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FOOD SYSTEMS PROFILE – KENYA

Catalysing the sustainable and inclusive
transformation of food systems



Kenya



FOOD SYSTEMS PROFILE – KENYA

Catalysing the sustainable and inclusive transformation of food systems

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Contents

Figures and tables	iv
Acknowledgements	v
Key messages	1
Methodology and process	5
National context: key figures	6
Key figures and trends in food production, consumption and trade	8
Characterization of the dominant actors in the food systems of Kenya	15
Key sustainability questions	17
Transition to sustainable food systems	49
References	51



Figures and tables

Figures

1. Analytical representation of the food system	5
2. National context: key figures – Kenya	9
3. Trends in cereal productivity	9
4. Evolution of animal production in Kenya	10
5. Trends in national fish production in tonnes and value.....	11
6. Food availability by commodity groups (in terms of food energy), 2018	12
7. Main commodity exports, by volume (tonnes)	13
8. Value of exports and imports of food and beverages	13
9. Food commodity import trends	14
10. Prevalence of severe food insecurity	17
11. Trends in nutritional status of children under 5 years old	18
12. Regional disparities in Kenya – children’s nutrition levels and micronutrient intake (2014).....	18
13. Dynamics of food and nutrition security outcomes and regional disparities in Kenya (KSQ1)	19
14. Food prices: average wholesale maize prices in Kenya, South Africa, Uganda, Ethiopia and International price – USA	23
15. Key drivers and impacts associated with underdeveloped agrifood value chains (KSQ2).....	29
16. Poverty rates in different counties of Kenya (2005/06 v/s 2015/16)	34
17. Key drivers and food system impacts of disparate levels of economic growth in Kenya (KSQ3)	35
18a. Maize yield and poverty by province in 2015/16	37
18b. Bean yields and poverty by province in 2015/16.....	37
19. Percentage of cultivated area under major crops	38
20. Drivers and impacts of natural resource degradation and climate change vulnerability (KSQ4)	43

Table

1. National context: key figures – Kenya	6
2. Export commodity values (KES million)	12
3. Summary of 2015/2016 headcount poverty measures	21
4. Percentage distribution of household food consumption by source and residence	23
5. Comparison of freight costs on different Kenyan routes	31
6. Status of selected development indicators in north and northeastern counties, compared to national average	36
7. Types of energy used	45



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FOOD SYSTEMS PROFILE KENYA

Key messages

Kenya covers approximately 583 000 km² in East Africa, of which more than 80 percent is arid or semi-arid and sparsely populated. It **steered to a new political and economic governance system** through its 2010 Constitution under which a bicameral legislature, a devolved government for its 47 counties, and a constitutionally tenured judiciary and electoral body were introduced (World Bank, 2022a).

The country was one of the most rapidly expanding economies globally between 2010 and 2018, averaging 5.9 percent in annual growth as it reached lower-middle-income status and the gross domestic product (GDP) reached USD 95 billion (World Bank, 2015; USAID, 2022). It made **significant progress in tackling poverty; the percentage of the population living below the national poverty line** declining from 46.8 percent in 2005/06 to 36.1 percent in 2015/16 (KNBS, 2018). Various economic sectors of the country were hit hard by the COVID-19 pandemic, but they have since recovered; economic growth was estimated to be 6.7 percent in 2021 (African Development Bank Group, 2022).

Despite these positive political and economic strides, Kenya faces **substantial challenges to transition sustainable agrifood systems**, as explored in the present report's key sustainability questions (KSQs):

- **Levels of food insecurity are increasing nationally, along with high regional disparity in terms of food and nutrition security outcomes.** Child malnutrition indicators have improved in recent decades, but are still very high in the arid and semi-arid northern and northeastern counties, specifically as compared to the national average. Incidences of non-communicable diseases (NCDs) are increasing, with overweight and obesity being among the major contributors, making Kenya vulnerable to the triple burden of malnutrition (KSQ1);
- **Inefficient and underdeveloped agrifood value chains are unable to meet their potential in offering returns to food system actors and in delivering enough safe food to Kenyans.** The agrifood value chains are characterized by declining productivity, limited value addition, high levels of post-harvest-losses and increasing incidences of food-borne diseases. The country also relies heavily on food imports (KSQ2);
- **Disparate levels of regional economic growth combined with high income inequalities.** North and northeastern counties suffer from persistently high levels of poverty – 68 percent in 2015–2016, compared to 36 percent nationally. Approximately 60 percent of total expenditure is controlled by the top 20 percent of the population, while the bottom fifth only control 3.6 percent (KSQ3); and
- **Natural resource degradation and increasing vulnerability to climate change impacts** pose major, mutually reinforcing challenges. Declining forest cover, overexploitation of water resources, increasing scarcity of water, land degradation and biodiversity loss are among the country's greatest challenges. Kenya has also experienced increasingly intense and frequent extreme weather events, such as droughts and floods, leaving millions of people in dire need of humanitarian assistance (KSQ4).



Several cross-cutting drivers can be identified as contributing to these challenges:

1. **Disparities in regional development due to continued inequities in public policy focus and investment, in favour of high rainfall areas and urban areas.** The more marginalized arid and semi-arid counties in the north and northeast of the country suffer profound infrastructure deficits and perform poorly in all development indicators. Human development prospects are poor; food production, productivity and diversification are low; and integration into value chains is weak. Subsistence farming dominates, with low-household incomes and poor food, nutrition and health outcomes;
2. **A growing population and urbanization** put immense strain on natural resources, along with increased livestock production. Water demand is expected to increase substantially and use of some major aquifers are unsustainable; agricultural land is lost to residential use; and crop farming is expanding into marginal lands. Overstocking and overgrazing lead to severe land degradation. Population growth, urbanization and poorly planned infrastructure accelerate deforestation, destruction of water ecosystems and biodiversity loss. Competition over natural resources is a major cause of intercommunal tensions, and food and nutrition insecurity;
3. **Low budgetary allocation and lack of investments and credit hold back improvements in production and productivity in agrifood systems.** Public investments at the national and county levels in agriculture total approximately 3 percent of the national budget, well below the 10 percent target; and
4. **Ineffective implementation of relevant policy initiatives** means that although Kenya has taken notable policy initiatives to support a transition to sustainable agrifood systems, the increasing food insecurity levels, vulnerability to climate change, and widespread regional and economic disparities, show the effectiveness of such initiatives needs to be monitored to assess the extent they address the systemic vulnerability of the agrifood systems.



In the light of the key drivers mentioned here, and others discussed in this assessment, the following **systemic levers have been proposed under four KSQs:**

1. **Regarding food and nutrition insecurity and associated regional disparities:**
 - effective implementation of relevant policies, acknowledging geographical, environmental, socioeconomic and demographic factors, to achieve equitable results in urban and rural areas;
 - increase investment in research and development for climate-resilient varieties and nutrition-sensitive agriculture; and
 - provide support to smallholder family farming.
2. **Regarding the weak agrifood value chains:**
 - increase investment in the agriculture sector and infrastructural development;
 - promote and strengthen producers' organizations;
 - increase awareness among food system actors along with developing a strong regulatory and monitoring mechanism to improve food safety.
3. **Regarding disparate regional economic growth and income inequalities:**
 - Improve the focus of policymaking, investments and development funding to address disparities in regional development; and
 - Streamline and consolidate social protection and agricultural input subsidies.
4. **Regarding natural resource degradation and increasing vulnerability to climate change:**
 - improve governance, coordination and management of natural resources; and
 - ensure community development and use of science-based natural resource management approaches and technologies.



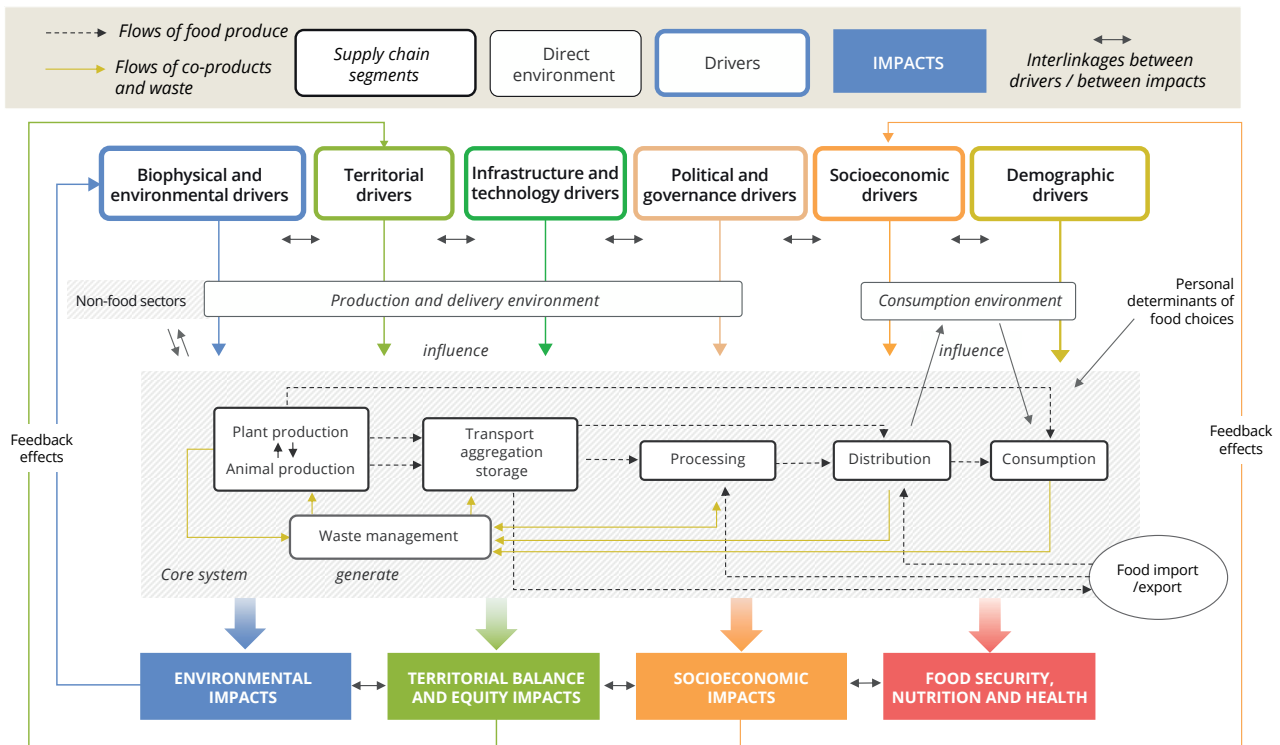


Methodology and process

This brief is the result of a collaboration between the Government of Kenya, the Food and Agriculture Organization of the United Nations (FAO) and the European Union, in close cooperation with national experts. It was implemented in Kenya between April and July 2021. The methodology used for preparing this brief is the result of a global initiative of the European Union, FAO and CIRAD (the French Agricultural Research Centre for International Development) to **support the sustainable and inclusive transformation of food systems**. This assessment methodology is described in detail in the 2021 joint publication entitled *Conceptual framework and method for national territorial assessments: Catalysing the sustainable and inclusive transformation of food systems* (David-Benz et al., 2022).

The assessment integrates qualitative and quantitative data analysis with participatory processes by mobilizing public, private and civil society stakeholders. The approach includes interviews with key stakeholders and includes consultations to refine systemic understanding of the food system and discuss potential levers to improve its sustainability. The assessment process thus initiates participatory analysis and stakeholder discussion on the strategic opportunities and constraints to sustainable transformation of food systems. The approach assesses the actors and their activities at the core of the system, together with their interactions along the food chain as well as the environments directly influencing their behaviour. Conditioned by long-term drivers, these actors generate impacts in different dimensions that in turn influence drivers via a number of feedback loops (see **Figure 1**).

Figure 1. Analytical representation of the food system



Source: David-Benz, H., Sirdey, N., Deshons, A., Orbell C. & Herlant, P. 2022. *Conceptual framework and method for national and territorial assessments: catalysing the sustainable and inclusive transformation of food systems*. Rome, Brussels and Montpellier, France. FAO, European Union and CIRAD. <https://doi.org/10.4060/cb8603en>



The approach involves a detailed understanding of the key challenges along the four dimensions of sustainable and inclusive food systems: (i) food security, nutrition and health; (ii) inclusive economic growth, jobs and livelihoods; (iii) sustainable natural resource use and environment; and (iv) territorial balance and equity. Aimed at identifying critical issues affecting the sustainability and inclusivity of food systems, the assessment is both qualitative and quantitative in nature. Critical challenges and key food systems dynamics are specified in the form

of **key sustainability questions** (KSQs), whose answers (see schematic representations for all KSQs) help to identify **systemic levers** and areas of action that are essential to bring about desired transformations in food systems.

This approach is designed as a preliminary rapid assessment for food systems and can be implemented over a period of 8–12 weeks. The methodology has been applied in more than 50 countries as a first step to support the transition towards sustainable food systems.

National context: key figures

The indicators in **Table 1** show trends in key areas of development, which play an important

role in the functioning of the agrifood system and the related outcomes in Kenya.

Table 1. National context: key figures – Kenya

Indicators	2000	2010	2020	Comments
GDP growth rate ^a	0.6%	8.1%	-0.3%	Large change in growth rate mainly due to pandemic shock. It recovered in 2021.
GDP per capita growth rate ^b	USD 412	USD 1 093	USD 1 936	Increasing trend as of 2000 due to broad-based economic growth
Agriculture, forestry and fishing value added (% GDP)	28.7	17.6	22.6	Shows an increasing trend as of 2010 but still lower than the rate in 2000
Inflation rate	10	4	5.4	Relatively stable over the years, but a high increase of 9.1 percent in the period 2020–2022 due to the COVID-19 pandemic aftermath and war in Ukraine
Agricultural land (% of total land) ^c	46.9	48	48.5	Relatively stable, marginal growth
Access to electricity (% of population) ^d	15.1	19.2	71.4	Electricity access more than doubled from 32% in 2013 to 75% of households in 2022. The access rate for urban areas was 100% in 2022, while for rural Kenya, it was 65%



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Forest (% of total land)	7	6.4	6.3	Rising trend in deforestation
Population growth rate (%)	2.7	2.7	2.3	High rate of population growth, however, in 2020, it declined marginally
Urban population (% of total)	20	24	28	Rising urban population
Rural population (% of total)	80	76	72	Largest proportion of national population is rural, but this is declining over time
Access to health services (physicians per 1 000 people) ^e	0.1	0.2	—	Marginal change over the years; access to a physician remains a challenge for a large part of the population
Access to clean drinking water (% of population)				Steady but rising trend in access to drinking water in both rural and urban areas; limited disparities between urban and rural areas; but slightly more favourable in urban areas.
Rural	47	55	58	
Urban	61	59	62	

^a World Bank Database. 2022. GDP growth (annual %) – Kenya. In: *World Bank*. Washington, DC. Cited 15 October 2022. <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=KE>

^b World Bank Database. 2022. GDP per capita (current US\$) – Kenya. In: *World Bank*. Washington, DC. Cited 15 October 2022. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=KE>

^c World Bank Database. 2022. Agricultural land (% of land area) – Kenya. In: *World Bank*. Washington, DC. Cited 15 October 2022. <https://data.worldbank.org/indicator/AG.LND.AGRI.ZS?locations=KE>

^d International Trade Administration. 2022. Energy–electrical power supply. In: *Kenya Country Commercial Guide*. International Trade Administration, US Department of Commerce, Washington, D.C. Cited 15 October 2022. <https://www.trade.gov/country-commercial-guides/kenya-energy-electrical-power-systems#:~:text=Kenya%20has%20also%20aggressively%20tried,rural%20Kenya%20stands%20at%2065%25>

^e World Bank Database. 2022. Physicians per 1 000 people – Kenya. In: *World Bank*. Washington, DC. Cited 15 October 2022. <https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?locations=KE>

Sources: Apart from the specific sources given above for notes a–e, all other data have been taken from the following sources: Kenya National Bureau of Statistics (KNBS). 2019a. *Kenya population and housing census. Volume IV: distribution of population by socio-economic characteristics* and Kenya National Bureau of Statistics (KNBS). 2006. *Kenya Integrated Household Budget Survey 2005-2006*, Nairobi, Kenya: <https://www.kpda.or.ke/documents/Industry-Reports/KIHBS%202005%20Basic%20Report.pdf>



Key figures and trends in food production, consumption and trade

The agriculture sector **plays a crucial role in the economy of Kenya**, accounting for more than 20 percent of GDP in 2022. The sector employs more than 40 percent of the country's 54 million people and more than 70 percent of the rural population (Central Bank of Kenya, 2022). A multitude of public, parastatal, non-governmental and private sector actors are involved in agriculture, which comprises four major subsectors: crops; livestock; fishery; and forestry. The crop subsector is key to agricultural development and industrialization, accounting for 77.6 percent of the contribution to agrifood system gross domestic product (AgGDP). The livestock subsector contributes approximately 19.6 percent, while fishery and forestry contributes about 2 percent and 0.2 percent to AgGDP (Kenya, 2017a) Meanwhile, accounts for more than 65 percent of exports (Kenya, 2017a).

The **production trend for cereals has been very volatile** and has remained significantly below the population growth rate, especially over the past two decades (Figure 2). Fruit production has trended higher, but it also has remained below the population growth rate. Production of vegetables, roots and tubers has fluctuated, but was much higher in 2019 than in 2000, whereas sugar production trended lower, most likely due to high costs, mismanagement and high debts incurred by sugar companies (Okumu, 2021). Several droughts in recent years negatively affected

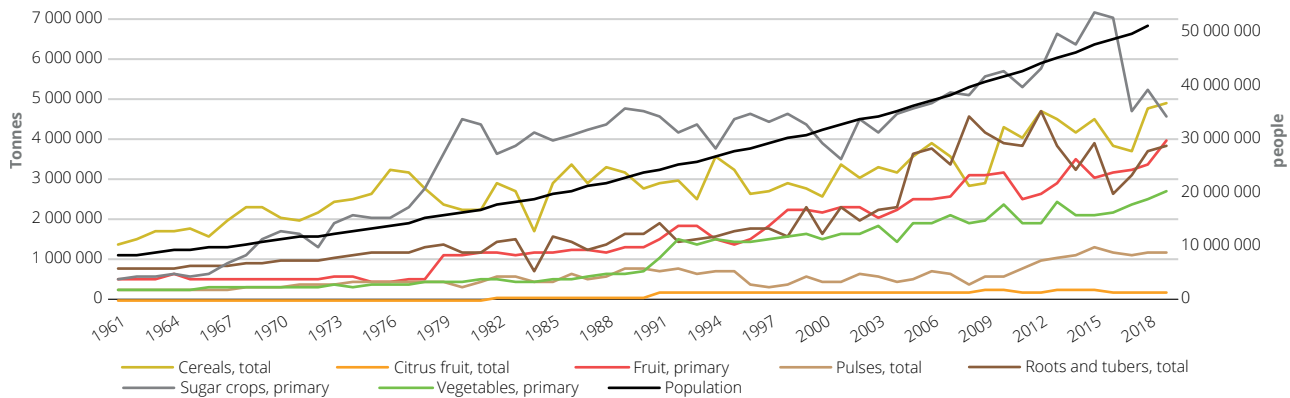
agricultural productivity and yields (Figure 3), and the resulting volatility, combined with continued inefficiency and demographic increase has put pressure on food production systems. Overall, these figures suggest that the **population growth rate has overtaken the production trends of all the key food crops**. This has major implications for food security, given that crops form the main staple foods and increased consumer demand has contributed to significant increases in staple food prices through greater import dependency and other impacts.

Land degradation poses a major threat to the ability of Kenya to address the increasing food demand. Declining land productivity was observed to be severe in the southern, eastern and coastal parts of the country (Kenya, 2020a). Deforestation and unsustainable land use are among the major contributors to land degradation and desertification. **At present, productivity levels for many crops are below their potential; for some crops, yields considered over a 5-year period have remained constant or even declined** (Figure 3). In the case of maize, the country's productivity level has remained below 2 tonnes per ha, which is substantially lower than "similar" countries in Africa, such as Ethiopia and South Africa, which recorded yields of 4.24 tonnes per ha and 5.86 tonnes per ha, respectively, in 2020 (Ritchie, Roser and Rosado, 2022).



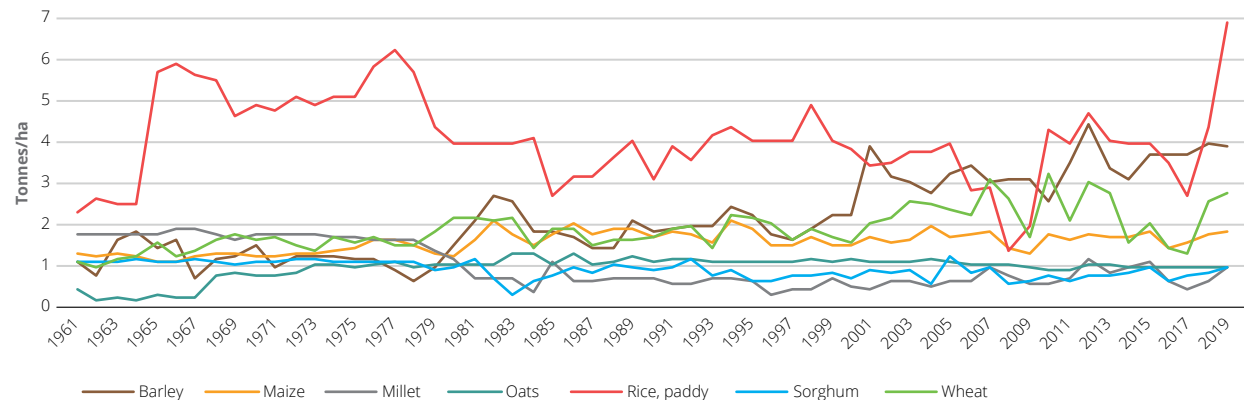


Figure 2. Production of major crops in comparison with population since 1961



Source: FAO. FAOSTAT, production database. In: FAO. Rome. Cited 20 March 2021. <https://www.fao.org/faostat/en/#data>

Figure 3. Trends in cereal productivity



Source: FAO. FAOSTAT, production database. In: FAO. Rome. Cited 22 March 2021. <https://www.fao.org/faostat/en/#data>

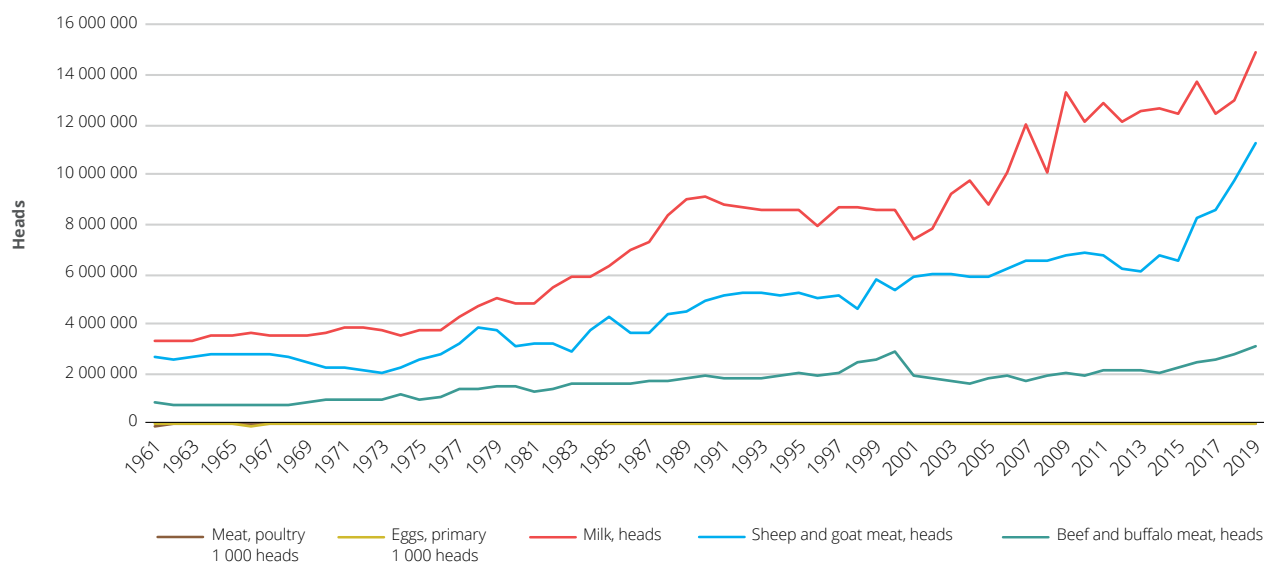
The **livestock subsector** accounts for approximately 19.6 percent of the agriculture GDP and approximately 4.9 percent of the country's GDP. The sector employs approximately 50 percent of the agricultural labour force and is the main source of livelihood to more than 10 million people living in the 'arid and semi-arid lands (Kenya, 2017a).

Most livestock is kept in arid and semi-arid lands, which comprises more than 80 percent of the landmass of Kenya. The key livestock subsectors are beef, dairy, sheep, goats, camels, poultry, pigs and emerging rearing of other animals, such as quails, ostriches and crocodiles. In the

rangelands, the small-scale livestock production system comprises mainly pastoralists, who keep cattle, sheep, goats and camels. Livestock is kept on communal grazing lands with low use of purchased inputs, such as feed, drugs and artificial insemination. The animals are kept mainly for food and income generation, where possible. The pastoralists, however, also keep livestock as a **mark of self-esteem and wealth** in the community (Embassy of Kenya in Germany, 2023). The prevalence of disease, and poor animal feedstuffs and nutrition, are major constraints to increased livestock productivity in Kenya, though production has generally been on the rise, as show in **Figure 4**.



Figure 4. Evolution of animal production in Kenya



Source: FAO. FAOSTAT, production database. In: FAO. Rome. Cited 22 March 2021. <https://www.fao.org/faostat/en/#data>

The **upward trend in livestock production (Figure 4), particularly dairy cattle**, has mainly been driven by the revival of New Kenya Co-operative Creameries – the largest milk processor – which has fuelled demand and growth. The dairy sector produced an estimated 3.8 billion litres in 2018, of which approximately 16 percent of it was delivered to dairy processors in the formal sector, but most of it was consumed on-farm or sold on the informal market. Farmers’ cooperatives handle about 18.7 million litres of milk worth about KES 5.6 billion (KNBS, 2020).

The country has approximately 13.5 million head of beef cattle – of which 95.8 percent are indigenous breeds; a total of 2.4 million households keep beef cattle (KNBS, 2019a). More than 75 percent of cattle are kept by pastoralists, who supply 60 to 65 percent of the meat consumed in Kenya (Farmer and Mwika, 2012). The country produces 320 000 tonnes of beef annually, worth approximately KES 62.1 billion. Beef production is, however, affected by climate

variability and animal diseases. The annual production of **sheep and goat** is approximately 262 000 tonnes. Together, they comprise approximately 30 percent of the total red meat consumed in the country (Kenya, Ministry of Agriculture, Livestock and Fisheries, 2019a).

The poultry sector of Kenya was **estimated at 57.7 million birds in 2019**, of which **76 percent** were free-ranging indigenous chickens and 22 percent commercial layers and broilers. Other poultry species, such as duck, turkey, pigeon, ostrich, guinea fowl and quail, made up only 2.2 percent, but are they are becoming increasingly important given changes in taste and preferences and the increase in more healthy diets among urban populations that emphasize poultry meat and egg consumption. Production of eggs and meat have increased by 22 percent and 12 percent per annum, respectively, over the period 2010–2019 (Kenya, 2020b). This growth is mainly driven by rapid urbanization and demand from a growing middle class, a rise in the number of fastfood

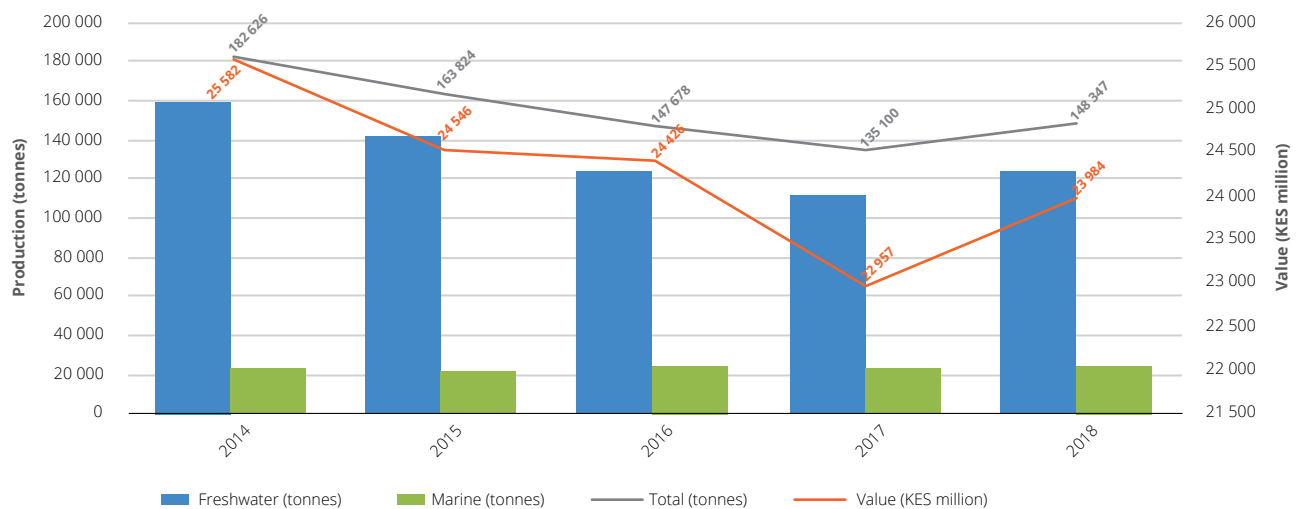


restaurants in urban areas and an increasing appetite for animal protein. Consumption of poultry meat by high-, middle- and low-income households has increased more rapidly than the consumption of red meat.

The fisheries subsector accounts for approximately 0.5 percent of national GDP, with **freshwater sources supplying 85 percent of the country's fish output.** Freshwater fish

production has been **declining since 2014**, most likely due to the encroachment of invasive water hyacinth, coupled with destructive fishing practices and dwindling stocks of Nile perch species in Lake Victoria (Farmbiz Africa, 2018). Fish from marine sources comprises a relatively small share, mainly due to inadequate facilities and technology necessary for fishing in deep waters. Total fish output in 2018 was 148 347 tonnes, worth KES 24 billion (Figure 5).

Figure 5. Trends in national fish production in tonnes and value



Source: Kenya National Bureau of Statistics (KNBS). 2019. *Statistical Abstract*; Nairobi, KNBS.

Food consumption

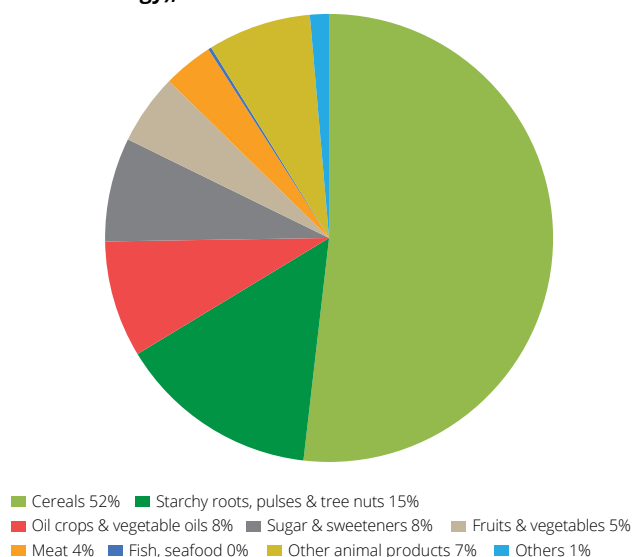
The total per capita daily supply of food energy decreased from 2 447 kcal in 2012 to 2 232 kcal in 2020, reflecting lower supplies of food available to consume.

The average diet as captured by food availability (Figure 6) mainly consists of cereals (52 percent), starchy roots (15 percent), oils (8 percent) and sugars (8 percent). Fruits and vegetables and meats constitute relatively small proportions of the diet, namely

5 percent and 4 percent, respectively. This high dependence on maize and other starches, and low consumption of fruit and vegetables and meat suggests an unvaried dietary consumption pattern. However, milk and its related products registered a higher per capita consumption in Kenya in 2018. Other foods whose consumption have decreased are rice, beans, cassava, sweet potatoes (in the highlands) and onions, largely driven by a rise in their prices from supermarket shelves and mama mbogas or small vegetable vendors (Mutua, 2019).



Figure 6. Food availability by commodity groups (in terms of food energy), 2018



Source: FAO. FAOSTAT, New food balance. In: FAO. Rome.

Cited 10 April 2021. <https://www.fao.org/faostat/en/#data/QCL>

The agriculture sector accounted for more than 60 percent of total exports and 7 percent of imports of Kenya in 2016 (Republic of Kenya, 2018). The main export commodities are tea, coffee, horticultural products and cut flowers; notably,

maize exports have also doubled since 2015 (Figure 7). Between 2016 and 2020, the export value of horticultural products increased by 10.6 percent to approximately KES 136.0 billion annually (USD 1.06 billion) and accounted for 24 percent of total domestic export earnings (Table 2) (KNBS, 2021a).¹

Kenya has gained in significance in the vibrant worldwide flower industry, and is the lead exporter of roses as cut flowers to the European Union, holding a market share of 38 percent. Kenyan flowers are sold in more than 60 countries; Approximately 50 percent of the exported flowers are sold through auctions in the Kingdom of the Netherlands, though direct sales are growing. In the United Kingdom, supermarkets are the main outlets, accounting for more than 25 percent of exported flowers that are delivered directly, providing an opportunity for value addition at source through sleeving, labelling and bouquet production. It is estimated that more than 500 000 people – including more than 100 000 flower farm employees – depend on the floriculture industry, which has a wider impact on more than 2 million livelihoods (Embassy of Kenya in Japan, 2023).

Table 2. Export commodity values (KES million)

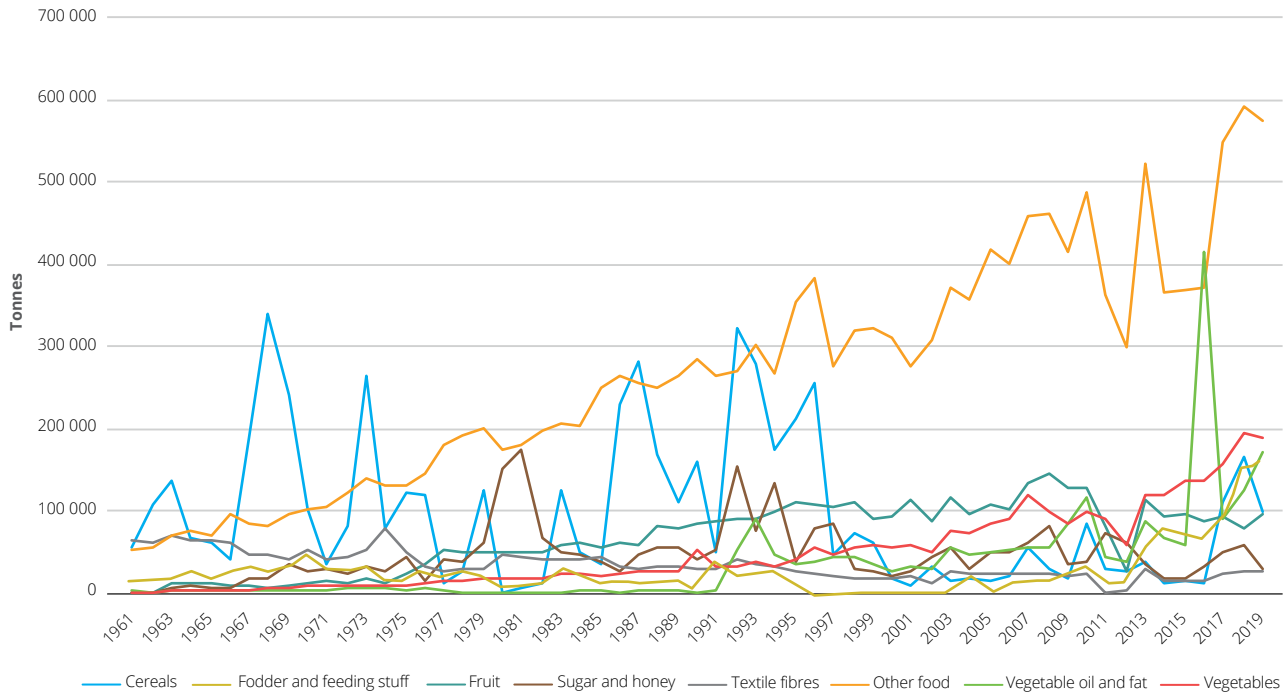
Year	Export commodity values (KES million)				
	Maize (un-milled, excl. sweet corn)	Meals and flours from wheat	Horticulture	Coffee, unroasted	Tea
2016	510.8	64.5	110 338.3	21 371.4	124 496.7
2017	766.4	72	113 349.4	23 452.7	147 250.8
2018	513.8	88.9	124 266.8	23 094.9	138 835.5
2019	508.7	94.3	122 916.3	20 309.9	113 550.7
2020	1 147.7	150.8	135 959.7	22 242.7	130 353.4

Source: KNBS (Kenya National Bureau of Statistics). 2021. Economic survey. <https://www.knbs.or.ke/wp-content/uploads/2021/09/Economic-Survey-2021.pdf>

¹ This figure excludes cut flowers.



Figure 7. Main commodity exports, by volume (tonnes)

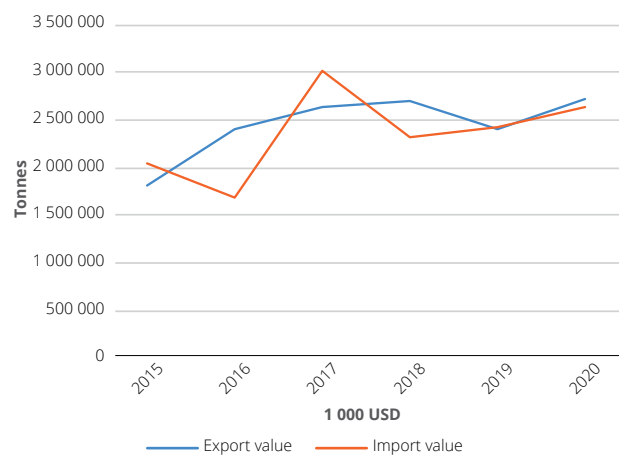


Source: FAO. FAOSTAT, production database. In: FAO. Rome. Cited 15 April 2021. <https://www.fao.org/faostat/en/#data>

In 2018, the value of exports appeared to be trending slightly lower while that of imports was trending higher. The country's imports of consumer-oriented food products grew at an average annual rate of 9.6 percent between 2016 and 2020. This increase was fuelled by the growing middle class with rising disposable income, coupled with increased urbanization, and expanding modern food retail and food service sectors (USDA, 2023). The overall trend indicates that the value of food imports is likely to surpass food exports in the near future (Figure 8). For the past decade, the value of fish products for export has declined, while imports have increased steadily, surpassing exports by 2016. Nile perch is the most commercially important species in the export trade, contributing approximately 90 percent in terms of volume and monetary value of the country's total fish exports. In contrast, fish imports have

increased by 25.5 percent annually due to the declining fish catch (KNBS, 2019b).

Figure 8. Value of exports and imports of food and beverages



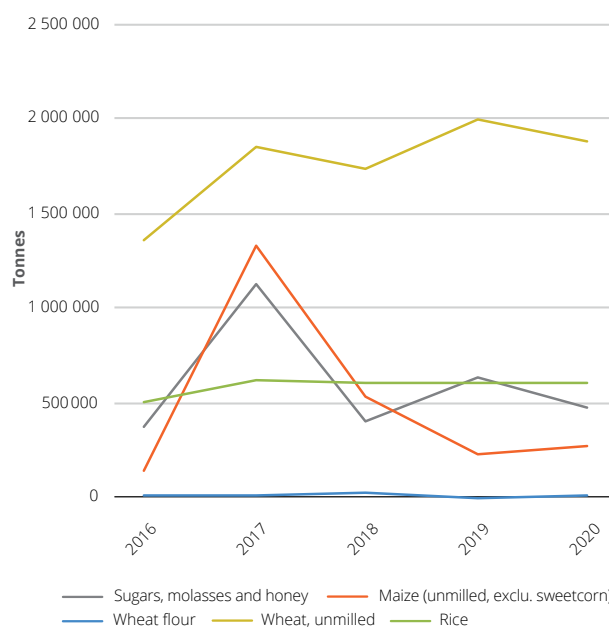
Source: FAO. FAOSTAT, trade database. In: FAO. Rome. Cited 25 October 2022. <https://www.fao.org/faostat/en/#data>



The **food imports** bill for Kenya in the first nine months of 2021 reached its highest level since 2017, driven by a major drop in local production due to prolonged drought. Data from the Kenya National Bureau of Statistics (KNBS, 2022) indicate that the food import bill rose 18 percent to KES 183.93 billion in 2022 from KES 155.42 billion in a corresponding period in 2021. In that year, wheat was the leading commodity in terms of import quantity (**Figure 8**) and value, at KES 54.94 billion, followed by rice, at KES 26.94 billion (KNBS, 2021a).

Imports of maize, the country's staple food, totalled KES 20.71 billion in 2019, while sugar accounted for KES 19.12 billion. In 2020, the **import volume of maize** increased slightly to 273 500 tonnes, up from 228 800 tonnes in the previous year (**Figure 9**). While maize is a major crop produced in Kenya, some imports of it are necessary to meet national demand (Statista, 2023). The increased imports were necessary to cover the impact of the **worst drought in 40 years**, which hurt food production in a country where farming activities are largely dependent on rainfall (OCHA, 2022).

Figure 9. Food commodity import trends



Source: Kenya National Bureau of Statistics (KNBS). 2021.

Economic survey. <https://www.knbs.or.ke/wp-content/uploads/2021/09/Economic-Survey-2021.pdf>





Finally, meat demand in Kenya outstrips local production, making it necessary to import meat, which comes mainly from neighbouring countries, such as Ethiopia, Somalia, Uganda and the United Republic of Tanzania (Mbae *et al.*, 2020). The livestock sector is held back by low

government budgetary allocations, high disease prevalence, recurrent droughts, poor market infrastructure, such as roads, water facilities and electricity supply, which have been cited as affecting production, and increasing meat imports (Murage, 2020).

Characterization of dominant actors in the food system of Kenya

In Kenya, approximately 66 percent of the farming community own land ranging between 0.5 and 5 hectares. These include 3.5 million crop farmers, 600 000 pastoralists and 130 000 fishers, among others (Kenya, 2018). Smallholder farmers are mostly in rural areas and contribute approximately 65 percent of marketed agricultural produce. They produce more than 70 percent of maize, 65 percent of coffee, 50 percent of tea, 80 percent of milk, 85 percent of fish, and 70 percent of beef and related products (D'Alessandro *et al.*, 2015). **It is estimated that approximately 34 percent of farms in Kenya are on more than 5 ha of land.** These farms supply 35 percent of agriculture produce in local and international markets, often under contractual arrangements (Kenya, 2014).

Turning to **input service providers**, there were 18 dominant fertilizer importing companies as of 2015, supplying small- and larger-scale farmers (Oseko and Dienya, 2015), and 177 registered seed merchants in Kenya in 2020,² of which 45 are members of the Seed Trade Association of Kenya (STAK, 2023), the main seed industry representative. The seed companies produced formal seed varieties that were supplied to more than 800 seed dealers around Kenya. In addition to inputs, farmers wanting to improve agricultural productivity need guidance on good agricultural practices, but the ratio of extension officers to farmers in Kenya is low, at 1:1500 (Otieno, 2019), despite the devolution of key agriculture functions to county governments under the new Constitution of 2010.

The government plays a key role in marketing and regulatory affairs with established formal trading channels in the form of quasi-government corporations, such as the Kenya Dairy Board (KDB), the Kenya Coffee Board and the National Cereals and Produce Board (NCPB). Their role is to monitor respective value chains and provide formal markets for smallholder farmers. Furthermore, the Kenya Tea Development Agency (KTDA), is a privately owned company with approximately 600 000 smallholder tea farmers, spread across 16 tea-growing counties in Kenya, with eight subsidiary companies, that add value to the tea value chain.

As of 2015, there were 187 food processing firms and 102 beverage companies in Kenya, represented by the Kenya Association of Manufacturers (KAM) (Kyengo, 2019).

Seventeen companies process fish, mainly for export. There are about 23 milk processors and 74 mini dairies licensed to operate by the Kenya Dairy Board (KDB, 2019). The milk processors congregate under the auspices of the Kenya Dairy Processors Association (KDPA). Installed dairy processing capacity is estimated to be 3.75 million litres per day. The Cereal Millers Association (CMA) represents the interests of more than 32 large grain milling companies in Kenya that deal in maize, sorghum and millet flour, wheat, fortified foods and rice (CMA, 2023). the main brief of CMA is to advocate the sustenance of a liberalized grain market.

² According to the Kenya Plant Health Inspectorate Service (KEPHIS) database of Seed Merchants 2020 (KEPHIS, 2020).



The types of food retailers vary widely, ranging from food kiosks and grocers, which are in open-air markets and residential neighbourhoods, to mini-market shops that retail larger quantities of food items as compared to the food kiosks (Berger and Helvoirt, 2018). Additionally, food safety concerns among urban dwellers have influenced the rapid growth of supermarkets, which offer processed foods, staple foods, fruits and vegetables.

In recent times, the food industry has recorded a surge in the number of multinational companies that have invested in fastfood outlets in Kenya (Nandonde and Kuada, 2018). Among the most recent examples are the launches of plans announced by Chicking, British-based Chicken Cottage, and U.S. pizza chain, Papa John's, underlining a trend towards westernization of consumer food preferences in Kenya and more broadly in East Africa (Fitch Solutions, 2022).

There are more than 14 000 agricultural cooperatives in Kenya, with the dairy industry being their main focus. Specific value chain cooperatives provide services in terms of collective input sourcing and marketing of final products. Savings and Credit Cooperative Societies (SACCOS) provide financial services to smallholder farmers on friendly terms, compared to banks. Farmers' groups provide peer monitoring and collective group repayment arrangements, reducing the risks of lending to them by SACCOS (Rampa and Dekeyser, 2020).

The Kenya National Farmers' Federation (KENAFF) is the umbrella producer organization, which represents farmers' interests and brings together various commodity interest groups and associations. The main private sector organization is the Agriculture Sector Network (ASNET), which is an affiliate of the umbrella Kenya Private Sector Alliance (KEPSA).

"There are several institutions and agencies involved in the food safety and quality control

systems in the country, coordinated by the National Food Safety Coordination Committee (FSCC), an ad hoc committee, chaired by the Ministry of Agriculture, Livestock and Fisheries. The Ministry has the mandate of food safety and quality control. Some of the key agencies under the Ministry that are responsible for food safety and quality control include, Agriculture and Food Authority (AFA), Kenya Plant Health Inspectorate Service (KEPHIS), Pest Control Products Board (PCPB), Directorate of Veterinary Service (DVS), Kenya Dairy Board (KDB), Kenya Fisheries Service (KFS) and Kenya Bureau of Standards (KEBS) (Republic of Kenya, 2021)."

Other important actors in the food systems are government institutions at the national level and especially at the county level, as these entities decide on regulations for trading, markets and zoning (Rampa and Dekeyser, 2020), the private sector, public research institutions, academia, non-governmental organizations and development partners.





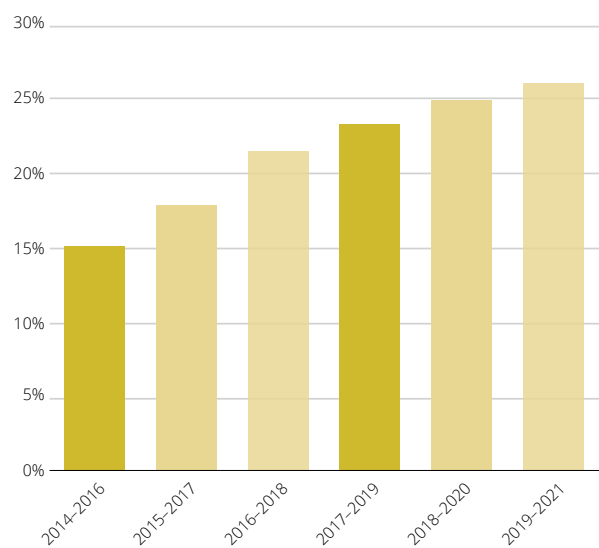
Key sustainability questions

KSQ1: Why is the food security situation in Kenya worsening and what are the dynamics of the high regional disparities in terms of food and nutrition security (FNS) outcomes?

Kenya faces serious food insecurity and ranks 94 out of 121 countries on the 2022 Global Hunger Index (GHI, 2022). In addition, high regional disparities in terms of relative indicators are recorded for the country. While indicators related to child malnutrition showed improvements between 1998 and 2014 nationally, the percentages remained very high in some counties, especially in the arid and semi-arid regions. Data on child malnutrition after 2014 are not yet available. The country's food insecurity indicators, however, have been rising since 2014. Additionally, the incidences of overweight and obesity are rising, and are major risk factors for NCDs. This shows Kenya to be vulnerable to the triple burden of malnutrition.

The **prevalence of severe food insecurity nationally** increased from 15 percent of the population during the period 2014–2016 to 26.1 percent during the period 2019–2021 (**Figure 10**). The percentage of moderate or severe food insecurity in the total population was as high, at 70 percent during the period 2019–2021 (FAOSTAT). The situation has been worse in the arid and semi-arid land (ASAL) of northern and northeastern regions of the country (Korir *et al.*, 2021). According to a food security assessment released in February 2022 (IPC, 2022), an estimated 3.1 million people – 20 percent of the population in the country's arid and semi-arid lands – were classified as IPC Phase 3 (crisis) or above. Compared to the same period a year earlier, there was an **increase from 1.4 million people to 3 million** people classified in IPC Phase 3 (crisis) and IPC Phase 4 (emergency). The number of children under the age of five requiring treatment for acute malnutrition had risen by 16 percent over the six months to February 2022, while acute malnutrition in pregnant and lactating women increased by 7 percent over the same period.

Figure 10. Prevalence of severe food insecurity

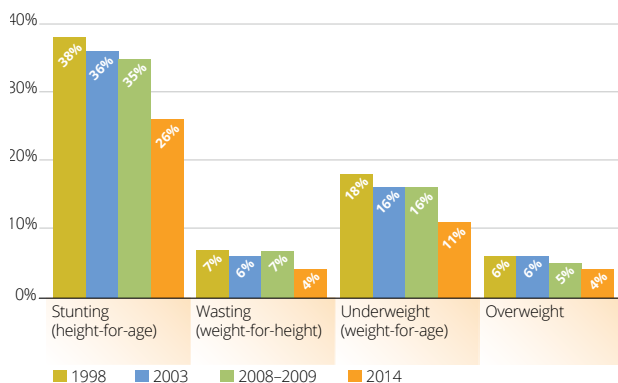


Source: FAO. FAOSTAT, suite of Food Insecurity Indicators database. In: FAO, Rome. Cited 10 November 2022. <https://www.fao.org/faostat/en/#data/FS>

On a positive note, Kenya has **recorded a declining national trend in levels of children's malnutrition** over the past few years. Data from the Kenya Demographic and Health Survey (KHDS) in 2014 (KNBS, 2015) indicate a significant reduction in the levels of stunting (**Figure 11**). This strong performance may be attributed to political commitment and leadership at the highest level. In 2012, Kenya joined the global Scaling Up Nutrition movement (SUN), and has taken steps to focus on maternal and child health and nutrition, recognizing the importance of a child's first 1 000 days, leading to effective implementation of the National Nutrition Action Plan (NNAP), 2012–17. Kenya also legislated fortification of key foods with essential minerals and vitamin A (FAO *et al.*, 2020).



Figure 11. Trends in nutritional status of children under 5 years old



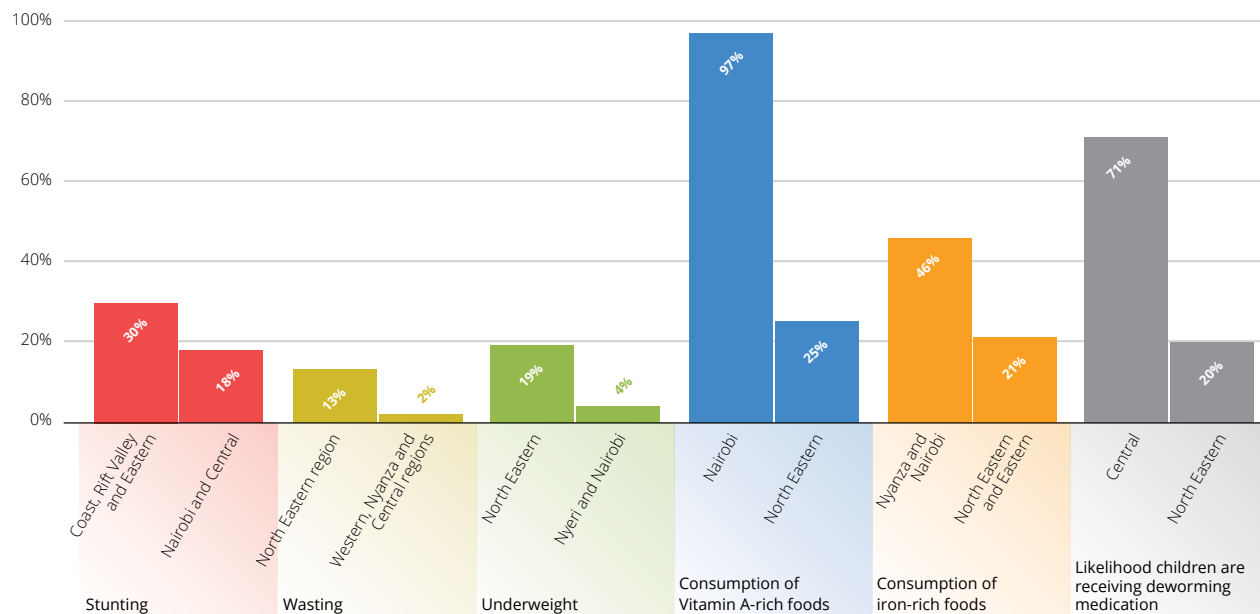
Note: The data are based on the WHO Child Growth Standards adopted in 2006. Data for 1998 were collected only for children whose mothers were interviewed; for other surveys, data were collected for all children listed in the Household Questionnaire. Data from 1998 exclude North Eastern region and some northern districts in the Eastern and Rift Valley regions.

Source: Kenya National Bureau of Statistics (KNBS). 2015. Kenya Demographic and Health Survey (KDHS), 2014. <https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf>; <https://microdata.worldbank.org/index.php/catalog/2544>

Despite positive strides in reducing malnutrition made by Kenya, **large regional disparities remain in terms of nutritional and health levels, and micronutrient intake.** The situation is particularly worrisome in the northeastern and eastern counties, where the indicators for child malnutrition have been the highest, and children had the lowest micronutrient intake (**Figure 12**).

Additionally, Kenya is experiencing a rapid rise in the case of NCDs. Approximately 39 percent of the deaths in the country were attributable to NCDs in 2019–2020, up from 27 percent in 2014. This figure is projected to increase by 55 percent by 2030. The government of Kenya identifies **overweight and obesity** as major risk factors for NCDs, such as cardiovascular diseases, diabetes and some types of cancer. The latest available data show that approximately 17.5 percent of men and 38.5 percent of women in Kenya are overweight, while 4.7 percent of men and 13.7 percent of women are obese (Kenya, Ministry of Health, 2021).

Figure 12. Regional disparities in Kenya – children’s nutrition levels and micronutrient intake (2014)

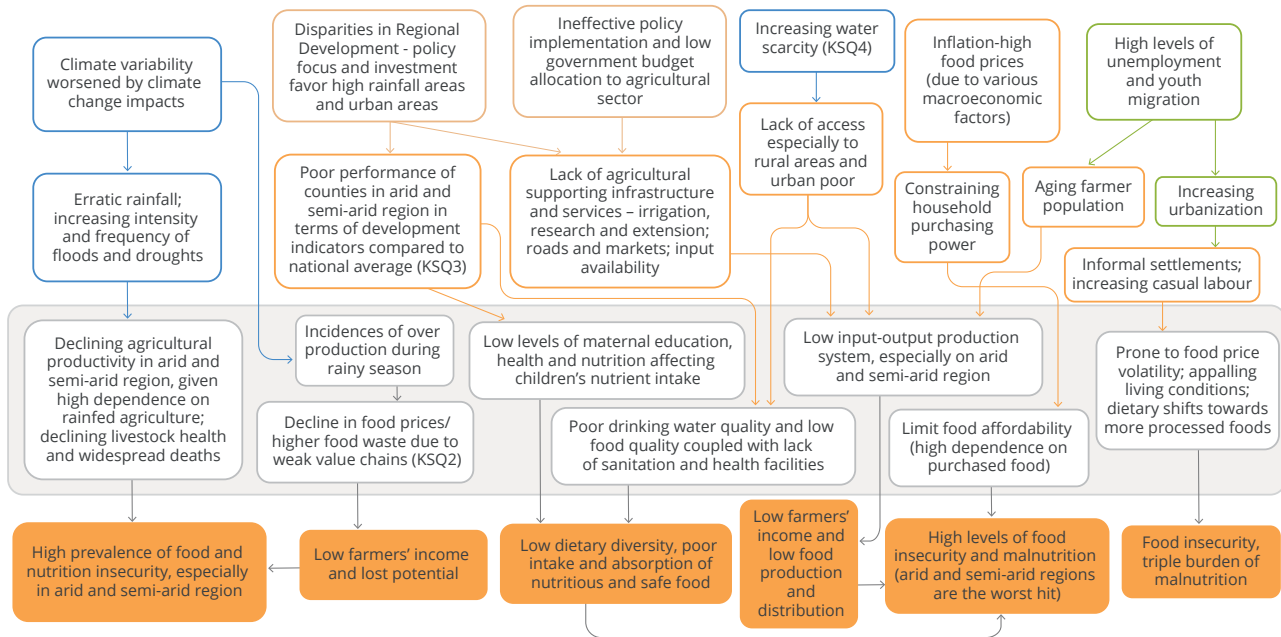


Sources: Lokuruka, M.N.I. 2021. Food and Nutrition Security in East Africa (Kenya, Uganda and Tanzania): Status, challenges and prospects. In: B. Mahmoud, ed. *Food Security in Africa*. London, UK. IntechOpen. doi.org/10.5772/intechopen.95036; KNBS (Kenya National Bureau of Statistics) 2015. Kenya Demographic and Health Survey (KDHS), 2014. <https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf>; <https://microdata.worldbank.org/index.php/catalog/2544>



Figure 13 offers a schematic view of the key drivers and impacts associated with increasing food insecurity levels and high regional disparities in terms of poor food and nutrition outcomes in Kenya.

Figure 13. Dynamics of food and nutrition security outcomes and regional disparities in Kenya (KSQ1)



Source: Authors' own elaboration.

Key drivers for high regional disparities in food and nutrition security outcomes in Kenya

Climate variability worsened by climate change impacts

In Kenya, food crop production is mainly rainfed, which leads to recurrent incidences of food insecurity, especially during the lean season. **Given the large proportion of arid and semi-arid lands (ASAL), unequal water availability is a key factor.** Only 18 percent of the country receives sufficient rainfall to make rainfed agriculture feasible. This heavy dependence on rain and the regular water shortages during the dry season lead to food insecurity in large tracts of Kenya for approximately eight months of the year, with particular challenges in arid and semi-arid lands. During the rainy season, by way of contrast, there

are often incidences of overproduction, which can result in declining prices and contribute to higher food waste.

Kenya is **already experiencing episodes of climate change, manifested through seasonal changes in precipitation and temperature of varying severity and duration**, worsening the impacts of overreliance on rainfed agriculture (Kogo, Kumar and Koeh, 2021).

Climate change is also expected to increase the frequency of extreme droughts, posing significant threats to livelihoods and food security. Being naturally prone to drought resulting from high interseasonal and interannual variability, Kenya experienced severe droughts in 2010–2011, 2016–2017, and in 2019, driven by la niña weather patterns. Agricultural



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productivity in Kenya is particularly vulnerable to erratic rainfall and intensifying droughts caused by the prevalence of rainfed agriculture and because 60 percent of livestock are in arid and semi-arid lands (USAID, 2021). According to the Kenya Food Security Steering Group (KFSSG), the maize harvest in the marginal agricultural areas was recorded to be 45–50 percent of the five-year national maize production average. In the pastoral areas, declining forage and water resources have kept livestock in dry-season grazing areas and force them to continue to migrate in search of pasture and water, resulting in conflict among communities over rangeland resources. Due to starvation, disease and long trekking distances, declining livestock health has resulted in widespread livestock deaths in pastoral counties (FEWS NET, 2022a).

Drought in 2019 severely affected more than 3 million people, particularly the populations in the northwestern Turkana region, where up to 25 percent of the people experienced malnutrition (USAID, 2021). That came after hostile weather conditions in April–May 2018, when **floods** displaced approximately 310 000 people and left 2.6 million people in need of urgent food assistance. Over the period 2019–2021, the prevalence of moderate or severe food insecurity

in the country's total population was estimated to be as high as 69.5 percent (FAO, 2022c).

In summary, climate variability and climate change significantly affect agricultural production and productivity, and are forecast to continue to hamper crop and livestock production and undermine the food security of already vulnerable communities – especially in the arid and semi-arid areas.

Disparities in regional development caused by continued inequities in terms of policy attention and public investment

Kenya is characterized by disparities in regional development that has continued from colonial times. The initial policy on development funding emphasized higher investment levels in high rainfall areas due to perceived higher returns, and in urban areas because of the political leverage of city populations. The low investments and weak policy focus are evident in the low levels of many development indicators in the counties of arid and semi-arid lands. Poverty levels are as high as 68 percent on average in those counties, compared to the national average of 36 percent (KSQ3). Income poverty is directly associated with food poverty, as shown in **Table 3**.³

³ Food poverty: households and individuals whose monthly adult equivalent food consumption expenditure per person is less than KES 1 954 in rural and peri-urban areas and less than KES 2 551 in core-urban areas respectively are considered to be food poor or live in “food poverty”.

**Table 3. Summary of 2015/2016 headcount poverty measures**

Residence	Headcount poverty measure	Poor individuals (% of population)	Poor households (% of households)
National	Food poverty	32	23.8
	Overall poverty	36.1	27.4
	Hardcore poverty	8.6	6.0
Rural	Food poverty	35.8	28.1
	Overall poverty	40.1	32.6
	Hardcore poverty	11.2	8.7
Peri-urban	Food poverty	28.9	21.5
	Overall poverty	27.5	21.1
	Hardcore poverty	6.0	4.6
Core urban	Food poverty	24.4	17.7
	Overall poverty	29.4	20.6
	Hardcore poverty	3.4	2.0

Source: Kenya National Bureau of Statistics (KNBS). 2018. *Basic report on well-being in Kenya*. Cited 10 April 2022. <https://www.knbs.or.ke/download/basic-report-well-kenya-based-201516-kenya-integrated-household-budget-survey-kihbs/>

As indicated in the 2014 KDHS, **maternal education and household wealth** are crucial determinants of children's nutritional status and micronutrient intake. It has been observed that the northernmost counties with high levels of wasting are characterized by low rates of contraception use, high fertility rates and low levels of women's education (KNBS, 2015). The counties with the highest levels of stunting, West Pokot and Kitui, have high levels of poverty – 57 percent and 48 percent, respectively (Lokuruka, 2021). **High stunting rates in Kenya are also related to poor quality drinking water and sanitation practices, low dietary diversity, inadequate access to health services and low food quality (including the presence of aflatoxins)**. In northern Kenya, less than 4 percent of children have access to a minimum acceptable diet, and while 49 percent of women exclusively breastfeed, the Women's Dietary Diversity Score (WDDS) is low, at 3.37 (of nine) food groups nationwide. These figures point to extreme nutrition deficiencies (GFSS, 2018).

The poor state of the infrastructure contributes significantly to persistent food insecurity and malnutrition. Bad and inadequately maintained roads limit farmers' accessibility to improved inputs, resulting in low productivity and low returns. This lack of connections also limits smallholders' access to local markets or urban centres, as well as aggregation and distribution of food from major production areas to consumer markets. Rural communities also often lack reliable electricity, internet access, good schools and health-care facilities (Mohajan, 2014; Mugendi, 2020).

Lack of investment in **irrigation infrastructure** contributes to severe food insecurity and malnutrition. While 83 percent of the country's land area is arid and semi-arid, 2 percent of arable land is under irrigation compared to an average of 6 percent in sub-Saharan Africa and 37 percent in Asia. The low usage of irrigation means that agriculture in Kenya is fully rain dependent and susceptible to drought shocks. It has been



shown that investing in irrigation and agricultural water management for smallholders can reduce productivity shocks and raise the sector's total factor productivity, potentially contributing to climate-proofing the sector (World Bank, 2019a).

Additionally, **the disadvantaged areas** experience higher incidences of **insecurity and civil conflicts** that exacerbate food insecurity and malnutrition (Breisinger, Ecker and Trinh Tan, 2015). The situation is compounded by unviable **land tenure** and **property rights**, which result in increased **land subdivision** and smaller holdings. The fragmentation of land has manifested in use of ineffective agriculture technologies, **unfavourable land use, land cover change** and low agricultural land productivity, aggravating food insecurity and malnutrition, especially in arid and semi-arid lands (NLC and FAO, 2021).

The discussion ahead reflects on the drivers at the national level associated with food and nutrition insecurity in the country.

Ineffective relevant policy implementation and low government budget allocation to the agricultural sector

Kenya has drawn up several strategic documents and policies intended to guide the country towards achieving food security. These include Vision 2030; the Agriculture Sector Transformation and Growth Strategy (ASTGS) 2019–2029, the Big Four Agenda (Big4)⁴ and national adaptation plan and drought management strategies to curb drought emergencies at the national level; the African Union Malabo Declaration at the regional and continental level; and United Nations post-2015 goals at the global level (Mutea *et al.*, 2022). However, in the view of the increasing food insecurity levels, the effectiveness of such initiatives needs to be evaluated to

determine the extent they address the systemic vulnerabilities contributing to food insecurity in Kenya. In addition, it is notable that the budgetary allocation to the agriculture sector is approximately 3 percent, with combined public investments at the national and the county level, falling short of the 10 percent targeted in the Malabo Declaration. Low budgetary allocations, low private sector investments and poor credit availability restricts the overall development of the sector (KSQ2), and hampers the provision of adequate, safe and diverse food to the population.

Inflation, high food prices

High staple food prices are constraining household purchasing power and food access, in both urban and rural areas. Staple food prices range from 22 to 63 percent above average for maize and 12 to 44 percent above average for beans (FEWS NET, 2022b). The increase in the cost of living, and especially high food prices, can be attributed to a combination of external and domestic factors, such as below-average production in 2021/2022, expected below-average production for 2022/2023, high market demand due to low household stocks and high inflation. Under pressure from the International Monetary Fund (IMF) to raise more revenue, the government has increased taxes on everyday household goods, such as cooking gas, fuel and food. Additionally, the COVID-19 pandemic hit tourism and exports, and the Kenyan shilling has depreciated – by about 14 percent against the United States dollar over the two years to March 2023 – pushing up the prices of imports.⁵ The pandemic, and responses to it, also have disrupted global supply chains, making it more expensive, tedious and time-consuming to access and move goods and services across borders (Kiprop, 2022).

⁴ The Big Four Agenda is the set of priority programmes and reforms of the Government of Kenya planned for implementation over five years (2018–2022). The Big Four include: food security, affordable housing, manufacturing, and affordable health care for all. The Big Four Agenda was integrated into the Third Medium-Term Plan of Kenya's long-term development blueprint – Kenya Vision 2030 (Mutinda, 2020).

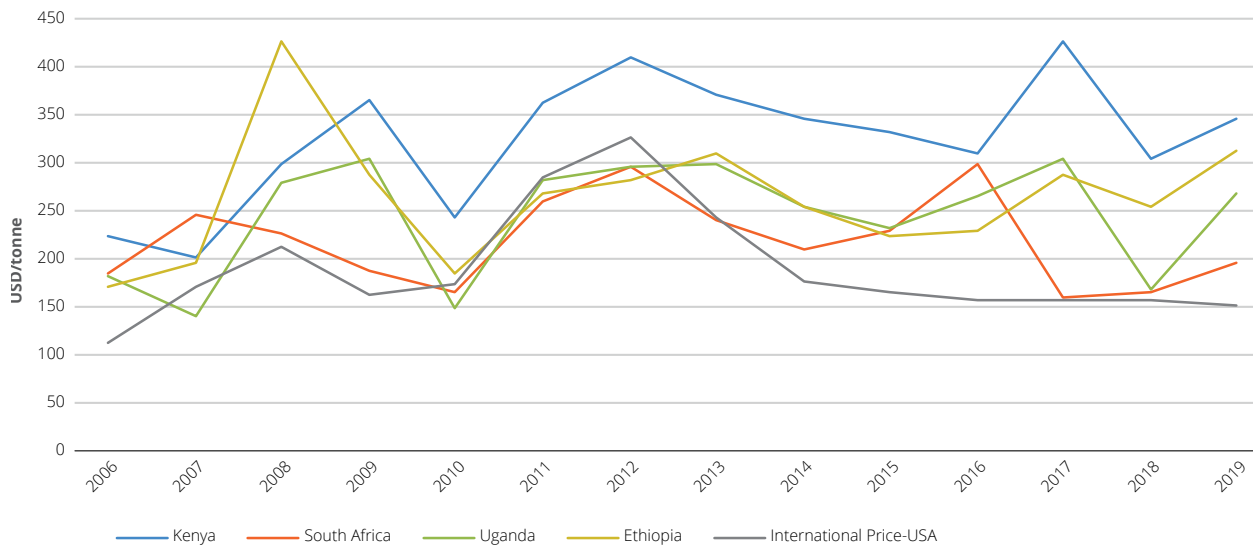
⁵ Kenyan Shilling to US Dollar exchange rate movements can be tracked using the Xe.com historical currency exchange rates chart (Xe.com, 2023).



Considering the cost of staples, maize prices in Kenya are often considerably higher than those in neighbouring countries (Figure 14). This is especially important given that a large proportion of households source their food from purchases

– even in the rural areas (Table 4) – implying that market efficiency is of utmost significance in mitigating food insecurity. The regions with low agricultural production and productivity are the worst-hit.

Figure 14. Food prices: average wholesale maize prices in Kenya, South Africa, Uganda, Ethiopia and International Price – USA



Source: FAO. FAOSTAT, Prices. In: FAO, Rome. Cited 5 October 2022.. <https://www.fao.org/faostat/en/#data/QCL>

Table 4. Percentage distribution of household food consumption by source and residence

Residence	Purchases	Stock	Own production	Gifts
National	68.3	8.4	18.0	5.2
Rural	57.4	8.1	27.7	6.7
Peri-urban	65.6	7.9	21.7	4.8
Urban	85.7	8.9	2.4	2.9

Source: Kenya National Bureau of Statistics (KNBS). 2020. Economic Survey. Cited 10 April 2022. <https://www.knbs.or.ke/download/economic-survey-2020/>

Increasing water scarcity

At least one third of the Kenyan population does not have access to clean drinking water. More than 16 million people are dependent on untreated and unsafe water sources, such as ponds, shallow wells, rivers and lakes, for their drinking water. The situation is particularly grim in

rural areas, and among the urban poor, who are unlikely to be able to afford clean water where it is available. Urban water scarcity is driven by low supply and high demand, particularly as urban population growth, including migration from rural areas, is added to poor planning and resource management. In the informal urban settlements especially, water supply is controlled by cartels.



In rural areas of Kenya, lack of access is compounded by poor coverage by the water network and people need to travel long distances to fetch water from the sources already mentioned. Inadequate and poor-quality drinking water severely affects health, having an impact on nutrient intake and absorption.

Natural resources have also deteriorated, with Lake Victoria providing an example. The lake, which is divided between Kenya, Uganda and the United Republic of Tanzania, has been affected by increasing urban and agricultural pollution for more than a century. These factors have led to a reduction in water quality and fish stocks for the more than 40 million people in the region who directly rely on the lake, resulting in a major impact on their food security (Waruru, 2022).

Increased rural-urban migration and urbanization

Young people account for 35 percent of the population of Kenya and more than 1 million of them enter the labour market each year (FAO, 2022b). The country is characterized by internal migration (rural-rural and rural-urban), with migrants, mostly young people, seeking employment prospects (FAO, 2022b). As Kenya has 17.5 million people between the ages of 15 and 34, **young people are nearly twice as likely to be unemployed** (RTI International, 2022). This increase in rural-urban migration has also raised concerns about rural young people abandoning agriculture, at a time when more grown food is needed and farmers working the land are ageing. This reduces the availability of human resources in the agricultural sector, limiting its overall growth and development, and its ability to improve food production and productivity. The regions high dependence on rainfed agriculture are likely to experience more youth migration, exacerbating the situation.

The increase in urban population (3.7 percent annual growth in 2021) (World Bank Database)

is shadowed by concerns about urban food insecurity and malnutrition. The populations of the major urban centres, including Nairobi, Kisumu, Nakuru, Mombasa and Eldoret, also **comprise struggling dwellers in informal settlements.** This section of the urban population – especially the unemployed and casual labourers – are highly vulnerable to food price volatility and poor health, as they live in appalling conditions where they lack basic services, such as water and sanitation facilities. Because of such surroundings, Nairobi recorded the second highest child mortality rate in 2014 among different regions in Kenya (KNBS, 2015).

The combined factors of population growth, urbanization and economic growth have led to dramatic and structural changes in the overall context of the food system of Kenya in recent decades (Rampa and Dekeyser, 2020). The modern dynamics are evident in increasing market share of supermarkets, a rise in overall demand for food and dietary shifts towards more processed foods and animal-based proteins. These trends are projected to increase further, which would worsen the situation regarding overweight and obesity and the country's vulnerability to the triple burden of malnutrition among a population deeply affected by regional disparities.

Potential impacts

Poor health outcomes and higher rates of food and nutrition insecurity reduce human capital and add an increasing burden on health services that will face diseases resulting from the triple burden of malnutrition. Over and above the incalculable human impacts, the data indicate substantial blows to the economy of Kenya too, which can also have repercussions for socioeconomic stability through, for example, increased internal migration, poverty and conflicts. Kenya is estimated to have lost the equivalent of KES 373.9 billion in 2014 – 6.9 percent of GDP – in combined productivity, health and education losses,



estimated at KES 352.1 billion, KES 18.6 billion and KES 3.2 billion, respectively. The opportunity costs in productivity alone represented 6.52 percent of GDP in 2014, followed by health and education, at 0.34 percent and 0.06 percent, respectively (Kenya, 2019).

Systemic levers

As food and nutrition security is a cross-cutting phenomenon, the systemic levers mentioned in the other three KSQs are crucial to dealing with this and associated high regional disparities in Kenya. The following levers may be considered in addition.

1. Effective implementation of relevant policies

Existing policies and strategies of the Kenya government – including the new Constitution of 2010, Vision 2030, ASTGS and the National Agricultural Investment Plan (NAIP), among others – reflect the **positive intentions to deal with food insecurity and malnutrition** in the country. The reduced levels of malnutrition at the national level over the past few years also act as supporting evidence. This analysis, however, signals the importance at the implementation level of recognizing and taking into account the interplay of geographical, environmental, socioeconomic and demographic factors in order to achieve equitable results in different regions, including in urban and rural areas. It is also imperative for policies and strategies to benefit from effective public participation and be accompanied by ring-fenced **budgetary support** at national and county levels. **This requires resource mobilization efforts.** Noting that counties have neither comprehensive agriculture sector programmes nor the capacity to develop and implement them, capacity-building support is also required.

The governance aspects of the food and nutrition security policy need to be streamlined by operationalizing key institutions, such as the National Food and Nutrition Security Authority/

National Food Council, which was proposed more than a decade ago, but not actualized. A notable feature is that while the country identified an improved strategic food reserve as a tool for relieving food insecurity in times of distress, it needs to broaden its coverage to a wider set of commodities and groups to effectively tackle nutrition concerns.

Finally, promoting multisectoral stakeholders' cooperation, including the ministries of agriculture, health, education and other relevant actors, in addition to the private sector (such as supermarket chains), development partners and farmers' organizations will contribute towards improving the food security and nutrition situation in Kenya. Some multisectoral partnerships with the agriculture, health and education sectors already exist and are, for example, being used in Kenya to mainstream nutrition into agricultural development, with the aim of reducing malnutrition. This is being attempted through a range of activities, from developing and promoting production and consumption of nutritious crops, such as millets, sorghum and legumes; biofortification; and partnering with stakeholders to mainstream health, agriculture, nutrition education and women's empowerment (ICRISAT, 2021).

2. Increased investment in research and development, including climate-resilient varieties and nutrition-sensitive agriculture

Research and development has contributed significantly to the country's food and nutrition security from the food availability perspective, but new challenges require a reorientation. ASTGS outlines some of these challenges and efforts to improve resilience: drought and other extreme weather-tolerant crops and livestock; commercialization and development of indigenous crops and livestock, which may be better adapted to areas at greatest risk from climatic issues; and disease- and pest-resistant animals and crops – including transgenic crops to be used in combating pest resistance. More



recent research and development-related challenges in food and nutrition security are nutrition-sensitive agriculture, which focuses on nutrition-rich, diverse foods, and encompasses product development, biofortification and developing technical capacity for industrial-level food fortification. Agricultural research spending as a share of agriculture GDP, however, fell from 1.33 percent to 0.79 percent between 2011 and 2014, while government spending on agricultural research by the Kenya Agricultural and Livestock Research Organization (KALRO) and its predecessors decreased by more than 17 percent over the same period. Improving food and nutrition security outcomes must be commensurate investments in research and development and nutrition-sensitive agriculture.

3. Supporting smallholder family farming

Targeted interventions are key to improving food and nutrition security. Interventions in rural areas need to focus on improving productivity, as opposed to in urban areas where improved food access is needed. Similarly, interventions in arid and semi-arid areas need to focus

on social services and infrastructure. It is, therefore, important to support and strengthen the capacities and competencies of family farmers (both in rural and peri-urban areas), **including women and young people**, to increase productivity and diversify production. This could be done in conjunction with strengthened social protection programmes, and value chain development efforts (e.g. supporting interventions that focus on increasing the production and commercialization of nutrition-sensitive value chains) (see lever 2 and KSQ2, KSQ3). Efforts could include promotion of production and use of indigenous vegetables and other foods (Rampa and Dekeyser, 2020) and consumption of protein-rich livestock products, and fish. It could also be combined with efforts to demonstrate appropriate technologies for the preparation of diversified, nutritious food that is affordable to the rural population. Creation awareness of the importance of nutrition could be considered to encourage more varied and healthier diets, such as through strengthening and scaling-up nutrition education programmes.





KSQ2: Why are agrifood value chains in Kenya not able to generate potential returns to food system actors and deliver sufficient and safe food to the population?

Value-chain development and the commercialization of smallholder agriculture are important elements of the strategy of the government of Kenya to increase economic growth and, improve income generation and food security (World Bank, 2022b; Kenya, Ministry of Agriculture, Livestock and Fisheries, 2019b). However, the country's agrifood value chains remain inefficient and underdeveloped, characterized by low production and productivity (see KSQ1), low levels of agrifood processing and high levels of post-harvest losses and food safety issues. This has systemic implications for food systems, given the low returns for food-system actors, especially smallholder farmers; limited availability of food; lost opportunities to tap the potential of processed food markets; high dependency on food imports; and increasing incidences of food-borne diseases. This KSQ reflects upon relevant indicators, major drivers and systemic impacts of weak agrifood value chains on different elements of the food systems of Kenya.

Significant **post-harvest food losses have been recorded for crops, livestock and fisheries**. In 2017, more than **1.9 million tonnes of food was lost at the post-harvest phase**, worsening the impacts of drought that Kenya faced during 2016/17 (World Bank, 2022b). It is estimated that **20 percent of cereals are lost** prior to reaching the market. This is a contributing factor to increasing dependency on food imports. Over two decades, **the cereal import dependency ratio of Kenya increased from 23.9 percent (over the period 2000–2002) to 43.1 percent (over the period 2019–2021)** (FAO, 2022c).

In 2017, Kenya recorded **37 million bags of maize, of which 12 percent was estimated to have been lost to poor post-harvest handling and storage**. These losses translate into approximately 4.5 million bags. Post-harvest

losses are estimated at 12–20 percent of total national production (Onyango and Kirimi, 2017). Fruit production provides another example; **40 percent of the mango fruit crop goes to waste and only 8 percent of the fruits are processed**. This means significant opportunities are being missed for producing finished juices and soft drinks, as well as for integrated pulps and concentrates (ITC, 2016) as the fruit sector has grown by 12 percent annually between 2005 and 2015 due to the demand for healthier drinks and fresh fruits, powered by rising incomes.

In Kenya, potato production and consumption are increasing. Potatoes place second only to maize in terms of production and consumption. This is mainly a result of the partnership between the International Potato Center (CIP) and KALRO to provide farmers with more resilient and higher-yielding varieties that also meet the demands of consumers. Potatoes are grown by approximately 800 000 small-scale farmers (CIP, 2019). Nearly a quarter of Kenyan potatoes that make it to markets, however, are damaged or green, and face relatively higher losses within different channels. Retailers are most affected by the low quality of produce supplied, and losses reported by the processing industry and supermarkets range from 12 to 25 percent. A total of 815 000 tonnes of potatoes are damaged or lost each year, which represents wasted value of approximately KES 12.9 billion (USD 100 million) to businesses (Musita, Okoth and Abong, 2019).

Milk loss estimates at the farm level range from 3 percent to more than 6 percent of total production (USAID, 2015). According to FAO data, Kenya loses approximately 95 million litres (7.3 percent, of which 5.3 percent is at the farm level) of milk annually, equivalent to USD 22.4 million per year.



Key food-safety issues in Kenya relate to the contamination of foods with **chemical residues such, as heavy metals in vegetables – particularly in urban areas; aflatoxin contamination of staple foods**, such as maize and groundnuts; and food-borne diseases, which lower food safety (Yen *et al.*, 2018). The incidence of diarrhoea cases linked to food-borne diseases has remained high (3 564 833 cases) as reported in public health facilities (KNBS, 2020).

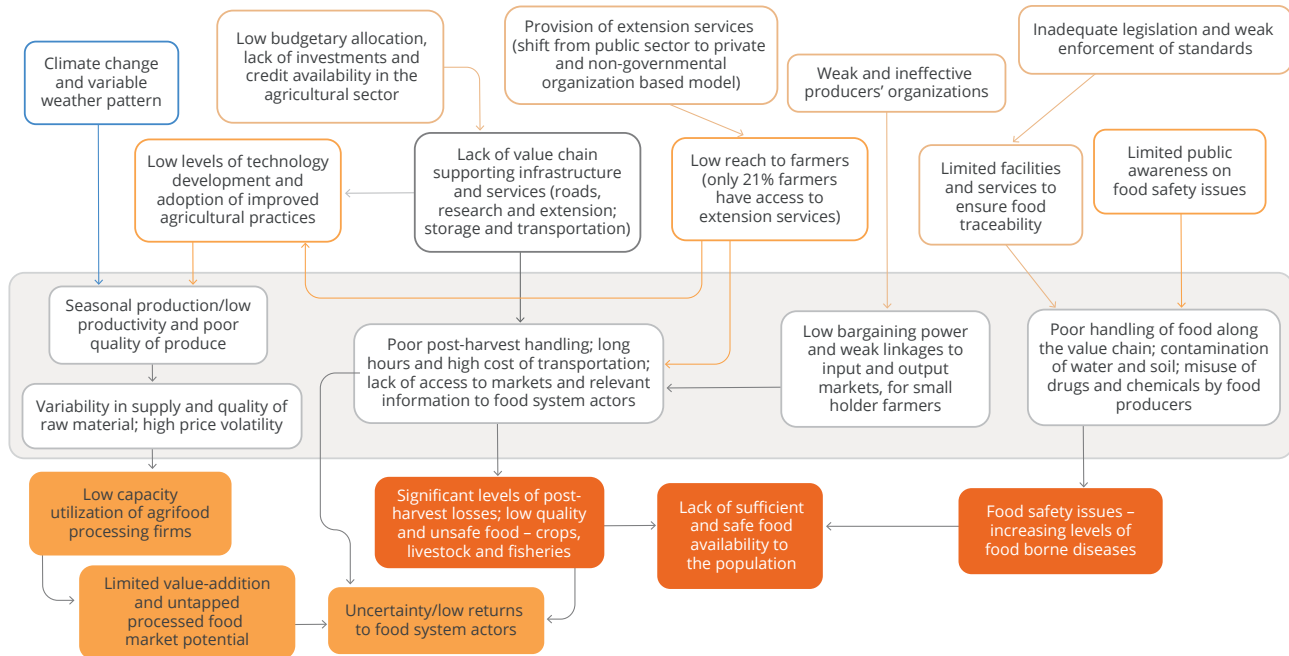
The Agricultural Sector Transformation and Growth Strategy and the Big Four Agenda, emphasize manufacturing as a key component of future economic growth, **of which agrifood processing is the major component, at 41.4 percent of manufacturing by value in 2019. Value addition and local agroprocessing were identified as key to the sustainable transformation of the sector** to reduce food waste and losses and boost food security and income in rural communities. Food processing, however, contributes only 2.4 percent to national employment and 3.2 percent to GDP, while accounting for 8.5 percent of exports (KNBS, 2020). According to KNBS, **agrifood processing is dominated by three major subsectors: tea**

and coffee processing; followed by **milling of rice, maize and wheat flour** and processing of **vegetable and animal oils and fats** (KNBS, 2019c). The bulk of the workers (46 percent) in food products manufacturing are based in the cities of Nairobi, Kiambu and Thika, demonstrating the **bias towards locating in urban centres. Only approximately 16 percent of agricultural exports from Kenya are processed, compared to 57 percent of imports.** Some of the country's major cash crops either do not require processing, such as cut flowers, or need only primary processing for export, such as for tea and coffee. Only exports of pineapples and beans have achieved significant scale among processed exports, reaching USD 100 million per year and USD 50 million per year respectively. Significant untapped export potential remains in processing fruit purees, such as mangoes and passion fruit, vegetables, macadamia nuts and meat. Domestic opportunities include products, such as fruit purees, potatoes and other vegetables, canned or smoked fish, meat and dairy (World Bank, 2019b).

Figure 15 offers a schematic view of key drivers and the impacts associated with underdeveloped agrifood value chains in Kenya.



Figure 15. Key drivers and impacts associated with underdeveloped agrifood value chains (KSQ2)



Source: Authors' own elaboration.

Key drivers

Few firms are actively exploring the agroprocessing growth opportunities for the domestic markets of Kenya, mainly because of **production issues that hinder the supply of sufficient quantities and adequate quality of raw materials to justify capital-intensive processing investments** (World Bank, 2019b). Production issues include the **impacts of climate change and variable weather patterns** – especially erratic rainfall and lack of irrigation – which lead to low production and productivity, seasonal production fluctuations and variable quality of produce (KSQ1).

In addition, **inadequate technology development and adoption** hinders potential productivity increases in Kenya (KARI, 2019). Low mechanization and lack of economies of scale in agricultural production has depressed productivity levels, constrained quality and

standards, and contributed to underdeveloped agrifood processing. It is estimated that only approximately 30 percent of farm operations on small farms in Kenya use tractors and powered equipment. Approximately 50 percent of cultivated land is prepared using hand tools, and the remaining 20 percent is prepared using animal-drawn implements. Accordingly, considerable scope exists for scaling up mechanization, especially among smallholders (World Bank, 2013).

With the support of development partners, the Government of Kenya has introduced or implemented several efficient and productivity-enhancing technologies, programmes and projects at the household level. Improved technologies for soil and water conservation, enhance storage facilities and labour-saving and improved seeds have also been developed and disseminated, particularly by the Kenya Agricultural Research Institute (KARI) (Ogada,



Mwabu and Muchai, 2014). Despite such efforts by the government and development partners, **technology adoption levels remain low and vary across regions**, due to economic, institutional (lack of extension), social and cultural aspects. For instance, the key factors that influenced the likelihood of a household adopting **inorganic fertilizers** and improved maize varieties are various household-specific factors, such as plot size, education level, security of land tenure, distance to the input market, water-retention capacity of the plot, access to credit, expected yields and yield variability (Ogada, Mwabu and Muchai, 2014).

Inadequate extension and advisory services also play a key role in the level of improved agricultural practices adoption among farmers.

In Kenya, the agricultural extension service — which used to be offered by the government for free — has broken down in recent years and has partly been replaced by private sector alternatives or faith-based organizations and non-governmental organizations, with mixed results. Agricultural extension services are understaffed and only 21 percent of farmers accessed extension services in 2016 (IFAD, 2019). Key institutional constraints are inadequate skills among technical staff and service providers, incomplete devolution processes, understaffed and underresourced extension staff, and poor linkages between agricultural research, extension and farmers (IFAD, 2019).

Low budgetary allocation and lack of investments and credit availability in the agricultural sector.

The share of the central government budget allocated to agriculture was 2.4 percent in 2021, a marginal increase from previous year's allocation of 2.2 percent. Further public investments are intended to be made by county governments under the country's devolved governance system. The budget allocation to county governments was 12 percent of the total budget, of which

approximately 6 percent was expected to be allocated to the agricultural sector, on average, based on the previous year's estimates. The combined public investment in the sector was, therefore, slightly more than 3 percent in the country, falling well short of **the 10 percent public investment in agriculture target set in the 2014 Malabo Declaration** (Njeru, 2021).

In addition, access to credit (or the lack thereof) is a major constraint for many actors in the food chain, holding back development of these value chains and entrenching poor agricultural practices, which can lead to low yields for smallholder farmers. **Lending to the agriculture sector has generally stayed below 5 percent of total lending, with annual credit needs across key commodity chains estimated at KES 130 billion in 2015, compared to only KES 40 billion available** (World Bank, 2022b). Additionally, the private sector is discouraged from investing in the sector by the uncertainty in supply, low quality of raw materials and the lack of supporting infrastructure. **Low budgetary allocations, investments and credit availability in the agricultural sector continue to hinder growth, contributing to ineffective agricultural research and advisory services, reduced agricultural production and productivity, and lack of infrastructure to support overall value-chain development** (World Bank, 2022c).

Subsequently, **low level of development in infrastructure and technology** continue to pose systemic impacts, in terms of poor post-harvest handling, lack of value addition and poor market access, hindering value chain development. Market access by rural populations is severely limited by poor rural roads, and poor communication, which often prevents them from participating fully in the formal economy. **Only approximately 38 percent of the country's classified roads** were paved as of 2020. Sections of the 140 156 km of earth or gravel roads often become impassable in the rainy season, especially for larger trucks (WFP, 2016).



In the dairy value chain, milk losses are highest at the farm level as a result of spoilage, lack of markets and rejection of the product at market, often because the quality has suffered as the result of poor handling and long travel times to reach the point of sale because of **bad road conditions**. Significant losses also occur with evening milk, when collection ceases and farmers do not have adequate **milk preservation techniques** (FAO, 2018).

Rejections are often higher during the wet season, when production peaks, but roads are often impassable (World Bank, 2013). Post-harvest cereal losses are estimated at 12–20 percent of national production. The losses are mainly the result of spillages during handling, transportation, processing and marketing; rotting and aflatoxin contamination due to improper handling and **inadequate or inappropriate storage**; losses to pests, such as birds, insects and rodents; and mechanical damage from **farm-level elementary processing** and off-farm value addition. These losses total between 4.8 million and 8 million bags annually – enough to cover 1.4 months of Kenya’s consumption demand (Onyango and Kirimi, 2017).

Road transportation costs, including handling, are a significant element of the infrastructure and technology driver of post-harvest losses and low agrifood processing. **Table 5** shows such costs, with freight from primary to secondary markets at KES 20.80 (USD 0.26) way above the rest, which are lower the closer one is to the international corridor.



Table 5. Comparison of freight costs on different Kenyan routes

Category	Transport costs in 2011/2012 (per tonne, per km)
Freight from primary to secondary market	KES 20.80 (USD 0.26)
Freight from primary to major cities	KES 13.60 (USD 0.17)
Inland freight from Mombasa to major cities	KES 12.57 (USD 0.15)
Freight in the international corridor – Mombasa to major cities	KES 9.60 (USD 0.12)

Source: World Bank. 2013. *Agribusiness Indicators: Kenya. Agriculture and environmental services*, Washington, DC, World Bank Group. <http://documents.worldbank.org/curated/en/639421468203650530/Agribusiness-indicators-Kenya>

Weak and ineffective producer organizations

In Kenya, **most geographically dispersed smallholder farmers are not integrated into key agricultural value chains**. Dispersion leads to increased production costs and reduced competitiveness. Strong producer organizations are essential to strengthen backward and forward linkages for smallholder farmers and promote their economic inclusion and market competitiveness (World Bank, 2022b). Kenyan producer groups, however, especially in the cooperative movement, have suffered from severe and chronic **mismanagement, resulting in very weak organizations often incapable of executing their mandates effectively, despite registering phenomenal growth**.

Modern markets focus on processed and semi-processed foods and require quality produce, standards, timeliness and stable volumes. Few producer organizations, however, have embraced vertical or horizontal integration and, as a result, farmers miss out on the **improved returns available further along food system value chains** (Pingali, 2019).



Inadequate regulatory support services and policies and limited public awareness on food safety

Lax legislation and weak food regulatory agencies have contributed to poorly regulated food outlets and low hygiene levels. For instance, a study on milk retailing indicated that most retailers had sold less than 20 litres per day of raw milk. Although 58 percent of retailers had heard about aflatoxins – and the majority of them agreed that this toxic compound could be present in milk – only 29 percent believed that “milk safety cannot be solely judged by sight or taste” and only 6 percent that “milk is not completely safe even after boiling” (Kirino *et al.*, 2016). Accordingly, one key constraint with regard to achieving food safety outcomes is the **limited public awareness** on the issue and the **resultant poor handling** of food along the value chain, contamination of water and soils, misuse of antibiotics by producers and the lack of awareness and enforcement of standards.

Food safety assurance is constrained by insufficient testing capacity and **limited facilities, and services and lack of systems for food traceability**. Inspection and testing are carried out mostly on foods destined for sale through the formal market chain or for export; rarely are they carried out on those destined for informal markets (Kang'ethe *et al.* 2021). Achieving improved food safety results requires interventions across the entire food system and improved mitigation capacity, from production to consumption.

Potential impact

Without any significant intervention, underdeveloped and inefficient agrifood value chains will continue to generate negative impacts on the food system of Kenya. Low levels of agrifood processing and value addition limits income generation potential and the creation of export manufacturing jobs. Global experience suggests that an increasing

agribusiness-to-agriculture ratio can be an important driver of poverty reduction and productive employment (World Bank, 2019a). Furthermore, high levels of post-harvest losses, along with low food production and productivity, leads to food supply deficits and higher dependency on food imports and, consequently, poor food and nutrition outcomes. Low quality and unsafe food is detrimental to people’s health, burdening the health sector and reducing human resource potential.

Systemic levers stop

1. Increasing investment in the agriculture sector and infrastructural development

The first lever would be to support investments in infrastructure (e.g. roads, electricity and communications), technology and extension services. These are critical to in **addressing underdeveloped agrifood processing, improving food safety and reducing post-harvest losses, while enhancing smallholders’ market access and productivity through quality inputs and advice**. Simple, practical technologies and innovations are available for reducing post-harvest losses, which need to be disseminated and scaled up to minimize losses.

Such investments are also crucial to support **micro-, small- and medium-sized enterprises (MSMEs)**. This involves (i) fostering business support services, e.g. supporting MSME and agricultural marketing associations to aggregate produce from small-scale farmers, herders and fishers; and (ii) supporting farmers to raise production volumes and quality sustainably. Relevant actions taken could include exploring opportunities for organic agricultural production systems or science-smart alternatives that facilitate adaption to climate change. An important consideration is for investments and credit-extension in the sector to be inclusive of women and young people to support the transition to sustainable agrifood systems.



Small- and medium-sized enterprises (SMEs) engaged in food processing in Africa procure approximately 95 percent of their supplies from smallholders, signifying the importance of their role in maintaining local, community-based food systems and ensuring the supply of safe and nutritious foods. In Kenya as well, the government has extended support to SMEs involved in fruit and vegetable supply chains, including the provision of capacity building to ensure food quality and safety; improving access to financial resources; and strengthening market linkages (FAO *et al.*, 2021).

2. Promoting and strengthening producers' organizations

Producers' organizations are crucial to create an enabling platform for geographically dispersed smallholder farmers in Kenya and to foster their economic inclusion and market power. By providing economies of scale, effective producer organizations ensure backward and forward linkages for farmers and strengthen value chains. Such integration can help to mitigate

the challenges for smallholder farmers associated with access to quality inputs and markets, as well as offer the benefits of extension services, aggregation, post-harvest handling, transportation, processing, branding and retailing, specifically for perishable and higher-value commodities, such as fruits, vegetables and dairy products.

3. Increase awareness among food system actors along with developing a strong regulatory and monitoring mechanism to improve food safety

To improve food safety, it is crucial to generate awareness of the importance of safe food consumption and to promote safe food-handling practices. It is also important to develop strong regulatory, monitoring and enforcement mechanisms to ensure food safety throughout supply chains. This may entail certification, mandating licences for food vendors and creating a body to address consumer grievances and management of the relevant information and data.

KSQ 3: How is the agrifood system in Kenya contributing to disparate levels of regional economic growth and income inequalities nationally?

Kenya is among the most rapidly growing economies in Africa (World Bank, 2015). However, this growth is uneven across different regions of the country and sections of the population, which is manifesting substantial income disparities in the food system.

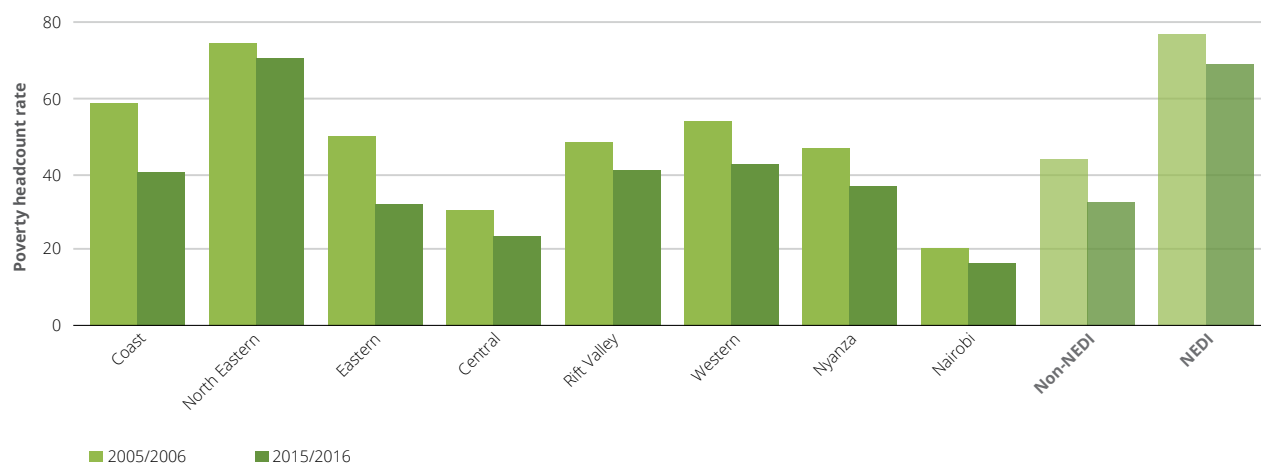
The proportion of the **population of Kenya living below the national poverty line declined from 46.8 percent in 2005/06 to 36.1 percent in 2015/16** (World Bank, 2022d), but **high regional disparities remain**. On one hand, **Nairobi** recorded the lowest poverty headcount, at 16.7 percent of the population in 2015/16. At the other

extreme, Turkana, Samburu and Mandera counties recorded poverty headcounts that exceeded 75 percent of the population (Kenei, 2018).

The national poverty reduction mainly resulted from a decline in poverty rates in rural areas, from 50.5 percent in 2005/06 to 38.8 percent in 2015/16. In urban areas, the incidence of poverty was relatively stagnant at 32.1 percent in 2005/06 and 29.4 percent in 2015/16 (World Bank, 2019b). Over that period, the major **concern is that the disparate poverty reduction at the county level has persisted (Figure 16)**.



Figure 16. Poverty rates in different counties of Kenya (2005/06 v/s 2015/16)



Source: Pape, U. and Mejia-Mantilla, C. 2019. More than just growth: accelerating poverty reduction in Kenya. World Bank Blogs. 12 February 2019. Washington, DC. Cited 16 September 2022. <https://blogs.worldbank.org/african/more-than-just-growth-accelerating-poverty-reduction-in-kenya>

The populations of north and northeastern counties – commonly referred to as NEDI counties, from the North and North Eastern Development Initiative, continue to suffer from high and stagnating levels of poverty, at approximately 68 percent in 2015-16 (Pape and Mejia-Mantilla, 2019). The people in these areas are prone to high food insecurity, very low levels of educational attainment, and little access to improved sanitation and clean water (World Bank, 2022d).

It is notable that while poverty rates are highest in the arid and semi-arid lands (ASAL), these comprise some 44 percent of the poor in Kenya, with the other 56 percent around the rest of the country, due to higher population concentrations in those areas (Kenya, 2017b). Accordingly, it is also important to analyze the income disparities in the country in general. On a positive note, Gini coefficient of Kenya declined from 46.5 in 2005 to 40.8 in 2015 (World Bank, 2022d), even though income disparities are wide. Results from a quintile analysis shows that nationally, more than half (59.4 percent) of

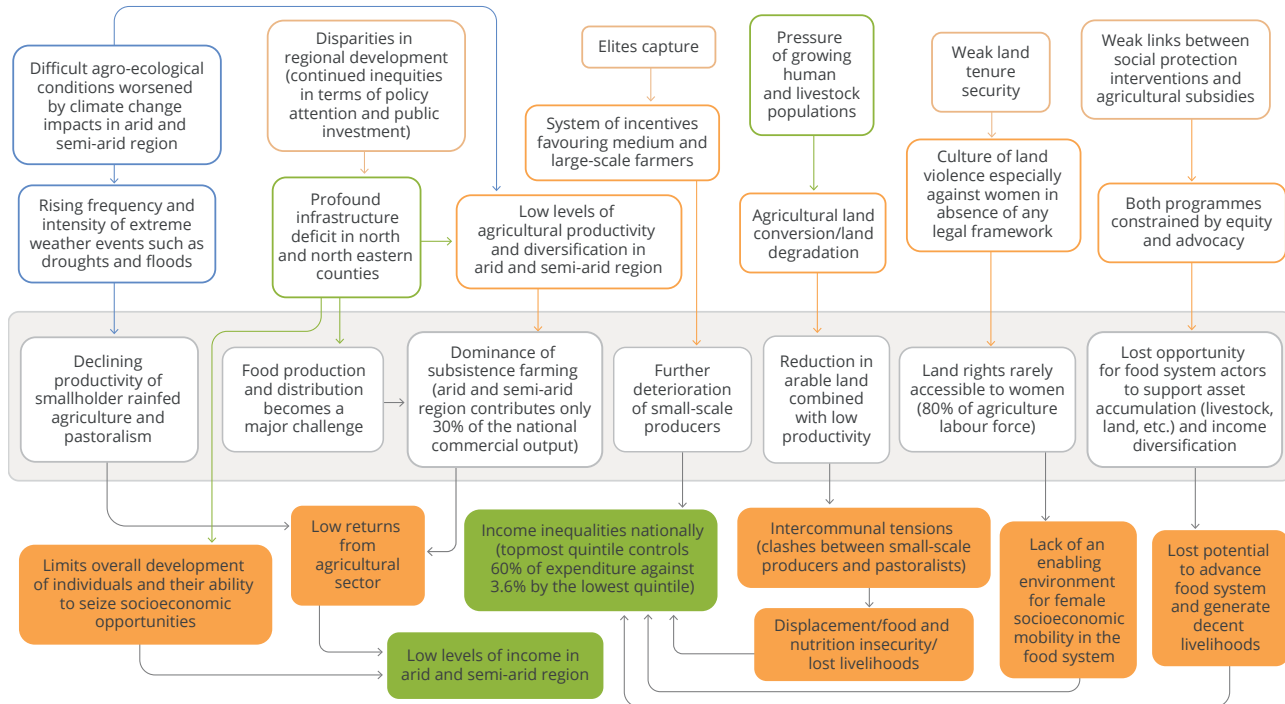
total expenditure is controlled by the topmost quintile (Q5) while the bottom quintile (Q1) controls the least share of 3.6 percent (KNBS, 2018), indicating the prevalence of high economic inequality in which a minority elite is favoured in terms of economic resources and opportunities.

Poverty trend data are not yet available post 2015/16 at the regional level. Estimates at the national level, however, suggest a continued decline in poverty over the period 2015–2019, at the rate of one percentage point per year. After 2019, there were indications of increasing poverty related to the COVID-19 pandemic, followed by modest improvements in 2021. However, environmental and global shocks, such as ongoing drought, higher global fuel prices and food price shocks brought on by the Russia–Ukraine war were possible risks to this trend continuing (World Bank, 2022d).

Figure 17 offers a view of the key drivers and impacts on the different elements in the food system of Kenya associated with disparate levels of economic growth.



Figure 17. Key drivers and food system impacts of disparate levels of economic growth in Kenya (KSQ3)



Source: Authors' own elaboration.

Key drivers

Difficult agroecological conditions worsened by climate change impacts

Approximately 98 percent of agriculture in Kenya is rainfed and depends entirely on a bimodal rainfall pattern. As little as 16 percent of the country's land is estimated to receive adequate and consistent rainfall, and is, therefore, considered suitable for crop production. The remaining 84 percent, classified as arid and semi-arid lands, receives average annual rainfall of 400 mm. Since the 1960s, the counties of arid and semi-arid lands have been prone to increasing changes in weather patterns, such as abnormal changes in temperature and precipitation, manifest in the variability in seasonal rainfall, extreme temperatures, and rising frequency and intensity of extreme weather events, such as droughts and floods. In arid and semi-arid lands,

smallholder rainfed agriculture and pastoralism are the major sources of livelihoods and well-being, increasing communities' vulnerability to the impacts of climate change (Kalele *et al.*, 2021). Moreover, zones considered semi-arid are at risk of becoming arid, while arid zones have become too dry to be considered suitable for agricultural projects (KARI, 2019) (See also KSQ1 and KSQ4).

Disparities in regional development due to continued inequities in terms of policy attention and public investment

Kenya is characterized by **disparities in regional development that continued from colonial times**. The initial policy on development funding emphasized higher investment levels in high rainfall areas due to the perceived higher returns and in urban areas due to the political leverage of urban populations. Fourteen of the country's 47 counties were identified as marginalized by the



Commission on Revenue Allocation (CRA), based on its County Development Index (CDI).⁶ The 14 marginalized counties include all ten north and northeastern counties, three coastal counties and Narok, west of Nairobi (Korir *et al.*, 2021). Together, these counties represent the majority of the country's arid and semi-arid lands.

The low investments and inadequate policy attention are evident in the profound infrastructure deficits, including lack of access to roads, electricity, health care, education, water and sanitation in north and northeastern counties (Table 6). Absence of basic infrastructure

limits individuals' overall development and their potential to seize socioeconomic opportunities. Without roads, challenges are compounded in accessing jobs, markets and social services. In addition, adequate food production and distribution become even greater challenges. Poor electricity access is also a major drawback, and, as noted by the governor of Mandera county in the northeast, the lack of a connection to the national grid means power supply is limited to diesel generators in a few towns (World Bank, 2018b). Turkana and West Pokot counties have the lowest connection rate, of 6.5 percent and 6.9 percent, respectively (KNBS, 2021b).

Table 6. Status of selected development indicators in north and northeastern counties, compared to national average

Development Indicators	North and northeastern counties	National average
Average poverty rate	68%	36%
Primary school attendance	55%	82%
Secondary school attendance	19%	37%
Skilled births	34%	71%
Literacy among women	41%	89%
Access to safe water	57%	72%
Improved sanitation	34%	59%

Source: World Bank. 2018b. Boosting Prosperity, Improving Equity in North and North Eastern Kenya. 8 May 2018. Cited 25 January 2023. <https://www.worldbank.org/en/news/feature/2018/05/08/boosting-prosperity-improving-equity-in-north-and-north-eastern-kenya>

Low levels of crop productivity and production diversification translate into low returns from the sector

The economy of Kenya is largely dependent on agriculture, which accounts for approximately 40 percent of the total workforce and 70 percent of the rural workforce. Returns within the food

system are, therefore, crucial in determining the poverty levels in the country. Provinces where higher yields of maize and beans are recorded usually have lower poverty rates (Figure 18a and Figure 18b). The underlying causes of low productivity include poor agricultural practices and limited access to quality inputs (seeds, fertilizer and breeds), distorted input and output

⁶ The CDI is a composite index based on indicators measuring the state of poverty, education, health and infrastructure in a county. The Commission on Revenue Allocation also drew on expert analysis of historical and legislative discrimination, and its county marginalization survey results in its assessments (Korir *et al.*, 2021).



markets, low levels of improved production technologies, higher incidences of pests and diseases, poor soil health (acidity due to excessive use of nitrogen-based fertilizers),

limited access to extension services, and low investments in infrastructure (e.g. irrigation, drainage, rural roads) and increasing vulnerability to climate change (World Bank, 2019b).

Figure 18a. Maize yield and poverty by province in 2015/16

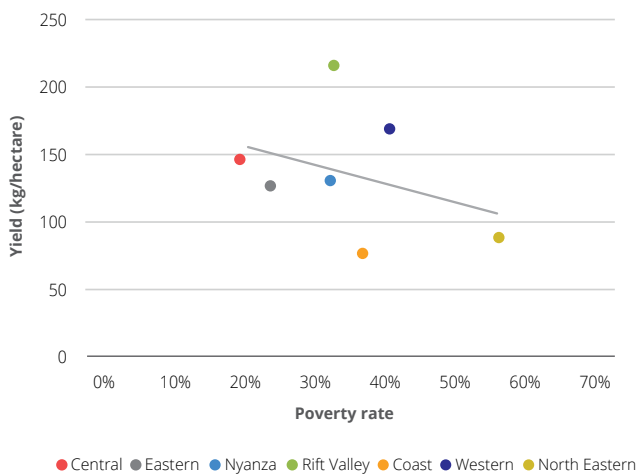
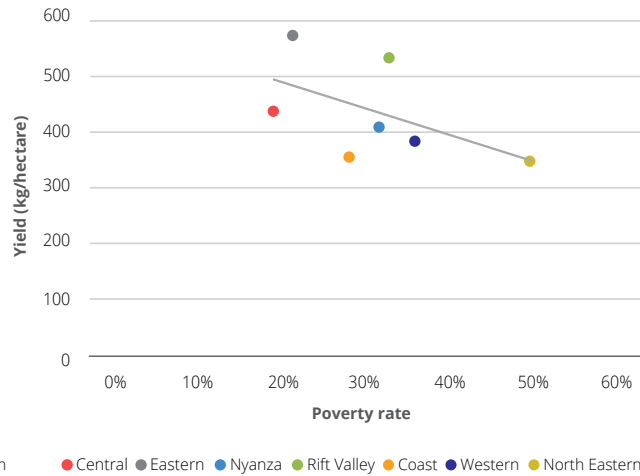


Figure 18b. Bean yields and poverty by province in 2015/16



Source: World Bank Group. 2019b. *Kenya Economic Update. Unbundling the Slack in Private Sector Investment – Transforming Agriculture Sector Productivity and Linkages to Poverty Reduction.* Kenya Economic Update No. 19. Washington, DC. World Bank Group. Cited 25 February 2023. <http://documents.worldbank.org/curated/en/820861554470832579/Kenya-Economic-Update-Unbundling-the-Slack-in-Private-Sector-Investment-Transforming-Agriculture-Sector-Productivity-and-Linkages-to-Poverty-Reduction>

With low productivity levels, the rural poor households are more likely to be subsistence farmers. The country's high rainfall areas comprise about 10 percent of arable land, but produce about 70 percent of the national commercial agricultural output as against 20 percent produced by the semi-arid regions and 10 percent by the arid regions of the country (ITA, 2022). Crops like beans, legumes and nuts are grown by both subsistence farmers and those commercially oriented. However, more subsistence-farming households grow maize and cereals, along with those crops, which altogether comprise approximately 94 percent of the area under cultivation for such producers, indicating low production diversity. Market-selling households, on the other hand, more often focus

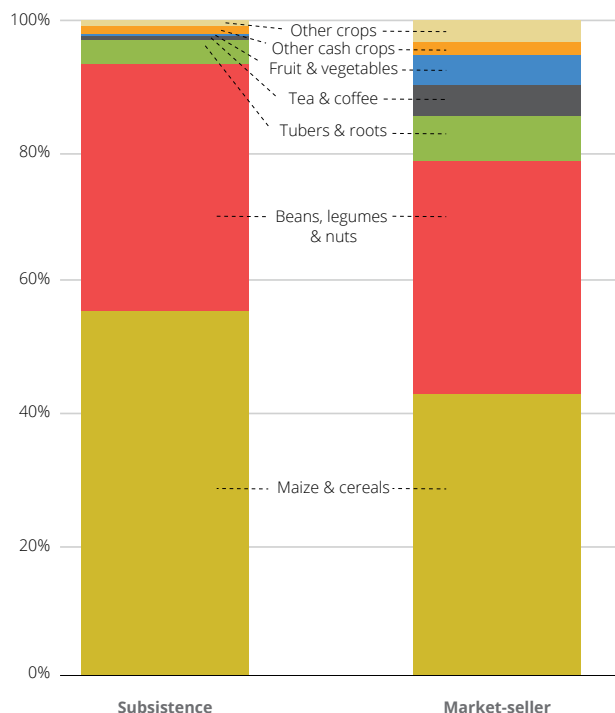
on more varied crops, and also produce other cash crops (**Figure 19**). Market-selling households also demonstrate greater use of fertilizers and have better access to credit (World Bank, 2019b).



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Figure 19. Percentage of cultivated area under major crops



Source: World Bank. 2019b. *Kenya Economic Update. Unbundling the Slack in Private Sector Investment – Transforming Agriculture Sector Productivity and Linkages to Poverty Reduction*. Kenya Economic Update No. 19. Washington, DC. World Bank Group. Cited 25 February 2023. <http://documents.worldbank.org/curated/en/820861554470832579/Kenya-Economic-Update-Unbundling-the-Slack-in-Private-Sector-Investment-Transforming-Agriculture-Sector-Productivity-and-Linkages-to-Poverty-Reduction>

Elite capture

Milk processing in the formal value chain, for example, is dominated by just three companies. Here, linkages between the elite and the state are also evident, as one of the three largest milk processing companies – including the largest in East Africa – is owned by the president’s family. The government has difficulty in reconciling the interests of large- and small-scale producers. The political elite, with connections to, or investments in, medium or large farms, create a system of incentives to their advantage, as shown the recurrent input subsidies favouring larger farmers (Rampa and Dekeyser, 2020). The urban middle class of Kenya also invests in farming, leveraging financial and political

power. As a result, many small-scale farms have deteriorated, and do not offer decent, equitable and sustainable livelihoods, especially in the marginalized counties.

Growing human and livestock population

The increasing population and urbanization is driving **agricultural land to be converted** to residential and other uses. Consequently, land scarcity is becoming a constraining factor to agricultural growth, which is leading to unsustainable forms of agricultural production. For instance, approximately 87 percent of the farmers in Kenya operate on less than 2 ha of land and approximately 67 percent operate on less than 1 ha. Since approximately 20 percent of the farmers with the smallest land holdings generate 57 percent of their income from farming activities, a decline in the availability of arable land has added to low levels of productivity with a significant impact on returns from the agriculture sector (World Bank, 2019b).

Pressure from growing human and livestock populations, plus market demand for homogeneous cattle, are also contributing to **deteriorating vegetation cover, soil erosion and the decline of grassland diversity for grazing animals**. The encroachment of the invasive shrub *Prosopis juliflora* is contributing to losses of endemic plants and grasses. The decline in viable pasture, aggravated by bouts of drought, increasingly pushes herders toward places where they used to only go as a last resort during dry seasons, **leading to clashes with other pastoralists and small-scale maize farmers**. **Competition over available water and land is a major source of intercommunal tensions and a key driver of displacement, affecting livelihoods, food security and nutrition** (Kang-Chun, 2022). For example, in central Baringo county, increased droughts, floods and invasive species are fuelling violent conflicts between pastoralists over livestock, the intensity of which is exacerbated by the proliferation of illegal firearms.



Weak land tenure security

Security of land tenure security (i.e. having a land title deed) is closely associated with access to credit for a farming household, and thus better prospects of obtaining required inputs and improving crop productivity. In Kenya, secure land tenure rights are still available for men, and **rarely accessible to women**, though they provide 80 percent of the labour in agricultural production – the mainstay for most households in Kenya (Basil and Kaaria, 2022). For decades, women have only accessed land based on their relationship with men, for example, husbands, uncles, fathers or sons, which adversely affects women’s livelihoods. In most households, men and their sons conduct land transactions. There is also a culture of violence in some rural parts of Kenya, and women are forced to give up their land to those who employ physical violence as a tactic for dispossession. The absence of a comprehensive framework to manage such a culture presents a fertile ground for land-grabbing. Through more than 75 laws and policies governing land – such as the National Land Policy of 2009, the Matrimonial Property Act of 2013, the Law of Succession (Amendment) 2021 – **Kenya has made strides in privatizing tenure rights to transcend discrimination against women. The gap between theory and practice or implementation remains, however.** For instance, a report by the Kenya Land Alliance showed that women acquired 103 043 titles while men attained 865 095 titles out of a sample of more than 1 million between 2013 and 2017 – from a total of 3.2 million issued over that period. The divergence is even wider when considering land size. From a sample of 10.1 million hectares of issued land titles, women only attained 1.62 percent of them. Even when spousal co-ownership is considered, the proportion of women who hold land titles jointly with their male partners is less than 5 percent (Basil and Kaaria, 2022).

Weak links between social protection interventions and agricultural subsidies

The government of Kenya spends significant amounts on social protection and agricultural subsidies. The weak links between these subsidies, however, does not serve to promote synergies or complementarity, resulting in poorly managed, disconnected social protection and agricultural subsidy interventions. While it has been shown that some social protection programmes and agricultural subsidies are intended to serve almost the same Kenyans, especially in the rural areas, there is a lack of interface that would provide coherence and integration. For instance, the National Accelerated Agricultural Inputs Access Programme (NAAIAP) was allocated KES 36 billion to cover 2.5 million farmers. The Hunger Safety Net Programme (HSNP), that supports vulnerable communities in northern Kenya, was funded by the Department for International Development (DfID) of the United Kingdom in a pilot phase at a cost of KES 5.5 billion. In the second phase, the government of Kenya contributed KES 4.68 billion (Kenya, 2017b).

It has been revealed, however, that the government of Kenya was spending approximately USD 29 million annually on subsidy programmes. The Kenya Social Protection Sector Review 2017 (Kenya, 2017b), indicated that the government had been expending billions of Kenya shillings in various social protection projects, despite being heavily funded by non-governmental organizations, donors and development partners. Additionally, both programmes are constrained by equity and adequacy issues, because not all poor households are covered, and for those who do benefit, their expectations are not fully met (Kenya, 2017b).

While maintaining these programmes is a financial burden to the government, as they require large budgetary allocations to be implemented, their ineffectiveness may be due



to factors other than the amounts expended. For example, the three elements of social protection (social security, social insurance and social assistance) and agricultural subsidies are all administered through different and separate legislation and institutions.

It has been established that social protection programmes can also support asset accumulation in the form of livestock, land or other holdings, thereby enhancing productive capacity and potential income diversification, which, in turn, can trigger new opportunities for farm and non-farm employment. Accordingly, social protection programmes implemented in parallel with agricultural subsidy interventions can simultaneously increase agricultural employment and productivity, thereby increasing social welfare (Osabohien, 2020). **Failure to link social protection programmes and agricultural subsidies constrains their potential complementarity in advancing food systems and decent livelihoods.**

Potential impacts

If the regional disparities continue to persist at such a high scale, Kenya will not be able fully to reap the benefits of its economic growth. With more than a quarter of the population living in the arid and semi-arid lands, human resources remain untapped, and continue to face poverty, food and nutrition insecurity, poor health, and lack of education and employment opportunities. The situation may have severe repercussions for socioeconomic stability, resulting in increased poverty, inequalities, in-country migration, increased social unrest and criminality, among other impacts.

Systemic levers

1. Improve focus of policymaking, investments and development funding – to address disparities in regional development

In Kenya, the significance of regional balance is crucial in mitigating the incidences of income

disparities. Though the economy has been growing impressively and record declining rates of poverty have been recorded, the persistent regional disparities call for an improved focus at the level of policymaking and investments. The provision of basic infrastructure in terms of roads, clean drinking water, sanitation facilities, adequate education, health services and irrigation in marginalized counties could go far in improving livelihood opportunities, household income, food production, and productivity and food and nutrition security outcomes.

In 2018, the government of Kenya, with World Bank support, launched a USD 1 billion initiative to increase investment – the North and North Eastern Development Initiative (NEDI) – with a special focus on transformative and integrated infrastructure investments and support to sustainable livelihoods in this region. This was in addition to other World Bank investments of USD 1 billion (World Bank, 2018a and 2018b). However, in the view of the continued poor performance of the development indicators (World Bank, 2018b), there is a need to assess the results against the stated targets and to identify the challenges.

2. Streamlining and consolidating social protection and agricultural input subsidies

Initiatives to streamline and consolidate social protection and agricultural input subsidies offer an opportunity for decent, inclusive and equitable livelihoods. As has been shown, in many instances, social protection and agriculture subsidy beneficiaries are selected on the basis of vulnerability to poverty. The adoption of social protection interventions as a strategic investment to enhance the economic and productive potential of the poor could have greater impacts by linking them with agricultural interventions that address the structural constraints that limit poor households' access to natural resources, inputs, financial services, advisory services, improved technologies and markets (FAO, 2017).





KSQ4: How is the agrifood system in Kenya contributing to natural resource degradation (land, water, forest and biodiversity loss), while being increasingly vulnerable to climate change?

The agrifood system in Kenya is characterized by continued degradation of natural resources, while being highly vulnerable to climate change impacts, ranked 149 out of 182 countries in the 2020 ND-GAIN Index Country Rankings.⁷ The two phenomena are interlinked and create systemic impacts across the four sustainability dimensions of the agrifood system.

Average temperatures have increased in Kenya by 1°C since 1960. The most significant rise in temperature has been observed at the start of the primary rainy and humid spring season (March–May) in the arid and semi-arid regions. The temperature is also projected to rise by a further 1.7°C by the 2050s and by approximately 3.5°C by the end of the century. Increased heat and more extreme heat conditions pose significant risks for human and animal health, agriculture and ecosystems (World Bank, 2021).

Precipitation trends for Kenya have become highly variable, with significant geographical diversity observed in rainfall trends. **The events of extreme rainfall are occurring at greater frequency and intensity. Increasing incidence of aridity and droughts have also been observed**, with moderate drought or floods recorded every three to four years and major drought events every ten years. Over the past 100 years, 28 droughts have occurred (World Bank, 2021). As of late 2022, **Kenya was experiencing an ongoing severe prolonged drought, with four consecutive rainy seasons of below-average falls in arid and semi-arid lands, and some areas having missed out on rain entirely over a three-year period, while also suffering high temperatures.** This has left approximately 4.2 million people in dire need of

humanitarian assistance. Malnutrition in some counties, such as Mandera, reached an alarming level; children, pregnant women and lactating women were severely affected by acute food shortages; and diarrhoea, acute respiratory infections and malaria cases were increasing in drought-stricken regions. Pastoralists were no longer able to cope with increasing vulnerability to prolonged dry spells and droughts. Additionally, the National Drought Management Authority assessed that the drought situation would continue to worsen for 20 of the 23 arid and semi-arid lands counties (Chimbi, 2022).

Increasing incidences of events and variability attributed to climate change are also accompanied by **natural resource degradation in Kenya** – deforestation, land degradation, increasing water scarcity and biodiversity loss. In 1963, about 10 percent of the land was under forest, which fell to 6 percent by 2009 (Mutuku, 2019). In terms of tree cover, Kenya lost about 368 kilohectares from 2001 to 2021 – equivalent to an 11 percent decrease in tree cover, and a substantial contribution to greenhouse gas emissions (Global Forest Watch, 2023).

Water resources in the country are stressed and unevenly distributed, with more than 80 percent of the land classified as being arid or semi-arid. Water stress is high, considering that 33 percent of the total resource endowment is withdrawn by the major economic sectors of the country, whereas the availability of total annual renewable water resources per person is only 617 m³, which is below the Falkenmark Water Stress Index threshold for water scarcity of 1 000 m³ (USAID, 2021).⁸

⁷ The ND-GAIN Index ranks 182 countries using a score based on their vulnerability to climate change and other global challenges – as well as their readiness to improve resilience. (ND-GAIN Country Index, 2022).

⁸ The Falkenmark Water Stress Index measures water scarcity as the amount of renewable freshwater that is available for each person each year. Less than 1 000 m³ is considered a situation of water scarcity and less than 500 m³ is classified as absolute or severe water scarcity (USAID, 2021).



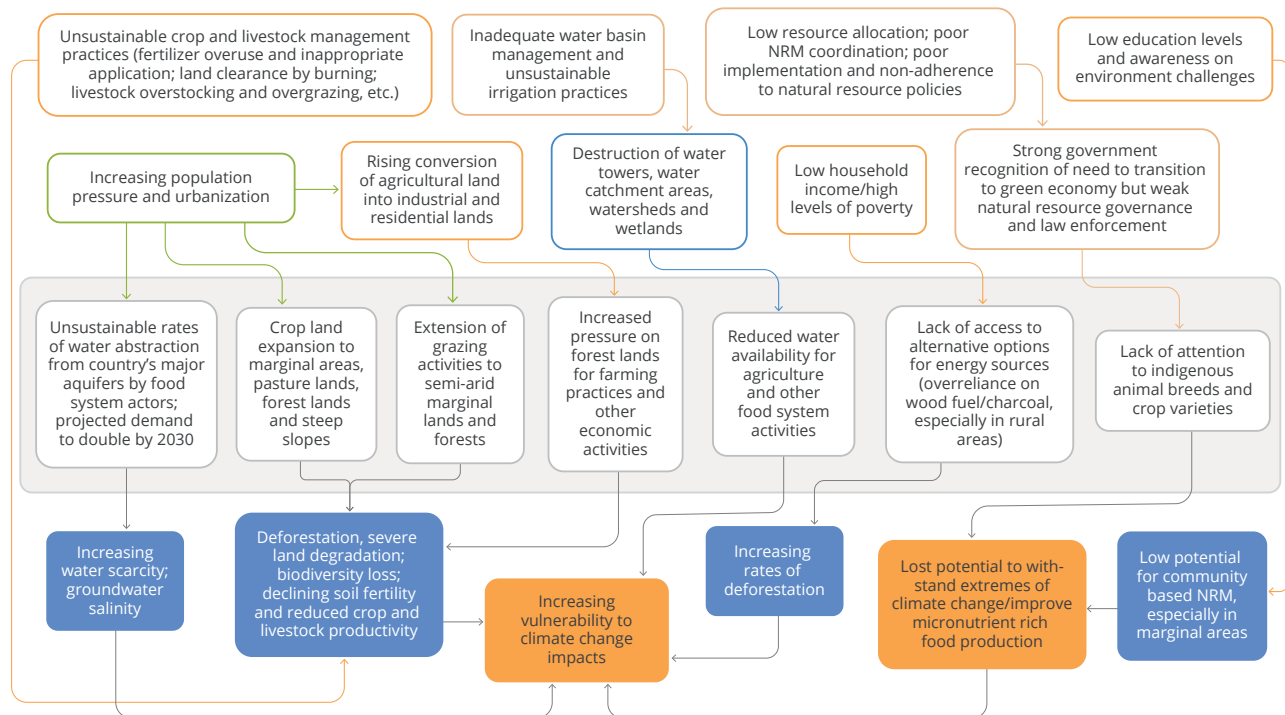
Estimates for **land degradation** in Kenya vary depending on the source and calculation methodologies. But well-documented types of soil and land degradation often found in Kenya include soil erosion; loss of fertility and salinization; increased sedimentation of water bodies, such as Lake Ol Bolossat, the Winam Gulf on Lake Victoria, and Lake Baringo; reduced ground cover; and the declined carrying capacity of pastures, such as Amboseli National Park. The areas most affected by land degradation include the eastern and northeastern parts of Kenya, where more than half of the land (52 percent) is facing moderate degradation, 12.3 percent of land is hit by severe degradation and 33 percent of the land is vulnerable to degradation (Mulinge *et al.*, 2016).

With respect to **biodiversity loss**, despite an increase in coverage of key biodiversity areas (KBAs) within protected areas, of which there is

a large number in Kenya, a continuous decline in species is taking place. Based on the IUCN Red List Index (RLI), the survival probability for birds, mammals, amphibians, corals and cycads showed a declining trend over the period 1993–2000 (Gudka, 2020).

The incidences of climate change and variability and natural resource degradation are not distinct phenomena; they reinforce each other. This leads to increasing vulnerability of the population – especially among the poor and marginalized – to food and nutrition insecurity, poor health, loss of livelihoods, and intensified socioeconomic and regional inequalities. **Figure 20** represents some of the major drivers and the impacts associated with natural resource degradation and increasing vulnerability to climate change in the agrifood systems of Kenya.

Figure 20. Drivers and impacts of natural resource degradation and climate change vulnerability (KSQ4)



Source: Authors' own elaboration.



Key drivers

Increasing population pressure and urbanization

High rates of population growth are putting immense pressure on the natural resources of Kenya, leading to their overexploitation and unsustainable use, while contributing to increasing vulnerability to climate change.

Water abstraction from some major aquifers, such as the Merti (Ewaso Ng'iro Basin) and Nairobi (Tana Basin) aquifers, is reaching unsustainable rates as a result of population growth. Total water demand in the Ewaso Ng'iro Basin is projected to increase thirteenfold by 2030, which will increase projected use of groundwater to 40 percent of renewable supply. Overexploitation of the Nairobi Aquifer has reduced the Athi River's base flow rate. The Athi Basin, which supplies Nairobi and Mombasa, is already stressed and interbasin transfers from the Tana River are required to meet demand. The maximum transfer capacity of the Tana Basin is 181 million m³/year. However, the populations of Nairobi and Mombasa are projected to increase by 3 million by 2030, which will double domestic water demand to 941 million m³/year. Overexploitation has also increased groundwater salinity in some aquifers (USAID, 2021).

Increasing human population pressure subjects land to intense pressure, leading to degradation. This has led to the expansion of cropland into marginal areas, pastureland and forest lands, and steep slopes. The growth of the pastoralist population and subsequent increase in livestock have also led to the extension of grazing activity into semi-arid marginal lands and forests, causing severe degradation and reduced livestock productivity. The rising conversion of agricultural lands into industrial and residential lands, especially with increasing urbanization, has also led to increased pressure on initially productive lands. For instance, the ongoing development

of a technology hub – Konza Technopolis – on more than 2 000 hectares of prime agricultural land in Machakos County, southeast of Nairobi. The story is similar in other counties that are rapidly urbanizing, including, among them, Narok, Kiambu and Nakuru (Mulinge *et al.*, 2016).

Rapid population growth in the country, coupled with the impact of urbanization, has contributed to the depletion of forest resources at an alarming rate. With declining availability of land for farming, a majority of the population is pushed towards forest areas for farming and cultivation. The growing population also has had an impact on land subdivision, resulting in trees being cut down to allow other economic activities on small farms (Njora and Yilmaz, 2022). Accelerated deforestation caused by agricultural activities is recognized as a major, irreversible cause of biodiversity loss (Global Nutrition Report, 2020). In Kenya, the six regions worst affected were responsible for 52 percent of all tree cover loss between 2001 and 2021. Top on the list was Narok, which lost 73.1 kilohectares (Global Forest Watch, 2023).

Inadequate water basin management and unsustainable irrigation practices

It is postulated that six out of seven water catchment areas in Kenya will be under stress by 2030 and not able to match the Vision 2030 proposed target of putting approximately 1.2 million hectares under irrigation. This is mainly due to poorly planned and uncontrolled abstraction of water and underexploitation of ground, storm, used and saline waters. Only rudimentary mechanisms are applied for participatory water-level monitoring, evaluation, and integrated information management. Water availability is projected to drop to approximately 230 m³ per person by 2025, in part due to climate change, which has contributed to the increased incidence and severity of droughts (Kenya, 2018). That would be classified as absolute water stress under the Falkenmark Water Stress Index.



Widespread poverty translates into inability to afford alternatives to wood fuel and charcoal for energy

Low household incomes and the lack of access to alternative energy sources, especially in the rural areas, has resulted in an overreliance of wood fuel, either as firewood or charcoal. More than 80 percent of the rural households rely on wood fuel. **Table 7** shows primary sources of energy in Kenya.

Table 7. Types of energy used

Fuel type	% Population	
	Urban	Rural
Firewood	9.3	84.2
Charcoal	17.7	7.7
Kerosene	17.7	1.6
Liquefied petroleum gas	53.0	5.6
Electricity	1.6	0.3
Biogas	-0.7	-0.3
Solar	-	0.2

Source: KNBS (Kenya National Bureau of Statistics). 2019. *Kenya Population and Housing Census (KPHC)*. 21 February 2020. Cited 10 September 2022. <https://www.knbs.or.ke/2019-kenya-population-and-housing-census-reports/>

The charcoal industry is a leading contributor to job creation, employing approximately 700 000 people, and estimated to support between 2.3 million and 2.5 million (Kenya, 2016). It is evident, however that **deforestation has increased because of excessive use of biomass as an energy source, which has reduced resilience and exacerbated the impacts of climate change** (WFP, 2016). Deforestation has deprived the economy of Kenya of KES 5.8 billion (USD 68 million) in 2010 and KES 6.6 billion in 2009, far outstripping the roughly KES 1.3 billion injected from forestry and logging each year (UNEP, 2014). Going by the current trend, Kenya is set to lose 65.6 percent of its forest cover to charcoal burning and utilization by 2030 (Onekon and Koech, 2016).

Unsustainable cropping and livestock management practices

In Kenya, land degradation manifests itself in many ways, including, for example through unsustainable loss of vegetation and landscape functions; increasing incidences of aridity; increasing scarcity of water sources; shrubs in areas which were predominantly rich in pastures; gullies, thin and stony soils; and invasion of intrusive species that lead to food and water insecurity. These components do not act separately, but are intrinsically linked to each other and may act as mutual supporters and accelerators of other factors in the degradation process, **including poor agricultural activities, such as inappropriate application and overuse of fertilizers, up-down slope ploughing, land clearance by burning, large herd sizes and poor grazing management, and lack of soil protection or run-off management on slopes**. Consequently, dietary diversity, food quality and resilience of farms and food systems to shocks has been undermined severely (FAO, 2019).

As degradation continues, it becomes increasingly difficult and costly to rehabilitate and restore affected lands to their original state (Kenya, 2020a). Land degradation and conversion of natural ecosystems for crop production or pasture has significantly reduced agricultural production and productivity in arid and semi-arid areas, which is threatening the livelihoods of the more than 12 million people who reside in areas affected by degradation (Mulinge *et al.*, 2016). Biodiversity loss has further been shown in a study on communities around the Mau forest complex in the Rift Valley, where people engage in unsustainable land activities, such as indigenous forest **extraction, tea farming, urban settlement and overstocking**. **This loss is reducing the potential of biodiversity to support agricultural productivity** (Njue *et al.*, 2016). A result is the exposure of the majority of the rural population to chronic malnutrition and food poverty. This vulnerability is an impediment to the actualization of right to food envisioned in Article 43 of the Kenyan Constitution.



Deforestation and biodiversity loss lead to declining soil fertility, and negatively affect the hydrological cycle, which, in turn, affects, crop and animal production. Deforestation also negatively affects food production through increasing temperatures that destabilize climate system dynamics.

Overstocking and overgrazing

Many households depend on livestock for their livelihoods. The livestock serves as a store of wealth and provides food; it is beneficial in terms of cultural norms. However, the traditional practice of keeping large numbers of livestock is no longer tenable, often resulting in overstocking and overgrazing, which lowers community resilience, especially in the arid and semi-arid areas in northern Kenya, where pastoralism is the dominant livelihood (Bolo *et al.*, 2019). Overstocking and overgrazing increase pressure on pasture land and cause environmental degradation, which, in turn, reduces land carrying capacity, creates denuded lands and ultimately fans desertification and threatens sustainability of land resource utilization (Tawane and Mugalavai, 2019).

Weak natural resources governance and law enforcement

The government of Kenya recognizes that the transition to a green economy represents a strategic opportunity to foster sustained economic growth, reduce environmental degradation (including the impacts of climate change), create jobs and promote inclusive growth. Accordingly, Kenya ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and submitted its first national communication to the UNFCCC in 2002 (WFP, 2016). To support ASTGS, Kenya enacted the Climate Change Act, 2016. Around the same time, the Kenya Climate Smart Agricultural Project (KCSAP) began to be implemented, which

extended over a five-year period (2017–2022). Under the ASTGS framework and the National Climate Change Response Strategy (NCCRS) of 2010, the government committed to restoring 5.1 million ha of degraded landscapes as a contribution to the Africa Forest Landscape Restoration Initiative (AFR100),⁹ 50 percent reduction of greenhouse gases from the forest sector by 2030 as part of its nationally determined contributions (NDC) to climate change, and to achieve land degradation neutrality by 2030 as a commitment to the United Nations Convention to Combat Desertification (UNCCD). Kenya has also ratified the Convention on Biological Diversity (CBD) and the Nagoya Protocol on access to genetic resources and benefit-sharing (ABS), under which most relevant resources in Kenya occur in forests.

Despite all these pronouncements and commitments, the requisite support has not been extended, and **natural resource conservation efforts have continued to suffer from low resource allocation, as demonstrated by poorly coordinated natural resource management, poor implementation of natural resource interventions and frequent non-adherence to natural resource policies, laws and regulations** (Rao *et al.*, 2015).

This is amply demonstrated by the poor animal and crop improvement programmes, which have led to increasing loss of indigenous animal genetics; and the meagre emphasis on indigenous crop varieties, especially vegetables. Indigenous animal breeds and indigenous crop varieties receive hardly any significant attention from mainstream improvement programmes; they also do not attract appropriate funding. This is despite the fact that indigenous animal genetics exhibit abilities to withstand extremes of climate variation (Hoffmann, 2010). Indigenous vegetables could also contribute to mitigation of micronutrient deficiencies and improve food security in the presence of climate variability (Dushimimana *et al.*, 2018).

⁹ The AFR100 is intended to restore 100 million hectares of land in Africa by 2030. (Africa Forest Landscape Restoration Initiative, 2022).



Weak forest governance, coordination and implementation of natural resource management, including community and private forests, coupled with the fact that major agroforestry initiatives have been left to non-governmental organizations operating on very small scales with limited budgets, implies only small, localized impacts can be realized. Additionally, farmers have limited access to credit facilities that target agroforestry development, and such practices are dwindling in rural areas, despite agroforestry being a viable source of livelihoods that can contribute to economic growth (Kenya, Ministry of Agriculture, Livestock, Fisheries and Irrigation, Kenya, Ministry of Environment and Forests & Climate Technology Center and Network, 2021).

Low education levels and awareness on environmental challenges

Low education levels and insufficient knowledge and awareness about climate change impacts, environmental issues and sustainable farming practices have contributed to inadequate capacity of communities

– especially those in marginal areas – to manage natural resources. This has increased vulnerability to climate change and reduced resilience. Marginal areas record the lowest mean education achievements in the country and also suffer the brunt of climate change impacts (Kenya, 2012). Climate change education is a feasible opportunity that has not been utilized, denying learners the chance to understand the effects of climate variations within their environment and to take the necessary actions to ameliorate such effects (Apollo and Mbah, 2021).

Potential impacts

Climate change vulnerability, and the other factors discussed here, make the food system in Kenya unsustainable and contribute to land degradation and depletion of renewable and non-renewable natural resources. This includes factors, such as soil degradation, biodiversity loss, depletion of water resources and forests through human settlements, charcoal production and logging, among others. These dynamics directly threaten the expansion of agricultural output, along with the livelihoods,



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food security and quality of life of the people of Kenyan people. Moreover, they jeopardize the future sustainability of the country's food systems, further increasing its vulnerability to climate change events and posing challenges to socioeconomic stability, which increases the likelihood of poverty, food insecurity, conflict, and migration.

Systemic levers

Improve governance, coordination and management of natural resources

Building resilience to climate change and the sustainability of natural resources, including land, water, forests and biodiversity, **requires adoption of effective policies and adherence to stipulated regulations and appropriate implementation and enforcement frameworks** that advance the key tenets of absorption, adaptation and transformation. While Kenya has acceded to several global, continental and regional conventions and formulated relevant policies and regulations on climate change and natural resource use, their effects can hardly be **discerned due to slow or non-implementation**. Improved governance and coordination of the many conventions and implementing institutions involved in natural resource management

remains critical. Furthermore, strengthening natural resource governance mechanisms needs strong encouragement at the county level (including through traditional leaders) to facilitate implementation of regulatory instruments dealing with, for example overexploitation and unsustainable agricultural practices.

Community development and use of science-based natural resource management and technologies

Strengthened community-based management practices for water resources, forests and biodiversity, in combination with supporting sustainable farming systems, would serve as an important lever. Specific actions could include exploring opportunities for agroecological production systems and for science-based climate-smart agricultural practices and technologies (see KSQ1 and KSQ2). In addition, the exploration and use of **smart alternative energy sources that reduce dependence on wood fuels** (firewood and charcoal) and increased emphasis on conservation of indigenous animal breeds and crop varieties would be critical to building resilience to climate change and enhanced sustainability of natural resources.



Transition to sustainable food systems

The commitment of the government of Kenya to food systems transformation to achieve sustainability, resilience and inclusive socioeconomic prosperity, and improve public health and nutrition is not in doubt. Specifically, Vision 2030, ASTGS, NAIP and the Big Four Agenda demonstrate this commitment. Vision 2030 sets the agenda for inclusive growth and people-driven sustainable development, particularly under its initiatives that prioritize agriculture and food security.

Food systems are, however, vast and complex, which hampers the formulation of interventions that are able to achieve different goals simultaneously. In particular, **current food system governance is incoherent, lacks coordination and has large power asymmetries – conditions in which inefficiencies and waste thrive**. Different policies and investments often limit or cancel each other out, or entail trade-offs. Against this background, **adopting a food system approach to formulate interventions could increase coherence and maximize synergy across multiple goals**. Discussing and formulating proposals in complex systems come with their own challenges, however, including power inequalities, overlapping mandates, and entrenched interests, among other issues.

For effective leverage to improve the food systems, it is crucial to adopt a multisectoral approach. The silo-like approach in the structure of the government of Kenya and its policy implementation is a main factor impeding food systems' sustainability. **Multisectoral collaboration between government ministries and departments is critical, along with increased cooperation and information-sharing among the government, civil society, farmer unions, advocacy groups, academic institutions, the private sector, and community institutions.**

There is a need to further deepen the transformation process of the food systems in Kenya. This FSA study reveals serious data gaps throughout the food systems. Consequently, more research is needed to analyse the key factors and conditions impeding the food system transformation. This includes better understanding of the state of the country's natural resources, especially soil, water and biodiversity, and the farming systems. More research is also required to understand the financial and other mechanisms and incentives needed to boost production and productivity, diversification and value-chain development. It would also be crucial to determine the contribution of women and young people to different economic sectors, and to offer ways to increase their effective participation in the food systems of Kenya.

The findings of this assessment serve as a first step in thinking about the transition and necessary steps for sustainable food systems transformation. Further research would help to better detail the challenges and their impact on food system sustainability and **refine the levers and necessary actions** for the desired impact. Institutional innovations could help to ensure that the voices of all stakeholders, especially in the most vulnerable sections of society, are reflected in the activities and plans.



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References

- African Development Bank Group.** 2022. *Kenya Economic Outlook*. In: *African Development Bank Group*. Cited 7 October 2022. <https://www.afdb.org/en/countries-east-africa-kenya/kenya-economic-outlook>
- Africa Forest Landscape Restoration Initiative.** 2022. In: *AFR100*. Cited 6 August 2022. <https://afr100.org>
- Apollo, A. & Mbah, M.** 2021. Challenges and opportunities for climate change education (CCE) in East Africa: A critical review. *Climate*, 9(6): 93.
- Basil, D. & Kaaria, J.** 2022. *Resolving the paradox of land tenure for rural women in Kenya*. 27 October 2022. Kenya Institute for Public Policy Research and Analysis. Nairobi, Kenya. Cited 25 February 2023. <https://kippra.or.ke/resolving-the-paradox-of-land-tenure-for-rural-women-in-kenya/>
- Berger, M. & van Helvoirt, B.** 2018. Ensuring food secure cities – Retail modernization and policy implications in Nairobi, Kenya. *Food Policy*, 79: 12–22. <https://doi.org/10.1016/j.foodpol.2018.04.004>
- Bolo, P.O., Sommer, R., Kihara, J., Kinyua, M., Nyawira, S., & Notenbaert, A.M.O.** 2019. *Rangeland degradation: Causes, consequences, monitoring techniques and remedies*. Working Paper. CIAT Publication No. 478. Nairobi, International Center for Tropical Agriculture (CIAT).
- Breisinger, C., Ecker, O. & Trinh Tan, J.F.** 2015. Conflict and food insecurity how do we break the links? In: *2014–2015 Global Food Policy Report, 2015*, Chapter 7, pp 51–60. Washington, International Food Policy Research. Washington, DC, Institute (IFPRI)
- Central Bank of Kenya.** 2022. MPC Agriculture Survey, July 2022. Cited 25 February 2023. <https://www.centralbank.go.ke/2022/07/29/mpc-agriculture-survey-july-2022/>
- Chimbi, J.** 2022. Lives hang in the balance as Kenya's ASAL region ravaged by severe prolonged drought. In: *Global Issues*. 4 October 2022. Inter Press Service. Cited: 25 February 2023. <https://www.globalissues.org/news/2022/10/04/32078>
- CIP (International Potato Center).** 2019. Productive varieties. In: *CIP Annual Report 2019. Discovery to impact: science-based solutions for global challenges*. Lima, International Potato Center. 37p. Cited 25 February 2023. <https://hdl.handle.net/10568/108891>
- CMA (Cereals Millers Association).** 2023. Cereal Millers Association. In: *CMA*. Nairobi, Kenya. Cited 25 February 2023. <http://test.logiclabs.co.ke/fo/cma/>
- D'Alessandro, S., Caballero, J., Lichte, J. & Simpkin, S.** 2015. *Kenya agricultural sector risk assessment*. Agriculture global practice technical assistance paper, Washington, DC., World Bank Group
- David-Benz, H., Sirdey, N., Deshons, A., Orbell C. & Herlant, P.** 2022. *Conceptual framework and method for national and territorial assessments: catalysing the sustainable and inclusive transformation of food systems*. Rome, Brussels and Montpellier, France. FAO, European Union and CIRAD. doi.org/10.4060/cb8603en
- Dushimimana, C., Nemerimana, M., Gatarira, P. C., Habineza, J. P. M. & Mungai, J.K.** 2018. Nutritional content of certain indigenous vegetables for food insecurity and malnutrition reduction in Kiambu County, Kenya. *International Journal of Agronomy and Agricultural Research*, 12(4): 64–69.
- Embassy of Kenya in Germany.** 2023. Livestock Farming. In: Government of Kenya – Kenya Embassy in Germany. Cited 27 February 2023. <http://kenyaembassyberlin.de/Livestock-Farming.54.0.html>
- Embassy of Kenya in Japan.** 2023. The Flower Industry in Kenya. In: *Government of Kenya – Kenya Embassy in Japan*. Cited 25 February 2023. <http://www.kenyarep-jp.com/en/business/flower/>
- FAO.** 2017. *Combined effects and synergies between agricultural and social protection interventions: What is the evidence so far?* Review paper. Rome, FAO. Cited 5 March 2023. <https://www.fao.org/3/i6589e/i6589e.pdf>
- FAO.** 2018. Costs and benefits of clean energy technology in Kenya's milk value chain. <https://www.fao.org/3/i9041en/i9041EN.pdf>



FAO. 2019. *State of World Biodiversity for food and Agriculture report*. Rome, FAO. <https://www.fao.org/3/CA3129EN/CA3129EN.pdf>

FAO. 2022a. Kenya country brief. In: *Global Information and Early Warning System*. Rome, FAO. Cited 20 January 2023. <https://www.fao.org/gIEWS/countrybrief/country.jsp?code=KEN&lang=ZH>

FAO. 2022b. Reducing rural youth migration in Kenya. <https://www.fao.org/3/cc1446en/cc1446en.pdf>

FAO. 2022c. FAOSTAT: Suite of Food Security Indicators. In: *FAO*. Rome. Cited 8 October 2022. <https://www.fao.org/faostat/en/#data/FS>

FAO, ECA (Economic Commission for Africa) & AUC (African Union Commission). 2020. *Africa – Regional Overview of Food Security and Nutrition 2019*. Accra, FAO, United Nations Economic Commission for Africa (ECA), African Union Commission (AUC). <https://www.fao.org/3/ca7343en/CA7343EN.pdf>

FAO, IFAD (International Fund for Agricultural Development), UNICEF (United Nations Children’s Fund), WFP (World Food Programme & (WHO) World Health Organization 2021. *The State of Food Security and Nutrition in the World 2021. Transforming food Systems For Food Security, Improved Nutrition and Affordable Healthy Diets for All*. Rome, FAO. <https://doi.org/10.4060/cb4474en>

Farmbiz Africa. 2018. Why fish production is declining in Kenya. 4 July 2018. <https://farmbizafrica.com/training-registration-farmbiz-society-members-only/13-yields/2115-why-fish-production-is-declining-in-kenya>

Farmer, E. & Mwika, J. 2012. *End market analysis of Kenyan livestock and meat*. USAID desk study. Cited 25 February 2023. https://www.marketlinks.org/sites/default/files/resource/files/Kenya_Livestock_End_Market_Study.pdf

FEWS NET. 2022a. Kenya Food Security Outlook Update, February to September 2022. *Reliefweb*. 8 March 2022. Cited 20 January 2023. <https://reliefweb.int/report/kenya/kenya-food-security-outlook-update-february-september-2022>

FEWS NET. 2022b. Kenya Food Security Outlook, June 2022 to January 2023. *Reliefweb*. 24 August 2022. Cited 20 January 2023. <https://reliefweb.int/report/kenya/kenya-food-security-outlook-june-2022-january-2023>

Fitch Solutions. 2022. Kenyans begin to fill their plates with convenience. 20 May 2022. In: *Fitch Solutions*. London. Fitch. Cited 25 February 2023. <https://www.fitchsolutions.com/food-drink/kenyans-begin-fill-their-plates-convenience-20-05-2022>

GFSS (Global Food Security Strategy). 2018. Kenya Country Plan. Washington, DC. Feed the Future. <https://www.feedthefuture.gov/resource/global-food-security-strategy-gfss-kenya-country-plan/>

Global Forest Watch. 2023. Tree cover loss in Kenya. In: *Global Forest Watch*. Washington, DC. Cited 6 March 2023. <https://www.globalforestwatch.org/dashboards/country/KEN/>

GHI (Global Hunger Index). 2022. *2022 Global Hunger Index: Food Systems Transformation and Local Governance*. In GHI .Bonn, Germany Welthungerhilfe and Dublin, Concern Worldwide. Cited 20 January 2023. <https://www.globalhungerindex.org/ranking.html>

Global Nutrition Report. 2020. *Global Nutrition Report: Action on equity to end malnutrition*. Bristol, UK, Development Initiatives. https://globalnutritionreport.org/documents/566/2020_Global_Nutrition_Report_2hrssKo.pdf

Gudka, M.S. 2020. *Kenya National Biodiversity Threat Assessment: direct human threats impacting Kenya's biodiversity*. BIODEV 2030, AFD, Expertise France, IUCN and WWF. https://www.biodev2030.org/wp-content/uploads/2021/07/Annexe-33_Rapport-Final_National-Biodiversity-Threat-Assessment_Kenya.pdf

Hoffmann, I. 2010. Climate change and the characterization, breeding and conservation of animal genetic resources. *Animal Genetics*, 41: 32–46.

ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). 2021. Forging multi-sectoral partnerships to tackle malnutrition in Kenya. In: *ICRISAT Happenings Newsletter*. Cited 20 January 2023. <https://www.icrisat.org/forging-multi-sectoral-partnerships-to-tackle-malnutrition-in-kenya/>

IFAD (International Fund for Agriculture Development) 2019. *Republic of Kenya Country Strategic Opportunities Programme 2020-2025*. <https://webapps.ifad.org/members/eb/128/docs/EB-2019-128-R-19.pdf>.



Kang'ethe, E.K., Mutua, F., Roesel, K., Ntawubizi, M., Kankya, C., Niragira, S., Kilima, B., et al. 2021. *A review of the food safety architecture in the East African Community: Animal-source foods, fruits and vegetables*. ILRI Discussion Paper 41. Nairobi, ILRI. <https://hdl.handle.net/10568/115586>

IPC (Integrated Food Security Phase Classification) 2022. Kenya: IPC Food Security & Nutrition Snapshot: acute food insecurity: February – June 2022; Acute Malnutrition: February – May 2022. In: *Reliefweb*. Cited January 22, 2023. <https://reliefweb.int/report/kenya/kenya-ipc-food-security-nutrition-snapshot-acute-food-insecurity-february-june-2022>

International Trade Administration 2022. Kenya – Country Commercial Guide: Agribusiness. 19 August 2022. Washington, DC, U.S. Department of Commerce. Cited 5 March 2023. <https://www.trade.gov/country-commercial-guides/kenya-agribusiness>

ITC (International Trade Center). 2016. Investment profile: agro-processing and light manufacturing. Cited 2 February 2023. http://invest.go.ke/wp-content/uploads/2016/10/PIGA_Kenya_Agro-manufacturing.pdf

Kalele, D.N., Ogara, W.O., Oludhe, C. & Onono, J.O. 2021. Climate change impacts and relevance of smallholder farmers' response in arid and semi-arid lands in Kenya. *Scientific African*, 12: e00814. doi.org/10.1016/j.sciaf.2021.e00814

Kang-Chun, C. 2022. Conflict over resources in Kenya hits deadly highs with firearms in play. *Mongabay.com*, 19 May 2022. Cited 2 February 2023. <https://news.mongabay.com/2022/05/conflict-over-resources-in-kenya-hits-deadly-highs-with-firearms-in-play/>

Kenei, S. 2018. The needs of Kenyans by county: exploring the latest poverty data. *Development Initiative*. Blog, 30 May 2018. Cited 5 October 2022. <https://devinit.org/blog/the-needs-of-kenyans-by-county-exploring-the-latest-poverty-data/>

KARI (Kenya Agricultural Research Institute) 2019. The major challenges of agricultural sector in Kenya. In: *KARI.org*. Cited 4 September 2022. <https://www.kari.org/the-major-challenges/>

KDB (Kenya Dairy Board). 2019. Milk producers groups. In: *Kenya Dairy Board*. Cited 4 September 2022. <https://www.kdb.go.ke/milk-producers-groups/>

Kenya. 2012. *Programming Framework to End Drought Emergencies in the Horn of Africa: Ending drought emergencies in Kenya*. Country Programme Paper. Cited 25 February 2023. <https://resilience.igad.int/wp-content/uploads/2020/10/Final-Kenya-CPP-EDE-Final-8-8-2012.pdf>

Kenya. 2014. *Agricultural Sector Development Support Programme (ASDSP): Strategic Action Plan Gender and Social Inclusion in Value Chain Development*. Nairobi, Ministry of Agriculture, Livestock and Fisheries. https://publicadministration.un.org/unpsa/Portals/0/UNPSA_Submitted_Docs/2018/2B59EE82-1EB8-43D3-922B-1D54625BA13D/Gender%20and%20Social%20Inclusion%20action%20plans_Generic_county_%20results_4.pdf

Kenya. 2016. *Land Degradation Assessment in Kenya*. Ministry of Environment and Natural Resources <https://academia-ke.org/library/download/menr-land-degradation-assessment-in-kenya-2016/>

Kenya. 2017a. Kenya Climate Smart Agriculture Strategy 2017–2026. Ministry of Agriculture, Livestock, Fisheries. Nairobi. Cited 25 February 2023. <https://www.adaptation-undp.org/resources/plans-and-policies-relevance-naps-least-developed-countries-ldcs/kenya-climate-smart>

Kenya. 2017b. Social sector protection review. Ministry of Labour and Social Protection, State Department for Social Protection. Draft report. Cited 23 June 2022. <https://www.unicef.org/esa/sites/unicef.org/esa/files/2019-04/PER-and-Sector-Review-of-Social-Protection-in-Kenya-%282017%29.pdf>

Kenya. 2018. Agricultural Sector Transformation and Growth Strategy (ASTGS). Towards sustainable agricultural transformation and food security in Kenya. Ministry of Agriculture, Livestock, Fisheries and Cooperatives. Cited 23 June 2022. <https://leap.unep.org/countries/ke/national-legislation/agricultural-sector-transformation-and-growth-strategy-astgs>

Kenya. 2019. The cost of Hunger in Africa: Social and Economic Impact of child undernutrition in Kenya. WFP. https://docs.wfp.org/api/documents/WFP-0000119783/download/?_ga=2.3835824.1625855320.1667471447-576940120.1667471447

Kenya. 2020a. *Land degradation neutrality target setting final report*. https://knowledge.unccd.int/sites/default/files/ldn_targets/2020-09/Kenya%20LDN%20TSP%20Final%20Report%20%28English%29.pdf



- Kenya.** 2020b. *Kenya livestock sub-sector NDC report: A scoping of gaps and priorities*. https://globalresearchalliance.org/wp-content/uploads/2020/12/2020-09-02_Livestock-sub-sector-NDC-report_FINAL.pdf
- Kenya, Ministry of Agriculture, Livestock, Fisheries and Irrigation .** 2019a. *Draft national livestock policy*. Cited 25 October 2022. <https://repository.kippra.or.ke/bitstream/handle/123456789/483/Draft-reviewed-National-Livestock-Policy-February-2019.pdf>
- Kenya, Ministry of Agriculture, Livestock, Fisheries and Irrigation.** 2019b. Investing in Kenya's Agricultural Sector Transformation. *National Agriculture Investment Plan (NAIP), 2019-2024*. <https://faolex.fao.org/docs/pdf/ken189052.pdf>
- Kenya, Ministry of Agriculture, Livestock, Fisheries and Irrigation, Ministry of Environment and Forests & Climate Technology Center and Network.** 2021. *Kenya National Agroforestry Strategy 2021-2030. Final Draft*. Cited 2 March 2023. https://www.ctc-n.org/system/files/dossier/3b/KENYA%20AGROFORESTRY%20STRATEGY%20DRAFT%20February%202021_.pdf
- Kenya, Ministry of Health.** 2021. *National Strategic Plan for the prevention and control of Non-Communicable Diseases (2021/22 – 2025/26)*. Nairobi, Government of Kenya
- KNBS (Kenya National Bureau of Statistics).** 2015. *Kenya Demographic and Health Survey (KDHS), 2014*. <https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf>; <https://microdata.worldbank.org/index.php/catalog/2544>
- KNBS (Kenya National Bureau of Statistics).** 2018. *Basic Report on Well-Being in Kenya*. Cited 10 April 2022. <https://www.knbs.or.ke/download/basic-report-well-kenya-based-201516-kenya-integrated-household-budget-survey-kihbs/>
- KNBS (Kenya National Bureau of Statistics).** 2019a. *Kenya Population and Housing Census (KPHC)*. 21 February 2020. Cited 6 May 2022. <https://www.knbs.or.ke/2019-kenya-population-and-housing-census-reports/>
- KNBS (Kenya National Bureau of Statistics).** 2019b. *Statistical Abstract 2019*. Nairobi, KNBS.
- KNBS (Kenya National Bureau of Statistics).** 2019c. *Census of Industrial Production (CIP) Report*. <https://www.knbs.or.ke/publications/>
- KNBS (Kenya National Bureau of Statistics)** 2020. *Economic Survey 2020*. Nairobi, KNBS. <https://www.knbs.or.ke/download/economic-survey-2020/>
- KNBS (Kenya National Bureau of Statistics).** 2021a. *Economic Survey 2021* Nairobi, KNBS.
- KNBS (Kenya National Bureau of Statistics)** 2021b. *Statistical Abstract 2021*. Nairobi, KNBS.
- KNBS (Kenya National Bureau of Statistics).** 2022. *Economic Survey*. <https://www.knbs.or.ke/wp-content/uploads/2022/05/2022-Economic-Survey1.pdf>
- KEPHIS (Kenya Plant Health Inspectorate Service).** 2020. *Seed merchants, 2020*. <https://www.kephis.org/images/application-forms/seed-merchant-forms/Seed%20Merchants%202020.pdf>
- Kiprop, V.** 2022. Kenyan food prices: Why have they gone up so much? *BBC News*, 22 February 2022. London. Cited 25 February 2023. <https://www.bbc.com/news/world-africa-60485499>
- Kirino, Y., Makita, K., Grace, D. & Lindahl, J.** 2016. Survey of informal milk retailers in Nairobi, Kenya and prevalence of aflatoxin M1 in marketed milk. *African Journal of Food, Agriculture, Nutrition and Development* 16(3): 11022 - 11038.
- Kogo, B.K., Kumar, L. & Koech, R.** 2021. Climate change and variability in Kenya: a review of impacts on agriculture and food security. *Environment, Development and Sustainability*, 23(1): 23–43.
- Korir, L., Rizov, M., Ruto, E. & Walsh, P.P.** 2021. Household Vulnerability to Food Insecurity and the Regional Food Insecurity Gap in Kenya. *Sustainability*, 13(16): 9022. <https://doi.org/10.3390/su13169022>
- Kyengo, J.M.** 2019. *Strategic assets and performance of food processing firms in Nairobi city county, Kenya*. Nairobi, Kenya, Kenyatta University. PhD thesis. Cited 26 February 2023. <https://ir-library.ku.ac.ke/bitstream/handle/123456789/20146/Strategic%20Assets%20and%20Performance%20of%20Food%20Processing.pdf?sequence=1>



- Lokuruka, M.N.I.** 2021. Food and Nutrition Security in East Africa (Kenya, Uganda and Tanzania): Status, challenges and prospects. In: B. Mahmoud, ed. *Food Security in Africa*. IntechOpen. <https://doi.org/10.5772/intechopen.95036>
- Mbae, R., Kimoro, B., Kibor, B., Wilkes, A., Odhong, C., van Dijk, S., Wassie, S. et al.** 2020. *The Livestock Sub-sector in Kenya's NDC: a scoping of gaps and priorities*. UNIQUE Livestock sub-sector NDC report. Global Research Alliance on Agricultural Greenhouse Gases (GRA) & CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS). Cited 26 February 2023. <https://hdl.handle.net/10568/110439>
- Mohajan, H.K.** 2014. Food and nutrition scenario of Kenya. *American Journal of Food and Nutrition*, 2(2):28-38
- Mugendi, J.** 2020. Challenges in Implementing Digital Technologies in Rural Kenya. *Engineering for Change*. 15 December 2020. Cited 21 February 2023. <https://www.engineeringforchange.org/news/challenges-implementing-digital-technologies-rural-kenya/>
- Mulinge, W., Gicheru, P., Murithi, F., Maingi, P., Kihui, E., Kirui, O.K. & Mirzabaev, A.** 2016. Economics of Land Degradation and Improvement in Kenya. In: E. Nkonya, A. Mirzabaev & J. von Braun, eds. *Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development*. pp. 471–498. Cham, Springer International Publishing.
- Murage, G.** 2020. Kenya yet to meet its meat demand. *The Star*, 24 November 2020. Nairobi, Kenya. Cited 25 February 2023. <https://www.the-star.co.ke/business/kenya/2020-11-24-kenya-yet-to-meet-its-meat-demand/>
- Musita, C.N., Okoth, M.W. & Abong', G.O.** 2019. Postharvest handling practices and perception of potato safety among potato traders in Nairobi, Kenya. *International Journal of Food Science*, 1–8.
- Mutea, E., Hossain, M.S., Ahmed, A. & Ifejika Speranza, C.** 2022. Shocks, socio-economic status, and food security across Kenya: policy implications for achieving the Zero Hunger goal. *Environmental Research Letters*, 17(9): 094028.
- Mutinda, P.** 2020. Role of Big Four Agenda and Vision 2030 for Kenya's sustainable development. Conference paper: IEK International Conference, 24-27 November 2020. Mombasa, Kenya. <https://iekenya.org/27thIEKConference/27thIEKConferencePapers/ROLE%20OF%20BIG%20FOUR%20AGENDA%20AND%20VISION%202030%20FOR%20KENYA'S%20SUSTAINABLE%20DEVELOPMENT.pdf>
- Mutua, J.** 2019. Foods that Kenyans eat the most. *Business Daily*, 9 May 2019. Nairobi. Cited 25 February 2023. <https://www.businessdailyafrica.com/bd/data-hub/foods-that-kenyans-eat-the-most-2249422>
- Mutuku, K.P.** 2019. Kenya has lost nearly half its forest – time for the young to act. *The Africa Report*, 12 August 2019. Paris. Cited 25 February 2023. <https://www.theafricareport.com/16150/kenya-has-lost-nearly-half-its-forests-time-for-the-young-to-act/>
- Nandonde, F.A. & Kuada, J.** 2018. Perspectives of retailers and local food suppliers on the evolution of modern retail in Africa. *British Food Journal*, 120 (2): 340-354. <https://doi.org/10.1108/BFJ-02-2017-0094>
- ND-GAIN Country Index.** 2022. In: *Notre Dame Global Adaptation Initiative*. Cited 5 March 2023. University of Notre Dame, Indiana, USA. <https://gain-new.crc.nd.edu>
- NLC (National Land Commission) & FAO.** 2021. *Effects of land fragmentation on land use and food security: Case Study of Nyamira, Laikipia, Nandi, Trans Nzoia, Taita Taveta, Kiambu, Kajicho, Nakuru, Tana River, Makueni, Isiolo, Kisumu and Vihiga*. Nairobi, Kenya, NLC. Cited 1 March 2023. <https://landcommission.go.ke/download/effects-of-land-fragmentation-on-land-use-and-food-security>
- Njeru, T.N.** 2021. What the budget holds for the agriculture sector in Kenya. *Down To Earth*, 15 June 2021. Centre for Science and Environment, New Delhi, India. Cited 21 February 2023. <https://www.downtoearth.org.in/blog/africa/what-the-budget-holds-for-the-agriculture-sector-in-kenya-77457>
- Njora, B. & Yilmaz, H.** 2022. Analysis of the effects of deforestation on the environment and agriculture in Kenya. *International Journal of Water Management and Diplomacy*, 1: 91–110.
- Njue, N., Koech, E., Hitimana, J. & Sirmah, P.** 2016. Influence of land use activities on riparian vegetation, soil and water quality: an indicator of biodiversity loss, South West Mau Forest, Kenya. *Open Journal of Forestry*, 6(5) 373–385.
- OCHA (United Nations Office for the Coordination of Humanitarian Affairs).** 2022. Horn of Africa drought: regional humanitarian overview & call to action. 4 July 2022. In: *Reliefweb*. Cited 5 July 2022. <https://reliefweb.int/report/ethiopia/horn-africa-drought-regional-humanitarian-overview-call-action-published-4-july-2022>



Ogada, M.J., Mwabu, G. & Muchai, D. 2014. Farm technology adoption in Kenya: a simultaneous estimation of inorganic fertilizer and improved maize variety adoption decisions. *Agricultural and Food Economics*, 2(12).

Okumu, W. 2021. Sweet deals for sugar smugglers lead to bitter losses for Kenya. In: *EnactAfrica.org*. 13 October 2021. Institute for Security Studies, Pretoria. Cited 16 September 2022. <https://enactafrica.org/enact-observer/sweet-deals-for-smugglers-lead-to-bitter-losses-for-kenya>

Onekon, W.A & Koech, O.K. 2016. Assessing the effect of charcoal production and use on the transition to a green economy in Kenya. *Tropical and Subtropical Agroecosystems*. 19(3): 327-335.

Onyango, K. & Kiriimi, L. 2017. Post-harvest losses: a key contributor to food insecurity in Kenya. Tegemeo Institute of Agriculture Policy and Development, Egerton University. Nairobi, Kenya. Cited 23 March 2023. https://www.researchgate.net/publication/329117720_Post-Harvest_Losses_a_Key_Contributor_to_Food_Insecurity_in_Kenya.

Osabohien, R., Onanuga, O., Aderounmu, B., Matthew, O. & Osabuohien, E. 2020. Social protection and employment in Africa's agricultural sector. *Business: Theory and Practice*, 21(2): 494–502.

Oseko, E. & Dienya, T. 2015. *Fertilizer consumption and fertilizer use by crop (FUBC) in Kenya*: Technical Report AfricaFertilizer.org (AFO), p. 47.

Otieno, H.M.O. 2019. Pesticide training tool: a simplified guide for agricultural extension officers and farmers. *Asian Journal of Research in Crop Science*, 3(4): 1–5.

Pape, U. & Mejia-Mantilla, C. 2019. More than just growth: accelerating poverty reduction in Kenya. World Bank Blogs. 12 February 2019. Washington, DC. Cited 16 September 2022. <https://blogs.worldbank.org/africacan/more-than-just-growth-accelerating-poverty-reduction-in-kenya>

Pingali, P., Aiyar, A., Abraham, M. & Rahman, A. 2019. Linking farms to markets: reducing transaction costs and enhancing bargaining power. In: *Transforming Food Systems for a Rising India*. pp. 193–214. Palgrave Studies in Agricultural Economics and Food Policy. Cham, Springer International Publishing.

Rampa, F. & Dekeyser, K. 2020. *AgriInvest-Food Systems Project – Political economy analysis of the Kenyan food systems. Key political economy factors and promising value chains to improve food system sustainability*. Rome, FAO. Rome, FAO. <https://doi.org/10.4060/cb2259enhttps://doi.org/10.4060/cb2259en>

Rao, J., Midega, C., Atieno, F., Auma, J.O., Cadilhon, J.J., Mango, N., Odhiambo, G.D. et al. 2015. *A situational analysis of agricultural production and marketing, and natural resources management systems in West Kenya*. ILRI/icipe Project Report. Nairobi, International Livestock Research Institute for the Humid Tropics CGIAR Research Program.

Republic of Kenya. 2021. Draft. *The National Food Safety Policy*. <https://kilimo.go.ke/wp-content/uploads/2022/02/Draft-Food-Safety-Policy-2021.pdf>

Ritchie, H., Roser, M. & Rosado, P. 2022. Crop yields. In: *OurWorldInData.org*. Cited 25 February 2023. <https://ourworldindata.org/crop-yields>

RTI International. 2022. Understanding rural urban migration. In: *RTI International*, Research Triangle, North Carolina, USA. Cited 25 February 2023. <https://www.rti.org/impact/understanding-rural-urban-migration-youth-kenya>

STAK (Seed Trade Association of Kenya). 2023. <https://members.stak.or.ke/members>

Statista. 2023. Import volume of maize in Kenya from 2016 to 2020. In: *Statista*. Hamburg, Germany. Cited 25 February 2023. <https://www.statista.com/statistics/1170255/import-volume-of-maize-in-kenya/>

Tawane, A.A. & Mugalavai, E.M. 2019. Household level of preparedness to climate change in Mandera County, Kenya. *American Journal of Earth Sciences*, 6(2), 36-63.

UNEP (United Nations Environment Programme). 2014. *Green economy assessment report*. Kenya. https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/KenyaGEassessment_UNEP.pdf



USAID (United States Agency for International Development). 2015. *USAID-KAVES Dairy Value Chain Analysis*. https://pdf.usaid.gov/pdf_docs/PA00M2T1.pdf

USAID (United States Agency for International Development). 2021. *Water Resource Profile series. Kenya water resources profile overview*. https://winrock.org/wp-content/uploads/2021/08/Kenya_Country_Profile-Final.pdf

USAID (United States Agency for International Development). 2022. *Kenya. Economic Growth and Trade: inclusive economic growth fact sheet 2022*. Washington DC. USAID. Cited 26 February 2023. https://www.usaid.gov/sites/default/files/2022-05/Kenya_Economic_Growth_2022.pdf

USDA (United States Department of Agriculture). 2023. *Exporter Guide – Kenya. United States Department of Agriculture*. Washington, DC, FDA. Cited 25 February 2023. https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Exporter%20Guide_Nairobi_Kenya_KE2022-0012.pdf

Waruru, M. 2022. Water, Africa's Gold: Kenya's urban slums need water, even as lakes Victoria, Turkana in trouble. *Down to Earth*. 8 February 2022. Cited 28 October 2022. <https://www.downtoearth.org.in/news/water/water-africa-s-gold-kenya-s-urban-slums-need-water-even-as-lakes-victoria-turkana-in-trouble-81455>

World Bank Database. Urban population growth (annual %) – Kenya. In: *World Bank*, Washington DC. Cited 16 September 2022. <https://data.worldbank.org/indicator/SP.URB.GROW?locations=KE>

World Bank Database 2021. Agriculture, forestry, and fishing, value added (% of GDP) In: *World Bank*. Washington, DC. Cited 16 September, 2022. <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=KE>

World Bank Database. 1960-2021. Rural population (% of total population) – Kenya. In: *World Bank*. Washington, DC. Cited 16 September 2022. <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=KE>

World Bank Database. Access to Electricity – Kenya. In *World Bank*. Washington, DC. Cited 16 August 2022. <https://data.worldbank.org/indicator/EG.ELC.ACCS.UR.ZS?locations=KE>

World Bank. 2013. *Agribusiness Indicators: Kenya. Agriculture and Environmental Services*. <https://openknowledge.worldbank.org/bitstream/handle/10986/16669/825170WP0ABIKe00Box379865B00PUBLIC0.pdf?sequence=1&isAllowed=y>

World Bank. 2015. Kenya Among the Fastest Growing Economies in Africa. Press release, 5 March 2015. Cited xxx. <https://www.worldbank.org/en/news/press-release/2015/03/05/kenya-among-the-fastest-growing-economies-in-africa>

World Bank. 2016. *Kenya Urbanization Review (Report No. AUS8099)*. Washington DC, World Bank Group. <https://documents1.worldbank.org/curated/en/639231468043512906/pdf/AUS8099-WP-P148360-PUBLIC-KE-Urbanization-ACS.pdf>

World Bank. 2018a. NEDI: *The North and North Eastern Development Initiative. Boosting shared prosperity for the North and North-Eastern counties of Kenya*. Washington DC, World Bank Group. <https://documents1.worldbank.org/curated/en/556501519751114134/pdf/NEDI-Boosting-Shared-Prosperty-for-the-North-and-North-Eastern-Counties-of-Kenya.pdf>

World Bank. 2018b. *Boosting Prosperity, Improving Equity in North and North Eastern Kenya*. 8 May 2018. Cited 23 August 2022. <https://www.worldbank.org/en/news/feature/2018/05/08/boosting-prosperty-improving-equity-in-north-and-north-eastern-kenya>

World Bank. 2019a. Kenya Economic Update: *Transforming Agricultural Productivity to Achieve Food Security for All*. Published 8 April 2019. Washington DC, World Bank Group. Cited 25 February 2023. <https://www.worldbank.org/en/country/kenya/publication/kenya-economic-update-transforming-agricultural-productivity-to-achieve-food-security-for-all>

World Bank. 2019b. *Kenya Economic Update. Unbundling the Slack in Private Sector Investment – Transforming Agriculture Sector Productivity and Linkages to Poverty Reduction*. Kenya Economic Update No. 19. Washington, DC. World Bank Group. <http://documents.worldbank.org/curated/en/820861554470832579/Kenya-Economic-Update-Unbundling-the-Slack-in-Private-Sector-Investment-Transforming-Agriculture-Sector-Productivity-and-Linkages-to-Poverty-Reduction>

World Bank. 2021. *Climate Risk Country Profile: Kenya*. Washington DC, World Bank Group. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-05/15724-WB_Kenya%20Country%20Profile-WEB.pdf



World Bank. 2022a. *Kenya. Overview*. Washington, DC, World Bank Group. Cited 27 February 2023. <https://www.worldbank.org/en/country/kenya/overview>

World Bank. 2022b. *Kenya economic update, December 2022. continued rebound, but storms cloud the horizon: policies to accelerate the productive economy for inclusive growth*. Washington DC, World Bank Group. Cited 25 February 2023. <http://documents.worldbank.org/curated/en/099400212072220291/P1797690ba796602b092ba0149f48220ed7>

World Bank. 2022c. National agricultural value chain development project (NAVCDP). In: *World Bank, Washington DC, World Bank Group*. <https://projects.worldbank.org/en/projects-operations/project-detail/P176758>

World Bank. 2022d. *Poverty and equity brief: Africa Eastern and Southern – Kenya, October 2022*. Washington DC, World Bank Group. https://databankfiles.worldbank.org/public/ddpext_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global_POVEQ_KEN.pdf

WFP (World Food Programme). 2016. *Kenya – Comprehensive Food Security and Vulnerability Analysis (CFSVA)*, June, 2016. <https://www.wfp.org/publications/kenya-comprehensive-food-security-and-vulnerability-analysis-cfsva-june-2016>

Xe.com. 2023 Kenyan Shilling to US Dollar Exchange Rate Chart. In: *Xe Currency Charts*. Cited 25 February 2023. www.xe.com/currencycharts/?from=KES&to=USD&view=2Y

Yen, E., Hoffmann, V., Grace, D., Karugia, J. & Aguda, R. 2018. *Food safety in Kenya: Focus on fruits and vegetables*. March 2018. Project notes, International Food Policy Research Institute (IFPRI). Washington, DC. <https://EconPapers.repec.org/RePEc:fpr:prnote:pnmarch132533>.



