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FOOD SYSTEMS PROFILE - ZAMBIA

Catalysing the sustainable and inclusive transformation of food systems

Zambia

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Catalysing the sustainable and inclusive transformation of food systems

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FOOD SYSTEMS PROFILE ZAMBIA

Zambia is a landlocked country in southern Africa that has a total area of 752 612 km^2 and population of 18.4 million people (UNdata, 2020). It borders eight countries, which serve as markets for its exports, including maize. The country is experiencing a major demographic shift and is one of the youngest countries in the world by median age. This demographic shift is increasing pressure on its food system, as well as demand for jobs, health and social services. The western and southern parts of the country are prone to drought, with limited crop potential, while high rainfall in the north makes for leached soils. The central agroecological zone has the strongest agricultural prospects.

Key messages

Zambia has made positive strides in enhancing its food system, as indicated by the following:

- **improving trends in the nutritional status of children** under five years old since 2000/2001, and decreasing prevalence of undernourishment between 2009 and 2018;
- continuing to increase agricultural production, driven by **land expansion, adoption of improved seed varieties and sustainable land preparation** methods;
- attained and maintaining the status as a **net surplus producer and exporter of maize** in the southern Africa region and a positive agricultural trade balance; and
- continued **rise in production of oilseed crops** (e.g. soybeans, groundnuts and sunflower) in response to growing demand, including for stock feed in the country and the region.

Challenges remain in ensuring sustainable food systems in the country:

- **agriculture makes a low and declining contribution to GDP** (3 percent in 2019, down from 9 percent in 2010);
- **rural poverty is persistently high**, with the most recent estimate at 76.6 percent in 2015;
- agricultural production **diversification remains low**, due to continued **maize-centric policies**;
- **high malnutrition levels**, particularly among **children**, with 35 percent of them being **stunted**;
- territorial and socio-economic **inequities between urban and rural regions** in terms of **infrastructure and provision of basic services**, and also based on **gender**;
- **high deforestation rates**, mostly driven by **agricultural land expansion, charcoal production and timber extraction, threaten biodiversity** and compromise the country's **climate change mitigation potential**; and
- heavy reliance on **rainfed agricultural production** makes the food system increasingly **vulnerable to climate shocks**.

To make its food systems more sustainable, Zambia could consider formulating and implementing policies to do the following:

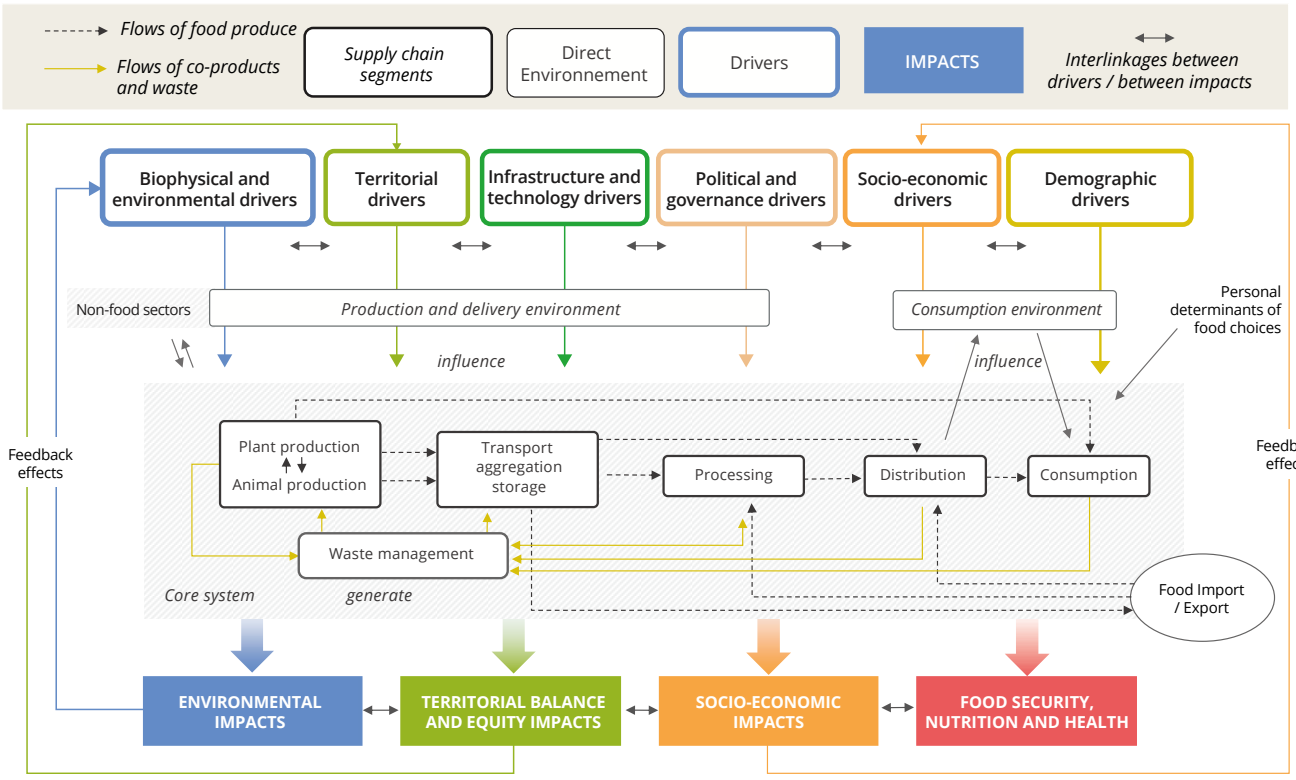
- promote **agricultural diversification** away from maize, to include other crops and food commodities;
- encourage consumption of **healthy foods** and improve availability of **nutrition information and education**;
- improve the provision of **basic services and infrastructure**, particularly in rural areas;
- offer **incentives for rural investment** in agricultural production and value addition, such as processing; and
- promote adoption of **climate-smart agricultural practices** to build resilience in food production.

Food systems assessment methodology and process

This brief is the result of a collaboration between FAO, the European Union, CIRAD in close collaboration with FAO experts. It was implemented in Zambia during May to August 2021. The methodology used for preparing this brief is the result of a global initiative of the European Union, FAO and CIRAD to support the sustainable and inclusive transformation of food systems. This assessment methodology is described in detail in the joint publication entitled *Conceptual framework and method for national and 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 a consultation workshop 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: *Conceptual framework and method for national and territorial assessments: Catalysing the sustainable and inclusive transformation of food systems.* David-Benz *et al.*, 2022.

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 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

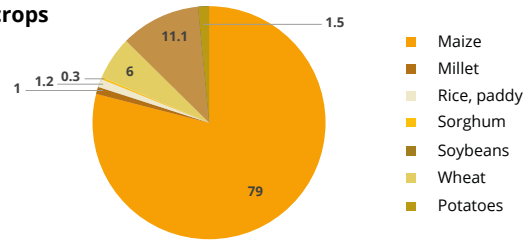
Indicators	2000	2010	Current status	Comments
Population growth rate	2.7%	2.9%	2.9%	Minimal change in growth rate; remained constant since 2010
Percent rural population	65%	61.5%	55.4%	Steady decline of rural population
Urban population growth rate	3.5%	4.0%	4.1%	Accelerating growth in urban population
GDP/capita	USD 345	USD 1 489	USD 1 501	Sharp rise between 2000 and 2010 and marginally afterwards
Agriculture, forestry and fishing value added (% of GDP)	16.15%	9.42%	2.73%	Steady decline of contribution of agriculture, forestry and fishing to GDP
Employment in agriculture (% of total employment)	70.88%	64.33%	49.64%	High rates of employment in agriculture, but it is sharply declining; related to value added, indicates low agricultural productivity
Inflation rate	26.0%	8.5%	15.7%	Sharp variations: three-fold decline between 2000 and 2010 followed by two-fold increase between 2010 and 2020
Access to electricity	16.7%	22%	43.1%	Significant increase in the past two decades
Access to safe drinking water Urban Rural	N.A.	N.A.	90% 53%	Significant disparity between rural and urban populations
Access to health facilities (% of households within 5 km radius of health facility) Urban Rural	N.A.	N.A.	92% 57%	Access to health facilities is a challenge for a larger percentage of the rural than urban population
Forest coverage (%)	62.5%	62%	60%	Rising trend in deforestation

Sources: Ministry of Agriculture, Government of the Repulic of Zambia and IFAD (2021); ZDHS 2018 (Zambia Statistics Agency, Ministry of Health and ICF, 2019); World Bank (2019b).

Key figures & trends in food production, consumption and trade

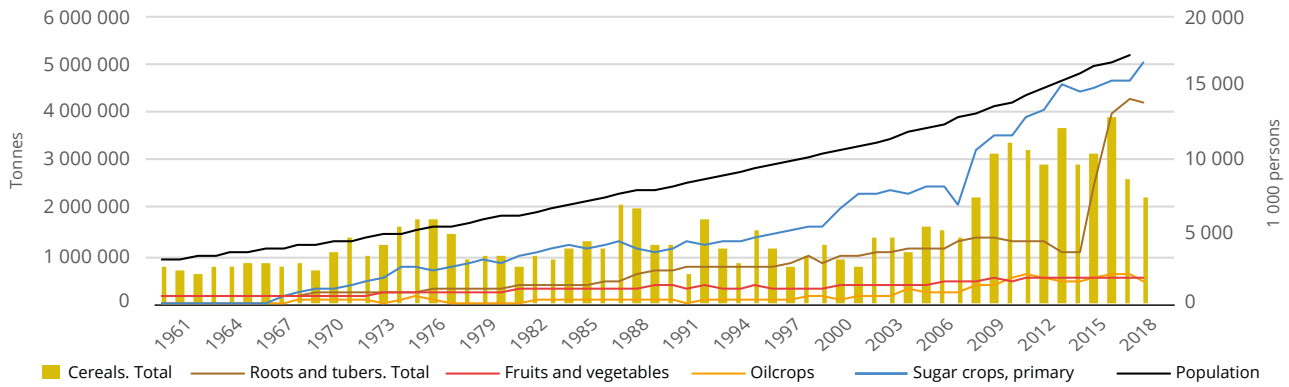
Food crop production in Zambia is dominated by maize, which accounts for 79 percent of total output of major food crops (see Figure 2). Supply exceeds domestic requirements, making the country a major exporter of the commodity in southern Africa. Production of key food crops and meat has generally been increasing, in tandem with the population (see Figures 3 and 4).

Figure 2. Percentage share of total production for major food crops



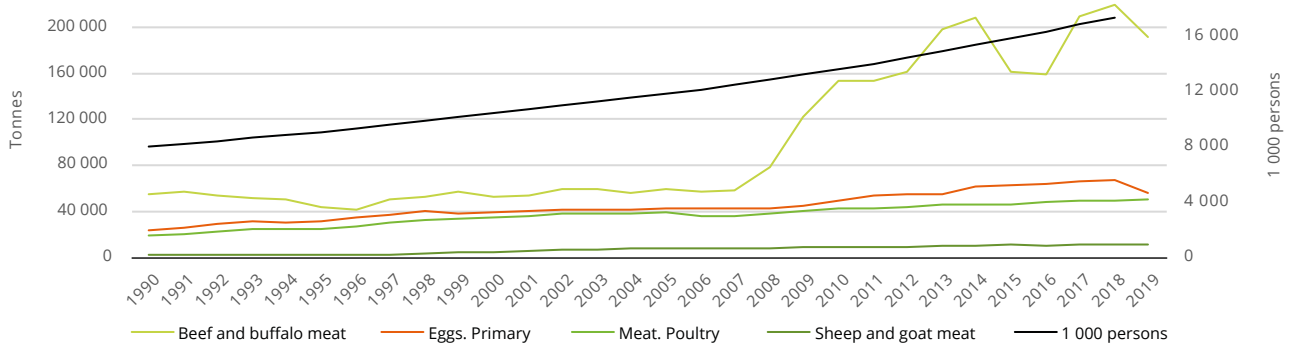
Source: Chapoto and Subakany (2019).

Figure 3. Production trends of selected crops in comparison with population



Source: FAOSTAT.

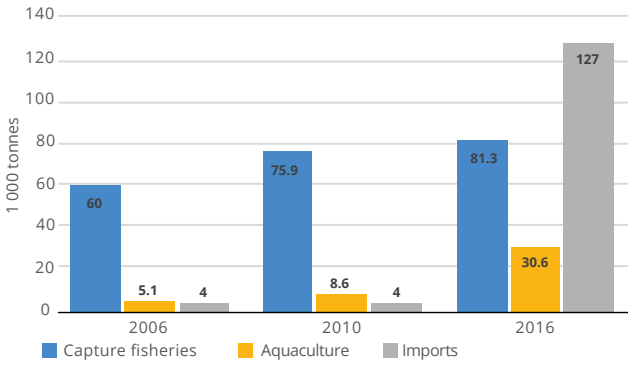
Figure 4. Animal-based food production trends in comparison with population



Source: FAOSTAT.

Domestic production of other food commodities such as wheat, fruit and vegetables, fish, dairy and edible oils, falls short of consumption. Rising incomes and changing diets are slowly shifting consumption from maize to other starchy foods, such as bread and rice, and to animal-source proteins, such as beef. This has contributed to a steep rise in beef production to meet the increase in demand. Gaps in the supply of these commodities are met through imports from the region and overseas. Annual fish consumption in 2016 was estimated to be well above annual domestic production (Namonje-Kapembwa and Samboko, 2017), with imports covering this deficit. Figure 5 shows that the country's fish imports increased significantly between 2010 and 2016.

Figure 5. Trends in fish production and imports in Zambia



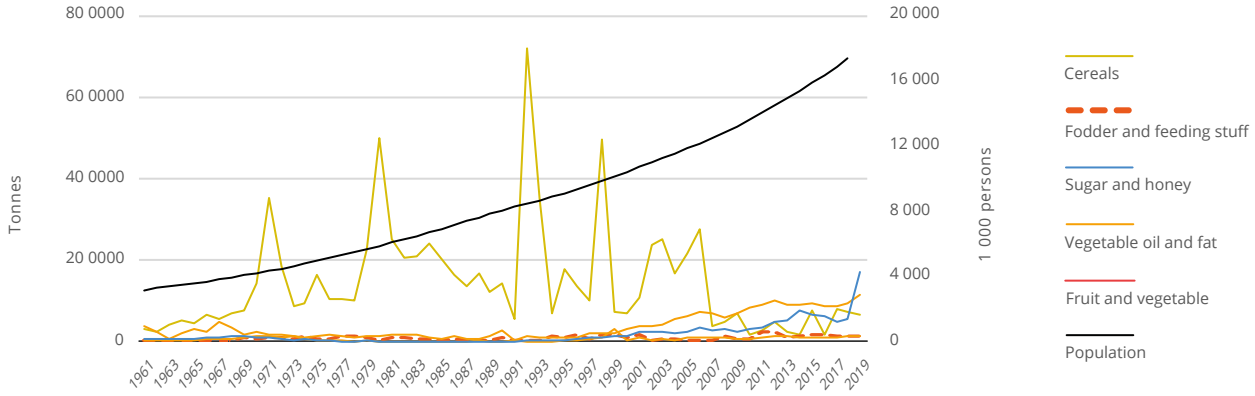
Sources: Namonje-Kapembwa and Samboko (2017) and COMSTAT Data Hub.

Zambia meets part of its food supplies through imports, dominated by cereals, fruits and vegetables, vegetable oils and fats in terms of volume. With increased cereal production, imports of these goods, while fluctuating, have trended lower since 2006. Imports of vegetables and fruits are increasing, as the rise in production lags growing demand. Imports of vegetable oils and fats have trended upward trend since 2001 (see Figure 6).

In summary, according to FAO data (FAOSTAT), 84 percent of the available food in terms of calories is supplied from local production, while approximately 9 percent is from destocking and nearly the same amount from imports. Cereals (mainly maize), roots and tubers constitute 69 percent of available food, as measured by calories, oil crops and vegetable oils 14 percent, meat 5 percent, sugar and sweeteners 5 percent, other animal products 2 percent, fruit and vegetables 1 percent, fish and seafood 1 percent, and others 3 percent. A trend analysis of food expenditure patterns from 1996 to 2015 showed that wealthier households spent more on animal protein, whereas poorer households spent twice as much on vegetables (Chisanga and Zulu-Mbata, 2018). Food expenditure patterns among high-income households, primarily in urban regions, reflect growing earnings and rapid urbanization.

As noted, maize is dominant and though dietary diversity is low, there is some divergence within the population. According to a discussion paper by Mwanamwenge and Harris (2017), based on available data from 2014, less than a quarter of children aged 6–23 months had received food from four or more food groups, indicating low dietary diversity among this group. Other findings detailed in the paper were that people in rural areas had lower dietary diversity scores than those in urban areas, and that the scores were also lower for poorer households compared with wealthier ones. In addition to poverty, as noted in the paper, other factors that contribute to low dietary diversity in Zambia are "(un)availability of diverse foods on farms or in the market, and of consumer preferences for different foods and food groups".

Figure 6. Trends in food imports of Zambia (1961–2016)



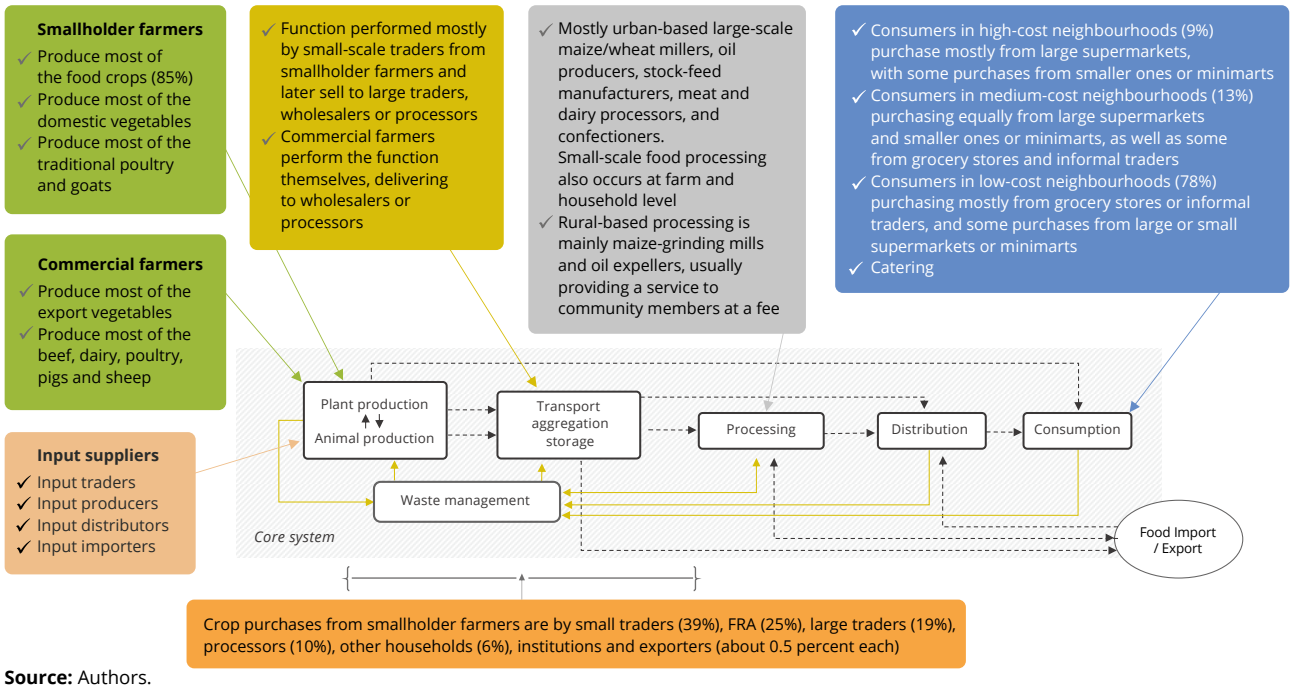
Source: FAOSTAT.

Characterisation of the dominant actors of the Food System

Figure 7 shows a schematic representation of the main food system actors in Zambia. Approximately 85 percent of the food crops in the country are produced by smallholder farmers (Crop Forecasting Survey Data: Ministry of Agriculture, 2020). Small-scale traders purchase most of the crops from smallholder farmers, accounting for 39 percent of all crop purchases in 2019, according to the Rural Agricultural Livelihoods Survey (Chapoto and Subakany, 2019). The Food Reserve Agency (FRA)[1] accounted for 25 percent of purchases from smallholders, mostly maize for strategic reserves and to stabilize market prices. Purchases by other buyers were large-scale traders (19 percent); processors (10 percent); other households (6 percent); and institutions and exporters (approximately 0.5 percent each).

Exotic fruits are largely produced by commercial farmers; this sector also produces high-value exotic vegetables for export. Commonly consumed vegetables for the domestic market are mainly produced by smallholder farmers. Commercial producers predominate in the supply of beef, dairy, pig, sheep and poultry products for processing, while small-scale producers have a larger share of the market for traditional poultry and goats. The Government, through the Zambia Development Agency (ZDA),[2] views agroprocessing as a vehicle to increase income and give the poor access to food. Most related ventures, however, involve large-scale maize and wheat milling companies, stock-feed manufacturers, edible oil producers, and meat and dairy processors. Only small-scale maize milling and oil extraction

Figure 7. Schematic representation of key food system actors in Zambia



Source: Authors.

[1] The FRA is intended to manage sustainable strategic food reserves for national food security and has an additional crop marketing mandate. (https://fra.org.zm/?page_id=2863).

[2] The Zambia Development Agency (ZDA) is a quasi-government body under the Ministry of Commerce, Trade & Industry, with a leading role in economic development, promoting and facilitating trade, investment and enterprise development. It also is tasked with enhancing the country's investment profile to increase capital inflows, capital formation and employment creation, and expand the micro, small and medium enterprise sector (https://www.zda.org.zm/index.php/about-v-4/).

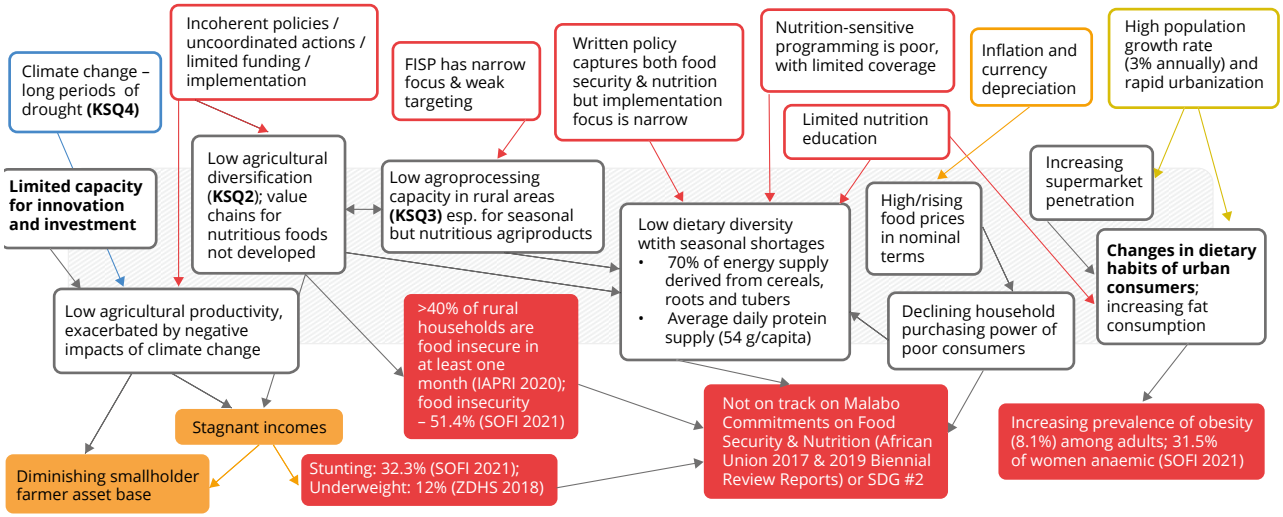
are commonly carried out in rural areas, with these services provided in the communities for a fee (Zambia Development Agency, undated).

Informal food markets offer crucial opportunities for livelihoods and income generation, especially for women, young people and the less educated. These markets play a critical role in linking the urban poor to buyers of fruit, vegetables, legumes and meat products. Available data show that the informal sector accounts for 65 percent, 57 percent and more than 90 percent, respectively, of the urban market share of staples, meat and livestock products, and fruit and vegetables. (Hichaambwa, 2012 and Hichaambwa *et al.*, 2009).

Key challenges to the achievement of the core sustainable food systems goals

Key Sustainability Question 1: Why does Zambia have a high prevalence of malnutrition and seasonal food security challenges despite significant public investment in agricultural input and output subsidies?

Figure 8. Schematic representation of the drivers and impacts of food insecurity and nutrition in Zambia



Sources: Authors based on data from APRI (2020) (Mofya-Mukuka and Singogo, 2020); ZDHS 2018 (Zambia Statistics Agency, MoH and ICF, 2019); SOFI 2021 (FAO *et al.,* 2021); African Union, 2017, 2020.

Zambia faces formidable challenges in meeting its global commitments related to food security and nutrition. Recent data show that the prevalence of moderate or severe food insecurity in the total population is at 51.4 percent, affecting some 9.2 million people (FAO, *et al.*, 2021). Additionally, approximately one million children under 5 years are stunted, with prevalence of 32.3 percent in 2020, slightly higher than the 29 percent average for the Africa region. Meanwhile, the prevalence of obesity among adults (18 years and older) was 8.1 percent – some 600 000 people in 2016. Among women of reproductive age (15–49 years), anaemia prevalence was at 31.5 percent, meaning that 1.6 million women were affected in 2019 (FAOSTAT and Zambia Statistics Agency; Ministry of Health and ICF, 2019). Figures 9 and 10 show the trends in the prevalence of child stunting and of undernourishment respectively. The overall trends of the nutritional status of children under 5 years have been improving since 2000/2001. Similarly, the prevalence of undernourishment decreased between 2009 and 2018.

These improvements, however, have not been rapid enough for Zambia to be able meet its targets, and the country is off-track in its effort to achieve Sustainable Development Goal (SDG) 2 on ending hunger and all forms of malnutrition by 2030. Similarly, the African Union has indicated that Zambia is not on track towards achieving the food security and nutrition targets and commitment of the Malabo Declaration by 2025 (African Union, 2020).

These levels of unsatisfactory nutrition and food security prevail, despite high public expenditure on agricultural input subsidies through the Farmer Input Support Programme and food price subsidies, mainly through interventions by the Food Reserve Agency (World Bank, 2021). Under the Farmer Input Support Programme, the Government distributes subsidized agricultural inputs to small-scale maize producers and provides a guaranteed minimum price at which the Food Reserve Agency buys maize, cassava and sorghum from farmers (see Key Sustainability Question 2).

Several interacting factors contribute towards food insecurity and malnutrition in Zambia. The Zero Hunger Strategic Review (IAPRI and WFP, 2018) identifies policy incoherence as one of four key gaps that hinder progress towards achieving zero hunger in Zambia by 2030. It proposes a revision of the 2008 Nutrition Policy to update and align it with more recent frameworks, such as the SDGs, the country's Vision 2030 and the Seventh National Development Plan.

The Seventh National Development Plan, covering 2017–2021, which was aimed at reaching the country's long-term objective of becoming a prosperous middle-income country by 2030, had a narrow implementation focus and poor targeting of nutrition and food security programmes. In addition to these shortcomings, the Plan was further hindered by socio-economic drivers, such as rising inflation and currency depreciation, and demographic drivers, such as high population growth and rapid urbanization.

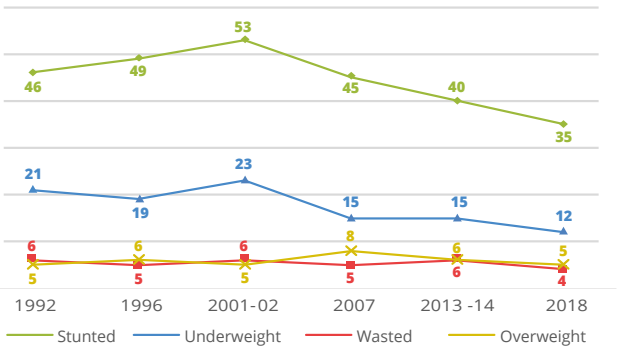
Moreover, rapid urbanization, accompanied by a rise in supermarkets and fast food chains and access to convenience (ultra-processed) foods (Harris *et al.*, 2019), is changing dietary habits of urban consumers, resulting in increasing fat consumption associated with non-communicable diseases.

Climate shocks, through more extreme weather events, such as prolonged droughts and increasing incidence of flooding, have compounded the challenges for smallholder farmers, reducing their asset base and capacity for investment and adoption of innovation, as well as their productivity.

The combination of these factors and drivers can be attributed to the low productivity, limited diversification in agricultural production and low incomes, leading to a reduction in purchasing power, limited choices and low dietary diversity (see Figure 8).

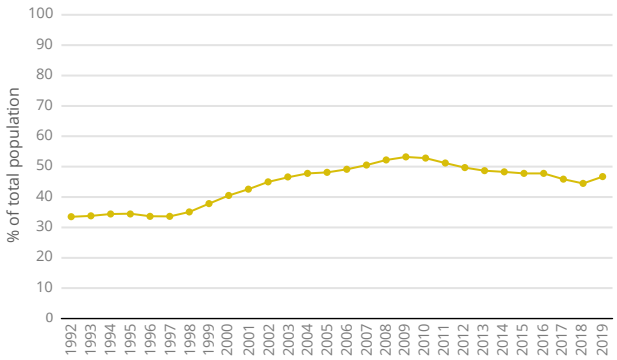
Figure 9. Trends in nutritional status of children, 1992–2018

Percentage of children under age 5 who are malnourished



Sources: 2018 Zambia Demographic and Health Survey (ZDHS) (Zambia Statistics Agency, Ministry of Health and ICF, 2019).

Figure 10. Prevalence of undernourishment 1992–2019



Sources: Zambia Food Security and Nutrition Report (Mofya-Mukuka and Singogo, 2020).

Lever: Combining a broad range of policy instruments, which promote the development of diversified nutrition-sensitive value chains that are commercially viable.

The use of a combination of policy instruments across different sectors (e.g. agriculture, education, health and commerce) could address the narrow focus and implementation of food security and nutrition policy and programming.

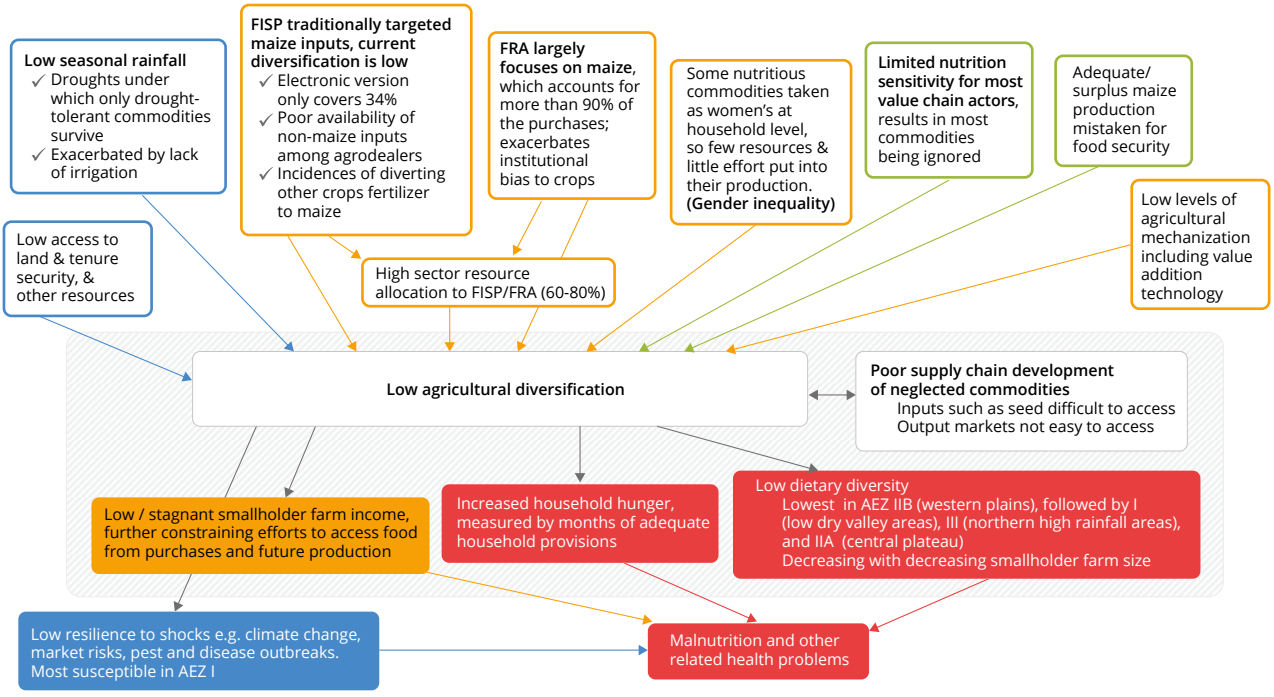
Interventions that focus on increasing the **production and commercialization** of nutritious food could incentivize activities within nutrition-sensitive **value chains**. According to the Fill the Nutrient Gap Zambia study (WFP, 2020), the daily cost of a nutritious diet (based on estimates of the cost of meeting nutrient requirements using locally available foods) for a household of five is about 33 Zambian kwacha (ZMK) (USD 1.43). That is almost three times the cost of an energy-only diet and unaffordable for about half of all households, particularly those in rural areas. Accordingly, promotion of mass production and commercialization of a diverse range of nutrient-rich foods, such as legumes, fruits, vegetables and livestock, could improve nutrition outcomes.

Some pre-conditions for the successful implementation of these initiatives are **policy consistency and coherence** across different sectors and over time; and prioritizing the development of diversified input and output markets and access to processing technology and infrastructure to promote value addition.

Some existing programmes, such as "First 1 000 Most Critical Days" can provide insights through monitoring the supply and consumption of a wider range of food through a nutritious food balance sheet, which could help to reduce incidences of food and nutrition insecurity.

Key Sustainability Question 2: What are the constraints to sustainable diversification of the food production system in Zambia despite stakeholder recognition of its importance?

Figure 11. Schematic representation of the drivers and impacts of low agricultural diversification



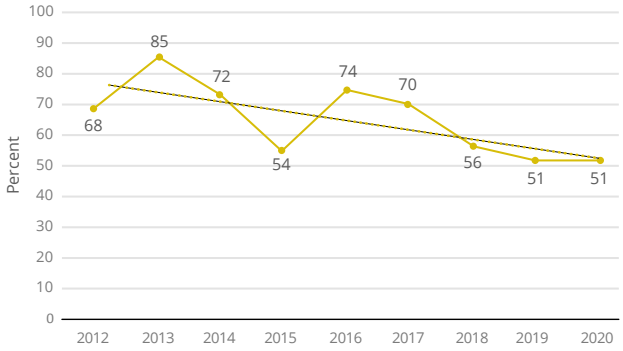
Source: Authors.

In key policy documents over the years, the importance of diversification to agricultural sector growth and increasing its contribution to food and nutrition security has been noted and emphasized. The Farmer Input Support Programme, which traditionally only targeted maize inputs, added rice in the 2010/11 season and sorghum, cotton, and groundnuts in the 2012/2013 season (Mason, Jayne and Mofya-Mukuka, 2013) to enhance diversification. The electronic version, introduced in 2015/16, allows beneficiaries to get any desired inputs, including for livestock production, and is seen as a way to increase agricultural diversification. Other efforts in this direction, including projects and programmes of limited scale in many parts of Zambia as part of climate-smart agriculture strategies for increased productivity, resilience and diversity, have had significant local success.

Based on RALS data for 2012, 2015 and 2019, Simpson's Diversity Index[3] for agricultural diversification in Zambia in accordance with values of production of maize and other staples, legumes, fruits and vegetables, cash crops and livestock products – increased marginally from 0.38 to 0.42 and again to 0.48, respectively. Low diversification in Zambia is closely associated with undeveloped agricultural supply chains, which are inadequately supported by policy and institutional efforts.

The main drivers of low agricultural diversification are the Farmer Input Support Programme subsidy programme, which has historically targeted mostly maize production through maize seeds and fertilizer, and the Food Reserve Agency crop purchases, of which 90 percent is maize. This combination tends to encourage production and marketing of maize, rather than other food commodities. These two programmes together account for 50 to 80 percent of annual public spending in the sector, leaving very little for key drivers of agricultural growth and diversification (see Figure 12). Additionally, the national budget allocation for agriculture has been decreasing, from 9.3 percent in 2015 to 3.7 percent in 2020. These figures are well below the African Union's Comprehensive Africa Agriculture Development Programme (CAADP) commitment of at least 10 percent, and reduces the resources available for diversification.

Figure 12. Farmer Input Support Programme Food Reserve Agency share of agriculture budget (2012–2020)



Sources: IAPRI, Various years.

In addition, the potential for agricultural diversification is constrained in some areas by low seasonal rainfall, especially in agroecological zones I and IIB, in the southern and western parts of the country. These zones receive less than 1 000 mm of annual rainfall.[4] Only limited agricultural commodities are adapted to these environments, which account for about 12 percent of the land area.

Limited access to land and poor land tenure security, which discourages long-term investment, constrain the number of agricultural commodities produced per household. Limited availability of technology for adding value also hampers market supply, including nutritious and traditional foods. This is exacerbated by poor nutrition education of actors in the supply chain – consumers, in particular. A widely held notion among stakeholders that adequate or surplus maize production equates to food security tends to limit efforts and resources at all levels – from national to household – in producing a variety of foods for diverse and nutritious diets.

[3] Simpson's Diversity Index measures diversity, taking into account the number of species present and the relative abundance of each species. As species richness and evenness increase, so diversity increases, with 1 representing infinite diversity and 0, no diversity.

[4] Further details on the agro-ecological zones are available at https://www.wto.org/english/tratop_e/agric_e/presentation_zambia.pdf.

Key impacts of low agricultural diversification are poor dietary diversity, low or stagnant smallholder farm incomes and reduced resilience to shocks, such as climate change, market risks, and pest and disease outbreaks. These factors contribute to malnutrition and other related health problems. (World Bank, 2019a; Mofya-Mukuka and Hichaambwa, 2018).

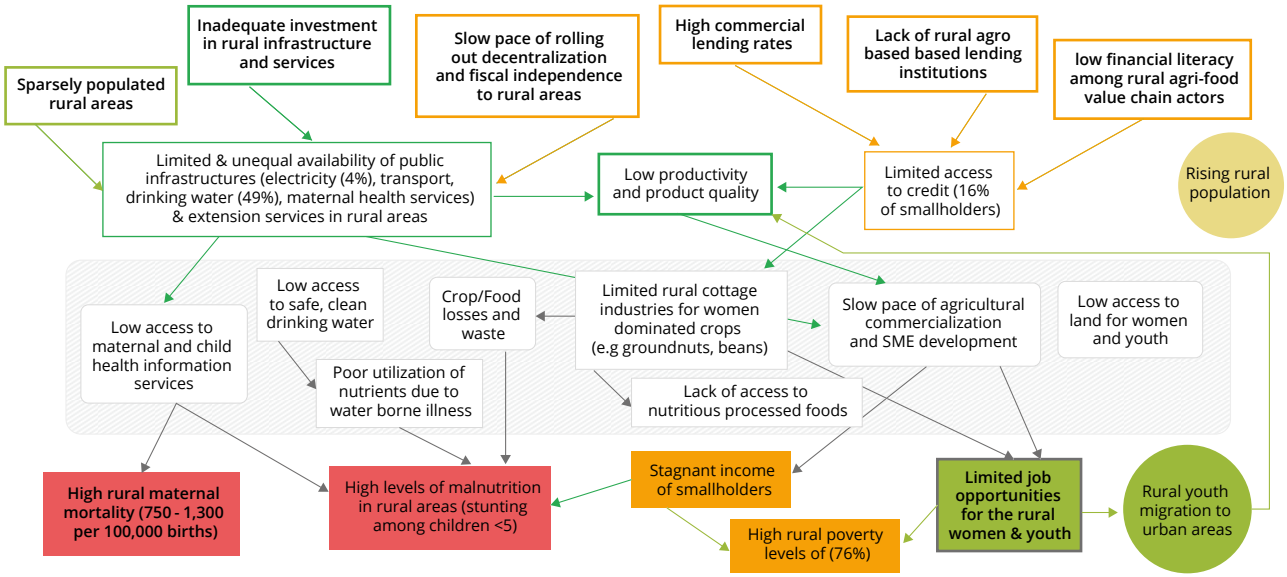
Lever: Increase availability of resources to invest in important drivers of agricultural growth and diversity, and offer more efficient smart subsidies[5]

Increasing resources for key agricultural growth drivers – research, extension, and irrigation – and developing rural infrastructure, such as roads and power systems, would result in a more productive and diverse agriculture sector. An improved research and extension system, better-equipped to support productivity and diversification, as well as nutrition messages, would help boost the adoption of agroecological practices (including climate-smart agriculture) in a gender-equitable manner. This would significantly contribute to sustainable utilization of natural resources and the environment, and enhance resilience to shocks. Sustainable production of a variety of commodities linked to markets would contribute to increased smallholder incomes and enhance their ability to purchase more nutritious foods.

Diversified agricultural commodities would need sustainable linkages to local, national, regional and international input and output markets. Sensitization of consumers to the nutritional values of neglected foods, such as cowpeas, would create demand for these commodities and encourage sustained production. Men and women alike in households need exposure to nutritive-sensitive agriculture and the possibility to consume diverse nutritious foods from their own production.

Key Sustainability Question 3: What are the reasons for territorial and socio-economic inequities among different actors across value chains in the Zambian food system?

Figure 13. Schematic representation of the territorial and socio-economic inequities dimension of the food system in Zambia



Source: Authors.

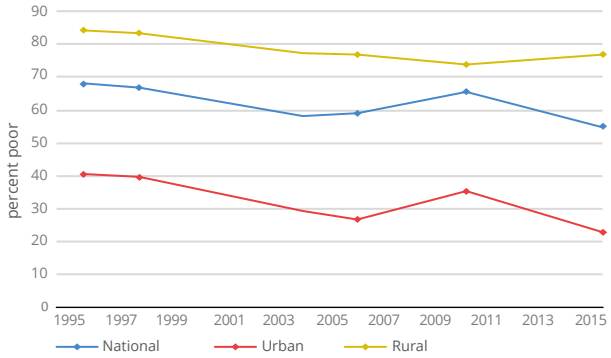
[5] Smart subsidies are designed to target the poor and favour market-based solutions in input supply, aiming to promote pro-poor economic growth through increasing competition, economic efficiency and empowerment of farmers.

Lessons can be drawn from specific programmes and activities from within the country along with learning from global best practices. Some in-country examples are the Smallholder Productivity Promotion Programme and initiatives of the Scaling Up Nutrition programme, which exemplify the role of home gardens in improving household dietary diversity (NFNC, 2021).

Despite efforts to foster inclusive and equitable growth and development, territorial and socio-economic inequities still pose a challenge to the food system of Zambia (see Figure 13). Disparities are most obvious between rural and urban areas and across gender. Rural areas are characterized by high poverty rates and a lack of basic infrastructure and services (e.g. clean, safe drinking water, health facilities, electricity, schools, markets, roads, and extension services).

As rural areas are sparsely populated, investing in capital-intensive infrastructure may not be deemed economically viable. This is further exacerbated by the country's high public debt, which has reduced the fiscal space. In addition, lack of decentralization in development planning and programme implementation has hampered infrastructure and service delivery in rural areas. For example, only 58 percent of rural households have access to clean water, compared to almost 92 percent in urban areas (Zambia Statistics Agency, Ministry of Health and ICF, 2019). Only 14 percent of rural households have access to electricity, compared to more than 80 percent in urban areas (World Bank, 2019b). Such inequities negatively affect food production and consumption. Limited infrastructure has led to low value addition, implying fewer jobs for the young people It has also increased the labour burden for women, who have to fetch water from distant places and gather wood as cooking fuel, reinforcing gender inequities. This also means women have limited time to prepare nutritious meals and provide the necessary care for children, which has contributed to child malnutrition. These territorial and socio-economic imbalances have led to high rural poverty; the most recent available estimate (for 2015) of poverty in rural areas was 76.6 percent of the population, versus 23.4 percent in urban areas (CSO, 2016) (see Figure 13). As a majority of rural households make their living from agriculture, the high rural poverty rates imply that rural food systems are disproportionately affected.

Figure 14. Poverty trends in Zambia



Sources: CSO (2016) and World Bank (2019).

Notwithstanding regional differences, extreme poverty is highest among female-headed households (60 percent in rural areas and 15 percent in urban areas) (United Nations, 2015). These disparities have also led to high rural maternal mortality, malnutrition, limited economic opportunities and migration of young people to urban areas in search of jobs. Young people account for 60 percent of the total labour force. Currently a majority of them are unemployed and economically inactive (Population Council and UNFPA, 2018). This problem is more acute in rural areas where only 39 percent of the young people are employed, compared with 60 percent in urban areas (CSO and Ministry of Labour and Social Security, 2018). In addition, inequities along the value chain mean producers receive lower margins than those downstream, mostly driven by the number of intermediaries. In the goat value chain, for example, smallholder producers made, on average, a gross margin of about ZMK 120 (USD 7.45) per goat sold to a trader, compared with ZMK 180 (USD 11.20) obtained by traders and processors (Namonje-Kapembwa, Chiwawa and Sitko, 2016).

Lever: Incentivise agro-based investments in rural areas

To ensure incentives for infrastructure in rural areas, **backbone infrastructure**, such as water supply systems, roads, communication networks and electricity. must be developed and financial services need to be improved in rural areas to facilitate business needs to be improved.

Specific incentives could include facilitating access to land and favourable credit terms along with flexible repayment plans. This would foster an environment to attract investment in improving production and processing technologies, increasing productivity, product quality and value addition in rural areas. These incentives would spur the proliferation of agroprocessing enterprises at various scales, including rural cottage industries, which, in turn, would help to facilitate the commercialization of smallholder agriculture and the development of small and medium-sized enterprises. **Rural cottage industries**,[6] being **off-takers of raw materials** from smallholder farmers, could serve as markets for local agricultural production. Leading to smallholder **commercialization** and **local job creation**. In-country examples, such as the government-implemented **farm block programme**, can provide insights for planning such initiatives.

It is worthwhile noting, however, that even with other incentives in place, the **slow pace of infrastructure development**, limited basic amenities and services in rural areas (extension, safe drinking water and health services), may still be barriers to agricultural investment.

[6] Cottage industries refer to small-scale, farm-level or backyard processing and value-adding enterprises that use low-cost equipment.

Key Sustainability Question 4: What are the reasons for the increasing vulnerability of the food system to climate change and environmental degradation?

The food system of Zambia is dependent on rich natural capital (land, forest, water and biodiverse ecosystems), but it is unsustainable, resulting in the depletion of these assets. Combined with climate change and events, such as droughts and floods, this exacerbates the vulnerability of much of the rural population (Thurlow, Zhu and Diao, 2012).

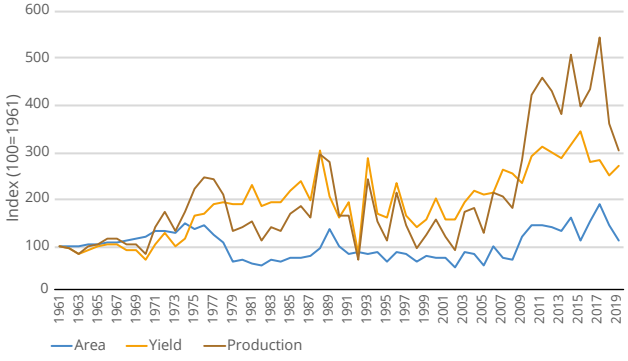
Since independence in 1964, **hybrid maize and input subsidies** to support production have been a major feature of the country's cornerstone agricultural policy. This rainfed staple crop is cultivated in half of the harvested area and approximately 1.2 million smallholder households depend on maize for their livelihoods (Mulenga, Wineman and Sitko, 2017). These households are thus vulnerable to economic and ecological fluctuations affecting production.

While the most recent Farmer Input Support Programme subsidies programme has boosted maize yields and acreage (see Figures 15 and 16), by targeting "vulnerable but viable" farms, it is effectively excluding the very small (those with holdings less than 0.5 ha) and most vulnerable households.

In addition, while fertilizers have raised the carrying capacity of the land, misapplication associated with soil acidity on the majority of maize fields, and reduced fallow periods of shifting cultivation (the "chitemene" system), among other factors, have resulted in a loss of soil fertility and related productivity (Burke, Jayne and Sitko, 2012).

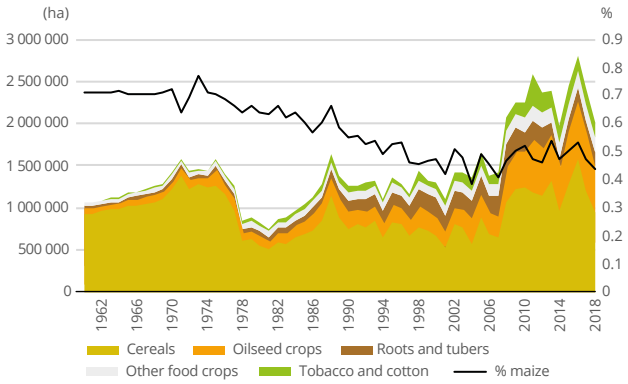
This is reinforced by climate change. Modelling under future climate conditions (Ngoma *et al.,* 2020) shows that the combination of reduced rainfall, increased temperature and drought events is likely to cause insufficient soil moisture, crop loss and reduction in agricultural production. It is also projected to affect forest cover, livestock population and length of the growing season, and increase water stress. Production of heat- and drought-sensitive crops, such as maize, is expected to decline in all provinces – ranging from 20 percent in the Northwestern province, to 77–82 percent in the Copperbelt and Muchinga provinces (Hunter *et al.*, 2020). At the household level, the costs of reduced production of maize are estimated to range from USD 1.50 to USD 28 per person, up to USD 169 per household in the Southern province (Hunter *et al.*, 2020).

Figure 15. Maize acreage, yield and production indices (1960–2018)



Source: FAOSTAT.

Figure 16. Harvested areas and share of maize acreage (1960–2018)



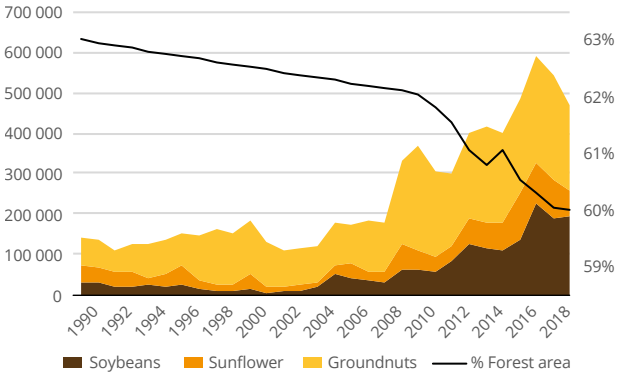
Source: FAOSTAT.

Maize predominance does not favour adaptive capacity of food system actors. In addition to its high water requirement compared to indigenous crops such as millet and sorghum (Hunter et al., 2020), the lack of crop and genetic diversity (hybrid maize) increases vulnerability to pest and disease outbreaks (Keneni *et al*., 2012). Conservation agriculture and agroforestry are the most widely promoted climate-smart agriculture practices in Zambia. Despite this, there remains a need to increase the preparedness of small-scale farmers for pests or flood events, and to further support local innovation for climate-change adaptation, which is necessary to build resilient systems.

Forests cover approximately 60 percent of the total land area of Zambia. Since the 1990s, Zambia has experienced significant deforestation attributed to land clearance, charcoal production, unsustainable fire management and timber extraction. Deforestation has accelerated at an alarming rate in recent years, with a net annual loss rising from 35 000 ha between 1990 and 2010, to some 188 000 ha in the past decade (FAO, 2020).

This deforestation has accompanied the expansion in areas under maize cultivation, resulting from the most recent Farmer Input Support Programme along with increases in the production of oil crops and a rising cattle population (see Figure 15). Both have been driven by the agro-industry sector supplying transformed food and animal-based products to the growing urban population (see Figure 4). The area of groundnut cultivation has doubled in the period and areas used to cultivate soybeans have increased even more dramatically to reach the same acreage as groundnuts (see Figure 17). Some 85 percent of soybeans are supplied by commercial farms, but emergent farmers have also adopted the crop, driven by a commercially oriented regional value chain and supported by favourable prices relative to maize.

Figure 17. Oil crops acreage and percentage of forest/total area (1990–2018)



Source: FAOSTAT.

While this may represent an economic opportunity in the short term for a limited number of food system actors, the medium-term environmental impact may be wider.

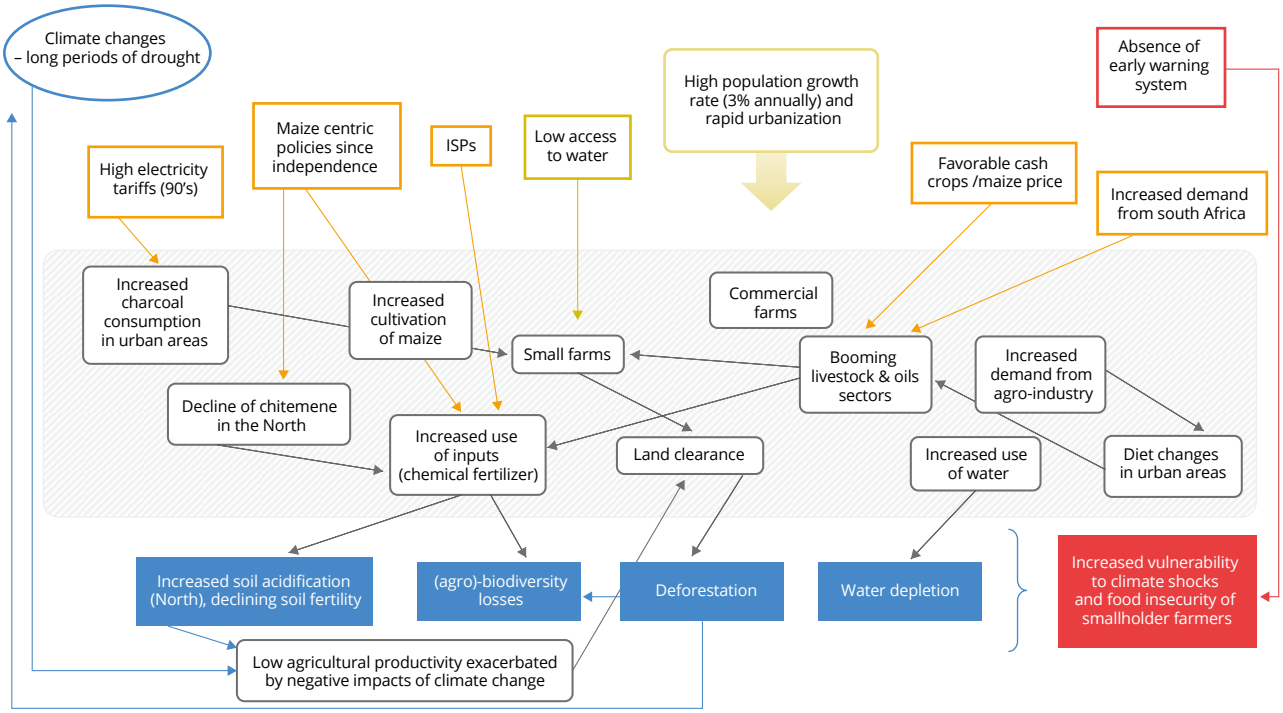
Deforestation is compromising the country's climate change mitigation potential, as it accounts for 87 percent of the greenhouse gas emissions (CIAT and World Bank, 2017). It also affects the resources provided by forest ecosystems, such as wild meat and fuelwood, which rural livelihoods depend on.

Soybean production is characterized by high use of irrigation, which, together with the agro-industry sector, is responsible for the depletion of water resources. Notably, most smallholders do not have access to irrigation.

The total internal renewable water resources per capita of Zambia has declined significantly to 4, 947 m^3/person/year as of 2014, down from 17 886 m^3/person/year in 1962 (World Bank, 2020). Projections indicate that, on aggregate, the changes in rainfall and temperature will reduce water availability by approximately 13 percent from the most recent (observed) levels of approximately 97 km^3 to approximately 84 km^3 by the end of the century. By mid-century, there will be a reduction in future availability of water resources in the Zambezi, Kafue, Luangwa, Chambeshi-Luapula, and Rufubu river basins.

The vulnerability of water resources is expected to increase as cumulative demands for irrigation agriculture and other uses by mid-century will put significant pressure on water resources.

Figure 18. Schematic representation of environmental vulnerability of the food system in Zambia



Source: Authors.

Lever: Improve the adaptation capacity to climate change and livelihoods resilience of small-scale farmers through crop diversification

There is a need to develop different climate adaptation strategies across different sectors (agriculture, livestock, water, forestry, etc.) to support the protection and restoration of natural capital and biodiverse ecosystems (see Figure 18). One solution is to identify suitable alternative livelihoods and diversify production away from maize, in particular, **through a wider use of indigenous species of cereals** (such as finger millet and sorghum), **tubers** (cassava) and **vegetables**, in association with trees. Increased agricultural biodiversity could provide a buffer against crop vulnerability to climate change and related pests and diseases, and improve food and nutritional security.

At the production level, a primary condition for promoting traditional crops is to recover traditional genetic resources (seeds) and reconsider selection criteria based on their capacity to be associated with other plants, and their nutritional quality. A potential solution is to create linkages between genetic banks, research institutions and farmers through agricultural extension services. **Involving smallholder farmers in the genetic and agronomic research process** could help to increase farmers' knowledge about growing such crops.

Consumption trends and habits must evolve and align with the potential redeployment of these traditional crops if this is to succeed. It is important to tailor the commodity chain – from food processing to marketing – to offer transformed products and ensure "readoption". That would make it possible for

producers to access markets to sell traditional crops and develop home-grown processing. Lessons can be drawn from the Good Food Logo programme, which promotes the nutritional properties of cassava, sorghum and millet among Zambian consumers.

Traditional crops are endangered by herbicides, which constitute a substantial barrier to move back to crop association (for example, between beans and maize). Many of the organizations that promote conservation farming in the country are supporting herbicide use as a way to manage weeds. Agroecological approaches could be promoted as an alternative, along with water conservation practices.

Finally, key adaptation measures entail focusing on water efficiency through drip-irrigation techniques, catchment conservation programmes, and enhanced access to improved water sources. Meanwhile, carbon farming can offer a significant contribution to climate change mitigation.

Transition to Sustainable Food Systems

The agriculture and food system is the backbone of the economy of Zambia, providing food, employment and income to the majority of households in rural and urban areas. Agriculture is, however, under-diversified and productivity is low, resulting in a lack of dietary diversity and poor nutrition outcomes. Additionally, farmers are exposed to greater market risks and weather-related shocks. The food system as a whole remains vulnerable. Enhancing sustainability requires action to **improve agricultural diversification**, accelerate **improvements in food security and nutrition** outcomes, address **territorial imbalances and inequalities** among food system actors, and **improve resilience to climate and other environmental shocks**.

Zambia could benefit from the allocation of sufficient resources to the agricultural and allied sectors and investment in the key drivers of growth in a more strategic and targeted manner. More resources should be allocated to research and development, training and extension, and rural infrastructure. Priority should be given to environmental sustainability and climate resilience in implementing programmes and activities to transform the food system. These efforts could be boosted by reducing the proportion of annual public spending on ineffective subsidies – for maize production and marketing, in particular – and developing incentives or subsidies that encourage more diversified crop and livestock production using sustainable agricultural practices.

Several strategic and policy documents collectively articulate the different aspects of a sustainable food system in Zambia, including the multi-sectoral Seventh National Development Plan (2017–2021), the Economic Recovery Plan (ERP), the Second National Agricultural Policy (2016–2021), and the National Agricultural Investment Plan (2013–2021). Implementation of these policies and strategies, however, needs invigoration and a focus on key levers of change to bring about sustainable food system transformation.

Success in implementation requires effective coordination, backed by improved monitoring and evaluation of steps taken. Progress has been made in coordinating interventions and activities in the nutrition sector coordination at all levels, led by the National Food and Nutrition Commission. Similar coordination and implementation mechanisms across the food system would also help to achieve improved outcomes.

Transformation of the food system in Zambia requires deepening this initial assessment to build on the insights gained and to identify and adapt interventions that seize opportunities and address systemic constraints to the desired impact.

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