it should transform within the food system. Therefore, data and analytics are needed on (1) impacts of the food system on food security, nutrition and health, environment and climate change, socioeconomic factors, and territorial balance and equity; (2) causes of the impacts, including drivers and activities; and (3) stakeholders and actors that influence both positive and negative impacts on the food systems (see Mkwambisi et al. 2021) and all activities along the food value chain.

For example, with good data and analytics, the pervasive issue of environmental degradation and damage to ecosystem services—some of which can be attributed to aspects of food production, processing, and consumption—can be better understood, and through policy levers, food systems transformation can

be engineered to minimize such negative externalities. Policies that enable the private sector to establish agribusinesses along all nodes of the value chain in response to changing consumption demands and patterns can speed up transformation with important positive implications for the entire food system. Food systems transformation also demands other sets of human capital skills, for example, in food processing, food labeling, and rapid food delivery. Timely data and analytics can facilitate policymakers' understanding of the state of human capital skills for food systems, which in turn, is important for a faster and more desirable food systems transformation.

Other relevant drivers of food systems transformation include access to water, access to information, and markets. Researchers and policymakers need data on access to food and information about food types, access to markets and financial resources for smallholder farmers, and the capacity of individuals and vulnerable groups to withstand shocks and stresses in the food system. In addition, the following issues will all need attention if the United Nations Food Systems Summit (UNFSS) action track propositions (see next section) are to be implemented successfully: metrics and measurement, human resources, governance, multisectoral planning capability, applied interdisciplinary research, and systems change capabilities (UN 2021c).

Data and Analytics to Inform Food System Action Tracks and National Food Systems Transformation Pathways

Timely data and analytics are needed for countries to successfully implement their national food systems transformation pathways and the UNFSS action tracks. The UNFSS developed five relevant action tracks to guide countries' and other players' thinking on food systems (UN 2021c). These action tracks represent some of the desired outcomes that should emerge from a transformed food system and also the shifts that must be undertaken to achieve transformation. The five tracks are (1) increase access to safe and nutritious food for all; (2) shift to sustainable food consumption; (3) boost nature-positive production; (4) advance equitable livelihoods; and (5) build resilience to vulnerabilities, shocks, and stress. Guided by the action tracks, several African countries have developed national food systems transformation pathways that will require data and analytics to inform their effective implementation.

For instance, to successfully transform food systems such that there is an increase in access to safe and nutritious food for all, countries need data and analytics that inform decision-making around the types of food eaten by different subsets of the population; their affordability, safety, and accessibility; and all the indicator groups outlined in Table 11.1.

Similarly, up-to-date and closely monitored data on food policies, food environments, and food loss and waste (Table 11.1) are all critical to understanding whether food systems are transforming toward sustainable consumption. Assessing this is critical for corrective action.

Further, if governments and stakeholders in general are to understand and make good decisions about their progress in transforming food systems toward boosting nature-positive production, then monitoring and evaluation is critical and, therefore, good data must be collected and analyzed on greenhouse gas (GHG) emissions from the food system, ecosystem health, energy use, production, and all the activities in the food system value chain. Similarly, there can be no successful advance toward equitable livelihoods in food systems without guiding data and analytics for decision-making. To achieve this transformative shift, data and analytics on livelihoods for different subpopulations, employment types, inclusion, income distribution, and other areas are needed to guide decisions. Last but not least, better and timely data are needed if countries are to achieve the ambition of transforming food systems toward building resilience to vulnerabilities, shocks, and stress. Thus, analyses and data on household resilience over time, during different crises, and across different geographical locations (Table 11.1) are critical to understand whether such a shift toward food system resilience to vulnerabilities and stress is happening, and to take corrective decisions if not.

Food System Levers of Change

For food systems to transform, the policies, technologies, and science affecting them must change, leading to shifts at each stage of the food value chain (production, processing, distribution, and consumption). A lever of change can be understood as an area of work that has the potential to deliver wide-ranging positive effects beyond its immediate focus. In the context of the UNFSS, four levers of change have been identified: human rights, gender equality and women's empowerment, finance, and innovation (UN 2021b). The levers are fundamental in establishing pathways to sustainable and equitable food systems by 2030.

To move toward transformed food systems, policymakers need to understand the status of these policy levers in addition to the action tracks, outcomes, and

drivers of change. This implies that analysis of data on levers of change is needed to capture the state of these elements over time, across groups of stakeholders, and across other disaggregated categories in order to make informed decisions.

A minimum amount of data is needed for each of the highlighted UNFSS action tracks and levers of change, including those summarized in Table 11.1. Table 11.1 is critical for food systems transformation because it highlights some of the key types of data that should be tracked to understand what should change in food systems (diets, consumption patterns, nature of production patterns, equity and distribution, and resilience to vulnerabilities), as well as how the change should happen (using levers of change). Similarly, Table 11.2 presents key types of data needed to analyze and understand where the changes should take place in the food system (food system activities including production, food processing and packaging, distribution and retailing, and consumption).

Production requires data on inputs, technology, and land laws, among others, while food processing and packaging require information on raw materials, standards, storage, and other types of technologies. Food distribution and retailing require data on means of transportation, roads, and information technology, among others, and food consumption requires data on acquisition

TABLE 11.1—DATA NEEDS FOR FOOD SYSTEM ACTION TRACKS AND LEVERS OF CHANGE

Action tracks					Levers of change			
Access to safe and nutritious food for all	**Shift to sustainable consumption patterns**	**Boost nature-positive production**	**Advance equitable livelihoods**	**Build resilience to vulnerabilities, shocks, and stress**	**Human rights**	**Gender equality and women's empowerment**	**Finance**	**Innovation**
• Access to nutrition information • Prevalence of over-/undernutrition • Access to nutritious food • Share of vegetables and fruits in diet • Cost of a healthy diet • Diet quality • Nutrient supply and demand • Food safety	• Food waste • Postharvest food losses • Affordability • Sustainability of diets • Food environment and policies	• GHG emissions from agriculture • Forest land being deforested for agriculture • Food loss across supply chain • Regeneration of ecosystems • Biodiversity and habitat index • Gene banks • Water footprint of foodstuffs and commodities	• Income inequality • Gap between farmgate price and wholesale price • Gender equity • Women's empowerment • Employment equity groups • Wage equity • Land tenure and security • Water access • Access to markets • Storage infrastructure • Social protection • Financial inclusion	• Household resilience capacity • Risk distribution by gender • Access to macro- and microcredit financial services • Government social security budget • Notre Dame Global Adaptation Initiative (ND-GAIN) Country Index • Food production diversity • Incidences of storm surges, floods, droughts, and disease • Poverty and unemployment • School enrollment • Crop and livestock insurance	• Presence of food systems–related governance bodies and mechanisms • Political governance indexes • Transparency indexes • Corruption indexes • Land laws and institutions • Coordination among government systems • Skills in food systems	• Share of women empowered in agriculture (Women's Empowerment in Agriculture Index) • Youth as a share of population • Youth in agriculture • Gender inequality • Share of youth in high-value value chains (e.g., macadamia nuts, cashew nuts, cotton, tea, coffee, ornamental plants, and others)	• Financial inclusion for food system players – Share with access to finance – Share with bank accounts – Share with access to microfinance – Loan availability • Share of public spending on agriculture • Agriculture foreign direct investment	• Agricultural patents • Shares of improved crop varieties and livestock breeds in circulation • Investment in leadership, technology, and human resource capability • Investment in mechanization of production • Scaling up of sustainable technologies such as cold chain • Investment in nutritious dietary options

Source: Authors' compilation.

TABLE 11.2—INDICATORS FOR FOOD SYSTEM OUTCOMES, ACTIVITIES, AND DRIVERS

Food system outcomes			Food system activities				Food system drivers		
Social welfare	**Food security**	**Environmental security / natural capital**	**Production**	**Food processing and packaging**	**Food distribution and retailing**	**Food consumption**	**Biophysical drivers**	**Socioeconomic drivers**	**Natural drivers**
• Agricultural income per capita • Employment rates • Inequality • Wealth • Social capital • Human capital • Political capital • Over-/ undernutrition • Women-managed farm share • Share of food income to women • Share of women working in high-value crops • Life expectancy • Disease prevalence • Policies with institutions/ legislation support • Energy security	• Food availability • Amount of food production – Amount of food trade – Dietary diversityFood access – Price of food – Cost of a healthy diet – Inequality in food access – Share of land with fruits – Share of land with vegetables • Food security – Food utilization – Nutritional value – Proportion who consume nutritious foods – Food safety – Social value of food – Malnutrition	• Ecosystem flows • Ecosystem stocks • Ecosystem services available • Access to natural capital	• Natural resources • Inputs • Fertilizer per hectare • Labor productivity • Land productivity • Share of expenditure on agriculture • Technology • Agriculture patents, breeds, and varieties • Irrigation • Subsidies to agriculture • Market systems • Land laws and institutions • Food waste and loss	• Raw material availability • Quality standards • Storage infrastructure • Labeling and tracing • Strategic grain reserves • Supply chain robustness • Electricity availability and access • Processing capacity • Share with electricity • Postharvest technology • Food waste and loss	• Transport infrastructure • Marketing boards / mechanisms • Advertising prevalence • Status of value chain development and transport networks • Efficiency of food distribution systems • Postharvest technology • Food waste and loss	• Acquisition ease • Preparation ease • Nutrition content • Food and nutrition education • Food loss • Food waste • Access to a nutrient-adequate diet • Cost of a healthy diet	• Land cover and soils • Atmospheric composition • Water availability and quality • Climate variability • Notre Dame Global Adaptation Initiative (ND-GAIN) Country Index • Nutrient availability and recycling • Biodiversity • Temperature changes • Floods • Agriculture subsidies • Share of agriculture commercialized • Share of modern seeds in agriculture	• Demographics • Incomes • Inequality • Sociopolitical context • Cultural context • Science and technology • Input markets • Storage and transport infrastructure • Farming practices • Agriculture productivity • Gender differences • Agriculture research spending • Policy environment • Information gaps • Access to funding/finance • Commercialization of food production • Trade and other policies • Food price volatility • Land tenure insecurity • Macroeconomic stability • Climate change • Extension systems • Agricultural terms of trade • Governance and corruption • Illiteracy	• Volcanoes • Solar cycles • Floods • Droughts • Pests and diseases

Source: Authors' compilation.

of food, preparation, food loss and waste, food messaging, and costs of food, among others (Table 11.2). All these types of information are needed to engineer or understand food systems transformation and correct its trajectory if needed.

Table 11.2 also highlights key data needed to understand exogenous and internal drivers (in addition to the levers of change presented in Table 11.1) that can be leveraged to engineer changes in food system activities. The outcomes of a food system are shaped by many drivers that may fall into three broad categories, namely, biophysical drivers, socioeconomic drivers, and natural drivers. Biophysical drivers are those related to land cover and soils, atmospheric composition, water availability, climate variability, and temperatures,

whereas socioeconomic drivers include all those related to actor characteristics, economic characteristics, trade, markets, employment, gender, and many others. Finally, natural drivers relate to phenomena that are exogenous and that actors cannot prevent from happening within a food production and consumption cycle—for example, volcanoes, solar winds, cyclones, and some floods. For food systems to be moved from their current trajectories, which are characterized by poor access to nutritious food for some people, stakeholders need evidence on which drivers can help spur production of the desirable goods, and, thus, data for these food system drivers are critical (Table 11.2). All these data must be collected and analyzed to understand and make decisions about whether the state of these drivers align with societal goals for food systems transformation.

Finally, Table 11.2 also highlights data that should capture the main outcomes of food systems transformation (improved social welfare, food security, environmental security/natural capital) to help understand whether transformative efforts resulting from stakeholders' use of drivers and levers of change across all food system activities are yielding better or desired food system outcomes. Any food system ought to be organized such that it can deliver certain objectives. These objectives may include the achievement of the five action track goals and other transformation pathways. Food system outcomes that are consistent with achieving many of these objectives can be grouped as social welfare, food security, and environmental security. Food system outcomes related to social welfare include those related to life expectancy, incomes of farmers, nutrition outcomes, and others (Table 11.2), whereas food security outcomes include those related to food access, food availability, and food utilization. Outcomes that fall under environmental security include those related to ecosystem flows, ecosystem stocks, available ecosystem services, and access to natural capital, among others (Table 11.2). To ensure that society understands whether food system changes are progressing in the right direction and whether better outcomes are emerging, tracking and analyzing the data types highlighted under the food system outcomes in Table 11.2 is critical, and stakeholders should maintain current databases for data in those categories, the specifics of which may depend on the stakeholders' actual food systems. The bottom line is that data and analytics on food system components are crucial for corrective action and general decision-making within food systems.

Data are also needed to assist decision-makers in understanding the trade-offs associated with their choices of solutions to the wide range of challenges facing food systems. This is important because each decision brings with it both benefits and costs, and analyzing those in advance can be useful in shaping food systems to maximize gains. Examples of these information needs include the need to increase and focus investments in targeted education (for example, around the advantages and disadvantages of different dietary patterns), as well as to ensure that relevant information is provided. Information should help all concerned to assess the value of different options, such as prioritizing producer livelihoods over regenerating natural resources, or saving the best produce for export rather than using it for domestic consumption (UN 2021a).

It is important to note that the indicators in Table 11.2 can be disaggregated at various levels, including national, provincial, community, and district levels, depending on data availability. Ultimately, for food systems transformation to be achieved, tracking this information at various levels of society is critical. Since the universe of indicators useful for food systems transformation is large, narrowing down the priorities from the lists provided here is a task that should be accomplished by each country in consultation with experts and stakeholders in the area.

Data and analytics are essential for decision-making in other ways, too. For example, when nationwide production of nutritious crops is low compared to consumption demand, better food system analysis using data from food system databases could serve to guide policymakers on the extent of this deficit and the location-specific variations in food availability within the country. This information could be used to make decisions about what levels of food imports or in-country distribution the country might need, as well as where to distribute it to meet the deficit. Further, in cases where it is important to maintain sustainable production of food, rich datasets on what food products a country or locality produces, what inputs are used, and to what degree such inputs are used can help in calculating GHG emissions and water consumption by production activities. Equipped with such calculations, policymakers can make decisions on what to grow more or less of in order to transform production to nature-positive levels. Without better data or deliberate efforts to gather food systems data, such transformations may not be feasible. At the farm and agricultural commodity aggregator level, data on variety-specific productivity, technology effectiveness, costs, transportation margins, infrastructure, markets, access, and affordability are all important for driving decision-making. For example, if available seed varieties are of low productivity, but real-time data reveal that neighboring

markets have better and adapted varieties, farmers can use this information to acquire better seeds.

Biermann and colleagues (2021) provide further pointers on how food systems data can be used. Some examples of the usefulness of food systems data and their analysis include situations in which data inform policies to control poverty and food insecurity. Carefully analyzed data can shed light on the characteristics of households with the lowest levels of well-being, and interventions can be developed to target such households. Food systems data may also be used to prioritize policies that support hugely diverse smallholder farming systems by identifying generic patterns (Frelat et al. 2016). Again, through the use of machine learning and artificial intelligence, food systems data can be analyzed to predict future food production, thereby helping policymakers to make decisions in advance about food imports and input purchases, and in the process reduce the strain on food systems (see, for example, Ly, Matchaya, and Dia 2023).

Food System Actors and Stakeholders

Food systems transform as a result of decisions (coordinated or not) of actors carrying out activities, either as policymakers or players across the various nodes of the food system value chain. One challenge with the current state of food systems is that stakeholders take a siloed approach, and, more often than not, other key actors are not involved in making decisions that have systemwide repercussions. Food systems are largely structured by private sector actors, be they farmers, food manufacturers, traders, retailers, or food service providers. Key stakeholders include actors at the various nodes of the value chain, including input suppliers, producers, processors, transporters, retailers, consumers, and policymakers at various levels of government. It is important to collect data on who these stakeholders are and their influence and roles at various nodes of the food value chain in order to understand the degree of stakeholder coordination and increase the likelihood of leveraging them to advance a healthier food system. Stakeholder data may also help in identifying the components of the food system that each actor is involved in and individual interests in policy changes. Data that can help track food system actor decisions and activities are crucial for achieving food systems transformation.

Cross-Cutting Food System Issues

Various cross-cutting issues and themes also need due attention, such as gender and youth, trade, and policies. Data for such cross-cutting issues are necessary to analyze issues that may advance or undermine food systems transformation. In particular, gender- and sex-disaggregated data are important for assessing the contributions of women and girls to food systems and improving their welfare and gender equality. Yet, according to Open Data Watch (2023), gender data are much less available than nongender data categories. Thus, improving the availability and accessibility of gender data will require a concerted effort, including collecting data at both the household level and the individual level to better capture intrahousehold inequalities; prioritizing sex-disaggregated data in data collection and analysis; providing technical assistance to help countries collect and analyze sex-disaggregated indicators; and linking data producers and users to improve data use (Buvinic and Carey 2019).

Selected Data Initiatives and Databases: Strengths and Limitations

The need for accurate and timely data and statistics has grown as the world increasingly adopts a food systems approach to development that endeavors to recognize the importance of many sectors and actors acting together to determine food outcomes. Despite their vital importance, statistical data on the agrifood sector are scarce in many countries, with partial coverage and quality issues. African countries and their development partners are working together to produce more reliable data and statistics as well as to make them more accessible.

The analysis of food systems and their transformation requires many types of data beyond those related to the production of agricultural commodities and use of inputs. The following section discusses selected data initiatives and databases that can inform food systems transformation, with a brief overview of their strengths and limitations.

FAOSTAT Database

FAOSTAT is an online database maintained by the Food and Agriculture Organization of the United Nations (FAO). It provides access to comprehensive statistical information on food and agriculture from countries around the world.

In working directly with countries, FAO supports the development of national statistical strategies, the strengthening of their technical capacities, and the improvement of statistical systems. The database is organized by domain and contains data on a wide range of topics, including crop production, livestock, fisheries, forestry, land use, trade, GHG emissions, food balance sheets, the Food Insecurity Experience Scale, and public investments in agriculture.

FAOSTAT is an invaluable resource for researchers, policymakers, and others interested in food and agriculture. It offers a wealth of information on global trends, enabling users to track changes in production, consumption, and trade over time. The database is also used to inform policy decisions, such as those related to food security and sustainable agriculture. Overall, FAOSTAT is a powerful tool for anyone interested in understanding global food and agriculture trends.

Strengths

One of the main strengths of FAOSTAT is its comprehensiveness. The database includes data from more than 245 countries and territories, making it one of the most extensive sources of agricultural statistics available. Moreover, the data are updated regularly, ensuring that users have access to the most current information. Its user-friendly interface and extensive data coverage make it an essential resource for researchers, policymakers, and others seeking to make informed decisions about food and agriculture.

Limitations

The FAOSTAT database focuses mainly on information linked to agricultural commodity production, natural resources, and the role of women in agriculture. However, it does not cover in detail the entire food value chain, for example, transformation, packaging, and transport, or information linked to governance and macroeconomic indicators.

Living Standards Measurement Study: World Bank Survey Database

The Living Standards Measurement Study (LSMS) is a program initiated by the World Bank to support the collection of high-quality household survey data in developing countries. The LSMS program aims to provide policymakers, researchers, and development practitioners with reliable data to inform evidence-based decision-making and monitor progress toward poverty reduction and the SDGs.

The LSMS program was established in the early 1980s and has since supported more than 80 countries across various regions. It focuses on designing and implementing household surveys that capture a wide range of socioeconomic variables, including income, consumption, employment, education, health, and agricultural activities. The surveys employ rigorous methodologies to ensure data accuracy and comparability across countries and over time. The overarching goal of the LSMS is to foster and facilitate the development and adoption of new methods and standards in household data collection for evidence-based policymaking. An important component of the LSMS program is the Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS-ISA) initiative, a longitudinal survey with a strong focus on African agriculture.

Since 2008, the LSMS-ISA initiative has emerged as an exceptional model for (1) addressing national and international household survey data needs; (2) investing in methodological research with feedback loops into regular household survey operations; and (3) building the technical capacity of national statistics offices (NSOs) through on-the-job training, the introduction of innovative data collection technologies (including computer-assisted personal interviewing, GPS-based area measurement, and remote sensing and DNA fingerprinting–based crop variety identification), and involving the NSOs in an international program of validation of more accurate and cost-effective survey methods. The datasets from the LSMS-ISA generally allow for gender-disaggregated analysis, especially the LSMS+, which is designed specifically to produce data to facilitate such analysis.

To date, the LSMS-ISA initiative has engaged eight NSOs across Africa south of the Sahara in the design, implementation, analysis, and dissemination of national multitopic longitudinal household surveys that have a strong focus on agriculture and that are country-owned and integrated into national statistical systems. The financial and technical assistance, complemented by funding from national governments and numerous donor agencies at the country and global levels, has resulted in 33 surveys implemented, with more than 160,000 household interviews completed to date. The household survey data are made

publicly available within 12 months of fieldwork. The LSMS program also supports policy research and analysis and methodological studies, with feedback engagement with policymakers.

The data from the LSMS-ISA and other LSMS-supported surveys continue to be important for monitoring progress toward some SDGs as well as other regional indicators. These data have informed policy discussions and program designs in various countries over the years.

In addition to the LSMS datasets, the World Bank maintains a global database of economic indicators and trends for all countries in the world. These data help meet many of the requirements outlined in Tables 11.1 and 11.2.

Strengths

The LSMS-ISA dataset provides valuable information needed for analyzing the socioeconomic and demographic indicators linked to small agricultural producers, a valuable input for food systems transformation analysis relating to nutrition, food availability, and poverty.

The LSMS datasets are freely available to the public, allowing researchers and policymakers to access and analyze the data for various purposes. These datasets have been widely utilized in academic research, policy formulation, and program evaluation. They have contributed to a deeper understanding of poverty dynamics, inequality, household behavior, and the impact of policies and interventions on living standards.

Limitations

Not all indicators needed for analysis of food systems transformation are included in the LSMS datasets due to the nature of these surveys, which collect data at the household level. Indicators on food transformation, transport, storage, and retail are not fully covered, except for employment; the rest of these indicators require specialized surveys at a level other than the household. Even though LSMS-supported surveys have been implemented in more than 80 countries, the LSMS-ISA surveys have limited country coverage.

The 50x2030 Initiative

The primary objectives of the 50x2030 Initiative to Close the Agricultural Data Gap are to increase evidence-based decision-making in agriculture by empowering 50 low- and lower-middle-income countries (L/LMICs), including about 30 in Africa, to build sustainable and strong national data systems that produce and use timely, high-quality agricultural and rural data through survey programs using sound and cost-effective survey-related methods and tools.

In many L/LMICs, limitations in the scope, quality, and frequency of agricultural data collection severely constrain effective planning, financing, and implementation of agricultural development policies. The gap in agricultural data in these contexts may lead to suboptimal policy design, which may result in failure to adequately address hunger and poverty. The 50x2030 Initiative addresses these problems with the goal of promoting evidence-informed decision-making, especially to achieve SDG 2 (zero hunger) in partner countries. Embedded in the initiative, through its emphasis on capacity building and country partner ownership, is a significant contribution to SDG Indicator 17.18, which aims to boost capacity-building support to developing countries in order to increase the availability of high-quality, timely, and reliable data.

To close the agricultural data gap, the 50x2030 Initiative supports a flexible survey system that facilitates (1) computing SDGs and regional indicators (for example, a few of the Comprehensive Africa Agriculture Development Programme [CAADP] indicators); (2) timely reporting of national statistics and production monitoring; and (3) providing high-quality, integrated data for analysis and informed policymaking. The system builds on the experience of FAO's Agricultural Integrated Survey Programme (AGRISurvey) and the World Bank's LSMS-ISA program. Just like those programs, the Initiative is designed to be an integral part of national statistical systems. At the core of the 50x2030 Initiative is a data production component that supports the design and implementation of national data collection activities, integrating economic, social, technical, and environmental themes linked to agricultural production and rural development indicators. This allows for analysis of the drivers of agricultural productivity and linkages between sociodemographic characteristics, agricultural management practices, and productivity, among other policy-relevant relationships. Among the economic aspects covered are agricultural costs of production, marketing and finance practices, and productivity and farm income. In the socioeconomic domain, the initiative collects data on education, living conditions of people engaged in farm activities, intensity of agricultural activities, off-farm activities, and household income.

The data production component is supported by a methods and tools development component and a data use component. The methods and tools development component is directed at ensuring that the initiative promotes and incorporates innovation in data collection and develops and utilizes cost-effective data collection methods. The data use component aims to ensure that the data collection efforts supported by the initiative are informed by policy needs and that the data are effectively used for decision-making.

The minimum set of data to be produced from the 50x2030-supported survey programs will include the following indicators of the SDG agenda: volume of production per labor unit, by class of farming/pastoral/forestry enterprise size; average income of small-scale food producers, by sex and indigenous status; average income of small-scale food producers, by sex and indigenous status; proportion of agricultural area under productive and sustainable agriculture; proportion of total agricultural population with ownership or secure rights over agricultural land, by sex;[2] and share of women among owners or rights-bearers of agricultural land, by type of tenure.

Strengths

The initiative helps countries to produce high-quality data on the agricultural sector by using cost-effective statistical methodologies. The statistical programs are not limited only to agricultural production and use of inputs but cover economic aspects, production methods, innovations, use of technologies, access to markets, finance and insurance schemes, agri-environmental indicators, food loss, processing, and use at the farm level. The data are connected in an integrated system using international concepts and definitions, thus limiting the risk of releasing conflicting data.

With sustainability in mind, the initiative is designed to support a long-term survey program, with data collection taking place annually and continuous capacity building. The survey is envisioned to be integrated into a partner country's national statistical program rather than being a stand-alone effort. And under the 50x2030 Initiative, special attention is given to providing access to and use of the data collected. Open access to anonymized microdata and related documentation, a key principle of the initiative, maximizes the use and value of the data.

Limitations

It should be noted that the 50x2030 Initiative does not maintain a database, the objective being to support the development of NSOs and improve their ability to generate and disseminate a regular flow of quality agricultural data. However, the proposed survey program does not span the entire food system outside of farms. The initiative supports the agricultural survey program; thus, information linked to governance and macroeconomic indicators is not included. Another limitation is the relatively small number of countries (up to 50) that can be financially supported to produce data.

The Global Strategy to Improve Agricultural and Rural Statistics

The Global Strategy to improve agricultural and rural statistics (GSARS) was designed as a blueprint for a coordinated and long-term initiative to address the relative decline in the agricultural statistical systems of many developing countries. The GSARS aims at providing a framework that will enable developing countries to produce more and better agricultural statistics through targeted training and technical assistance activities.

The implementation of Phase 1 of the Global Strategy (2012–2018) has had a significant positive impact on the agricultural statistical systems of many developing countries. It has also demonstrated its ability to respond to the needs of evolving international and regional agendas. The overarching objective of Phase 2 is to build stronger capacity in national agricultural statistical systems for accountability reporting and policymaking, building on the foundations established during Phase 1. In this context, four main components have been identified: the first is the Strategic Plan for Agricultural and Rural Statistics (SPARS), which focuses on the implementation of appropriate mechanisms for ensuring long-term national statistical development. The second component relates to formal training, and it aims to improve existing human resources and management policies, strengthen the technical capacity of statistical staff,

2 If the sampling universe is appropriate, the survey can produce the related SDG Indicator 1.4.2: proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure.

improve graduate programs on agricultural statistics, and facilitate access to scholarships. The third component is cost-effective methods. To support this component, the initiative provides technical assistance on cost-effective methodologies, most of which were developed during Phase 1. Finally, the fourth component relates to data analysis and dissemination. This component aims to increase countries' data analysis and dissemination capacities, enabling them to compute indicators relevant for accountability reporting and policymaking.

The GSARS targets 25 African countries in three economic communities—the Economic Community of West African States (ECOWAS), the Common Market for Eastern and Southern Africa (COMESA), and the Southern African Development Community (SADC)—that will directly benefit from certain technical assistance activities and also contribute to the implementation of various activities in the countries.

Strengths

The GSARS establishes the foundation for producing high-quality official agricultural statistics by training NSOs and ministries in new statistical methodologies.

Limitations

The GSARS focuses exclusively on capacity development in agricultural statistics, not on generating statistical datasets. The program limits its objectives to focused training on SPARS development; the indicators linked to agricultural production, productivity, profitability, and use of natural resources; and statistical data dissemination.

Africa Information Highway Database

The Africa Information Highway (AIH) was developed by the African Development Bank (AfDB) as part of the bank's statistical capacity-building program in Africa. AIH is a mega-network of live open data platforms (ODPs) electronically linking all African countries and 16 regional organizations. The overall objective is to significantly increase public access to both official and informal statistics across Africa, while at the same time supporting African countries in improving data quality, management, and dissemination. The AIH is a response to the decision of the African Union Summit of 2012, which called upon the AfDB, the African Union Commission (AUC), and the UN Economic Commission for Africa to help African countries develop more effective data management and dissemination systems to inform national development policies and strategies.

The AfDB launched the AIH that same year to support members under the AfDB's ongoing Statistical Capacity Building Program. The bank hosts the ODPs and makes funding and training available for improvement and maintenance. Since launching the AIH, the bank has expanded the system to include a variety of topic-specific portals—energy, climate change, infrastructure, and health, among others—creating a one-stop center for capturing and sharing development data on Africa. The expansion program has included a notable addition of SDG Data Hubs to facilitate monitoring the implementation of the 2030 Agenda for Sustainable Development across Africa. It also includes a new portal system to meet the bank's own data needs for monitoring the development impact of its interventions in African countries and ensuring that these are aligned with its "High 5s" transformation agenda for Africa for the period 2015–2025.

Strengths

The AIH aims to be a reference database for the African region, maintaining all necessary data for program development and monitoring and evaluation, and it covers all African countries.

Limitations

The main limitations are linked to the updating of data by countries, since these updates depend on a regular flow of data. The AIH focuses on macroeconomic data and analyses. Similar to the previously discussed databases and data initiatives, some important aspects needed for food systems analysis are not covered, for example, commodity transformation, transport, and retail.

CAADP-Related Databases

The Comprehensive Africa Agriculture Development Programme (CAADP) is a continentwide African Union framework for accelerating broad-based economic growth and progress toward poverty reduction and food and nutrition security through an agriculture-led growth strategy. Since its adoption by African heads of state and government in 2003, a key principle of CAADP has been to promote

the use of evidence-based analysis and reliable data to guide decision-making and performance monitoring. This principle is reinforced by CAADP's emphasis on improving agricultural sector governance through benchmarking, dialogue, review, and mutual learning and accountability. The adoption of CAADP was followed by the development of a CAADP monitoring and evaluation framework in 2008 for assessing implementation progress in resource allocation and the achievement of desired CAADP goals and targets. The framework identified a set of key indicators to monitor implementation processes and track progress toward meeting commitments and targets.

In 2014, African leaders adopted the Malabo Declaration, which broadened the CAADP agenda by introducing seven commitment areas: upholding the CAADP principles and values; enhancing investment in agriculture; ending hunger by 2025; halving poverty by 2025; boosting intra-African agricultural trade; enhancing resilience to climate variability; and strengthening mutual accountability for actions and results by conducting a biennial review (BR) of progress made across the seven commitments. The adoption of the Malabo Declaration was followed by the development of a new CAADP Results Framework (RF) for 2015–2025—with a total of 38 input-, output-, and outcome-level indicators—for measuring progress in CAADP implementation, including progress toward meeting the Malabo commitments. The CAADP BR process that was launched in 2017 further expanded and introduced additional indicators aimed at monitoring all seven Malabo commitments using the Africa Agriculture Transformation Scorecard. The CAADP BR has a total of 59 indicators, about 24 of which are drawn from the CAADP RF.

Strengths

Broad coverage of indicators: The 59 BR CAADP indicators span all seven Malabo Declaration commitments and are quite broad in their coverage. The indicators cover multiple food system activities and components, including food security and nutrition, socioeconomic factors, and environmental outcomes. In addition, CAADP indicators have progressively been expanded to cover new areas deemed essential and thus include more food system activities and components. For example, following the first BR in 2017 and the third BR in 2021, new indicators were added that include food safety, plant and animal health, severity of food insecurity, cost of a healthy diet, proportion of the population that is overweight or obese, and total GHG emissions from agriculture.

Digital platform for data entry and management: The electronic BR (eBR) is an interactive web-based data platform developed by AUC in partnership with the Regional Strategic Analysis and Knowledge Support System (ReSAKSS), to facilitate the collection, analysis, access, management, and reporting of BR data at the country, regional, and continental levels. It was introduced during the 2019 BR in order to address data reporting challenges encountered during the first BR in 2017, when countries had to manually enter data into a country reporting template that was then submitted to regional economic communities (RECs). The introduction of the eBR has improved the efficiency of BR data entry by countries through its user-friendly interface, and it allows other data users at the RECs and AUC to instantaneously review, validate, and provide feedback on the data. The platform includes a cloud database for data storage and analysis and allows for the automated generation of BR scores.

The eBR has been a major factor contributing to the success of the BR by improving data quality and the timeliness of producing the scorecard and related results used in preparing the BR report. The eBR has helped to create a time-series database that can be used to analyze agriculture and food systems transformation. In addition, the eBR has improved the rate of compiling, reviewing, and processing data, as well as data documentation.

Strengthened BR country data systems: In light of the data challenges underscored in each successive BR report, countries and development and technical partners have made targeted efforts to strengthen country data systems. For example, with funding support from the Bill & Melinda Gates Foundation, ReSAKSS has supported efforts to strengthen BR data systems in 10 target countries (Benin, Botswana, Burkina Faso, Kenya, Malawi, Mozambique, Senegal, Togo, Uganda, and Zimbabwe). The efforts have helped to improve BR data quality (data accuracy, consistency, traceability, and validity), fill data gaps through setting up data clusters, and build capacity through capacity-strengthening activities.

CAADP mutual accountability platforms that foster improved data quality: Mutual accountability is a management approach that uses performance information at all stages of the development process to make better and more effective decisions and to steer development efforts toward clearly defined goals. Under CAADP, mutual accountability platforms and processes, such as the CAADP BR and agriculture joint sector reviews (JSRs), have helped to ensure effective delivery and tracking of shared commitments, increased accountability,

and improved performance. To be effective, mutual accountability processes demand timely, high-quality data to inform their dialogue, review, and accountability activities.

In addition, country BR data validation meetings have provided platforms to review and improve data quality before the data are submitted to RECs. The BR validation workshops bring together a broad group of country stakeholders from different sectors, including nonstate actors, to review and validate BR data. Follow-up meetings to review BR performance through JSRs have facilitated discussions on the policy and programmatic adjustments that countries need to implement to meet the Malabo Declaration goals by 2025.

Limitations

Data quality issues and data gaps: Despite efforts to improve BR data quality and fill data gaps, data quality issues and data gaps remain, as noted in all three BR reports (2017, 2019, and 2021). The data still have internal inconsistencies; BR data values also sometimes vary too much from other data sources such as the World Bank's World Development Indicators (WDI), and the scorecard methodology has limitations such as assigning a zero score for different categories of indicator values, including missing observations and no change in the value of a parameter. Furthermore, several countries still report missing data in their BR reports. For example, out of 51 reporting countries in the 2021 BR, 29 countries reported missing 10 or more data parameters.

Limited data availability: There are still several data gaps in the BR, as some required data are not available because they are not collected, while some important data are not yet part of the process. For example, the BR does not currently include indicators on processing, storage, transportation, and marketing, all important food system activities. In addition, several types of BR data have not yet been introduced into the national statistical system of many countries. In some cases, even if the national statistical system were to collect the data parameters, the periodicity of the data availability would not match the needs of the BR, which occurs every two years. Also, some BR-related data previously provided by international organizations are no longer available or being published. These sources include the index of countries' capacity to generate and use agriculture statistical data and information (Agricultural Statistics Capacity Indicators) that was previously provided by the AfDB, and some parameters on the Trade Facilitation Index previously provided by the World Economic Forum and the Global Competitiveness Index.

Inadequate data capacity at regional and country levels: The BR process has revealed limited capacity at the country and regional levels to collect, analyze, and use BR data, as well as weak monitoring and evaluation capacity. Technical capacity is limited; BR experts with the critical monitoring and evaluation and analytical skills necessary to lead the review, analysis, and computation of indicators are in particularly short supply. In addition, monitoring and evaluation capacity is particularly limited at the REC level, where RECs are charged with controlling the quality of BR data submitted by countries in their regions.

World Development Indicators Database

WDI is the World Bank's primary database consisting of time-series development data that cover 1,400 indicators and 217 countries, with data for many indicators extending back more than 50 years. The data cover a broad number of thematic areas, including poverty and inequality, population dynamics, education, labor, health, gender, agriculture, climate change, energy, biodiversity, water, sanitation, economic growth, income, trade, markets, transport, technology, debt, aid dependency, and migration.

Strengths

WDI is one of the largest databases with internationally comparable data on development covering many countries, and it includes regional and global estimates, a long time series, and multiple relevant themes. It features an interactive, user-friendly online database that makes it easy to navigate, query, and analyze the data. Users can generate and visualize data using charts, tables, and maps and can download bulk data in various formats along with their metadata and sources. The database is regularly updated when new data become available, typically once a year using data from officially recognized national and international sources.

Limitations

Data availability remains a challenge, especially in poor countries and for data that rely on household surveys, which can impact the quality of data in WDI. This is because in poor and fragile countries household surveys may not occur

at all or in a timely manner with the desired frequency, which can create uncertainty about the direction of change in indicators. In addition, data comparability across countries and time is limited due to differences in the timing of surveys, sampling frames, and the quality and training of enumerators.

National Statistics Office Databases

NSO databases are the first points of contact for anyone looking for national or disaggregated data in a country. They play a central role in 1) collecting, analyzing, and disseminating data; 2) serving as the custodian of a country's official statistics and maintaining a country's database of socioeconomic statistics; and 3) establishing data standards, protocols, and best practices for the production, analysis, and dissemination of statistical information. Many countries update their databases regularly, with some indicators being updated every year (for example, cost of living, gross domestic product [GDP], inflation) and others every five years or more (for example, malnutrition indicators, livestock inventories, and household asset inventories).

It is beyond the scope of this chapter to analyze all national statistical databases from a perspective of food systems data needs; however, using search facilities at the International Water Management Institute Library, several of the databases were analyzed for possible strengths and limitations (Table 11.3). For this purpose, national statistical databases of six African countries—Côte d'Ivoire, Egypt, Ghana, Malawi, Mozambique, and Rwanda—were selected to represent the key geographical regions in Africa (northern, western, eastern, and southern) as well as the key colonial heritages (Anglophone, Arabic, French, and Portuguese), as many of these databases were inherited from the pre-independence period. It is clear from the search conducted that these databases manage large amounts of data relevant for food systems, including indicators on population, economics, unemployment, education, health, agriculture, environment, and governance (Table 11.3).

Strengths

Compared to other databases in a country, NSO databases, which are government funded, are often the most comprehensive in terms of indicators covered. They are also highly regarded as sources of credible data because of their rigorous data collection and archiving methods.

Limitations

A common limitation of NSOs is that updating of data depends on national budgets, and updates are often given low priority especially when countries are faced with economic challenges, which are frequent in Africa. Thus, while the databases may cover many indicators, they are subject to copious gaps, archaic data-gathering methodologies, and poor data maintenance and accessibility.

Despite their broad coverage, NSO databases typically do not cover many food systems activities such as agro-processing, transportation, food loss, food waste, water use in agriculture, nutrient content of food, and the costs of a healthy diet.

Data Dashboards and Platforms

In recent years, data dashboards have become increasingly popular, given their ability to present large amounts of complex data using easy-to-digest formats that support timely, informed data-driven decisions. Dashboards often provide visual displays of data from different sources in one place using charts, tables, and graphs that enable data to be easily and quickly understood. Dashboards are dynamic and interactive, can show near-real-time data, and present comprehensive overviews of complex and large datasets. Countries and their development partners are using dashboards to monitor implementation progress and progress toward achieving key goals such as the CAADP Malabo Declaration goals or SDGs, and to assess the impact of policies on outcomes. Today, a plethora of dashboards relating to food and nutrition security, climate adaptation, and food systems exist at the national, regional, and global levels. A few examples of existing dashboards are discussed after Table 11.3.

Food Systems Dashboard: Several dashboards have been developed to inform and guide food systems or different elements of food systems. For example, in 2020, the Global Alliance for Improved Nutrition and Johns Hopkins University launched the Food Systems Dashboard, which assembles data from multiple sources to give users an overview of food system components (drivers, food supply chains, and food environments) across countries and regions. The Food Systems Dashboard helps users identify and prioritize ways to sustainably transform food systems (GAIN 2023).

TABLE 11.3—SELECTED DATA INITIATIVES AND DATABASES: COVERAGE AND LIMITATIONS FROM A FOOD SYSTEMS PERSPECTIVE

Data initiative / database	Selected indicators covered	Indicators not expressly covered
FAOSTAT	• Gross domestic product (GDP) and agriculture value added • Temperature change statistics • Food security indicators: food availability, access, utilization, and stability of food for different populations • Agricultural production and input statistics: water-related statistics, food loss and waste, and many more (Quality varies from country to country, as does frequency of updates for some indicators.)	• Agro-processing • Transportation • Financial inclusion • Food processing and packaging • Nutrition
50x30 Initiative	• National indicators needed for agricultural and development policies and food loss reduction • SDG 2: zero hunger – SDG 2.3.1: labor productivity growth in agriculture – SDG 2.3.2: smallholder income growth – SDG 2.4.1: land under sustainable management • SDG 5: gender equality and women's and girls' empowerment – SDG 5.a.1: (a) proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure • SDG 10: reduced inequality (partially, for agricultural population) – SDG 10.2: proportion of employed people living below the national poverty line, by sex, age, employment status, and rural/urban areas • SDG 17: partnerships for the goals (contribution) – SDG 17.18: proportion of countries with a national strategy for data development and dissemination	• Agro-processing • Nutrition • Transportation • Food security • Nutritious diet information • Food processing and packaging • Food distribution and retailing • Food consumption • Food waste
Living Standards Measurement Study (LSMS)	• Household living conditions • Access to clean water and sanitation • Education • Health and nutrition • Welfare dynamics, land ownership and rights, and ownership of other assets • Time use • Labor market • Energy sources used • Food security and agriculture (included in Living Standards Measurement Study–Integrated Surveys on Agriculture [LSMS-ISA])	• Agro-processing • Transportation • Food processing and packaging • Food distribution and retailing • Food waste and loss
Africa Information Highway	• Africa Infrastructure Database: energy, transport, water supply and sanitation, information and communication technology, and more • African Economic Outlook: economic, social, and political evolution indicators for all African economies • African Development Bank Operations Data Portal: consolidated information and data on approvals and disbursements of Bank Group operations on all regional member countries since the inception of the bank • Socioeconomic indicators: statistical data on economic and social situations and information on basic indicators, including demographics, health and nutrition, education and environment, national accounts, prices and money, government finance, external sector, debt, and financial flows • Minimum set of core agricultural production and consumption data	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food consumption • Food waste and loss
Côte d'Ivoire National Institute of Statistics	• Population: population size, population growth rate, urbanization, etc. • Economics: GDP, inflation, foreign direct investment flows, unemployment, etc. • Agriculture: agricultural production, food security, and nutrition • Education: enrollment rates, completion rates, and educational attainment • Health: health status, access to healthcare, and maternal and child health • Environment: air quality, water quality, deforestation, desertification, and soil quality • Governance: corruption, access to justice, and political participation	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss

continued

TABLE 11.3—SELECTED DATA INITIATIVES AND DATABASES: COVERAGE AND LIMITATIONS FROM A FOOD SYSTEMS PERSPECTIVE

Data initiative / database	Selected indicators covered	Indicators not expressly covered
Egypt Central Agency for Public Mobilization and Statistics	• Population: population size, population growth rate, urbanization, etc. • Economics: GDP, inflation, unemployment, etc. • Agriculture: agricultural production, food security, and nutrition • Education: enrollment rates, completion rates, and educational attainment • Health: health status, access to healthcare, maternal and child health, and injuries • Environment: air quality, water quality, deforestation, desertification, and soil quality • Governance: corruption, access to justice, and political participation • SDGs 1–17	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
Ghana Statistical Service	• Population: total population of Ghana, as well as population estimates by age, sex, region, and other demographic characteristics • Economics: GDP, inflation, unemployment, trade, etc. • Agriculture: agricultural production, prices, and other agricultural indicators • Education: enrollment, completion rates, and educational attainment • Health: health status, access to healthcare, and maternal and child health • Environment: environmental indicators such as air quality, water quality, and deforestation • SDGs 1–17	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
Malawi National Statistical Office	• Demography and other social indicators: population size, growth rate, distribution, fertility, mortality, HIV/AIDS, and other social indicators • Economic indicators: GDP, inflation, unemployment, and other economic indicators • Agricultural indicators: agricultural production, prices, and other agricultural indicators • Education indicators: enrollment, completion rates, and other education indicators • Health indicators: health status, access to healthcare, and other health indicators • Environmental indicators: air quality, water quality, and other environmental indicators • A variety of datasets, including census data, survey data, and administrative data • Data for tracking all SDGs (SDGs 1–17)	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
Mozambique National Institute of Statistics	• Population: population size, population growth rate, urbanization, etc. • Economics: GDP, inflation, unemployment, etc. • Agriculture: agricultural production, food security, and nutrition • Education: enrollment rates, completion rates, and educational attainment • Health: health status, access to healthcare, and maternal and child health • Environment: air quality, water quality, and deforestation • Governance: corruption, access to justice, and political participation • SDGs 1–17	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
Rwanda National Institute of Statistics	• Population: population size, population growth rate, urbanization, etc. • Economics: GDP, inflation, unemployment, etc. • Agriculture: agricultural production, food security, and nutrition • Education: enrollment rates, completion rates, and educational attainment • Health: health status, access to healthcare, and maternal and child health • Environment: air quality, water quality, and deforestation • Governance: corruption, access to justice, and political participation • SDGs 1–17	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
International Debt Statistics	• Official development assistance • Foreign direct investment • Other private flows: debt flows • Financial development • Financial access: financial inclusion	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss • Nutrition

continued

TABLE 11.3—SELECTED DATA INITIATIVES AND DATABASES: COVERAGE AND LIMITATIONS FROM A FOOD SYSTEMS PERSPECTIVE

Data initiative / database	Selected indicators covered	Indicators not expressly covered
Africa Development Indicators	More than 1,000 indicators, for 54 African countries, in the following areas: • Population • Economics • Agriculture: agricultural production, food security, nutrition, water use, land use, irrigation, livestock production, crop production, and forestry • Education • Health • Environment: air quality, water quality, soil quality, deforestation, desertification, climate change, renewable energy, and waste management • Governance: corruption, access to justice, political participation, human rights, social development, gender equality, and peace and security	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss • Nutrition
World Bank WDI Databases	• Population: population size, population growth rate, population density, age structure, sex ratio, and urbanization rate • Economics: GDP, GDP per capita, inflation rate, unemployment rate, trade, foreign direct investment, poverty headcount ratio, poverty gap ratio, labor and income inequality • Agriculture: agricultural production, food security, nutrition, water use, land use, irrigation, livestock production, crop production, and forestry • Education: enrollment rates, completion rates, educational attainment, literacy rate, school readiness, and quality of education • Health: health status, access to healthcare, maternal and child health, communicable diseases, noncommunicable diseases, injuries, HIV/AIDS, malaria, and tuberculosis • Environment: air quality, water quality, soil quality, deforestation, desertification, climate change, renewable energy, and waste management • Governance and social development : corruption, access to justice, political participation, human rights, social development, social protection gender equality, and peace and security	• Agro-processing • Transportation • Food and diet information • Food processing and packaging • Food distribution and retailing • Food waste and loss
CAADP- Related Databases	• Evidence-based policies, institutions, and platforms in agriculture • Investment finance in agriculture • Agriculture inputs and technology • Agricultural productivity and agricultural growth • Postharvest loss • Social protection • Food security and nutrition • Poverty, inequality, and employment • Partnerships in agriculture • Youth in agriculture • Women's participation in agriculture • Intra-African trade in agriculture, markets, and intra-African trade policies and institutions • Food safety and plant and animal health • Resilience to climate shocks, environment, and investment in resilience building • Capacity to generate, analyze, and use data • Peer review and mutual accountability mechanisms	• Agro-processing • Food processing packaging • Food storage • Transportation • Food distribution and retailing • Food marketing • Food waste and loss

Source: Authors' compilation, drawing on International Water Management Institute Library.

Global Food and Nutrition Security Dashboard: In 2022, the Global Alliance for Food Security launched the Global Food and Nutrition Security Dashboard to help guide timely and data-driven policy and financial responses to an unfolding global food security crisis. The dashboard consolidates the latest global and country-level data on food crisis severity, global food security financing, and research and analysis to strengthen crisis response and resilience.

Agricultural Market Information System: In 2011, following the global food price hikes in 2007–2008 and 2010–2011, G20 ministers of agriculture launched the Agricultural Market Information System to provide agricultural market information such as global food supplies of wheat, maize, rice, and soybeans and guide policy responses to food crises. The system includes a markets database that provides an overview of crop production and utilization and a policy database that assembles information on trade and domestic policies that are likely to impact the prices, trade, and production of the four crops tracked across 28 countries.

Strengths

Dashboards help to present complex and large amounts of data and information in an intuitive, clear, and easy-to-digest format. They also provide near-real-time data and analytics and forecasting. Overall, they help to make data, including big data, more accessible and allow for data-driven and informed decision-making.

Limitations

The plethora of dashboards at the country, regional, and global levels do not all show linkages and complementarities with each other and thus leave decision-makers to obtain information from different dashboards that may not be well coordinated or are contradictory.

Key Food Systems Data Gaps and Challenges

As highlighted above, it is beyond the scope of this chapter to survey all the available databases from which a country or stakeholder can obtain data to feed into the food system indicators. There are, however, outstanding nationwide databases in many countries. Many of these are developed and managed by NSOs or international organizations such as the World Bank, FAO, UNICEF, the International Labour Organization, the International Monetary Fund, and others. The data needed to inform decision-making around the food system span many fields, including socioeconomic indicators, biophysical indicators, agricultural production, input supply, processing, packaging, retailing, transportation, economic indicators, consumption, and outcomes of production.

In other countries, the data managed by NSOs may appear to offer good coverage, but the frequency of updates is low. For example, annual data on fish production and food consumption are needed to understand food system outcomes, but countries sometimes update their databases only every five years. This also applies to data on nutrition outcomes such as stunting, obesity, overweight, and others. Data collection methods also differ from one data initiative to another, which makes it difficult to rely on one database when another database has data gaps (Devarajan 2011). In general, most of the indicators of importance to food systems are not disaggregated by gender or age. For example, it would be useful to understand nutritional patterns as well as costs of food consumed by men, women, and youth, but no such disaggregation exists in nationally representative surveys. The NSOs of Malawi and Mozambique, for example, do not collect such data, and even where some disaggregation is available, the data are usually only updated at long intervals.

As highlighted in Devarajan (2011), the quality of data across many indicators, especially in national databases, is poor, and sometimes different data sources present different values for the same indicators. The poor quality of the data reflects low investment in data systems as well as in technical and institutional capacities across the data value chain, and undermines the ability to achieve food systems transformation through evidence-based decision-making. In the case of African countries, the key food systems areas with the most data challenges include food processing and packaging, food retailing, distribution, and transportation, as well as food waste and loss, and diet quality and nutrient content. The paucity of complete databases with this information can undermine efforts to fully and sustainably transform African food systems. It is important, therefore, that countries make deliberate efforts to invest in strengthening statistical capacities and databases at least for the key components of their food systems, including transportation, retailing, nutrition information, food processing, agro-processing, and food loss and waste across all stages of the food value chain.

Conclusion and Recommendations

This chapter sought to highlight data challenges and opportunities for food systems transformation in Africa. It is clear that food systems are complex, and each food system comprises actors, policies, institutions, and players that constantly interact in the course of carrying out their activities across the food system. A food system also comprises levers and drivers of change, as well as activities across all nodes of the food value chain (from food production to consumption and disposal). These levers and drivers of change influence food system activities to generate food system outcomes, which in turn also influence the food system. Thus, transforming food systems toward desired outcomes requires timely and quality data to guide decision-making by food system actors across all food system activities, components, sectors, policies, drivers, transformation pathways, and outcomes. In particular, data are needed to inform the adaptation of food system activities by food system actors; inform shared food system goals and performance indicators; bridge food system knowledge gaps; and support the evidence-based design, coherence, coordination, implementation, and reassessment of food system policies, as well as guide dialogue, learning, monitoring, and performance assessments of food systems and their transformation.

This chapter's close examination of food systems and food systems transformation shows an enormous demand for a broad range of data. A review of selected data initiatives and databases shows that while efforts are underway to improve data availability and accessibility, especially through the provision of open access and digital dashboards, data for several relevant indicators critical to informing food systems policy are simply not yet available. For example, across many of the data initiatives and databases reviewed, data on food storage, processing, packaging, distribution and transportation, retailing, and food loss and waste are largely unavailable. Gender- and sex-disaggregated data are also largely not available across existing data initiatives and databases. The quality of data across data initiatives and databases has been constrained by inadequate technical and institutional capacity to collect and analyze data; lack of rigorous methodologies; and institutional, political, and financial obstacles that limit data collection, analysis, and accessibility.

Furthermore, while the national databases that serve as the default sources of data for African governments' decision-making collect data on many indicators relevant to food systems transformation, often these databases are not well maintained, data are not well disseminated, and data for some of the key food system elements (such as food security and nutrition) are updated at longer than desired time intervals. The national databases for the selected countries considered in this chapter also do not cover food system components such as food processing, agro-processing, food loss and waste, transportation, and women's empowerment. While some of these types of data can be sourced from international databases, key databases such as FAOSTAT, WDI, and the AfDB's AIH are not without their own limitations. For example, apart from FAOSTAT, which covers agricultural statistics in more detail, the others cover indicators at an aggregate scale and in less detail. Even in the case of FAOSTAT, data on agro-processing, transportation, and food waste are not covered or not regularly updated.

To help ensure timely and high-quality data to guide decision-making for food systems transformation, we recommend the following:

1. **Track key food system indicators**: Using relevant available data, African governments should track indicators that help inform food systems, including the national food systems transformation pathways and the UNFSS action tracks, levers of change, and drivers of food systems, as well as the outcomes and activities of the food systems. Since no single data initiative or database at present can provide all the required data, there is a need for those leading the food systems transformation agenda in countries to raise awareness on the available sources of data on food systems.
2. **Develop common indicators for tracking:** Since any attempt to track every indicator related to food systems may be an impossible exercise, as part of the Africa Common Position on Food Systems, the AUC should consider leading an effort to develop common indicators for tracking and transforming food systems, which African countries report on periodically. These indicators should be chosen from each of the key components of the food system, for example, drivers, activities, and levers of change (Tables 11.1 and 11.2). Furthermore, indicators should be expressly assigned for each of the five action tracks identified by the UNFSS Scientific Group.
3. **Promote coordination among food system data users and suppliers:** Enhancing coordination among food system data actors is paramount to

assessing available and required data, connecting data suppliers and data users, allowing for uniform data standards and protocols, prioritizing what data can be collected, and improving overall data governance and coordination of national statistical systems. The national JSRs and SPARSs being established in some African countries provide platforms for better data prioritization and planning within the national statistical system. Moreover, mutual accountability platforms like the CAADP BR and JSRs have the potential to serve as platforms for overall food systems transformation dialogue, review, mutual learning and accountability, and performance monitoring.

Furthermore, linking data users such as decision-makers (demand) and data producers (supply) is crucial to ensure that data are used to transform food system outcomes, inform the adaptation behavior of food system actors, and guide food systems policy assessments. The local analytical networks being set up by ReSAKSS in several countries are helping to link data suppliers and users by connecting decision-makers in key government ministries to local data and analytical institutions, such as NSOs, universities, research organizations, and think tanks, as they support the data and analytical needs of policymakers.

4. **Invest in strengthening data capacities and tools:** As limited capacity has hampered data quality and availability, there is an urgent need for governments and development partners to invest in strengthening institutional and technical capacity for data collection, analysis, and use. Capacities need to be strengthened across the data value chain, from data prioritization, production, and curation to analysis, interpretation, and use as well as investing in state-of-the-art data methodologies and tools.
5. **Increase funding for data gathering and management:** Funding for data gathering and management, especially by governments, should be increased to ensure that there is a sustained effort to accumulate data on food system indicators over time. In particular, there is a need to invest in comprehensive primary data collection across food system activities, from production to consumption, as well as in collecting gender- and sex-disaggregated data.
6. **Embed food system data efforts in NSOs:** Because the NSOs serve as the custodians of a country's official statistics, it is essential to embed all data efforts around food systems within NSOs to enhance data coordination; promote uniform data standards, protocols, and best practices; and ensure the long-term sustainability of food system data efforts.
7. **Coordinate and harmonize data dashboards:** The emergence of data dashboards and platforms underscores the benefits of leveraging digital technologies to support decision-making in a timely manner using interactive and accessible formats. However, the plethora of dashboards and platforms has created an urgent need to coordinate and harmonize the dashboards to leverage synergies and complementarities among them. Data platforms should also leverage big data, including remote sensing data and artificial intelligence and machine learning, to improve food system data analysis and decision-making.