

Environmental Resilience—Food and the City



Christine Chivandire, Thebeth Masunda, and Innocent Chirisa

Abstract The production and consumption of food in urban centres has changed many activities within urban centres to ensure food availability and reduce food insecurity among urban populations. This study seeks to unveil the interconnection between food systems, processes, the city and the environment. Many sources have been used to indicate and scrutinise the connection between these relations. Already existing studies have been used to support this notion. This chapter demonstrates that there is a relationship between food production, marketing and its consumption together with the city and the environment. Food and its processes have got both positive and negative impacts on the environment as revealed by this chapter. From the information gathered, it has been discovered that the production of food has greater effects and is both a threat to the environment as it results in the emission of greenhouse gasses that cause climate change while urban agriculture is also a solution to climate change as it allows the capture and storage of carbon gasses in the plants and crops that are grown in the urban societies. It is recommended that food production in the cities be done in such a way that the environment is preserved. In as much as food is a necessity in the cities, correct measures should be taken to strike a balance between the production and the environment.

Keywords Environmental systems · Management · Food market · Urbanity · Regulation

C. Chivandire

Department of Architecture & Real Estate, University of Zimbabwe, Harare, Zimbabwe

T. Masunda

Department of Community & Social Development, University of Zimbabwe, Harare, Zimbabwe

I. Chirisa (✉)

Department of Demography Settlement and Development, University of Zimbabwe, Harare, Zimbabwe

Department of Urban & Regional Planning, University of the Free State, Bloemfontein, South Africa

1 Introduction

In the context of growing urbanisation, urban poverty and climate change, the importance of urban food security and urban food systems is increasingly recognised. Urban food insecurity has been identified as a challenge for many low-income urban dwellers in Africa. This chapter explores the issues of food security and food systems in urban areas. Emphasis is placed on contribution of urban farming on urban food security and its effects on the environment. On the other hand, the advent of the coronavirus pandemic has had adverse impact on economies and livelihoods in urban areas. Hence the chapter highlights the impact of this pandemic on food security in urban areas as well. The rate of urbanisation has been increasing and is expected to continue rising as more people especially in developing countries continue to move from rural to urban areas. As such, more pressure is put on scarce urban resources to sustain this growing population. Food security has thus, become an issue of concern in urban areas, hence the need to explore food strategies, systems and processes in urban areas. The rapid urbanisation is also linked to various public health issues in urban areas, especially in informal settlements and densely populated areas. This chapter therefore highlights the COVID-19 pandemic affects urban life mostly in developing countries. Emphasis is on understanding how the pandemic has affected food security for urban dwellers and their general public health.

It is the duty of the city to provide adequate food with all nutritional values that make up a balanced diet for the people living in the urban areas and ensuring equality in terms of access to quality goods and services. Due to the increased rate of urbanisation, innovative and sustainable strategies are therefore, vital to supply enough food to meet the demand of the people. Among them is the adoption of urban agriculture that has become a part of the supplier of food consumed in the cities. Data from other studies shows that there is a growing inverse relationship between the production of food and the environment. There are negative effects of this relationship that have been recorded and measures have been taken to mitigate them. It has been noted that food production in cities is mostly a response to urban poverty, inadequate salaries, irregular and unreliable access to food. Regardless of the benefits associated with producing food in urban areas, a number of negative effects have been recorded. Food production in urban areas has affected the physical and the built environment in different ways and has brought both positive and adverse impacts on the environment.

2 Background and Overview

Food production, marketing and consumption are activities that are undertaken in both rural and urban areas around the world. Over the years the concept of food security has increasingly become topical due to the growing complexity and uncertainty

in food systems. Traditionally, debates on food security focused much on agricultural production and the rural economy [6]. This emphasised focus on agriculture was justifiable given that agriculture had a larger impact on poverty reduction, that in many rural areas and developing countries was aligned with food security. Hence, early concepts of food security focused on the supply side of food, concerned with food volumes where rural areas were the major production zones. It later evolved to incorporate the distribution aspect, recognizing the importance of agriculture in urban areas and its effects on food security amongst urban dwellers. Therefore, debates on production of food have become crucial for both rural and urban dwellers. It should however, be noted that urban areas historically emerged as places to dispose of agricultural surplus and places where food was consumed rather than produced.

Due to economic constraints that affected many urban dwellers especially in developing countries, low-income households and individuals began to practice urban agriculture to augment their incomes and reduce food insecurities. FAO [16], observes that urban agriculture is done to increase production of food in different countries, both in developed and developing. It is done worldwide with an estimated population of 800 million practicing it. Smit [28] shares the same sentiments, arguing that urban agriculture is an industry that produces, processes and markets food in response to the daily demands of the consumers within the town, city and the metropolis of a particular area.

In an attempt to alleviate urban poverty and urban food insecurity, focus was shifted to the concept of urban farming and urban agriculture. Different scholars have written in support of urban farming. It is argued that urban farming plays a crucial role in addressing consumptive needs of urban households and supplementing household income or reducing on food expenditure. Literature indicates that the majority of poor households in urban areas spend half of their incomes on acquiring food [1]. Urban agriculture is thus, regarded as a way to reduce this household expenditure on consumptive needs. Urban farming offers households a supply of fresh and nourishing produce that they could have bought from the food market. Dolekoglu and Gun [14] have noted that in developing countries, urban agriculture is mainly directed towards the grower's own consumption though market-focused small-scale agriculture has proved to be more profitable.

Chihambakwe et al. [12] posits that the main function of urban and peri-urban agriculture is seldom for monetary gain but augmenting household consumptive needs. Such is supported by Prain and Lee-Smith [25] as they argue that urban farming is not a significant contributor to urban household livelihoods given that there are diverse livelihoods in urban households, agriculture is just a part of such. For those who engage in urban farming, its main contribution is on consumption rather than market. Although both low- and high-income households are involved in urban agriculture, they do so for different reasons and they adopt different strategies. Moreover, household members have different degrees of involvement in these agriculture activities. Crush et al. [13] observes that although urban agriculture is practiced by people from different social classes, there is a great variation in urban agriculture depending on the income received by individuals and families. With a larger population of

people who practice urban farming being women. Crush indicates that in Harare high urban agriculture is practised amongst low-income areas.

Varying degrees of effects associated with urban farming have been recorded across the globe. Regardless of the identified benefits of urban farming, a different school of thought is emerging. The scholars argue that by cultivating in cities, urban dwellers are ruralising urban areas. The argument is that, cultivating in open spaces in the city is counter to the growth, planning and development as it spoils the aesthetics of the city. Chihambakwe et al. [12] observes that urban and peri-urban agriculture is seldom acknowledged through statutes and ordinances. Some governments discourage urban farmers from investing on the land since they can be moved any time due to insecure land tenure. Urban farmers do not have land rights, hence, the lack of sustainability in their activities. The idea of urban agriculture brings a number of problems as some question the safety of urban farming given the limited space and growing human population in cities. As such, there is need to evaluate whether the health benefits of urban agriculture outweigh its possible risks. Mudzengerere [22] discovered from his study that urban farmers in Bulawayo practise conventional mechanised farming on their farming lots particularly in low-density and peri-urban areas where there is availability of land. These processes are mostly done in the urban environments and they have different impacts on the natural and the built environment.

The link between food production, its marketing and the city and the environment has been debated across the world. From the studies undertaken it has been noted that food production has both negative and positive effects on the environment. Global reactions to conventional agriculture are centred on environmental concerns, arguing that nature of production and distribution increases greenhouse gas emissions. Tefft et al. [30] posit that the food system is a primary climate change driver, contributing to some 30% of greenhouse gas emissions related to agricultural production alone. Pachauri [24] supports the argument that food systems are very polluting in terms of climate change as they are associated with large volumes of greenhouse gases that are causing global warming and the change of climate. Although food production has been discussed earlier, there are limited measures taken to ensure environmental sustainability and how to preserve both the natural and the built environment. In as far as food security is vital, correct measures should be taken to better cities and reduce environmental degradation. The question is what should be done to create a balance between the production and the environmental sustainability in the context urban food (in)security.

It should however, be noted that although a significant growth in food production has been reported over the years, the number of undernourished people has remained high. Food supplies are severely compromised by various disasters that are expected to have greater effects as the climate changes. This changing landscape of food production, distribution and consumption has drawn attention to the nature of contemporary food systems, security and resilience. Most importantly, exploring the current global food crisis that many argue is not only as a result of natural disasters that affect food production, rather improper and unequal distribution of resources and agricultural products around the globe [26]. Tendall et al. [31] argues that almost

1 billion people in developing countries are hungry or undernourished while about 1.5 billion in developed countries are overweight or obese. Such discrepancies have increased social and economic inequalities in the world and contributed to the coexisting challenge of malnutrition and overconsumption in this globalised world. As such, in most developed countries it is now about the demand for high quality natural food while in less developed countries it is about food provision and livelihoods of millions living in poverty.

3 Conceptualising Food, Resilience, Environment and the City

3.1 Food Security

Food security cannot be comprehensively measured because of its multidimensional nature. Although many studies have been carried out on food security, they have produced different results because each study has been probing for a different dimension of food security. Food security is increasingly standing out among most problems in developing countries, both in rural areas and in urban areas. Many people are struggling to secure or access nutritious and healthy food [6]. The definition of food security as given by FAO [17] and Barrett [3] sums up food security as consisting of hierarchical pillars; food availability, access to food, utilisation of food and stability. Food security exists when all four dimensions are realised simultaneously. To achieve food security, the following elements are necessary; (a) the capacity to produce, store, distribute and if necessary, to import sufficient food to meet the basic food needs for people; (b) a maximum level of robustness to reduce vulnerability to market fluctuations and political pressures; and (c) minimal variations in access to food in relation to season, cycle and other factors. Food security is therefore, a situation where all people at all times have physical, social, access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for active and healthy lives (FAO 2003; WHO 2011 cited in [11]).

Ephrem [15] and Oluyole et al. [23] carried out a study on household food security in the Northern and Eastern part of Ethiopia and Nigeria respectively and found out that there is an association between household food security and various socio-economic and bio-physical factors, such as age of household head, dependency ratio, land use and availability of inputs, land quality and farmer's knowledge on the effect of land degradation on food security. These factors are identified as major determinants of household food security.

3.2 Pillars of Food Security

Food security is a complex phenomenon that manifests itself in a number of physical conditions and different dimensions are used to measure it. Food security is not entirely about the quantity or amount of food available. “Food security is more than having food on the table, it is a requirement for personal survival and advancement,” ([29]: 16). Barret (2010) notes that food security consists of four hierarchical pillars that is food availability, access to food, utilisation of food and stability.

The first pillar of food security is the physical availability of food. This pillar of availability denotes the physical presence of sufficient quantities of food at a household level. It entails a situation of having enough physical quantities or supplies of food available to provide everyone with an adequate number of calories. This dimension is highly determined by food production, levels of stocks and net trade. Accessibility is another pillar that entails that food security goes beyond availability. It highlights that food access is the ability of people to have sufficient resources to acquire appropriate food for a nutritious diet. In essence, food availability does not guarantee access if one has limited or no resources. The accessibility pillar considers the economic, social and physical access to food [19]. It takes into consideration the financial status, means of physical access, such as transportation. It is important to note that food can be available on the market, however, some people are rendered food insecure because they cannot afford to buy the food in the shops, thereby limiting its accessibility to all. Individuals and households are considered to be food secure when there are adequate food supplies available and accessible (Stringer cited in [9]).

Food utilisation is another pillar of food security that captures the nutrition components. While availability and accessibility of food is necessary, utilisation of nutrients by the body is crucial to support human health [31]. This pillar addresses food security issues that are related to diet quality, food safety and adequate intake of macronutrients and essential vitamins and minerals. The fourth pillar focuses on the stability of availability, accessibility and utilisation over time. The stability pillar ensures that nutritious food is available and everyone has access, all the time.

3.3 Food Systems

Food security is determined by varying factors as highlighted by the different pillars discussed above. Understanding food security holistically requires one to examine and understand the food systems that allow availability, accessibility, utilisation and stability of food at different levels. Seekell et al. [27] state that ensuring food security requires food production systems that function well regardless of disruptions. Therefore, it is important to understand the factors that contribute to the global food systems ability to respond and adapt to such disruptions.

Food systems encompass the entire range of activities involved in the production, processing, marketing, consumption and disposal of goods that originate from agriculture, forestry or fisheries, including the inputs needed and the outputs generated at each of these steps. Food systems also involve the people and institutions that initiate or inhibit change in the systems and the socio-political, economic and technological environment in which these activities take place ([30]: 2).

Food systems are networks of activities connecting people to their food. They encompass production, distribution and consumption components that are connected through complex social, ecological and economic relations [26]. These food systems comprise of all activities involved in food production, processing, packaging, distribution, retail and consumption. These include farmers, fishers, rangers, foragers, consumers; in essence food systems involve anyone connected in the network from food production to utilisation. The food system has been defined as “*an interconnected web of activities, resources and people that extends across all domains involved in providing human nourishment and sustaining health, including production, processing, packaging, distribution, marketing, consumption and disposal of food. The organisation of food systems reflects and responds to social, cultural, political, economic, health and environmental conditions and can be identified at multiple scales, from a household kitchen to a city, county, state or nation*” ([10]: 2).

As such, food systems have a critical role in ensuring food security at different levels. These systems determine that the four pillars of food security are attained. Harris and Spiegel [19] highlight that given the increased climatic changes and unstable markets, food systems have become vulnerable to different hazards. Hence, the move towards the resilience discourse in order to predict, assess and improve how systems and actors within food systems can cope with such disruptions. Food security is therefore, used as a normative benchmark for guiding policy-makers in resilient food system development.

3.4 Resilience and Food Systems

The concept of resilience in food system gained momentum through efforts to measure how well individuals and institutions or systems are able to cope with the challenges and shocks that disrupt food security. Seekell et al. [27] argues that ensuring food security requires food production and distribution systems that function regardless of disruptions. Understanding factors that contribute to the global food systems’ ability to respond and adapt to such disruptions is therefore critical for enabling long term sustainability. Given that food security is when all people at all times have physical, economic and social access to food, ensuring food security therefore, requires that food production and distribution system to function well despite potential disruptions. The resilience thinking has a high potential to contribute to food security and sustainable food systems.

Resilience entails the ability to cope with adversities. Its key attribute is the ability to respond to shock and stressors. In the food system these include immediate natural

disasters that disrupt food production and access to food. Food systems are increasingly exposed to multiple internal and external drivers of change. Slow but major shifts, such as climate change, soil degradation, pest outbreaks, economic and political crises and population growth are adding pressure to the global food systems [31]. In an attempt to emphasise the relevance of continuity, the economic development field identified sustainability as a preferred framework for describing the best practices of development [19]. Sustainability entails preserving the capacity of a system to function in the future. It symbolises the society's ability to maintain its economic, social and natural systems for longer periods. This is one of the conditions of maintaining resilience. Whereas sustainability measures a system's performance, resilience implies the capacity to continue providing the same function over time despite disturbances [31]. In relation to sustainability that has been broadly defined as the capacity to achieve today's goals without compromising the ability to meet future goals, resilience can be broadly defined as the dynamic capacity to continue to achieve the goals despite disturbances and shocks. Resilience is therefore complementary to sustainability. These two concepts are crucial in ensuring food security in the contemporary society.

4 Food Security and Urbanisation

Urbanisation is happening at a different pace across the globe. Wiskerk [35] posits that there are enormous variations in the patterns of urbanisation between regions and even a greater variation in the level and speed with that individual countries or individual cities within regions are growing. Tefft et al. [30] observes that rapid urbanisation in Asia and Africa is producing major demographic and spatial transformations in human settlement patterns. Regardless of this general acceptance of increasing rate of urbanisation, the majority growth of urban population occurs in smaller cities and towns, thereby creating a major resource challenge. This rapid urbanisation is changing the way food systems are perceived in urban areas. The types of foods consumed, where they are consumed and the way they are grown, processed and delivered to the consumer has also changed. As such these changes are impacting on the nutrition and health of the urban populations.

In the context of growing urbanisation, urban poverty is also increasing. Urban food insecurity has become a major challenge for low-income urban dwellers in Africa and other less developed countries. As the pillars of highlights, it is not about the availability of food that determines food security only, food insecurity for some urban dwellers is not caused by shortage of food but inability to afford it. Battersby and Watson [4] state that urban food insecurity is not entirely influenced by food production since urban households source their food from retail outlets. Therefore, understanding urban food security requires one to consider urban food markets, distribution structure and then explore how they impact on food security and urban poverty. In essence, urban food security is determined by the food systems and how sustainable and resilient they are. Such is supported by Burton et al. [6] who argues

that urban populations have found their food supplies to be compromised by different threats and shocks given the length of their food supply chains. As such more attention needs to be on the nature of contemporary urban food systems in general and security and resilience of urban food system.

5 Nutrition Transition and the Environment

Food environments and institutions are rapidly changing as the food systems are responding to the rising global food demands. As the population increases, their food and dietary preferences are also changing affecting their nutrition in the process. Feeding such a growing population requires food systems to be more productive, competitive, sustainable and capable of producing affordable safe foods. With billions suffering from diet-related morbidity, access to affordable nutritious food is critical for improved human health and welfare [30]. Growing demand for meat, dairy products, convenient and processed foods consumed outside the home environment is contributing to over-nutrition epidemic. There are significant inequalities in the consumption patterns between low- and high-income households within and across countries around the globe. Urban households in low-income areas exhibit limited dietary diversity with an over reliance on starchy foods, high energy foods but deficient in protein and micronutrients. This is due to lack of income to access balanced nutritious foods. Although urbanisation was associated with acceleration of the nutrition transition, traditionally, this was identified by changes in consumption as driven by increased disposable income [4]. Currently nutritional transition is identified by malnutrition due to poor diet. However, at the same time, overweight and obese people and diet-related non-communicable diseases are on the increase.

In recent years there has been a noted increase in the consumption of animal products [8]. As quality of life progresses, demand for animal protein also increases hence, the greater demand for feed crops since livestock production has increased to cater for this rising demand. As much as livestock production is necessary for improved human diet, excessive production can lead to competition for feed stuffs between human beings and livestock. With increased annual livestock production, the demand for feed stuffs is also increasing, yet the yields of corn and soya beans are not increasing at the same rate. As such, rather than improved production in general, agriculture development has become essential for food security. Although agriculture production has improved and more production is witnessed, the major challenge is that this improved production is not directly contributing to food security in terms of availability and affordability.

6 Food Security and Pandemics

Food security is more than availability of food as it entails accessibility and utilisation as well [31]. It is therefore important that people have the means to access food from the market and other food systems in the event they do not produce enough. Given that few people in urban areas produce their own food, the majority rely on the market to access nutritious and adequate food to meet their dietary needs. Disruptions in the food systems has the potential to affect such populations. The year 2020 saw the spread of an airborne coronavirus across the globe. Coronavirus or COVID-19 as the virus is affectionately known has adversely affected all aspects of life, from the way people interact to how they communicate, how they work and how they move around. Many countries across the globe have put in place measures to limit both internal and external human mobility during the coronavirus pandemic [21]. Governments across the globe adopted 'biggest state-led mobility and activity restrictions and this has proven effective in curbing the spread of the virus [32]. Strict lockdowns in the form of complete shutdowns have been implemented with greater emphasis on social distancing, banning of social gatherings and other public activities.

Although the lockdowns have proven effective in curbing the spread of the virus, they came at a high cost on the economies and livelihoods of many. They disrupted three main areas of human life, which are loss of income for those working in the informal sector, fall in income from remittances and disruption of food systems [32]. Measures to contain the pandemic are causing a major disturbance to food systems as disruptions to supply and access to food have been witnessed during the lockdown. Livelihoods and income sources are key to determining household access to food and improved welfare. Consequently, these lockdowns have had adverse effects on food security and nutrition especially those working in the informal sector who depend on a hand to mouth. Decline household income due to lockdowns translated to deepening poverty as many could not afford the very basic necessities. Due to these restrictions, World Bank 2020 cited in UNHABITAT [32] estimates that over the next five years, emerging and developing economies could experience drops in output and an additional 100 million people could be pushed into extreme poverty. USAID [33] posits that there is need to prevent this potential widespread of hunger, malnutrition and poverty because if left unchecked may pose a serious threat to the attainment of SDGs 2 and 3.

COVID-19 and its response measures have exacerbated various shocks on populations in the informal settlements. The spatial and socio-demographic configuration of informal settlements makes them more vulnerable to COVID-19 spread and poses as threats their livelihoods. Such controls, such as social distancing and regular washing of hands are not practical in such areas given there is limited or no provision of basic sanitation services. UNHABITAT [32] observes that, in urban areas, maintaining acceptable levels of hygiene in houses, work places, shops and public transport are crucial to surviving pandemics. The same dense interaction networks of people that are behind the cities' potential economic growth accelerators also carry embedded

risks, such as the spread of diseases and viruses. Hence there is need for proper planning of cities where health becomes a new guiding principle in urban planning. It is posited that for New Urban Agenda to succeed, there is need to incorporate public health as a central consideration in decision-making [34]. Expected health impacts should be assessed during the development of policies and all the planning.

7 Methodology

This chapter used secondary data from other studies to assess food supply in the urban areas in Zimbabwe and other urban areas around the globe. Various publications including published journal articles, book chapters, government and international bodies reports. Research reports by different research scholars and universities were also part of the documents reviewed to gather information for this study. Most of the studies reviewed were done using qualitative methods. This strengthened the analysis of this study since some of the results from the documents were quoted verbatim hence giving the actual information as presented by those who participated in the primary data collection.

8 Results

Urban agriculture has been regarded as a significant source of household food due to declining incomes in vulnerable urban households. Literature from both developed and developing countries concurs that urban agriculture can be a potential viable policy response to complex challenges of feeding the growing urban population amid declining production in rural areas. Many have commended urban and peri-urban agriculture for providing urban households with perishable products, such as vegetables. Arku [2] observes that vegetable supplies from within 30 km of urban areas in African countries attributes to 70% of the sources of these foods to urban agriculture. Other than provision of perishables, literature from African countries shows that farmers from African cities focus on producing staple foods, such as maize, cassava, among others. Much of the food produced in urban areas is for household consumption, hence it attributes to household food security and urban food supply.

The informal economy has been the lifeblood of many cities in developing countries. However, the nature of informal economic activities makes workers and their families vulnerable. Informal sector requires participants to go to work on daily basis as they depend much on a hand to mouth with little or no possibility of making any savings. Disturbances in their daily economic activities may have lasting effect on their income level, food security and general welfare. Urban planning should therefore consider sustainable ways to assist those in the informal sector to make necessary savings to fall back on in the event that they are not able to work everyday.

Nutritional improvement is an important contribution of urban agriculture to the vulnerable urban households. Given the epidemic of HIV & AIDS in Africa and that the majority of the affected households are poor, availability of fresh foods from urban agriculture helps in improving the nutritional status of such vulnerable groups. Enhanced food security can then improve adherence to HIV & AIDS treatment, thereby, help in boosting their immune systems and allow them to live healthier. Moreover, producing food within and around cities cut the costs of transportation and this can lead to reduced market prices. As such even the poor populations can afford to buy food on the market and ensure both availability and accessibility of food to all.

Regardless of the identified benefits of urban agriculture, it is considered oxymoronic and incompatible with existing land use policies. Urban development and policy did not tap into urban agriculture as a viable strategy to increase food supply and ensuring stable food supply in urban areas. A number of questions regarding the effects of urban agriculture on the environment have been posed. Hallett et al. [18] asked whether urban environments are sustainable for food production. They went on probing that if they are not, should urban agriculture be discouraged or should the environments be remediated so that agriculture can be performed. As such governments and city authorities, especially in African countries do not prioritise urban agriculture as a development initiative. Urban agriculture is therefore, regarded as a public health nuisance and economic activity characteristic of rural not urban economies. As a result, cases of the harassment and lack of support have been reported [2].

In Zimbabwe, city planning systems do not cater for agriculture and it is not classified as an urban activity, hence not backed by any statutory instrument and as such it is regarded as illegal. In a number of cities in the country cases of crop destruction, such as crop slashing were reported. In Zambia, it is officially considered illegal and prohibited by the law. However, authorities tend to turn a blind eye and ignore the activity where it is practiced. Authorities can only show concern in cases where the land in question is required for development or if there is disease outbreak or other problems.

Regarding the relationship between the environment and urban production, it has been highlighted that there is a relationship existing. Although positive impacts exist, they vary between regions and influence mainly the level of development of the country in question. In developed countries where resources are in place to support urban farming, it has been realised that urban agriculture can help mitigate the effects harmful chemicals and heavy metals from urban storm runoff [5]. Urban farming has therefore, been proposed as a potential mechanism for remediation of former industrial sites often known as brownfields [18]. Cities are characterized by the phenomenon of urban heat island [7]. This is due to excess greenhouse gas emission due to high levels of human activity. Such challenges can be ameliorated by having enough plants in urban settings. However, such benefits are limited to developing countries whose economic capacities to support such initiatives are minimal. Campbell argues that the value of urban agriculture lies in places other than large scale application. It requires resources that are environmentally friendly and sustainable.

Due to lack of resources to support extensive farming suitable for urban areas, African cities require large areas of land to practice farming that can produce enough for the growing urban population. However, such space is not available given the limited space in cities and towns. Moreover, access to arable soils in urban areas is limited given that contaminated soil is common place in urban areas. Another effect of food in the urban environment is pollution. The production and processing of food is associated with different types of pollution that disturbs the urban form. Land, air and noise pollution are as a result of food production, processing and marketing [20]. In African cities, urban farming can exacerbate contamination of soil and water given that the current practice still uses chemical fertilizers, synthetic pesticides and industrialized machinery that is known to have negative environmental effects. As such, the practice of urban farming is not supported by many African governments.

In terms of food markets in urban areas, there has been reported that the landscape of food production, distribution and consumption has changes over the years. Given these changes, analysis of food security in urban areas should not focus on production only but rather incorporate the aspect of marketing since a larger percentage of urban dwellers source their food from retail outlets. Wiskerk [35] observes that living and eating in cities is linked to the globalised chains of food provision. Processed foods, long distance, food, transportation and supermarkets as food outlets for domestic consumption are on the rise. As the world population grows and the rate of urbanisation increases, diets are also changing. People have changed their dietary preferences and as such they are acquiring food from different parts of the world. Such results show that food consumed in urban areas is produced in different places. With the increased consumption of animal products, urban farming may not produce a larger portion of food consumed especially by high-income households.

Prain and Lee-Smith [25] argue that in complex city ecosystems that include informal economies and social networks, poor households depend on multiple income sources. As they strive to earn a living in the urban areas, low-income individuals engage in the informal sector. There are different activities that people partake as a way of earning a living and some are selling food to other low-income individuals. Supermarket revolution has transformed the way in which urban and rural people source their food. Supermarkets now handle 50–60% of food retail and most if not, all food requirements can be obtained from supermarkets. There is however a proliferation of informal food networks and outlets that is now playing an important role in ensuring the availability and accessibility of food in urban areas. These informal food traders have the advantage of serving low-income households as they break bulk and sell food stuffs in smaller quantities that are affordable to low-income households.

In spite of the identified advantages, these informal food retailers are regarded as a public health risk in many African countries. Makwanda and Moyo [20] also argue that the catering industry in Zimbabwe has resulted in the increase in food borne illness due to contamination and poor food handling. Communicable disease out breaks are common in many developing countries and containing them becomes a challenge due to these informal and pavement food retailers. Many low-income households turn to these informal traders because they are cheaper as compared to

the formal markets. This makes low-income households more vulnerable to both ill health and food insecurity.

9 Discussion and Recommendations

Attaining food security in urban areas has proven to be a challenge especially among low-income households. As the pillars of food security entail, availability, accessibility, utilisation and stability is crucial for food security to be attained [19]. Production can help individuals and households to improve their food security statuses by making food available to them. As mentioned above, urban agriculture has the potential to improve availability of food to many low-income households in urban areas. However, given that urban food production is not well supported by governments and institutions in African countries, many urban dwellers fail to produce sustainably in their urban settings.

Other than production of food, urban dwellers can also access food from the market. However, given the limited incomes in some households, accessing food with dietary requirements to lead a healthy life becomes a challenge. As indicated above, when low-income households fail to afford food from the formal retailers, they turn to informal traders who help them by breaking bulk and sell products in smaller quantities that are affordable. However, such informal food traders are identified as health hazards that perpetuate the spread of communicable diseases. Such has limited the ability of low-income urban households to reduce food insecurity. Affordable ways to ensure food security amongst urban poor are compromised. As food security in urban areas is likely to remain a major challenge.

Given the relevance of urban farming in ensuring food security, it is imperative that:

- governments and other stakeholders support this practice in order to reduce effects of food insecurities.
- development policies and urban planning consider urban agriculture as strategy for poverty reduction and food security especially among low-income urban households.
- many urban households acquire their food from retail supermarkets, it is therefore, important to ensure that basic food requirements are accessible especially to the low-income households. Such food stuffs should be subsidised to ensure accessibility.

References

1. Abdulkadyrova MA, Dikinov AH, Tajmashanova HE, Shidaeva LA, Shidaeva EA (2016) Global food security problems in the modern world economy. *Int J Environ Sci Educ*

- 11(12):5320–5330
2. Arku G, Mkandawire P, Aguda N, Kuire V (2012) Africa's quest for food security: what is the role of urban agriculture?. The African Capacity Building Foundation, Harare
 3. Barrett CB (2010) Measuring food insecurity. *Science* 327(5967):825–828
 4. Battersby J, Watson V (2018) Improving urban food security in African cities: critically assessing the role of informal traders. In: Cabannes Y, Marocchino C (eds) *Integrating food into urban planning*. ULC Press, London
 5. Begley NH (2018) *The public health and environmental benefits of urban agriculture: an analysis of stakeholder perspectives*. University of Washington, Washington
 6. Burton P, Lyons K, Richards C, Amati M, Rose N, Desfours L, Pires V, Barclay R (2013) *Urban food security, urban resilience and climate change. Synthesis and integrative research final report*. National Climate Change Adaptation Research Facility, Gold Coast
 7. Campbell N (2017) *Farming cities: the potential environmental benefits of urban agriculture*. Duquark in peer reviewed articles
 8. Cao Y, Li D (2013) Impact of increased demand for animal protein products in Asian countries: implications on global food security. *Anim Front* 3(3):48–55
 9. Caraher M, Coveney J (eds) (2016) *Food poverty and insecurity: international food inequalities*. Springer, Cham
 10. Chase L, Grubinger V (2014) *Food, farms, and community: exploring food systems*. University of New Hampshire Press
 11. Chazovachii B (2012) The impact of small-scale irrigation schemes on rural livelihoods: the case of Panganai irrigation scheme Bikita District Zimbabwe. *J Sustain Develop Africa* 14(4):217–231
 12. Chihambakwe M, Mafongoya P, Jiri O (2018) Urban and peri-urban agriculture as a pathway to food security: a review mapping the use of food sovereignty. *Challenges* 10:6. <https://doi.org/10.3390/challe10010006>
 13. Crush J, Hovoroka A, Tevera D (2011) Food security in Southern African cities: the place of urban agriculture. *Prog Dev Stud* 11(4):285–305
 14. Dolekoglu C, Gun S (2017) *Urban agriculture: search for agricultural practice in urbanized rural areas*. Turk J Agric Food Sci Technol (Research Gate Publications)
 15. Ephrem A (2019) *Integrating sustainability into university curriculum in Tanzania: challenges and prospects*. Available online: <http://repository.udom.ac.tz/bitstream/handle/20.500.12661/2613/Abdon%20Ephrem.pdf?sequence=1&isAllowed=y>
 16. FAO (2006) *World agriculture towards 2030/2050*. Food and Agriculture Organization, Rome
 17. FAO (Food and Agriculture Organization of the United Nations) (2008) *Declaration of the high-level conference on world food security: the challenges of climate change and bioenergy*. FAO, Rome
 18. Hallett S, Haogland L, Toner E (2016) Urban agriculture: environmental, economic and social perspectives. *Hortic Rev* 44:65–120
 19. Harris J, Spiegel EJ (2019) *Food systems and resilience: concepts and policy approaches*. Center for Agriculture and Food Systems. <https://www.vermontlaw.edu/academics/centers-and-programs/center-for-agriculture-and-food-systems/projects>
 20. Makwanda PN, Moyo E (2016) Food safety and violation by food handlers in the food production industry in Zimbabwe. *Am J Nutr Food Sci* (SciKnow Publications Ltd)
 21. Mamun MA, Griffiths MD (2020) First COVID-19 suicide case in Bangladesh due to fear of COVID-19 and xenophobia: possible suicide prevention strategies. *Asian J Psychiatry* 51(1):1–2
 22. Mudzengerere FH (2012) *The contribution of women to food security and livelihoods through urban agriculture in The City of Bulawayo*
 23. Oluyole KA, Oni OA, Omonona BT, Adenegan KO (2009) Food security among cocoa farming households of Ondo State, Nigeria. *ARPN J Agric Biol Sci* 4(5):7–13
 24. Pachauri R (2008) Climate change and sustainability science. *Sustainability Science* 3(1):1–3

25. Prain G, Lee Smith D (2010) Urban agriculture in Africa: what has been learned? In: Prain G, Karanja N, Lee-Smith D (eds) *African urban harvest: agriculture in the cities of Cameroon, Kenya and Uganda*. Springer; IDRC; CIP, New York (USA), pp 13–35. ISBN 978-1-4419-6571-4
26. Schipanski ME, MacDonald GK, Rosenzweig S, Chappell MJ, Bennett EM, Kerr RB et al (2016) Realizing resilient food systems. *BioScience* 66(7):600-610
27. Seekell D, Carr J, Dell'Angelo J, D'Odorico P, Fader M, Gephart J, Kumu M, Magliocca M, Porkka M, Puma M, Ratajczak Z, Rulli MC, Suweis S, Tovani A (2017) Resilience in the global food system. *Environ Res Lett* 12:025010. <https://doi.org/10.1088/1748-9326/aa5730>
28. Smit J (2006) *The diverse roles of urban agriculture: case study of South Durban Basin KwaZulu-Natal*. Department of Agriculture Sciences, Royal Veterinary and Agricultural University, Frederiksberg, Denmark
29. Sonnino R (2016) The new geography of food security: exploring the potential of urban food strategies. *Geogr J* 182(2):190–200
30. Tefft J, Jonasova M, Adjao R, Morgan A (2017) *Food systems for an urbanizing world*. World Bank, Washington DC
31. Tendall DM, Joerin J, Kopainsky B, Edwards P, Shrek A, Le QB, Kruetli P, Grant M, Six J (2015) Food system resilience: defining the concept. *Glob Food Secur* 6:17–23
32. UNHABITAT (2020) *Impact of COVID-19 on livelihoods, food security and nutrition in East Africa: urban focus*. <https://docs.wfp.org/api/documents/WFP-0000118161/download/>
33. USAID (2020) *COVID-19: shocks on nutrition and potential mitigation USAID guiding principles and recommendations*. USAID Nutrition Leadership Council Responsible Office: RFS/CN
34. WHO (2016) *Health as the pulse of the new urban agenda: United Nations conference on housing and sustainable urban development Quito, October 2016*
35. Wiskerk JSC (2015) *Urban food systems*. In: de Zeeuw H, Drechsel P (eds) *Cities and agriculture: developing resilient urban food systems*. Routledge, New York