Enabling Urban Agriculture in the Global North and South: A Comparative Study of the UK and Nigeria

Tayo Ajisope

School of Science, Engineering and Environment
The University of Salford, Manchester
United Kingdom

A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy

June 2023

Table of Content

List of Figures

List of Tables

Acknowledgement

Firstly, I would like to give glory to the Almighty God for giving me the strength, unending mercy, and grace to finish this project.

I owe a great deal of gratitude to my wonderful supervisors, who have been consistently there for me and helped me grow professionally over the past few years. The range of Professor Michael Hardman and Andrew Clark's expertise and experience has added so much to my PhD journey, and their ongoing reassurance and patience have helped me tremendously! Thank you very much for being so kind with your time, providing prompt responses and excellent advice even with your busy schedules.

I want to thank everyone who agreed to speak with me and assisted me with my research at both of my study locations. I am grateful for the kindness of the people I have met during my PhD program, and I feel very fortunate to have crossed paths with such fascinating and generous people.

Thank you to my PhD colleagues for their moral support and stimulating conversations.

Lastly, I want to say a big thank you to my incredible parents for their almost endless capacity for support, love, prayers, and inspiration. Special appreciation goes to my wonderful siblings, Doyin, Alex, and Tosin, for their moral, financial support and encouragement. I would be remiss if I did not recognise my amazing husband, Oluwaseun, for his patience and support on the home front while I sat at my desk for hours on end. And to my amazing son, Oluwalani, for putting up with "busy mummy" while I wrote this thesis. Their belief in me has kept me optimistic throughout this process.

Abbreviations

DEFRA	Department for Environment, Food & Rural Affairs
EEA	European Economic Area
FAO	Food and Agriculture Organization
GN	Global North
GS	Global South
HLPE	High Level Panel of Experts
OECD	Organization for Economic Co-operation and Development
UA	Urban Agriculture
UN	United Nations
UNDP	United Nations Development Programme
UK	United Kingdom
US	United States
WHO	World Health Organisation

Abstract

As the world's urban population rises, we must reconsider our relationship with food. As a result of the growing population and insufficient food produced in rural regions, poverty and hunger are on the rise. Urban Agriculture (UA) has the potential to reduce food miles and improve urban food security. The coronavirus pandemic hampered the movement of people and products, reducing access to agricultural labour and the conventional food system; however, since the pandemic, UA has gained increased interest from a host of actors. UA has attained considerable success in the Global North (GN), but not in the Global South (GS) due to expensive set-up costs, negative perception, upscaling challenges and inadequate government support. In the GS, UA has a long history overall, but formal UA practice is restricted. This research assesses UA in the GN and GS by examining current methods and potential for upscaling practice in Lagos and the UK. This study uses a qualitative methodology to compare urban food growing systems. In Nigeria, limited education on innovative UA practices, exclusion from planning and zoning, and lack of supportive regulations and incentives are evident. Findings however show that the government's interest in UA has increased, as has the perception of young people and urban inhabitants due to food insecurity. This contradicts past findings and suggests UA has immense potential in Nigeria. In the UK, results reveal that one of the major challenges of UA is around categorisation of the practice, which due to its diverse nature sometimes hinders access to funding. Furthermore, as certain UA methods are new and sophisticated, communities are less receptive to them and thereby perceived as being too complex to understand. Nigeria's government encourages UA alongside urban farmers to enhance food accessibility and variety, while the UK leans towards promotion of physical activity, green space, and social cohesion. Both places require greater government funding, education, and resources. Policymakers and urban planners must collaborate directly with urban farmers to find methods to overcome these difficulties, as a close cooperation may bring about meaningful change.

Covid 19 Impact Statement has been redacted in the online version

[redacted]

CHAPTER ONE

1.0. Introduction

As Urban Agriculture (UA) grows in popularity across the world, key stakeholders have shown the importance of the practice in urban settings. (Tornaghi, 2019; Hume *et al.,* 2021). This increase in interest is a result of the risks to global food security which is partially caused by the increasing global population (Broom & Breene, 2020). The Food and Agricultural Organisation (FAO) continues to emphasise that addressing food insecurity and malnutrition presents considerable challenges and simultaneously, it seeks to eradicate poverty and hunger (FAO, 2020). Population growth has increased competition for vital resources, particularly in urban areas (Chipungu *et al.,* 2015); as a result, there is a need to find new methods for food production while promoting sustainable urban development in urban regions (Dona *et al.,* 2021). UA is the process of food growing in cities for human consumption and it may consist of crop production, animal husbandry, or a combination of both (Halvey *et al.,* 2021). UA was defined by Mougeot (2000, p. 11) as:

> *"An industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area."*

Urban farms can be found in a variety of settings such as private residence or gardens, communal and allotment gardens, community farms, indoor, vertical, and rooftop farms, and more contemporary technological advances such as aeroponics, aquaponics and hydroponics facilities (Santos *et al.,* 2016).

This report provides a critical analysis of UA practises in Nigeria and the UK and their upscaling potential. The potential benefits and difficulties related to the creation of large-scale urban farms are explored using data collected from case studies of various types of the concept. In addition, this study examines the opinions of various stakeholders as well as policy tools to facilitate UA. In this first chapter, the groundwork for the study will be demonstrated by discussing the study's context, the research problem, significance of the study, and the research aims and objectives.

1.1. Background

It was estimated that around one quarter of the world's poor reside in cities, this shows that poverty is gradually becoming a concern in cities as the poor urbanise quicker than the overall populace (Ravallion, Chen & Sangraula, 2007). UA may play a significant role in tackling poverty in cities and food security challenges due to the increase in population (Zezza & Tasciotti, 2010). The recent worldwide food price crisis for urban poor has highlighted the importance of ensuring adequate nutrition, as well as the need to recognise and address the problems associated with food insecurity (Zezza & Tasciotti, 2010). For example, to reduce the financial crisis in the Global North (GN), residents in North America repurposed abandoned lots and community properties into urban farms and this brought about an increase in the amount of food produced in that urban area (McClintock *et al.*, 2013). The urban poor are the most sensitive to negative food price shocks, and they suffer the most from negative food prices (Dessus, Herrera, & De Hoyos, 2008). UA as shown by McClintock *et al's* (2013) work in North America, could potentially offer a tool to tackle the reduced access to fresh food in cities for deprived populations.

Since 1974, when FAO first reported on the severity of hunger, there has been a tremendous increase in the world's population and an immense rise in the flow of migrants into urban areas (FAO, 2019). Some people have no access to food (severe food insecurity), while others have limited access (moderate food insecurity) (see figure 1) (FAO, 2022).

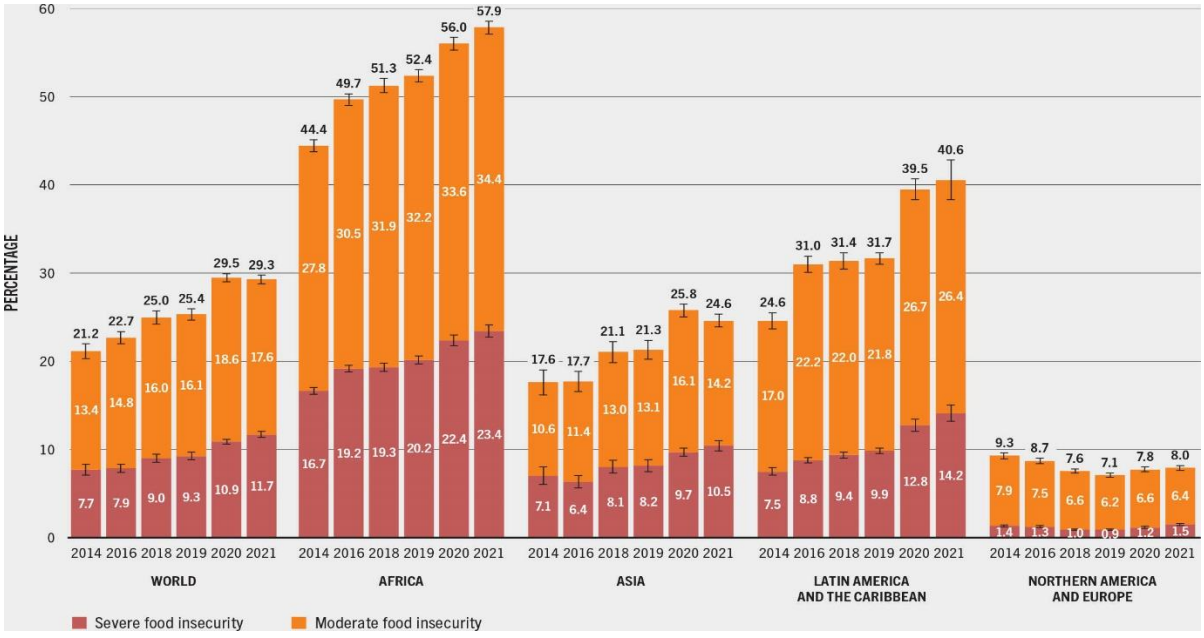


Figure 1: Medium to High Food Insecurity is stable at the global level although there are increases in every region except Asia, while High Food Insecurity increased worldwide and, in every region (FAO, 2022)

The United Nations Human Settlement Programme (UN-Habitat) reported in 2006 that UA contributes fifteen percent to twenty percent of the world's food output (UN-Habitat, 2006). In several countries of the GS, UA is an informal activity, and it is reported to have helped households become self-sufficient in food supply, hence reducing food insecurity, increasing income and employment prospects (Odudu, 2015). The main driving force is rapid urbanisation, which has a trickle-up effect of rural poverty into urban centres (Ravallion, 2002). It is common for low-income residents of GS countries to make purchases at local market and practise urban, small-scale food production (FAO, 2004). Poor water quality, poor soil quality, a shortage of farming equipment, and an absence of community organisation are all challenges to scaling up informal food production (Bisaga *et al.*, 2019).

Additionally, it helps shape and makes effective use of the environment by transforming unwanted open places into green areas (Odudu, 2015). In 1996, the United Nations Development Programme (UNDP) predicted that around two hundred million individuals participated in UA and related activities (UNDP, 1996; FAO, 1999). More recently, the Food and Agriculture Organisation [FAO] (2019) reported that eight hundred million people globally engage in UA; forty percent of urban residents in the GS engage in some type of UA, and this percentage increases to fifty percent in some Latin American nations (Zezza & Tasciotti, 2010). However, the pandemic has increased awareness of the potential impacts of UA to food security, including healthier lifestyles and improved ecosystems as well as resilient food supply (Bisoffi *et al.*, 2021).

Before the coronavirus (Covid-19) pandemic outbreak, the global food system was under pressure to ensure adequate food and nutrition reached the world's growing population, to protect the livelihoods of millions of people working end to end along the food chain, and to ensure the environmental sector's sustainability (Organisation for Economic Co-operation and Development [OECD], 2020). The global food systems are currently still under stress due to the impact of the pandemic; this is due to the measures put in place to limit disease spread, such as restrictions on the movement of people and products, which has had a significant impact (OECD, 2020). Reduced access to agricultural labour and inputs, disruption of food logistics, and increased demand on food banks are all symptoms of the present food system crisis (RUAF, 2020). Even though global food prices remain constant, numerous nations continue to face severe food price inflation and supply disruptions due to the pandemic (World Bank, 2020). Adding to this, due to a larger percentage of income being allocated to food in GS nations, the impact is more pronounced in this context than in GN countries (World Bank, 2020).

1.2. Research Problem

This chapter has already shown that urban populations around the world are rapidly increasing (Arbolino *et al.,* 2018). The World Health Organisation (WHO) revealed that GS cities will expand at a rate four times faster than GN cities on average per year (WHO, 2015). Specifically, it is anticipated that the sub-Saharan African (SSA) cities will grow at a faster rate than the average of 1.84 percent worldwide per year (WHO, 2015). By 2037, the population of people living in the cities in Nigeria is expected to have increased by a factor of four, or 4.3% annually (United Nations – Department of Economic and Social Affairs [UN-DESA], 2018). The growing human populations are the largest threat to global food supplies; it is projected that by 2050, there will be approximately two billion extra people to feed, representing a quarter increase over today's population (Broom & Breene, 2020).

To address food insecurity and malnutrition, there are major barriers to overcome even prior to recent events (FAO, 2020). The Covid-19 pandemic, as detailed later in this thesis, has exacerbated the vulnerabilities of global food systems (FAO, 2020). Population expansion, climate change, and the constant battle for survival all pose serious challenges to the future of food security across the world (Marsden, 2010; Wiskerke & Viljoen, 2012; Chipungu, 2015). Competition for vital resources is increasing as global urbanisation expands; this has prompted academics to focus more on food production to contribute to sustainable urban populations (Wiskerke & Viljoen, 2012). There is a potential for UA to close the gap that exists between food production and food consumption, but it must also be noted that its ability to help with waste management and other processes is also significant (Ackerman, 2012).

However, there is still a significant gap in knowledge regarding the perception and practise of UA (Colasanti, Hamm & Litjens, 2012; Hardman, Clark & Sherriff, 2022), which is one of the research gaps that this study seeks to address with a focus on Lagos, Nigeria in the GS. Furthermore, the impact of both small- and large-scale UA on food security must be explored further (Potts, 2009), as well as the importance of comparing the value of UA across countries (DiDomenica, 2015). Dona *et al.,* (2021) found a major difference in the geographical distribution of UA publications in GN and GS countries, with the latter accounting for less than half of all scientific articles published between 2010 and 2020. This was similar to a study by Cepic (2017), which found insufficient literature, scientific articles, and theories from GS countries. More importantly, studies on upscaling UA and how to best to integrate it into the urban system are required (Wiedner *et al.,* 2019), as are studies on how to improve UA's resilience and sustainability (Yan *et al.,* 2022).

Due to the fast rate of urbanisation and the impact it has on food security in cities, particularly in the GS nations (Gwan & Kimengsi, 2020), some experts have urged additional study into the concept of UA as an approach for preserving food supply in urban areas (Adeyemo *et al.,* 2017; Diehl *et al.,* 2020). Fruit and vegetable crops are grown through UA in the GN on a variety of land types (Orsini *et al.,* 2013), including plots which are allocated, home gardens, communal spaces, and gardens located in market spaces (Foster *et al.,* 2017; Schmutz *et al.,* 2018). Public and private land, as well as vacant lots, open fields, and greenhouses, are all used in the GS for UA (Olumba *et al.,* 2019). Furthermore, people across the world use UA for different reasons; unlike in the GS, where UA is undertaken for food availability and alleviating poverty, it is more commonly engaged in by those in the GN for leisure or social purposes (Zezza & Tasciotti, 2010).

Multiple studies have demonstrated that some stakeholders and consumers in a few European nations are willing to accept the use of UA techniques (Sanye- Mengual *et al.,* 2018). This was demonstrated during the introduction of aquaponics products to customers in Europe, where results suggested a favourable attitude towards embracing the method, with no significant difference between those who knew about it beforehand and those who were unaware of it (Milicic *et al.,* 2017). While informal UA is prevalent in the GS, there are public health concerns with the acceptance of new innovative methods; these include potential water supplies that might serve as malaria breeding grounds (Simatele & Binns, 2008), odour, noise, waste, and traffic obstructions (Hovorka, 2003). This study therefore aims to analyse critically how UA might be scaled up in Lagos, Nigeria, and in the UK by analysing different UA methods in these locations, stakeholder views, enabling tools for mainstreaming, as well as recognising the challenges and the potential of UA to provide food security.

1.3. The Potential Impacts of Urban Agriculture

UA is commonly referred to as the cultivation of essential food and rearing of farm animals for the benefit of people who live in cities (Zezza & Tasciotti, 2010). Communal farms, rooftop gardens, household gardens and farms, indoor farms, urban farms (see figure 2), peri-urban farms and hydroponic growing are all used by city dwellers, all of which are sustainable and new ways to grow food (Weidner *et al.,* 2019). UA is being suggested as a way that can help to improve food availability in cities (Zasada *et al.,* 2020) and to make food more sustainable (Caputo *et al.,* 2020). There is a growing body of evidence suggesting that UA can reduce the environmental, social, and health impacts of current agricultural practices and consumer habits (Menconi *et al.,* 2020). UA is thought to contribute to better food security (Edmondson *et al.,*

2020; Ma *et al.*, 2020), healthier food choices for individuals (Brown & Jameton, 2000), improved wellness (Mayer & Frantz, 2004), and social welfare (Batitucci *et al.*, 2019). UA has also been proven to have a significant contribution toward the achievement of the Sustainable Development Goals (SDGs) (Russo & Cirella, 2019). It is also a powerful resource for revitalising cities at the local level and for reviving urban areas (Sanyé-Mengual *et al.*, 2019).

Figure 2: Image showing example of an urban farm in Lagos (Author's own)

UA is a very dependable farming technique since it circumvents the short supply chain and the numerous agricultural techniques (Khan *et al.*, 2020). Research indicates that UA is becoming a more effective method for ensuring that there is sufficient food for everyone in the world (Langemeyer *et al.*, 2021). As an example, in Cuba, a single square metre of land may feed a family with 20 kilogrammes of food annually, more than enough to meet their nutritional requirements (Altieri & Nicholls, 2020). Yoshida and Yagi (2021) studied the persistence and resilience of UA in Japan, and their findings showed that UA was able to adapt to the pandemic demonstrating resilience to shock. In addition, it has been asserted that UA's environmental compatibility was enhanced by its ability to repurpose construction and household waste (Weidner *et al.*, 2019). Fruits, grains, vegetables, herbs, plants, milk, beef, and livestock are some of the products that may be produced through UA (De Bon *et al.*, 2010; Weidner *et al.*, 2019). An evaluation of the relevant literature revealed that UA can be an enabler for creating more sustainable communities, with impacts including improved community health, job creation, and ecological preservation (Azunre *et al.*, 2019). During the lockdown, there was an increased interest in fruit and vegetable cultivation (Evans & Davies, 2020). There is evidence

that small to medium-sized growing sites have increased their food output to fulfil demand throughout this period (Schoen *et al.*, 2021). Regarding its importance in ensuring continued access to nutritious foods, UA has helped to ensure that families have enough to eat and have more options of foods to select from, and it also has several other societal, ecological, health, and economic advantages (Alimba *et al.,* 2018). It also can sustain food production and supply by reducing the food miles from where food is produced and where it is consumed (Ackerman, 2012). In addition, it supports urban farmers and other service providers with food and employment opportunities (Binns & Nel, 2019). UA likewise contributes to the reduction of greenhouse gas emissions and energy consumption due to the reduction of food miles (De Zeeuw *et al.,* 2011). In terms of wider benefits, noise abatement through trees can enhance the quality of urban environments; and UA has also been shown that it can mitigate the negative impacts of climate change through some cropping systems (De Zeeuw *et al.,* 2011).

1.4. The Food Situation in Nigeria

Located in Western Africa, Nigeria is surrounded by the Atlantic Ocean to the south, Cameroon to the east, Chad to the northeast, Niger to the north, and Benin to the west (figure 3). Due to its immense population and prosperous economy, Nigeria is sometimes named "the Giant of Africa" (Uko, 2021). Nigeria is Africa's most populated nation, home to some of the continent's biggest and fastest-growing metropolises, and the continent's fourth-highest CO2 emitter (after South Africa, Egypt, and Algeria), with emissions only expected to rise as the economy grows and cities expand (Akpan & Akpan, 2012). The imperative need for research on UA in Nigeria and Lagos is a result of the country's increasing population and the potential for UA to combat the rising rate of food insecurity, especially among the urban poor. Because of this, the size of Nigerian towns has grown quickly, up to 10 times their starting point of growth, and this growth has been mostly unexpected and unregulated (Egunjobi *et al.,* 2002; Olanrewaju, 2004). Most large cities and villages have seen their populations explode during the last several decades (Aliyu & Amadu, 2017). Over the past 50 years, the populations of Lagos, Kano, Port Harcourt, Maiduguri, Kaduna, Ilorin, and Jos have all grown by more than 1,000% (Aliyu & Amadu, 2017). Less than one million, four million, and more than ten million people, respectively, resided in Lagos (The National Population Commission, 2008). Several studies have shown that the lack of planning and heavy use of urban land in Nigeria have made urban problems worse (Egunjobi *et al.,* 2002; Filani & Okafor, 2006).

According to Ayeni (2017) and Aliyu and Amadu (2017), Lagos state in Nigeria has the highest population density. It is believed that more than five percent of the country's total population

lives in the state's surrounding area (Ayeni 2017; Aliyu & Amadu 2017). Despite being the smallest state in terms of total area, it has 75,755 hectares of wetlands (Tangwa *et al.,* 2019), making its total area 356,861. Moreover, 85 percent of Lagos State's population lives in Metropolitan Lagos, which occupies just 37 percent of the state's total geographical area. The United Nations predicts that Lagos, Nigeria, will soon join Tokyo, Japan, and Bombay, India, as one of the world's three most populated megacities (UN, 2016). Tangwa *et al.,* (2019) report that about 48–50% of people in Lagos are still living in poverty.

Figure 3: Map of West Africa displaying Nigeria's boundaries (Google Maps, 2020)

Approximately two hundred million people call Nigeria home, making it Africa's most populous and economically powerful nation (International Monetary Fund, 2018). Until the 2008 - 2009 monetary crisis, Nigeria relied primarily on oil exports to generate foreign currency and fund the government (Odularu, 2008). Since then, the country's economy has diversified, with agriculture, telecommunications, construction, and services all contributing to expansion (Isa *et al.,* 2013). Economic development in Nigeria began decelerating in the second quarter of 2014, and by the second quarter of 2016, the country had entered a recession (Nigeria National Bureau of Statistics, 2017).

The urban population of Africa is expected to almost double in number during the next fifteen years, at a pace that is unmatched in human history (Kessides, 2006). From 39% in 1985 to 50% in 2010 and 65% in 2020, experts predict that the majority of Nigeria's population would reside in urban areas (Nigeria Bureau of Statistics, 2012). One-third of Africa's residents now live in cities, a rate that surpasses South Asia's 28% (Kessides, 2007).The World Bank (2018)

reveals that, compared to 40% urban population in SSA, 50% of Nigerians reside in cities because of increased urbanisation. Angola (66%), Gabon (89%), and South Africa (66%), for example, all have larger percentages of urban residents than Nigeria, but they also have smaller national populations and lower urbanisation rates than Nigeria (World Bank, 2018). Nigeria has a slightly greater yearly rate of urbanisation (4.2%) than the rest of Sub-Saharan Africa (4.1%) (World Bank, 2018). The World Bank (2003) estimates that Africa's dependency rate (now 89%) would not drop below 50% until the year 2050. There will be an economic boom as a result of this shift, which will be most noticeable in large cities at first (Montgomery *et al.*, 2003).

The urbanisation rates in countries like Mali (4.9%), Ethiopia (4.8%), Tanzania (5.1%), and Uganda (6.2%) are much higher than the global average; however, both the total and urban populations of these nations are much fewer than the global average (World Bank, 2018). Countries such as Benin, Kenya, Mauritania, Mozambique, Nigeria, and Senegal are expected to have 50 percent or more of their poor living in urban areas by 2036 due to anticipated urbanisation and the assumption of no change in rural and urban poverty rates (Kessides, 2006). As a result, Nigeria represents a microcosm of what much of Africa will look like in a few years, with a large total population, a large number of people living in cities, and a substantial yearly urbanisation rate (Uko, 2021). Since growing urbanisation aggravates poverty, food insecurity, and other livelihood difficulties, Nigeria is a crucial case study for the study of alternative livelihood methods such as UA. In the past, there have been reports of destruction of crops and eviction of farmers from plots in some cities as far back as 2010, so it is not safe to assume that Nigeria's UA environment is generally a permissive one, as there are currently neither policies that support nor restrict the practise (Olomola, 1998; Ezedinma & Chukuezi, 1999; Adedeju & Ademiluyi, 2009; Chah *et al.*, 2010; Ukeje, 2004).

Adequate quantity and quality of food consumed, is essential for maintaining good health and maximising one's potential in life (Omonona *et al.*, 2007). According to Uma *et al.*, (2014), although Nigeria has been endowed with an abundance of land, the food situation is dismal due to the inability of supply to keep up with demand and the reduced focus on agriculture. To alleviate hunger in the country and lessen its reliance on food imports, the Federal Ministry of Agriculture predict that Nigeria's food production would need to expand by an average of 5.9 percent every year (Amaza *et al.*, 2006). Due to the rapid rise in population, rising food consumption overtook supply by more than 3.5 percent (CBN, 2004). Low crop yields and inefficient use of resources are the major obstacles to the fast expansion of food production, and these problems may be traced back to poor farm management and a lack of funding

(Ambali *et al.,* 2012). With an index of 114.93 in 2013, Nigeria's food production has not expanded fast enough to keep up with the country's rapidly growing population (The World Bank Group, 2016). Those who consistently lack the financial or physical resources to purchase enough healthy and nutritious food are food insecure, and it is possible that this is a recurring, seasonal, or transient issue (FAO, 2003).

The urban poor of Nigeria lack the resources to address even their most basic requirements (Oyeleye, 2013). They have trouble finding enough to eat, and they lack basic services including roads, clinics, schools, power, water, and more (Oyeleye, 2013). Poor urban populations' activities and efforts to meet their needs, such as the need for housing, employment, and general subsistence, place a pressure on already limited urban natural and man-made resources, resulting in the formation of slums, and posing significant urban development challenges (Mabogunje, 2005). Proponents of UA continue to emphasise the importance of policy creation, implementation, and institutional support for the practice, particularly considering the established importance of UA as a livelihood strategy and the reality of population pressure and increasing competition for urban land (Stewart *et al.,* 2013; Paul & McKenzie, 2010; Mougeot, 2005; FAO, 2012; Dubbeling, 2016).

Lagos, much like other prominent urban centres in sub-Saharan Africa, is grappling with the challenges posed by population expansion, issues related to urban development, and the imperative for urban progress and civilization (Olajide *et al.,* 2018). What initially emerged as a means to assist impoverished urban families with food has transformed into a livelihood for individuals engaged in urban gardening (Frayne, McCordic, and Shilomboleni, 2014). Lagos has undergone substantial growth as a city, encompassing its physical layout, population, and socio-economic aspects, with its population experiencing an unprecedented rate of increase, accompanied by a lack of comprehensive planning (Olajide *et al.,* 2018). The city has evolved from a lagoon into a vast expanse predominantly characterized by low-rise structures, including approximately 200 distinct slum areas, varying in size from a few makeshift dwellings beneath a highway to entire districts (Gandy, 2005; Gandy, 2006). This suggests that a significant proportion of the population resides in informal settlements and relies on informal economic activities for their livelihoods (Olajide *et al.,* 2018). Persistent consequences of development in Lagos encompass poverty, the proliferation of illegal settlements, overcrowding, and deficiencies in physical and social infrastructure (Morakinyo *et al.,* 2012; Ilesanmi, 2010).

1.5. Urban Agriculture in Nigeria

Over 80% of Nigeria's labour force and the country's Gross National Product (GNP) were dependent on agriculture for some aspect of their income, making agriculture a critical component of the country's economy and food supply (Adedayo & Tunde, 2012). Due to the country's booming oil industry, many young and able-bodied men in Nigeria abandoned farming in favour of urban life, leaving the country's food supply in the hands of the rural community (Mohammed *et al.*, 2017). Until the 1980s, when the economy was reformed and many city inhabitants were compelled to depend on agriculture due to increasing food prices, inflation, and unemployment, the concept was not well recognised in Nigerian cities (Mohammed *et al.*, 2017). Two-thirds of Nigeria's labour force is employed in the agricultural sector, and its growth has been largely responsible for reducing poverty in the nation (Lawal & Atte, 2006). Despite UA activities having been practised in Nigeria since the 1980s, it was not until the governmental drive to reform the economy that they gained widespread recognition (Aina *et al.*, 2012).

It was found that the poor relied on agricultural operations conducted on the fringes and on abandoned land of urban districts (known as guerrilla gardening) often as their only means of subsistence (Aina *et al.*, 2012). The findings of Lynch (1995), Olofin (2006), and Maconachie, Binns, and Tengbe (2012), all demonstrated that urban actors in Africa are extremely interested in food production to provide food security for their population. According to research conducted by Egbuna (2009), UA is a major economic driver in GS nations. He went on to say that the over eight hundred million people who are engaged in UA provide the best hope for alleviating poverty in low-income urban families and meeting the food needs of city dwellers (Egbuna, 2009; Teng, 2020). In their socioeconomic study of UA, Salau and Attah (2012) noted that more than 35% of Nigeria's population lives in cities, and that UA acts as a source of revenue to farmers, improves family nutrition, and offers full-time employments chances for individuals.

The primary issue lies in the confluence of two factors: the expanding urban population and the simultaneous growth of cities, which have led to an increased demand for urban land and consequent diversion of agricultural land for non-agricultural purposes (Wu *et al.*, 2011). The rapid urbanization has escalated land prices and intensified competition for land within and surrounding cities, resulting in the displacement of fertile farming areas by more economically viable land uses (Bonye *et al.*, 2021). Additionally, challenges related to tenurial plans concerning suitable land allocations for UA further impede agricultural activities in urban areas (Chah *et al.*, 2010; Asadu *et al.*, 2016). Farmers situated in urban settings encounter difficulties

in accessing farmland due to social, economic, and political barriers (Odudu & Omirin, 2012; Olumba *et al.*, 2019), thereby hindering their productivity (Odudu & Omirin, 2012; Olumba *et al.*, 2019). Asadu *et al.*, (2016) also emphasize the arduous nature of UA due to challenges in obtaining credit, vulnerability to theft, and the potential for crop damage by animals. In Nigeria, for instance, farmers exhibit limited trust in crop insurance schemes, resulting in underutilization of such programs (Ajieh, 2012). Furthermore, some farmers remain unaware of the benefits offered by these schemes or possess an incomplete understanding of them (Okeke-Agulu and Salihi, 2019).

Based on their findings, Adeogun *et al.*, (2007) concluded that UA might significantly improve food security in cities if given the attention it deserves. Another crucial point to note is that economic growth, development, and food security are all severely impacted by the inequality that exists between men and women in terms of access to resources and opportunities (Mohammed *et al.*, 2017). Women are the primary food producers in Africa and other developing nations, however despite this, they are the most marginalised demographic (Adedayo & Tunde, 2012). Wages are another area where gender makes a difference; according to Duchin and Sinha (1999), males make around 20% more than women. Unequal access to land, financing, and market inputs are further barriers that women face that limit their potential (Streiffler, 1993). This suggests that substantial progress in UA, agricultural policy should aim to address the gender gap (Mohammed *et al.*, 2017).

1.6. Why is This Study Important?

The primary aim of this study is to identify strategies for increasing the acceptance of UA in Lagos, Nigeria, by making comparisons to existing, effective UA practises in the UK, and the wider GN. As such, the data and context given in this thesis will primarily relate to Lagos, Nigeria. This is due to the GN nations having more publications in the subject of UA research, whilst the GS nations have the fewest (Dona, Mohan & Fukushi, 2021). Additionally, despite having a wide range of UA activities, there are often fewer than twice as many journal articles in GS nations; this limits the interest in UA in GS countries (Dona, Mohan & Fukushi, 2021). However, despite UA's potential importance in GS countries, the practise has not yet been comprehensively summarised in global scholarly literature (Hamilton *et al.*, 2014). In addition, the absence of assured food security and the necessity for large-scale food production drive development in UA in GS nations (Zezza & Tasciotti, 2010). It has been suggested that UA may benefit in enhancing both dietary intake and food quality (RUAF foundation, 2015). Furthermore, Nigeria has the highest population in Africa with an estimated value of 215

million and 52% of the population reside in urban areas (UN-DESA, 2019). Lagos being the largest city in Nigeria and SSA also has an estimated population of about nine million justifying the need to upscale UA (Kamer *et al.*, 2022) (see figure 4).

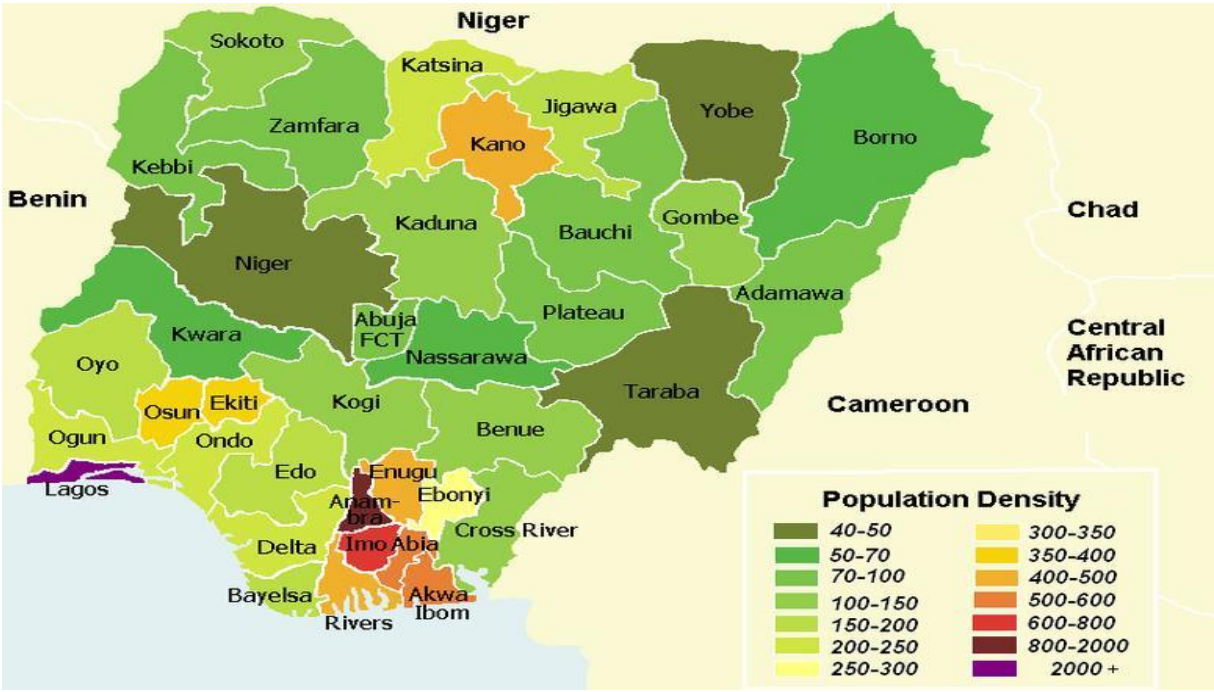


Figure 4: Map showing population density of states in Nigeria (Commons, 2022)

This study aims to identify and explore the necessary strategies to stimulate UA growth in Nigeria and the UK by examining the areas for development and creating a comparative study between the two locations. This study intends to investigate enabling food growing policies and measures that can form the basis for a sustainable UA practice, and to discover the potential areas where policy interventions are required for promoting food growing in cities to meet the needs of the increasing population. In particular, the study explores the potential formal tools for replication within the Nigerian context, using Lagos as a case study for investigation.

This paper provides a critical assessment of the potential of upscaling UA using Lagos, Nigeria as a case study. This research considers qualitative data compiled from a range of UA stakeholders, including opportunities, and barriers to setting up UA. To contribute to the expanding body of literature on UA in the GS field, this study will focus on Lagos. It is intended that the findings would give more evidence of the GS's issues over the inadequacy of UA systems and establish the basis for additional research and development in this area. This study is significant for policymakers, consultants, and academics interested in learning more about the potential of UA in feeding the urban population since it is being conducted in a rapidly urbanising country where UA is gaining attention.

1.7. Research Aim and Objectives

This study aims to critically appraise UA activity in the Global North and Global South through a case study approach, exploring existing practice and future potential in the UK and Nigeria, particularly around upscaling practice.

Objectives

- To critically compare approaches to city food growing in the Global North and Global South: assessing opportunities and barriers to practice
- To identify the policy tools for enabling UA in Nigeria and the UK
- To characterise the perception of different stakeholders towards UA and its potential to enhance food sustainability
- To ascertain barriers to UA in the Global North and Global South, such as poor soil quality and contamination issues
- To assess the impact of UA on food security and upscaling in Lagos, Nigeria

1.8. Structure of the Thesis

This dissertation begins by introducing the study's context, outlining its aims and objectives, and providing a justification for the research topic. Moving on to the second chapter, an extensive review of the existing literature on UA in both Nigeria and the UK is conducted. This review encompasses the urban food security situation, the potential benefits of UA, knowledge gaps in the field, as well as the advantages and disadvantages associated with UA. The third chapter delves into a comprehensive discussion of the predominantly qualitative approach employed in this study, while also acknowledging its limitations. Chapter four presents an overview of UA in Nigeria and the UK, followed by an exploration of the perceived impact of UA on food security. Furthermore, chapter four explores the role of age and gender in UA, along with the reasons for the increased interest in UA, with a specific focus on Nigeria.

Chapter five is dedicated to examining the current practices of UA, including various methods of food production, the policies governing land use tenure, and the quality of urban soil, including issues of contamination. In Chapter six, attention shifts towards analysing the barriers faced by UA, identifying opportunities for upscaling, and exploring the future potential of UA. Chapter seven aligns the study's aims with a thorough examination of the data analysed in chapters four, five, and six. This chapter then seeks to establish connections between the identified themes and evidence from the study and the broader issues outlined in the introductory chapters. The eighth and final chapter concludes the dissertation by providing a

brief discussion of the results, acknowledging their limitations, and presenting recommendations based on the findings of the study.

1.9. Conclusion

In conclusion, this chapter highlights the growing importance of UA in addressing food security challenges and promoting sustainable urban development. The increasing global population and competition for vital resources, particularly in urban areas, have necessitated the exploration of new methods for food production. UA, which involves food growing in cities for human consumption, has emerged as a potential solution.

This chapter emphasises that UA can play a significant role in tackling poverty in cities, especially as urbanisation continues to affect the urban poor. The recent worldwide food price crisis has underscored the need for adequate nutrition and the recognition of food insecurity issues. Examples from the GN, such as repurposing abandoned lots into urban farms, demonstrate the potential of UA in increasing food production and addressing financial crises. With urban populations projected to rapidly increase, particularly in sub-Saharan African cities like Lagos, Nigeria, the need for effective UA strategies becomes more pronounced. The chapter underscores the importance of identifying and comparing existing UA practices in both the GN and GS to inform strategies for increasing acceptance of UA in Lagos.

The study's aim and objectives revolve around critically appraising UA activities in the UK and Lagos, Nigeria, exploring opportunities and barriers to practice, identifying policy tools, understanding stakeholder perceptions, assessing barriers such as poor soil quality and contamination, and evaluating the impact of UA on food security and upscaling in Lagos. Overall, this chapter sets the stage for a comprehensive analysis of UA practices and their potential implications. By examining successful approaches and addressing challenges, stakeholders in Lagos, Nigeria, can develop effective strategies to enhance food sustainability, mitigate food insecurity, and promote urban development.

CHAPTER TWO

2.0. Introduction

Urbanisation is progressing at different speeds in various parts of the world (see figure 5) (Olumba *et al.*, 2021). The World Health Organisation (WHO) estimates that the average yearly growth rate of population in cities in the GS is four times that of the GN (WHO, 2015). Cities in the countries of SSA, where the bulk of global population growth is likely to take place, are forecast to expand at a pace of 4.1% per year, higher than the worldwide average of 1.84%. (WHO, 2015), and more than 90% of the predicted increase in urban populations will occur in GS countries (Zimmerer *et al.*, 2021).

Serious concerns about food production, storage, distribution, and consumption have arisen because of the changing aspects and expansion of today's cities (Zimmerer *et al.*, 2021). Sustainable urban food production has gained attention from several sectors in the industry and academia (Caplow, 2009). As a result of pressing global issues including climate change, unequal economic systems, and health concerns, UA has gone from being on the periphery to the forefront of public debate in recent years (Bohn & Viljoen, 2011; Evans & Davies, 2020). Several studies have urged comprehensive research work toward the implementation of UA as an approach for maintaining food resources in urban settings (Adeyemo *et al.*, 2017; Diehl *et al.*, 2020), owing to the extraordinary pace of development and its adverse consequences for urban food security, particularly in GS countries (Gwan & Kimengsi, 2020). It is expected that new and innovative UA methods will help provide fresh, locally grown food to cities (Brock, 2008) as urbanisation becomes more inevitable (United Nations, 2004).

Globally, the difficulties that cities are now facing are driving the advancement of building-integrated types of urban food production (Zimmerer *et al.*, 2021). Since urban areas are responsible for over two-thirds of the world energy consumption and seventy percent of global carbon dioxide emission (United Nations Framework Convention on Climate Change [UNFCCC], 2010), they have a significant opportunity to lead the way in carbon reduction via the reduction of CO_2 emissions (UNFCCC, 2010). For cities to adapt to climate change, they will require comprehensive plans that include food, water, energy, and food and waste transportation (Zimmerer *et al.*, 2021). Reducing the urban energy footprint and finding useful ways to recycle organic waste are only two of the many ways in which UA is seen as a solution to climate change adaptation (De Zeeuw, 2011). There are potential benefits to producing food

within the confines of the city as opposed to doing it in nearby areas and utilising substantial resources on transportation (Zimmerer *et al.*, 2021).

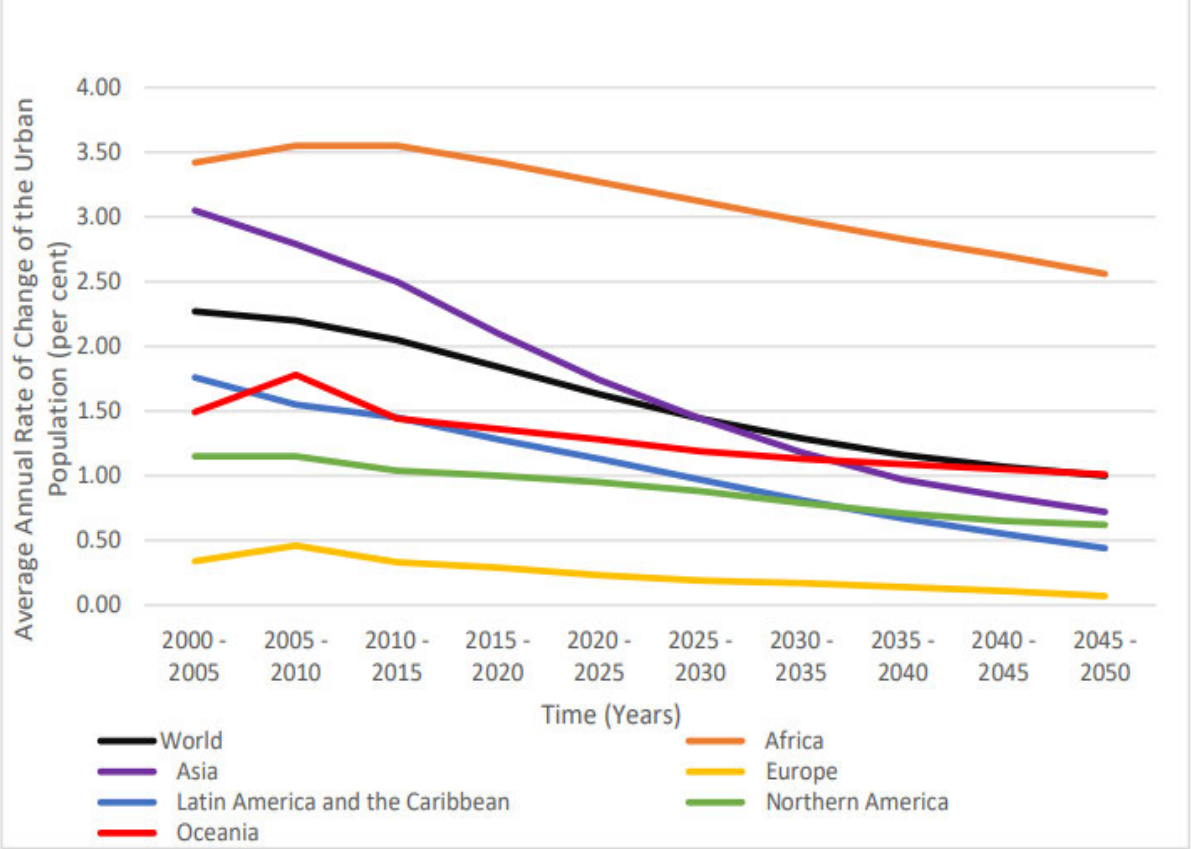


Figure 5: Average rate of urbanisation in the world: Historical series and projection 2000 - 2050 (Source: United Nations Department of Economic and Social Affairs, 2014)

Another rising trend that impacts food production is the increasing demand for produce despite a diminishing supply of arable land brought on by urbanisation and climate change (Zimmerer *et al.*, 2021). There are now 13.4 billion hectares (FAO, 2011) dedicated to agricultural production however traditional and intensive types of agriculture may cause serious environmental harm (FAO, 2011). As alternative forms of land use (such as bioenergy, urbanisation, and protected natural zones) arise, food crops in many regions of the world increasingly face competition for land, water, and other resources (FAO, 2012). As a result, practitioners and academics are exploring for ways to minimise food production using conventional farming methods that need more agricultural land, so that more food may be produced in buildings and on top of buildings in heavily populated urban environments (Specht *et al.*, 2013). This would provide new possibilities in the urban environment and relieve pressure on agricultural land (Specht *et al.*, 2013).

UA refers to the practise of growing, preparing, selling, and distributing food in an urban area (Orsini *et al.,* 2013). In its definition of UA, the FAO describes the practice as the growing of plants and livestock farming (fisheries included) inside towns and cities and their surrounding (Drechsel & Kunze, 2001), for the purpose of either subsistence or commercial sale (Olumba *et al.,* 2021), including all operations associated with agriculture such as the cultivation and selling of farm produce and the marketing and processing of good (Mougeot, 2000). UA also provides for food and non-food items for home use and revenue creation (Mougeot, 2000). As a global phenomenon, UA assists city dwellers in finding employment in a variety of industries (Olumba *et al.,* 2021). Allotments, private residential farms, community projects, and commercial market gardens are typical locations for UA in the GN (Foster *et al.,* 2017; Schmutz *et al.,* 2018), with the focus being on the production of fruits and vegetables (Orsini *et al.,* 2013). However, in the GS, people grow food in urban areas on their own or leased property, on empty lots and open areas, in greenhouses, and even in water sources like streams, fishponds, and seas (Ibitoye *et al.,* 2016; Olumba *et al.,* 2019). Furthermore, different regions of the world have varied reasons for engaging in UA; unlike in the GS, where UA is primarily practised for food security and poverty reduction, the GN engages in UA mostly for leisure or social objectives (Zezza & Tasciotti, 2010; Mok *et al.,* 2014).

Furthermore, UA is becoming more popular in many countries, and its research and implementation are becoming more important as a priority on the global development programme (Horst *et al.,* 2017). Numerous studies have shown that UA has positive effects on society, the economy, and the environment; one of such effects is that it ensures families have access to nutritious food and have a diverse meal option (Salau & Attah, 2012; Alimba *et al.,* 2018). According to Binns and Nel (2019), supply chain participants such as urban farmers might benefit from UA since it offers a stable revenue stream. UA also has a good impact on the environment by lowering energy consumption and greenhouse gas emissions owing to the shorter distances that food travels before reaching consumers (De Zeeuw *et al.,* 2011). In addition to improving the urban environment, regular tree maintenance in urban areas also serves as an adaptation and mitigating tool against the effects of climate change (De Zeeuw *et al.,* 2011). Overall, UA improves the efficiency of the food systems since it may serve as a complement to most of the agricultural production that happens in rural areas (Orsini *et al.,* 2020). Crops and animals or animal-based products may all be raised in UA (Orsini *et al.,* 2020), however, in most instances, fruits and vegetables cultivated in small plots of land dominate this sector (Orsini *et al.,* 2013).

2.1. Types of Urban Agriculture

Research has long shown that both city and rural recreation areas and other green areas provide significant benefits to people's well-being and overall health (Rui *et al.*, 2014; James *et al.*, 2015; Buck, 2016; Barry & Blythe, 2018; Ambrose *et al.*, 2020). Restriction of movement and social distancing during the COVID-19 pandemic led to a substantial rise in the usage of green spaces, mostly parks and gardens, highlighting the value of access to the environment in daily life (Bell *et al.*, 2016; Chalmin-Pui *et al.*, 2021; Armstrong *et al.*, 2021). Community resilience to future environmental, health, or economic problems, as well as recovery from Covid, may be greatly aided by the presence of urban farms (Honey-Rosés *et al.*, 2020; Ugolini *et al.*, 2020; Pouso *et al.*, 2021). This is because people have now started to realise how vital parks and other green areas are to urban environments (Swanwick *et al.*, 2003; White *et al.*, 2013). Their physical and operational features, aims and purposes, and advantages all differ widely but they all could provide urban residents with a place to grow food and take part in a wide range of social activities (Kirby *et al.*, 2021).

In recent years, UA has been shown to play a crucial role in both crisis response and for rebuilding the economy afterwards (Bell *et al.*, 2016). It is no surprise that food scarcity during wartime, like those that hit the United States and Europe all through World War One, would spark a gardening re-emergence (Schoen *et al.*, 2021). Upon the establishment of the National War Garden Commission in 1917, over 5.2 million gardens were built across the United States by the following year (Herrmann, 2015). The US National Victory Garden Program encouraged UA for the war effort and the promotion of patriotism, and by 1944, 20 million victory gardens had grown more than 40% of the nation's fresh fruits and vegetables (Schoen *et al.*, 2021). Comparable growth in UA has been seen in other countries with similar efforts, such as the UK (Smith, 2013) and Russia (Boukharaeva & Marloie, 2015).

UA has had a reappearance in recent years, with the recent Covid-19 epidemic being the most recent crisis to spur such activity (Schoen *et al.*, 2021). Food produced locally grew in reaction to a variety of repercussions of the pandemic, including but not limited to: grocery store restrictions in the initial start of the pandemic (Busby, 2020; Evans & Davies, 2020; Molteno, 2020), apparent threats to food industry systems (Vittuari *et al.*, 2021), leisure time as a result of layoffs and working remotely (Sams, 2020), and even the urge for regular exercise in order to combat obesity (BBC News, 2020). Some people also turned to gardening as a means of relieving tension and improving emotional wellness (Cockburn, 2020). Gardens have proven useful for mental health during lockdowns by decreasing feelings of isolation and boosting community spirit (Schoen *et al.*, 2021). Time spent outside related to significantly increased

positive emotional effects and decreased negative emotional impacts (Lades *et al.,* 2020). During the lockdown period of March – May 2020 in the UK, Bu *et al.,* (2020) found that gardening contributed to better psychological well-being. Similarly, Corley *et al.,* (2021) and Sunga and Advincula (2021) found that gardening was good for their physical, mental, and emotional well-being. According to a global online poll conducted by Pouso *et al.,* (2021) in nine countries, people's access to outside space was essential in mitigating the negative effects of the lockdown on their mental health. Through an online indoor micro-gardening initiative, Wang *et al.,* (2020) found that they were able to give social and emotional support to individuals in China who were experiencing some emotional distress during the pandemic.

2.1.1. Informal Type of Growing Food

In many GS countries, the informal economy often plays a role in the food system (Argenti, 2000). The primary driving force is rapid urbanisation, which brings with it the resulting urbanisation of poverty (Ravallion, 2002). The path to a more sustainable food system may be taken in quite different ways from country to country, even if the end goal is the same (Zhao, 2021). Low-income communities in GS countries often choose to buy their food from traditional markets and engage in small-scale urban food production (FAO, 2004). Some other GS countries including India and Nepal, have a disproportionate number of low or middle-income urban and peri-urban vegetable farmers compared to their number of animal farm owners (Padgham *et al.,* 2015). To a large extent, small farmer production and informal food selling in Southern African cities contribute to the economic well-being of the poor and the availability of nutritious food to city residents (Crush & Frayne, 2011). Many obstacles remain, even though informal UA efforts can reduce poverty and food insecurity. Scaling-up informal food production activities is hindered by factors such as poor water quality, poor soil quality, due to a lack of farming tools and social infrastructure (Bisaga *et al.,* 2019).

Even though many of the world's most well-known, community-minded, and productively expanding enterprises had their start as a result of an informal UA practise, there has been surprisingly little scholarly investigation of people who practise UA informally (Crane *et al.,* 2012; Reynolds, 2008). Those who engage in such activities are commonly referred to as "guerrilla gardeners," a catch-all phrase for any kind of illegal gardening that does not have the approval of the relevant authorities (such as the local government or the landowner) (Johnson, 2011; McKay, 2011; Tornaghi, 2014). While most people think of guerrilla gardening as a low-key hobby carried out more for fun than for food production, it may also refer to large-scale cultivation in the form of unlicensed community gardens and urban farms (Hardman &

Larkham, 2014). Many different people take part in this activity, from those engaging in it for trends in parts of North America and Europe to those engaging in it as a matter of survival in Africa and other countries of the GS (Adams *et al.*, 2014; Reynolds, 2008). Most UA in Africa is likely to be considered informal due to the widespread disapproval of the practise at both the municipal and national levels (Chipungu *et al.*, 2015). One of the most often mentioned examples of UA is the guerrilla gardening movement that emerged in response to government restrictions in Havana, Cuba (Hardman & Larkham, 2014). Once the benefits of UA were recognised, local officials in Havana actively promoted the industry and aided the entrepreneurs (Hardman *et al.*, 2018).

Despite these positive instances, most media coverage of guerrilla gardening focuses on its more controversial and unlawful components, such as people's illegal use of land (Lewis, 2010). Despite this, multiple scholarly investigations have shown evidence that informal UA practises have served as a platform for much bigger green movements (Crane, 2011; McKay, 2011; Zanetti, 2007). It has increased food availability and sparked several formal movements (Reynolds, 2008). Reynolds (2008) demonstrates how guerrilla gardening has transformed a broad variety of urban places, from jails to subways to city blocks, proving that no area is off-limits to being colonised and put to effective use. Although there are numerous advantages to guerrilla gardening, such as the capacity to bring communities together in interesting ways, improve the aesthetics of public areas, and provide food for those that need it, the technique is not without its drawbacks (Reynolds, 2008). Guerrilla gardening, according to Allen (2014), is a reactive activity that does not solve the problem of dominant elites controlling urban space. In addition to this, he calls attention to the fact that the guerrillas conduct their operations without first seeking the approval of the local authorities or the landowner, and that they don't bother to get input from the local communities and guardians who are making a difference in the area (Allen, 2014). This notion is supported by findings from the study of Hardman and Larkham (2014), who show how guerrilla gardening may have negative effects such as the neglect of colonised regions and the intentional exclusion of individuals living in the immediate vicinity.

2.1.2. Community Farms and Allotment Gardens

Allotments are typically a small plot of land used for agricultural purposes and given to individuals or families (Drescher *et al.*, 2006). Although each plot is tended by its owner, gardeners work together via allotment groups, lease the property, and establish regulations for the gardens' maintenance and operation in exchange for a nominal annual membership fee

(Holmer & Drescher, 2005). Individuals or families in a community garden work together to grow food mostly for their own use (Drescher *et al.,* 2006; Wang *et al.,* 2014; Martin *et al.,* 2017). Community gardens are defined by Glover (2003) as organised efforts where urban plots are utilised for growing crops like vegetables and flowers for the individual or communal benefit, while participants share resources including space, tools, water. Some writers argue that allotment gardens should be seen as communal places used and administered by all residents (Guitart *et al.,* 2012, Turner & Henryks, 2012).

Urban allotment gardening describes the practise of cultivating a small plot of land for the purpose of growing food (Barthel *et al.,* 2015; Pikner *et al.,* 2017; Corntassel & Hardbarger, 2019; Gibas & Boumova, 2020). Allotment is a type of UA where urban residents use small plots for the purpose of gardening, most often the cultivation of vegetables and fruits, for aesthetic and recreational purposes (Genter *et al.,* 2015; Taylor & Hochuli, 2017). For most plots, the family takes on the duty and financial burden of renting the land and committing to it (Zheng *et al.,* 2022). The planning system for allotments in the UK includes an encoding for the land use planning of allotments (Skamlova *et al.,* 2020). Plots are often located in clusters and managed by a central authority such as a city or group (Prove *et al.,* 2015; Cabral *et al.,* 2017). The routes through the plots and the associated amenities are open to the public, but individual plots are privately owned (Skamlova *et al.,* 2020). Vegetable gardens were a common feature of residential courtyards in the earliest periods of urban civilisation (Zheng *et al.,* 2022).

Rapid urbanisation makes it difficult for city people to maintain their own vegetable gardens, which has led to a rise in popularity for allotment gardens, in which individuals may cultivate small, individually owned parcels of land (Da Silva *et al.,* 2016). There have been several scientific investigations on the advantages of allotments (Zheng *et al.,* 2022); allotments were created to alleviate workers' precarious living conditions and abject poverty during the Industrial Revolution in the UK and North-Western Europe (Cepic *et al.,* 2020). Following World War II, the primary value of gardens was to provide food (Heremann, 2015; Fox-Kamper *et al.,* 2018).

Originally, the concept of allotment gardens was developed as a self-sufficient assistance for low-income households (Zheng *et al.,* 2022). Allotment gardens have developed into a multipurpose use of urban space throughout time (Moskalonek *et al.,* 2020). They evolved from providing social services to hosting recreational pursuits, occupying a space between active farming and leisure (Spilkova & Vagner, 2016). Improvements in urban quality of life and other indirect benefits also emerged and continue to this day (Zheng *et al.,* 2022). Young

et al., (2020) found that those who spent time in allotment gardens reported lower levels of stress and a greater appreciation for nature (Speak *et al.,* 2015). In addition, they promote a more sociable (Veen *et al.,* 2016) and healthy way of life (Wood *et al.,* 2016). Allotment gardening is used as a recreation (Jensen *et al.,* 2020) and is advocated as a beneficial hobby for the general community (Genter *et al.,* 2015). In this way, the allotment garden is seen by academics as a vital piece of urban green space (Russo, 2020; Sowinska-Swierkosz, 2021).

A widespread problem is the uneven distribution of green infrastructure in metropolitan areas (Zheng *et al.,* 2022). The availability of urban green space in Berlin is unequal across various social classes (Kabisch & Haase, 2014), family gardens in Portland, Oregon, USA cluster in the high-quality region in the city (McClintock *et al.,* 2016), and there are socioeconomic variations in the availability of nutritious food (Su *et al.,* 2017). Also, since apartheid, the green space in South Africa has been unequal (Venter *et al.,* 2020). On top of that, when it comes to allocating land in cities, non-agricultural uses get priority from city officials (Azunre *et al.,* 2019). Ever since they were first established, the placement of allotments in the city has been problematic due to their incompatibility with other aspects of urban development (Zheng *et al.,* 2022). Although allotment gardens provide a unique chance for city dwellers to engage in gardening (Young *et al.,* 2020), they also contribute to several unfavourable outcomes for locals (Lewis *et al.,* 2018), including displacement, gentrification, and social isolation (Egerer *et al.,* 2018; Wu & Kim, 2021).

Knowledge on the provision of urban allotments is extremely limited (Zheng *et al.,* 2022), even though urban allotments support sustainable planning strategies to revitalise urban space (Bell *et al.,* 2016) and people are becoming increasingly interested in UA and urban food (He & Zhu, 2018; Hardman *et al.,* 2018). By analysing satellite imagery, researchers in 2014 were able to determine the unique physical features of allotments in Ljubljana, Milan, and London (Glavan *et al.,* 2018). Ecosystem services in Leipzig, Germany were evaluated by analysing the geographical features of 276 allotment gardens (Cabral *et al.,* 2017). In Poland, a technique of valuation usable in urban planning was used to an analysis of the eighty-six allotment gardens in Pozna and how they contribute to the spatial development of the urban green space system (Dymek *et al.,* 2021). Research conducted in the UK found that the number of available plots in the city of London fell short of meeting demand, and that the city's 682 allotments were not spread equally (Fletcher & Collins, 2020). In summary, research on the supply of allotments is scattered, focusing mostly on European cities, and fail to establish the geographical distribution features of urban allotment sites (Zheng *et al.,* 2022).

2.1.3. High Tech Growing

High-tech urban farms are characterised as an alternative food production plan that makes use of innovative technology and new methods to meet the pressures of a city's growing population (Farhangi *et al.*, 2019). LED grow lights, computer-aided regulating, and monitoring systems to optimise the growing environment in terms of PH level, temperature, oxygen content of the nutrient solution, and fertiliser used for various crops are all examples of related technologies (Farhangi *et al.*, 2020). The regulated atmosphere not only ensures the development and general health of the crops, but also makes them readily accessible throughout the year (Despommier, 2013).

High-tech urban farms are defined as those that use a soilless production technique, such as hydroponic (see figure 6), aeroponic, aquaponic, or a mix of these methods with vertical farming, as explored in this research. In recent decades, the meaning of the term "hydroponic" has transitioned, but it is now generally accepted to mean an alternative growing method to traditional soil-based cultivation that employs nutrient-rich solutions containing major essential elements and micronutrients (Smith, 2005). To the contrary of conventional farming, hydroponic systems may reduce water use by as much as 90% (Barbosa *et al.*, 2015). Although hydroponics has been around for a while, it is only lately that its economic worth has been recognised (Smith, 2005). While the economic feasibility has been discussed, it remains controversial (Farhangi *et al.*, 2020). Researchers from the National Aeronautics and Space Administration (NASA) have found that hydroponics might one day make producing food in space a reality (Al-Kodmany, 2018).

Similar to hydroponics, but with more modern technology and even lower water use, is aeroponics (Farhangi *et al.*, 2020). The primary distinction between hydroponic and aeroponic systems is that the former uses water as a growth medium, while the latter does not (Love *et al.*, 2015). Instead of utilising water, plants in aeroponic systems thrive in a fine mist generated by a variety of atomisation techniques that split nutrient-rich liquid into droplets (Eldridge *et al.*, 2020).

Figure 6: Image showing hydroponic growing system in a greenhouse (Source: Research subject)

Aquaponics is a popular, rapidly expanding method of soilless food production (Al-Kodmany, 2018). By fusing hydroponics with aquaculture, "aquaponics" allows for both high-quality fish production and crop cultivation to occur simultaneously (Love *et al.,* 2015; Al-Kodmany, 2018). The fundamental feature of this set-up is the nutrient circulation, which is accomplished by watering plants with recycled fish-tank effluent (Love *et al.,* 2015).

By incorporating agriculture into urban planning, we may alter the dynamics between city dwellers, farm animals, food, and the natural world (Farhangi *et al.,* 2020). Producing food locally and enhancing the health of city dwellers are two ways in which high-tech urban farms contribute to social well-being (Lin *et al.,* 2017). According to Gould and Caplow (2012), these measures have the potential to drastically cut fossil fuel use, boost urban ecology, increase food safety and security, the city's people standard of living, and save energy in buildings.

While projected energy use has been cited as a potential roadblock to attaining economic and environmental sustainability, others have argued that more research into green energy sources might help reduce this effect in the future (Farhangi *et al.,* 2020). On top of that, they allow for the year-round cultivation of fresh, safe food in even the most adverse climates (Farhangi *et al.,* 2020). Putting them to use in cities has the potential to alleviate some of the pressures that

urbanisation places on the city's food supply while also providing several other advantages, including those of an educational and ecological nature (Love *et al.,* 2015; Farhangi *et al.,* 2020).

2.2. Urban Agriculture in the Global South

One of UA's major impacts in the GS has been to improve the food security of low-income urban families (Mkwambisi *et al.,* 2011). Reasons why low-income families in the GS resort to UA include inadequate, erratic, and inconsistent access to food as well as a lack of purchasing power (Tambwe, Rudolph & Greenstein, 2011; Taiwo, 2013). It is undeniable that low-income city residents are driven to participate in UA by their desperate need for food (Mkwambisi, Fraser & Dougill, 2011). Food and cities have developed a mutually beneficial connection, although Steel (2008) notes that cities continue to struggle with the high expense and logistical complexity of importing food from rural regions. Therefore, the challenges encountered by low-income urban families might worsen and contribute to urban food insecurity if UA is not utilised by the authorities (Shillington, 2013; Battersby *et al.,* 2014). It is indeed worth noting that in GS countries, it is estimated that low-income families spend between 60 and 70 percent of their money on food (Maxwell 1999; Dubbeling 2011).

The African continent has experienced a significant transition towards urban settlements as the primary focal point of food systems; this shift has been primarily attributed to the substantial increase in urban population, the growing number of large cities and second cities, and the observed changes in dietary patterns (Alliance for a Green Revolution in Africa [AGRA], 2020). Food security is encouraged, as it is in places like Accra, Kampala, and Ibadan where UA is promoted (Chilowa, 1998; Cabannes & Raposo, 2013). In these areas, urban farmers often turn to selling their produce to bolster their families' finances (Chilowa, 1998; Cabannes & Raposo, 2013). Research conducted in Kampala indicates that UA has evolved from a survival tactic to a commercial venture through which many local families benefit (Tambwe, Rudolph & Greenstein, 2011; Battersby *et al.,* 2014; Warshawsky, 2016). According to FAO's (2013) estimates, around 30 percent of the world's food supply goes to metropolitan centres, which is home to two hundred million people who generate food, and these are some of UA's attempts at improving global food security and nutrition in cities (FAO, 2013).

Studies, conducted in the GS, are mostly geared at promoting the idea that UA may be used as a catalyst for major reform and progress especially with respect to addressing food insecurity (Zezza & Tasciotti, 2010). The 1975 World Food Conference emphasised food insecurity as a crucial development concern, which led to increased attention on the notion of UA in the 1980s

(Maxwell, 1995). Since that time, most studies have focused on UA to improve urban dwellers' food security by decreasing poverty and boosting their economic opportunities (Ellis & Sumberg 1998; Mougeot, 2006; Foeken, 2006; Simatele & Binns, 2008).

The employment of UA is progressively advocated as a means for achieving sustainable urban development (Zasada *et al.,* 2020) and promoting agri-food sustainability (Caputo *et al.,* 2020). According to Okvat and Zautra (2011), community gardening is a form of UA that integrates farming objectives with the promotion of well-being and resilience across various levels, including the individual, social group, and natural environment. The practise of UA is commonly believed to offer numerous social and environmental advantages for individuals residing in urban areas by (Menconi *et al.,* 2020). This is due to its ability to address the unfavourable environmental, social, and health consequences that are often associated with prevalent production and consumption patterns that are linked to city life (UN General Assembly, 2016). UA is commonly recognised as a means of bolstering food security (Edmondson *et al.,* 2020; Ma *et al.,* 2020), promoting better health outcomes (Brown & Jameton, 2000), fostering greater wellbeing (Mayer & Frantz, 2004), and promoting social inclusion (Batitucci *et al.,* 2019). Additionally, it is acknowledged that UA can play a significant role in advancing the Sustainable Development Goals (Russo & Cirella, 2019). In addition, the practise of UA is recognised as a significant mechanism for urban revitalization and for fostering social innovation within urban areas (Sanyé-Mengual *et al.,* 2019).

Simultaneously, UA has been associated with several negative consequences and externalities. Several research studies have reported the presence of harmful levels of organic toxins, such as microbial contamination, and inorganic pollutants, such as pesticides and heavy metals, in plants, soil, and irrigation waters (Graefe *et al.,* 2019). Similar findings have also been documented by Perrin *et al.,* (2014), and Taylor and Lovell (2014). Furthermore, several studies have highlighted issues related to vandalism (Lee *et al.,* 2019) and green gentrification from a societal standpoint (Davidson, 2017).

In 1998, Maxwell *et al.,* conducted research showing that UA may be used to supplement income by selling agricultural products (Maxwell *et al.,* 1988). Furthermore, it was believed that UA may aid in the management of municipal waste such as wastewater and urban solid waste (Smit & Nasr, 1992). Despite UA's strong lobbying stance, public health concerns have been raised about stagnant water that might provide breeding grounds for the mosquitoes that spread malaria (Drakakis-Smith *et al.,* 1995). Concerns about odour, noise, rubbish (Hovorka, 2003) and legal roadblocks (Drakakis-Smith *et al.,* 1995) were also common in Harare and Lusaka (Simatele & Binns, 2008). Previously, the rural-urban connections in the GS countries,

where food is grown in the countryside and brought to urban centres, and where household rubbish from cities is carried to and deposited in the countryside, was very common (Orsini *et al.,* 2013). However, a way to enhance this connection is through composting where poultry and residential wastes is repurposed for other beneficial resources (Gupta & Gangopadhyay, 2006). While the economic and food security advantages are well recognised in GS nations, the social and communal benefits are often seen as less important (Foekan, 2006).

The disparity between the abundant accessibility of processed foods and beverages that are high in fat and sugar in urban diets and the insufficient provision of fruits and vegetables is evident in the literature (Siegel *et al.,* 2014; Mason-D'Croz *et al.,* 2019). According to the research conducted by Siegel *et al.,* the global supply of vegetables and fruits is insufficient by 22% on average, as per the WHO assessment data of 2009. Countries in the GS are particularly at risk of hunger (The World Bank, 2014). Although groceries can be found with relative ease at the supermarket, these communities' sustenance budgets are often disproportionately high, making them more sensitive to food price changes (Orsini *et al.,* 2013). The high costs of housing, transportation, and healthcare, along with the inaccessibility of food security nets like agriculture, make it difficult for most urban residents to afford a healthy diet (Cohen & Garrett, 2010). One of the greatest challenges to food security is the lack of available food, especially in the GS countries despite estimates showing that hunger is declining (FAO *et al.,* 2021).

In 2012 - 2014, about 804 million people worldwide were continually undernourished, with 791 million of them residing in GS countries (FAO *et al.,* 2021). Food insecurity is difficult to solve, especially in low-income countries, due to future risks such as population expansion, climate change, ecological imbalance, and depletion of resources (Godfray *et al.,* 2010). Even though great progress has been made towards the Millennium Development Goal of decreasing global poverty challenges in half by 2015, there are still 815 million people in the world that are food insecure (FAO *et al.,* 2021). The Sustainable Development Goals (SDGs) were established during the United Nations General Assembly in September of 2015, and are a comprehensive and all-encompassing plan for sustainable development on a global scale (UNGA, 2015). The global goals are comprised of 17 objectives that are accompanied by a set of 169 targets, each of which may have up to three indicators to gauge advancement towards the year 2030 (Nicholls *et al.,* 2020). The impact of UA on various goals, namely 1, 2, 3, 8, 11, 12, 13, and 15, has been studied by researchers and the findings suggest that UA has the potential to reduce poverty (Hamilton *et al.,* 2013), increase access to more nutritious food, thereby reducing hunger (Berti *et al.,* 2004), and contribute to sustainable development goals

such as health and economic growth, as well as sustainable cities and communities (Clatworthy *et al.,* 2013; Hamilton *et al.,* 2013; White & Stirling 2013).

Sub-Saharan Africa (SSA) has seen an increase in research and international development efforts that highlight the advantages of UA as an endeavour to help poor people in recent times (Clinton *et al.,* 2018; Nicholls *et al.,* 2020). In many communities throughout SSA, UA has increased access to healthy food, improved nutrition, decreased food costs, increased income, and provided opportunities for productive work (Alimba *et al.,* 2018; Shifa & Borel-Saladin 2019; Olumba *et al.,* 2021). With a high rate of urbanisation in the previous ten years, researchers and practitioners are constantly advocating for UA as a practical and realistic way to solve the problems of the growing urban population, as well as its ability the problems of poverty, global warming, food and water insecurity, and others (United Nations, 2015). It is therefore necessary to evaluate the UA system and the stakeholders involved to understand the part UA can play and the possibilities it holds in tackling these issues (Shifa & Borel-Saladin, 2019).

One often-cited barrier to UA is the loss of farmland in urban areas because of development (Amponsah *et al.,* 2015; 2016). The sustainability of the UA sector has significant limitations that threaten to undermine its capability to serve urban populations and food systems in the GS (Olumba *et al.,* 2021). Extreme land-use changes brought on by rapid urbanisation have negative effects on UA sustainability, especially in countries of the GS (Ayambire *et al.,* 2019). This makes it hard for most government agencies and urban planning departments to set official land aside for farming, and in some cities, it might even be against the law (Smith *et al.,* 2001). Numerous social, economic, and institutional barriers stand in the way of farmers seeking out farmland in densely populated regions, limiting their ability to maximize their output (Odudu & Omirin, 2012; Olumba *et al.,* 2019). The authors Kinnunen *et al.,* (2020) emphasise the vulnerability of regional zones that exhibit dense high-volume production in close proximity to consumers, notwithstanding the possibility of decreased greenhouse gas emissions and waste, as well as augmented local food provision that arises from alterations in production technologies and consumption preferences.

Other constraints common in UA in some GS countries include the inability to obtain financing, the risk of theft, and the destruction of crops caused by passing livestock (Asadu *et al.,* 2016). According to Rohit *et al.,* (2017), urban and peri-urban farming has significant difficulties due to a lack of available inputs, a lack of available labour, difficulties in selling and promoting their products, and economic and environmental difficulties. Nonetheless, UA has also been associated with a variety of unintended outcomes and externalities and these mostly involve

environmental risks associated with farming procedures, such as irrigation, fertilizer application, and control of weed and pest (Tapia *et al.*, 2021). Organic toxins and inorganic pollutants such as heavy metals, have been found at extremely high amounts in plants, soil, and water used for irrigation (Graefe *et al.*, 2019; Perrin *et al.*, 2014). These farming practices might be typically the result of inadequate knowledge of safe gardening techniques (Taylor & Lovell, 2014).

However, participation rates in 15 GS nations were analysed and at the national level varied from 11% to 69%, suggesting that systematic assessments of UA's prevalence are noticeably absent (Zezza & Tasciotti, 2010; Hamilton *et al.*, 2014). Additionally, in certain parts of Asia and Latin America, commercial UA is said to provide a an extremely high proportion of the meat and produce consumed (Maxwell, 2001). Researchers' interest in UA was further piqued by the 1975 World Food Conference, which recognised food poverty as a pressing issue for international development (Battersby, 2013). In addition to the lack of proof on UA's effect on food security (Zezza & Tasciotti, 2010; Crush *et al.*, 2011), some researchers have criticised this endeavour for being more focused on advocacy (Ellis & Sumberg, 1998; Webb, 2011; Battersby, 2013). Criticisms like this highlight the need for a more thorough assessment of the current UA research foundation and more defined goals for the future (Olumba *et al.*, 2022).

2.3. Poverty in Urban Areas in African Cities

Despite static living standards, Africa is seeing a rise in urbanisation (UN-Habitat, 2008; UNDESA, 2014). With little options for proper work and a steadily rising number of unemployment, governments have a tough time keeping up with population growth (UNDESA, 2014). Despite a lack of up-to-date statistics, UN-Habitat found that in 2013, when the poverty threshold was established at US$1 per day, half of Africa's urban residents were living in poverty (UN-Habitat, 2013). More than two hundred million (that is close to 70%) city people in SSA might be considered poor, if the poverty threshold is set at US$2 a day to account for the high expense of living in cities (FAO, 2012). In cities where formal work is scarce and highly competitive, the poor are frequently forced to improvise to satisfy their basic requirements, such as those for food, shelter, utilities, and income, despite the presence of strict planning restrictions (UN-Habitat, 2013). The result is unplanned or poorly planned urbanisation, the emergence of slums, and the proliferation of underground economies in cities and their peripheries which is a characteristic of most African cities (United Nations Fund for Population Activities [UNFPA], 2007). There are 189 million slum inhabitants in SSA's urban areas (United Nations, 2018). Africa's urban centres are characterised by slums, which are

informal communities that lack adequate housing, water, sanitation, and land tenure security (UNFPA, 2007).

For the urban poor in Africa's major cities, UA farming has emerged as a crucial means of subsistence (Mougeot, 1999). In addition to providing a means of income and employment, it also plays a crucial role in ensuring that low-income urban families have access to adequate food supplies (Uko, 2021). There were food protests held in 2008 in Guinea, Mauritania, Morocco, Senegal, Cameroon, Burkina Faso, Cote d'Ivoire, Ethiopia, Madagascar, Somalia, Tunisia, Egypt, and Mozambique due to the realities of poverty and urban hunger in Africa (Berazneva & Lee, 2013). Berazneva and Lee (2013) discovered that elevated levels of urbanisation and low domestic food production owing to inadequate land access related to riots in Egypt and Mozambique, which were triggered by high food costs. It has been suggested that low rates of urbanisation in Niger helped avoid urban food riots after a protracted drought period (Berazneva & Lee, 2013). This, as stated by the authors, was due to the fact that individuals still produced food at home, given that they had access to agricultural land (Berazneva & Lee, 2013). Food riots, the authors find, were more likely to occur in areas with high rates of urbanisation and low rates of domestic or local food production (Berazneva & Lee, 2013).

After public worker pay were reduced during a time of unfavourable economic shifts in the 1990s, Page (2002) reports that in Cameroon, UA was used to boost local food production as a safety valve against social unrest. Financial crises and/or increases in food and fuel costs disproportionately affect the poor and those who do not own lands since they must devote a larger portion of their income to basic needs like food and shelter, particularly in female-headed families (De Janvry & Sadoulet, 2008; Headey & Fan, 2008; Ivanic & Martin, 2008). The disadvantaged individuals in cities often have little or no access to land and must spend a disproportionately sizeable portion of their income (typically between 60 and 80 percent) on food (FAO, 2012; Ruel *et al.*, 2010). The ability to buy food affects not just the quality but also the amount and regularity of one's diet and as a result; when there is a financial or economic crisis in a city, the poor are hit the hardest (Ruel *et al.,* 2010). In Mozambique, for instance, poor non-farming urban families were shown to be severely impacted by rising food costs, whereas poor rural farming households were seen to be positively impacted by rising premium prices for their commodities (Arndt *et al.,* 2008). Additionally, it was found in Uganda that poor rural farming households were less vulnerable than their urban nonfarming counterparts during economic crises, as the rural households adapted their production levels and food purchases to reflect the prevailing economic situations (Benson *et al.*, 2008).

Research, international declarations, and global action plans all stress the need of protecting the most at-risk urban residents from the effects of economic downturns (Bush, 2010; Cohen & Garrett, 2010; Wodon & Zaman, 2009; Zezza *et al.,* 2008). In Benue State, Nigeria, there were instances where the governor declared Fridays as a state public holiday after the economic recession in 2016 so that civil servants and the general employed population could engage in agricultural activities within and outside the cities to supplement their unreliable income (Uko, 2021). This exemplifies the crucial role that UA plays in reducing vulnerability (The Will, 2016). In the same year, Imo State, Nigeria followed suit by making Thursdays and Fridays off-limits to boost UA (The Will, 2016)

2.4. Urban Agriculture in the Global North

The difficulty of meeting the demands of a rising global population and a rapidly expanding urban population places a strain on the food industry, not only in the GS but also within the GN context (Satterthwaite *et al.,* 2010). To ensure everyone has access to healthy food, it is important to device means of how to supply enough food at a time when increased number of people are demanding carefully sourced, locally grown produce (Grebitus *et al.,* 2017). Many U.S. cities have already started to encourage and facilitate on-site food production via means such as commercial urban farms and residential or communal gardens (Hughes & Boys, 2015; Printezis & Grebitus, 2018). Growing populations have exacerbated the shortage of land in GN areas like Europe, where urban growth has reduced agricultural productivity (European Economic Area [EEA], 2006). Some difficulties arise as a result of this trend for city residents, whose food security is threatened as they get more removed from the means of production (Howe & Wheeler, 1999).

Urban regions in Europe often have land allocation schemes that are used in the cultivation of fresh, locally sourced produce (Edmondson *et al.,* 2014). These plots of land (allotment gardens) are a special form of garden that are dedicated to food production (Berg *et al.,* 2010). Allotment gardening reached its peak in the UK during World War II (Martin & Marsden, 1999), and the country's citizens relied on their plots and backyard gardens for 10 percent of their daily caloric intake (Campbell & Campbell, 2011). Over 90,000 people in the UK were on the waiting list for a plot at an allotment with demand for plots and UA having grown during the preceding 17 years (Campbell & Campbell, 2011). Cities having unemployment and population issues may benefit from UA since it has been demonstrated to lower stress and improve activity among overweight and unhappy individuals (LaCroix, 2010; Pothukuchi, 2018; Davis *et al.,* 2011). It has also benefited in areas where people would otherwise struggle

to obtain enough to eat (Vitiello, 2008) and prevented social breakdown (Alaimo *et al.*, 2010). Both Glover *et al.*, (2005) and Viljoen *et al.*, (2005) suggested that the practise of UA may be therapeutic and help bring communities together, while also improving the quality of vacant land and building investment around the city.

While the UK has been at the forefront of this trend, the USA has also seen an uprise in interest as the significance of growing food has grown, especially in economically deprived regions and as vacant land becomes more readily available in cities (Grewel & Grewel, 2012). Since it was realised that UA increases access to fresh produce, reduces stress, and promotes overall well-being, awareness of its advantages has increased in the media, among scientists, and among policymakers and the public (Leake, Adam-Bradford & Rigby, 2009; Berg *et al.,* 2010; Kortright & Wakefield, 2011). The government of the UK established and supported the Healthy Towns Initiative programme to boost UA involvement, address the issue of physical activity, promote a healthy lifestyle, and encourage fruit and vegetable intake (Edmondson *et al.,* 2014). It has also been shown that UA may aid in the management of chronic diseases (Howarth *et al.,* 2020).

Numerous local companies, organisations, and government institutions participate in UA mostly because of climate change and the lack of progress in developing sustainable food systems (White & Bunn, 2017). Nonetheless, UA has not had the support it deserves from both the local and national government, and consequently, it occupies a volatile place in the cities despite all the good and major engagement by organisations (Henderson & Hartsfield, 2009; Thirbert, 2012). While many of the world's most visible, community-engaged, and productively expanding initiatives have their roots in informal UA, this approach has received surprisingly little scholarly attention (Crane *et al.,* 2012; Reynolds, 2008). Those who engage in such informal activities are typically labelled "guerrilla gardeners," an umbrella term for any kind of unlawful gardening that does not have the approval of a landowner or a municipality (Johnson, 2011; McKay, 2011; Tornaghi, 2014). While most people think of guerrilla gardening as a low-key hobby done more for fun than for food production, it may also refer to large-scale cultivation in the form of unregulated urban farms and community gardens (Hardman & Larkham, 2014).

The significance of urban food policies on a global scale has been acknowledged in prominent international platforms such as the United Nations New Urban Agenda and the Sustainable Development Goals (UN Habitat, 2015). Furthermore, the growing prevalence of institutional or grassroots initiatives that seek to address the challenges facing food systems illustrates that urban areas are recognising the potential of food to not only provide sustenance for a

progressively urbanised populace, but also to promote economic growth, tackle social and health disparities, and encourage ecological sustainability (Moragues-Faus *et al.*, 2013).

Moragues-Faus and Morgan (2015) have noted that the creation of "spaces for deliberation" and the development of models for inclusive stakeholder engagement are recurring features in various existing initiatives, although there is no uniform approach (Gianbartolomei *et al.*, 2021, p. 1).

Recent discussions on the topic of defining UA in GN cities have led to the development of definitions that build on the activity's key characteristics, such as its location, its output, its motivation, its market, its origin, and the actors (Vejre *et al.*, 2016). Also, because social impacts and non-food products may become the main reason for farming in UA projects in the GN, their categorisation may depend on the business strategy or the main reason for farming (Thomaier *et al.*, 2015). According to McEldowney's (2017) study, the distribution of UA in Europe has been influenced by its ability to meet the diverse needs of urban areas, including but not limited to food supply, recreation, environmental sustainability, and social welfare. According to Serra, Sauri, and Salvati (2017), the agricultural parks in Milan and Barcelona are the primary locations for UA innovations in Western Europe. According to the results of a survey conducted by Spilkova (2015), there is a growing trend of setting up new urban community gardens in Prague, with the founders driven by the aspiration to enhance their local environment and provide a venue for socializing and collaborative activities, as revealed by their interviews. According to McEldowney's (2017) analysis, the situation in Eastern Europe is dissimilar, where the establishment of successful UA businesses proved challenging due to the constraints of socialist economic systems and limitations on private investment, impeding the progress of small-scale entrepreneurship. McEldowney (2017) observes that in France, there is an enhanced level of collaboration between municipalities and chambers of agriculture, connecting professional urban farmers and citizens through a network of agricultural stakeholders.

The implementation of initiatives in urban areas exhibits variations with respect to the mobilised resources, the participating actors, the addressed concerns, the degree of democratisation of the procedures, and primarily, the models of governance (Minnoti et al., 2022). The observation that arises is the presence of a notable stability in the landscape concerning food policies, an arena in which cities, under diverse governance structures, are progressively taking on the mantle of policy pioneers (Minnoti et al., 2022). Regional, national, and international networks are crucial in the upward rescaling of food governance within this particular context, as noted by Minnoti et al. (2022).

For instance, the City of Rome has witnessed a significant increase in the area of cultivation (6,236 ha) and the number of urban gardens, registering a growth of nearly 17% between 2000 and 2010, making it the most agricultural municipality in Europe (Mazzocchi & Marino, 2020). This rise in gardens has facilitated the identification of several best practices in UA, as noted by Cavallo, Dinato, and Marion (2016). The Milan Urban Food Policy Pact, a protocol established in 2015 with the aim of promoting sustainable food systems, has garnered the support of over 200 mayors worldwide, exemplifying the growing trend of intercity collaborations (Minnoti *et al.,* 2022). Several initiatives have been developed to disseminate knowledge and experiences and expedite the conversion of urban foodscapes. These include thematic working groups within established networks such as C40 or Euro-cities, as well as new platforms that concentrate on food-related challenges, such as the UK Sustainable Food Cities network (which has recently been renamed as Sustainable Food Places) (Moragues-Faus and Battersby, 2021a) or the Italian Network on Local Food Policies (Dansero *et al.,* 2019).

Based on a case study published by the European Commission in 2015, rooftop gardens situated in cities have the potential to furnish over 75% of all vegetables consumed in urban areas. For instance, in Bologna, if all the available rooftop gardens were exploited, they could yield approximately 12,500 tonnes of vegetables annually, which would be adequate to meet 77% of the city's vegetable consumption, as per the actual data on consumption.

Roggema's (2015) investigation of the Amsterdam area revealed that 12.5% of the city's surface area, exclusive of roofs, private areas, and ecological spaces, could be effortlessly converted into productive food space, providing vegetables, fruits, and herbs to 25% of the city's population. However, if this estimate were combined with the potential of roofs, underground spaces, private areas, and indoor spaces, the percentage could increase to 90%. Meanwhile, Jenkins, Keeffe, and Hall's (2015) research on a raised aquaponic food system situated on the top floor and exterior roof of an abandoned mill in Manchester has been applied to the entire city, indicating that 33% of the city's surface area is cultivable for growing food.

UA in Europe is confronted with challenges, including tensions between traditional and modern urban farmers, limited open space and farmland, skills and competencies gaps, and legislation (Rogge, Kerselaers, & Prove, 2016). Economic issues also constrain UA projects as they rely heavily on public funding (McEldowney, 2017). Some researchers caution against overly optimistic expectations of UA's ability to provide food, job training, work experience, generate income for producers, and create jobs funded by profits from sales (Daftary-Steel, Herrera & Porter, 2015). European policy has been criticized for not having a transformative effect on UA because it regards food production as a rural activity (Curry *et al.,* 2014). The Barcelona

Declaration on UA and the CAP, issued by the COST Action project in June 2013, called for stronger consideration of UA as a driving force for innovation and its recognition within the EU administration and Member States.

The European Forum for a Comprehensive Vision on UA (EFUA) has recently conducted a project on UA, which includes a session on identifying common ground for UA. The session emphasises the crucial involvement of local and regional associations, the establishment of clear zoning for food production, and the necessity of a shared language and commitment from governing bodies (EFUA, 2022).

Recently, in the UK and most parts of Europe, community gardens and other activities inspired by the Americanised types of UA have expanded rapidly (Hardman *et al.,* 2022). In contrast to the private allotment plots in the UK, the American method is more communal in character and less limited, allowing for the development of additional places (Holland, 2004). This more social kind of gardening has grown in favour as allotments have become more difficult to obtain (St Clair *et al.,* 2020).

The COVID-19 pandemic has brought UA into focus, with evidence showing increased output from both micro and macro sites to meet surging demand (Social Farms & Gardens, 2021b). Even prior to the outbreak, there was a growing momentum in UA policies and plans, employing charters and planning papers to facilitate its implementation (Hardman & Larkham, 2014). However, despite the enthusiasm and the potential for upscaling post-pandemic, there are significant obstacles preventing UA from being implemented at a larger scale (Hardman *et al.,* 2022). Factors such as declining land availability due to climate change and land degradation, as well as the need to preserve natural resources and protect biodiversity, pose challenges in sustainably meeting the nutritional needs of growing urban populations (Walsh *et al.,* 2022). One major obstacle is contaminated soil, which requires costly solutions and alternatives for UA to progress (Hardman *et al.,* 2022). Nevertheless, simple measures like wearing gloves and thoroughly washing produce can help reduce exposure to contaminated soil (Stubberfield *et al.,* 2022).

Forecasts suggest that global demand for urban land, both residential and commercial, is expected to increase significantly by 2100, ranging from 1.1 to 3.6 million km2 (Gao & O'Neill, 2020). The importance of small-scale food production in urban areas is increasingly recognized for its contribution to sustainable development goals (Nicholls *et al.,* 2020), and the Intergovernmental Panel on Climate Change has highlighted the role of UA in climate mitigation (IPCC, 2018). The FAO also tends to encourage incorporating urban food into city planning (Cabannes & Marocchino, 2018; FAO, 2021). It is understood, in line with other

experts, that UA cannot sustain urban food systems on its own, but that it can enhance the current infrastructure (Tornaghi & Certoma, 2019). Utilising UA, we can lessen the burden on traditional farming in the countryside while giving city dwellers a greater stake in the food they eat (Hardman *et al.*, 2022).

While traditional UA systems have increased, there has been a new surge in curiosity in more innovative methods, such as growing food underground, on walls and roof or keeping animals on city waterways (Hardman & Larkham, 2014). Conventional and radical UA are on the increase in the UK, but significant challenges including finances, political backing, and soil quality remain (Caputo, 2012; Hardman & Larkham, 2014). There are also worries about how the public would react to large-scale agricultural endeavours in a city setting (Social Farms & Gardens, 2021b). Recent research by Nadal *et al.*, (2018) reveal that enthusiasm for the idea of UA is developing in certain regions of the globe, although this seems to be fading as interest in UA develops. Evidence suggests that large-scale efforts generally fail because of improper business models, a lack of societal buy-in, other related concerns and many UA ventures are small in size (Hardman & Larkham, 2014).

2.5. The Impact of Covid on Urban Agriculture

In many ways, the global coronavirus pandemic posed a significant threat to public health (Sridhar *et al.*, 2022). Food instability resulted from the virus's fast spread, which weakened the agricultural and industrial sectors (Jámbor *et al.*, 2020). Several government organisations, both domestic and international, such the Food and Agricultural Organisation (FAO) and the International Food Policy Research Institute (IFPRI) worked to keep international trade open (Pu & Zhong, 2020). However, several nations restricted foreign commerce and travel due to the rapid rate at which the virus spread, which caused poverty, starvation, and inadequate nutrition (Torero, 2020). Some of the fastest-growing sectors have been hit the worst (Sridhar *et al.*, 2022). In addition to a shortage of available labour, a delayed time to market, and consumers' inability to evaluate products in order of priority, the agriculture industry still faces numerous challenges (Luckstead *et al.*, 2020; Rajput *et al.*, 2020).

Large metropolitan regions were susceptible to crisis, and the consequences of the coronavirus pandemic were felt globally (Nguyen, 2020). Since its first outbreak in Wuhan, China, in January 2020, the disease has spread over the globe, resulting in over six million confirmed cases and over 371,000 fatalities as of June 1, 2020 (WHO, 2020). Malnutrition and poverty have risen as a result of the pandemic, revealing the fragility of the international food supply,

particularly in the GS nations (Stephen *et al.,* 2017). As the pandemic progressed, it became clear that most communities were not ready to cope with the aftermath of the mandatory lockdown intended at slowing the spread of the virus (Pulighe & Lupia, 2020). High consumption rates are seen in big and overpopulated cities, which rely heavily on the transportation of food to and from the city, as well as water, electricity, and other supplies (Pulighe & Lupia, 2020). The decreased supply of essential products has put tremendous pressure on the supply chain, increasing the volatility of retail pricing, most notably for fresh fruits and vegetables (Poudel & Subedi, 2020).

The issue was made worse by a state-wide lockdown, which left a shortage of farm labourers, a shortage of fertilisers, an inconsistency between market forces, and post-harvesting challenges due to social distancing (Consultancy Asia, 2020; Insights, 2020). Due to the pandemic, the agricultural sector is still struggling to keep up with the increased demand for food, making it even more important to put an emphasis on foods that promote health and nutrition, as well as on measures to make communities safer, alleviate poverty, and safeguard the environment (Christiaensen & Martin 2018; Chatterjee, 2020). With more individuals staying in, food insecurity is on the rise among the newly unemployed, the low-income earners, and the homeless (Pulighe & Lupia, 2020).

From farmers to retailers, the whole value chain felt the effects of the pandemic (Sharma *et al.,* 2020). Agriculture output was poor as farmers were hampered by restrictions on movement and acquiring necessary supplies (Aromolaran & Muyanga, 2020). Possible causes included a rise in the price of agriculture inputs including seeds and synthetic fertilizers, a drop in household expenditure, a shortage of resources, and a labour shortage in the initial start of the pandemic (Aromolaran & Muyanga 2020). Simon (2022) further explained how the pandemic negatively impacted major sectors such as the health, economic, social, government and other key public services (see figure 7).

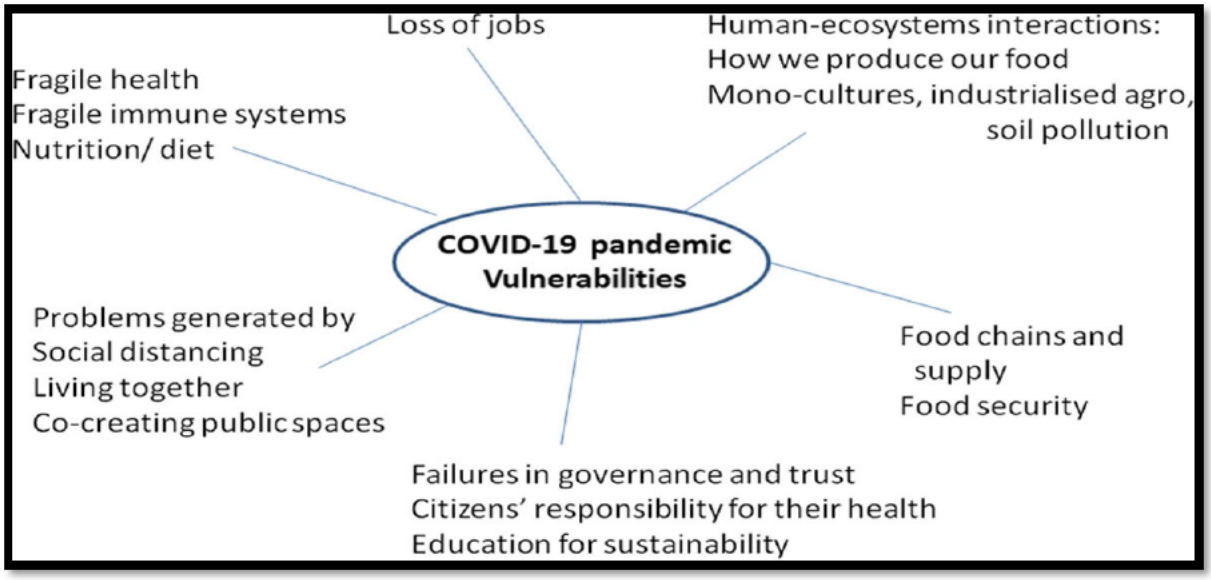


Figure 7: Image showing susceptibilities caused by the Covid-19 outbreak (Simon, 2022)

A recent analysis indicated that in the first quarter of 2020, Southeast Asian countries' agricultural output decreased by 3.11 percent due to a lack of farm labourers (Gregorio & Ancog, 2020). As a result of the coronavirus, the worldwide demand for food and food prices surged dramatically (Sridhar *et al.,* 2022). Adding to this, the global food commodity price products reached an all-time high of 97.19 on the FAO Food Price Index (FFPI) in September 2020 (FAO, 2020). The price increased by 5% compared to the previous year, reaching its highest point between September 2021 and February 2021 (Sridhar *et al.,* 2022). The pandemic caused numerous nations to implement several measures to limit the virus's detrimental effects on their citizens and economies (FAO, 2020). Most of the world's nations were affected by the pandemic, which caused a section of the economy to shut down to combat the virus (Mahajan & Tomar, 2020).

The lockdown measures implemented in various cities during the COVID-19 pandemic highlighted the critical importance of ensuring access to food (Poudel & Subedi, 2020). Despite the global transportation of food and its availability in markets, the pandemic has negatively impacted global food systems and accessibility (Pulighe & Lupia, 2020). In response to the consequences, many countries, including Russia, the largest wheat exporter, imposed restrictions on grain exports to maintain sufficient food stocks (Gbadegesin & Olajiire-Ajayi, 2020). FAO (2020) found that while though the pandemic has had considerable effects, these effects have been driven by higher demand and food prices, world markets are anticipated to be stable. Surprisingly, the major food supply system has been running well despite having to adjust to new socially distant practises, delays in harvesting and packing agricultural products,

restrictions on farm employees, and difficulties in transporting fresh food abroad (Pulighe & Lupia, 2020). Increased food and exporting prices, particularly for vegetables and other perishable farm goods, have resulted from border closures and restrictions on migration, revealing the nations who are not self-sufficient in food production (UN, 2020).

In Nigeria, partial to total lockdowns were implemented at various times depending on the severity of the outbreak (Gbadegesin & Olajiire-Ajayi, 2020). On February 27, 2020, the first case of the virus was reported in Nigeria, and the virus spread rapidly with the country being currently one of three African nations severely hit by the virus, and the worst-affected country in West Africa (FAO, 2020). Governments from all over the world took measures to limit the disease's incidence and impact on their citizens; and since then, social isolation and the employment of masks was adopted (WHO, 2020). Other regions were subject to more stringent regulations, such as curfews and lockdowns (Chan *et al.,* 2020). Complete lockdown measures had an adverse effect on all economic sectors and the virus outbreak had a disastrous impact on agriculture, leading to an increase in urban food shortages (Gbadegesin & Olajiire-Ajayi, 2020). Unfortunately, agriculture in the GS relies significantly on manual labour, and the outbreak's restrictions on intrastate and interstate movement exacerbated a labour crisis (Inegbedion, 2021). Concerning agricultural producers in peri-urban regions, the impacts of social distance produced by Covid hampered the supply of food to urban centres, where this virus spread was most rapid (Gbadegesin & Olajiire-Ajayi, 2020).

The agricultural food system in Nigeria was already under significant strain prior to the pandemic, raising concerns about food availability during the shutdown of public life caused by the virus (Gbadegesin & Olajiire-Ajayi, 2020). As a result, the pandemic made matters much worse for the world's 820 million people who were already suffering from chronic malnutrition prior to the outbreak (Food Security Information Network [FSIN], 2020). It was predicted that because of the pandemic, food security and sufficiency would decline, and both hunger and poverty may worsen (FSIN, 2020). Moreover, 265 million people were projected to have severe shortages of food in 2020 as a direct impact of the outbreak (FSIN, 2020). In the summer of 2020, between June and August, the Economic Communities of West African States (ECOWAS) predicts that fifty million people would be at danger of food instability and malnutrition as a result of the pandemic (ECOWAS, 2020). More than 250 million people throughout the world was pushed to the brink of hunger as a result of the pandemic's predicted effects on the global economy, including high inflation and a prolonged instability of the food supply chain (FAO, 2020).

Due to self-isolation, movement limitations that caused rural and urban farmers to lose agricultural hours, and low farm yields of essential food crops worldwide, the lockdown had a negative influence on the world's food supply (Kihara, 2020). The challenges involved in transporting agricultural products enhanced the rotting of perishable commodities grown in and near metropolitan centres thus the prices of food also increased (Nickle, 2020). As a result, many city dwellers found themselves unable to pay the cost of food at the market (Kihara, 2020). The decreased availability of animal feeds affected livestock, particularly the poultry industry and the supply of eggs to city dwellers; this is likely to have had a negative impact on the healthy dietary habits of groups susceptible to the virus, such as the elderly and young children, lowering their body's immune system (Kihara, 2020). Uncertainty caused consumers to spend less on high-quality food, which had a negative impact on sales and manufacturing due to fewer people going to stores to shop for food items, especially in places under partial lockdowns because of the contagious disease (Gbadegesin & Olajiire-Ajayi, 2020).

Cities throughout the world saw the effects of Covid-19, which has led to increasing demographic inequalities, strained healthcare systems, a lack of affordable housing, and deteriorating sanitation (Weiss & Wilkinson, 2020). As a result of the rapid disruption of food distribution networks caused by the lockdown, people were encouraged to rethink their sources of food (Social Farms and Gardens, 2021a). In response to the pandemic, many city residents started producing their own food at home, giving UA a long-term boost; but this increase in UA might be due to boredom, the desire to be busy during the lockdown, or the need for a safe means of obtaining food (Gbadegesin & Olajiire-Ajayi, 2020).

The pandemic raised several scientific questions about UA's multiple roles; among them is the need to strengthen the concept’s capabilities to combat food and nutrition insecurity in the wake of a pandemic (Lal, 2020). There is a significant issue of food and nutrition insecurity in metropolitan areas, which is home to the majority of the estimated 1.6 billion workers whose pay have been slashed and the estimated 71 million people who have been driven back into severe poverty as a result of the pandemic (UN Habitat, 2021). Nonetheless, the necessity for UA research investigating and improving multi-functionality extends well beyond food and nutrition during the pandemic and possible post-pandemic phases (Pulighe & Lupia, 2020. For instance, there is the need to consider how the recent pandemic has altered the practice of UA and what this means for their future roles, benefits, sustainability, governance, and justice (Pulighe & Lupia, 2020). Despite increasing research, we still know very little about the function of UA in a wide range of physical and mental health consequences (Siegner *et al.*, 2018; Audate *et al.*, 2019). In a similar vein, the effects of interconnected positives for food,

health, and nutrition that are thought to result from the forms of knowledge and awareness acquired from UA experience need to be researched (Surls *et al.,* 2015).

Research conducted in the UK revealed a lack of cohesive policy, with significant reductions in agricultural subsidies expected soon (Lang, 2020). In addition to seeking solutions on a global scale, planning and food systems in large cities should be redesigned to improve land use, hence boosting food production in urban and peri-urban areas (Pulighe & Lupia, 2020). The demand for urban spaces, particularly urban allotments in GN nations, has even risen further in recent years (Pulighe & Lupia, 2020), and there is evidence to suggest that the Covid lockdown period may have contributed to this trend (Independent, 2020). Individual desires for nutritious diet, physical activity, and mental relaxation are primary motivators of UA (Ruggeri, Mazzocchi & Corsi, 2016). In urban regions, edible greens are mostly farmed, and these crops are integrated into the city's ecological pattern via various infrastructure (Russo *et al.,* 2019). These initiatives, which are grounded on soil-based agriculture, have cast doubt on whether urban areas can become food-independent, particularly in terms of meeting their daily caloric and protein needs (Ruggeri *et al.,* 2016).

The pandemic has shown how challenging it is to increase the use of UA to reduce the negative effects of food transportation on the environment, increase access to nutritious meals, and improve the ridiculously inefficient food distribution systems throughout the globe (Pulighe & Lupia, 2020). Multiple research findings corroborated each other in demonstrating that innovative UA techniques, including vertical farming, indoor farming, greenhouses, hydroponics, and aeroponics, provide much greater yields (Armanda, Guinee & Tukker, 2019). These indoor urban farms are not only productive, but also less vulnerable to climate change and can revive unused buildings and public places (O'Sullivan *et al.,* 2020). Scaling up UA with sustainable business models is challenging, despite claims that it may help achieve food sufficiency, reduce food poverty, and reduce reliance on international markets (Orsini *et al.,* 2014). However, it is controversial in terms of how they should be implemented with regards to legislation, logistics, technology, and efficient distribution (Weidner, Yang & Hamm, 2019). The notion of cultivating food crops in places where they are required most, such as cities, hence reducing food shortages by maintaining a balance, is desirable; but UA has severe problems in terms of space availability and self-sufficiency (Mok *et al.,* 2014). Therefore, it is possible that eliminating urban food poverty and increasing food sufficiency while decreasing industrial waste may be accomplished through a combination of new and innovative forms of UA (Pulighe & Lupia, 2020).

2.6. Urban Agriculture's Benefits

Rapid urban population growth throughout the world is increasing congestion and deteriorating living conditions, with most of the increase owing to Africa's ongoing rural-urban migration (Adedayo & Tunde, 2012). Keeping up with the demands of a growing population and making sure people all around the world have the resources they need to stay alive is now the greatest problem confronting humanity (Department for Environment, Food & Rural Affairs, [DEFRA] 2010). Almost all megacities with populations above twenty million, as well as fast-growing nations in Africa, Asia, and Latin America, have 75% of their populations living in urban areas by the year 2020 (Hoornweg & Munro-Faure, 2008). Poverty and hunger are problems that arise from this situation because the urban food supply system is being stretched to its limits, and the rural food supply is not sufficient to fulfil the needs of the growing population (Mohammed *et al.,* 2017). In recent years, UA has received widespread attention as a crucial activity for solving many pressing societal, economic, and ecological issues (White & Bunn, 2017). A wide variety of UA techniques exist, from smaller farms like allotments and rooftop gardens to large urban farms, communal gardens, and land sharing agreements (Ackerman, 2012; Bryant, 2012; Tornaghi, 2014). Unlimited potential exists for UA in Nigeria because of the country's abundance of arable land and favourable growing conditions, provided that the necessary innovations and regulatory frameworks are put in place (Stewart *et al.,* 2013).

To provide for the basic needs of city residents, the commercialisation of urban life has stoked a rise in demand for resources like sustainable infrastructure and affordable food (Okvat & Zautra, 2011). In the food industry, the difficulty of producing enough food is caused by the quick migration into cities and the increasing population (Satterthwaite *et al.,* 2010). This problem must be fixed so that people everywhere have access to healthy, high-quality food, but it also raises the challenge of meeting rising consumer demand for fresh, local produce while maintaining appropriate nutritional supplies (Grebitus *et al.*, 2017).

The percentage of GS residents who engage in UA varies widely, from around 10% in Indonesia to over 70% in Vietnam and Nicaragua (Zezza & Tasciotti, 2010). In a review of fifteen countries in the GS, thirty percent of urban families was found to participate in UA in eleven of the fifteen GS nations, and in eight of the fifteen countries, that percentage rises to fifty percent when only low-income households are examined (Zezza & Tasciotti, 2010). UA has excellent potential to positively impact the city's food chain (Koscica, 2014). The many benefits of UA come from the fact that these activities can be multifunctional; economic, social/cultural, health, and environmental (Golden, 2013). For example, they can produce food while also helping the environment and providing space for social and cultural activities

(Lovell, 2010). Findings from a study demonstrated that in some cities in SSA, UA can provide anywhere from 20% to 60% of a household's food supply (Armar-Klemesu, 2001). These gardening and farming projects in cities use UA as a tool to help with things like job training and starting new businesses (Albert, 2015; Krasny & Doyle, 2002). Also, UA uses many types of production systems, such as crop production, ornamental plants, forest management, fish farming, and livestock farming (Stewart *et al.*, 2013). Plantain, rice, potatoes, peppers, tomatoes, mushrooms, and leafy greens, along with eggs, milk, and meat, are all examples of crops and animal products that fall under this category; and these are among the wide range of agricultural products in any GS city (Veenhuizen, 2006). Research shows that UA households may have access to food that is cheaper and comes in a wider variety of foods that are especially healthy (Zezza & Tasciotti, 2010). In terms of food security, UA is helpful as it provides low-income households that engage in UA direct access to a healthy, micronutrient-rich diet (Koscica, 2014).

Research by the World Bank and the RUAF Foundation in 2011 compared urban producers in Accra, Lima, Bengaluru, and Nairobi, and found that 30 percent of them see UA as a key source of revenue (Dubbeling, 2013). A few other studies have revealed that the proportion of a household's income that comes from this source varies widely across different countries and regions (Zezza & Tasciotti, 2010). Therefore, UA families can increase their income by avoiding food costs or by selling agricultural products (Stewart *et al.*, 2013). In either case, the extra money means that the poor in GS cities will have more food security (Koscica, 2014). UA is also seen to improve the outlook of a community; as mentioned above, the increase in home prices near community gardens could be due to better looks (Lawson, 2005). Most of the time, these gardens are a response to the lack of investment in urban areas and they are used to make better use of empty lots, partly to improve the area's image and lower crime rates (Bradley & Galt, 2013). These gardens can also be used for recreation and fun, as well as to maintain an open space (Ferris, 2001). Community gardens can also be used to help certain communities grow plants they are familiar with, get job skills, or learn new things (Kerton & Sinclair, 2009; Krasny & Doyle, 2002). Gardens thrive in institutional settings, from schools where kids learn how to grow their own food to prisons where inmates learn job skills (Blair, 2009). For many people, these gardens are their first time growing, picking, and cooking their own food and farmers' markets and food trucks can be places for people to get together (Taylor & Vaage, 2015). Many farmers' markets have music and other forms of entertainment to make the atmosphere more fun and may have foods that fit with their cultures but are hard to find elsewhere (Taylor & Vaage, 2015). There are also other benefits, such as the fact that livestock

and general waste could be composted to make fertiliser and these fertilisers can be used instead of fertilisers made from petrochemicals, which are bad for water quality (McClintock, 2010). Composting can also help to improve soil infiltration, reduce soil erosion, and get rid of heavy metals that are often found in urban soils (McClintock, 2010).

2.6.1. Urban Agriculture and Food Security

While some cities in GS countries have access to estimates of the potential contribution of UA to food security and its importance (Orsini *et al.,* 2013), the focus on UA's potential for food production in the GN has increased due to economic crises in some areas as seen in Detroit in recent years (Colasanti *et al.,* 2012). Innovative economic and land-use models are among the new kinds of UA that have emerged as a reaction to the problem of urban food insecurity, as shown in Detroit, Michigan (Draus *et al.,* 2014), Berlin, Germany (Clausen, 2015), and Yokohama, Japan (Ikejima, 2019). This attention is particularly significant as UA can help mitigate the adverse effects of poverty on the health of the less privileged (Meenar & Hoover, 2012; McClintock *et al.,* 2013).

There has never been greater interest in UA, with talks centred on the UA's potential and how, if properly implemented, can significantly contribute to the demands of the urban food system. (Mohammed *et al.,* 2017). A sizable proportion of city residents fall into the category of the urban poor, and this population typically devotes between fifty percent and seventy percent of their monthly revenue on food (FAO, 2007). Most UA initiatives are short-term because of the pressures of urbanisation, and they are often conducted on undeveloped areas like city fringes, fishponds, and school gardens (Mougeot, 2005; Wiskerke & Viljoen, 2012). Urban food systems are needed in cities to meet the needs of a rising population, cut down on food costs and transportation time, and lessen the environmental impact of food delivery (Mohammed *et al.,* 2017). The United Nations (2010) recommends that urban architecture and planning be used to aid with rural food production to lessen the distance that food must be transported inside and to the city. A healthier diet and more disposable income are both positive outcomes for UA because UA allows them to either spend less on food overall or earn money by selling off part of their harvest (Stewart *et al.,* 2013).

UA has been recognized as making a significant impact on achieving the United Nations' Sustainable Development Goals (SDGs) in areas such as reducing urban poverty, addressing world hunger, and promoting environmental sustainability (SDGs 1, 2, and 17) (FAO, 2007). In regions with limited access to healthy food, UA plays a crucial role in enhancing the accessibility and safety of food and nutrition for the population residing in those areas (Algert,

Baameur, & Renvall, 2014; McClintock & Simpson, 2017).This assertion is supported by several studies that reveal how urban farmers reduce their family's food budgets by purchasing fewer perishable items (Brown & Carter, 2003; Gray *et al.*, 2014). For example, participating households in Seattle's community gardens save an average of 30 – 40 percent on their weekly vegetable budgets (Hagey, Rice, & Flournoy, 2012). Some people who engage in UA produce more food than they can use themselves, so they donate the extras to food banks or give it away to neighbours (Balmer *et al.*, 2005; Corrigan, 2011). Half of the gardeners in one Baltimore (Maryland) community garden gave away their harvest, making the garden known to others in the region who were hungry as a place where they could get free food (Corrigan, 2011). Considering these experiences, academics in cities as diverse as Detroit and Seattle have hypothesised that repurposing large areas of land for agricultural purposes may increase food security in such places (Horst & Gaolach, 2015; MacRae *et al.*, 2010; McClintock, Cooper, & Khandeshi, 2013). However, just as expanding global food production does not guarantee the eradication of hunger, those who are food insecure should not assume that increased food production in urban areas would automatically benefit them., since availability and accessibility are critical (Holt-Giménez & Altieri, 2012). To accurately assess the sustainability of UA, further study is required, with a particular focus on all phases of food production, processing, and supply (Sanyé-Mengual *et al.*, 2019). The current literature's incapacity to draw conclusions on UA's real contribution in terms of sustainability is due to the fact that the information available is confined to particular case studies, typically experimental or small-scale, and geographical regions (Sanyé-Mengual *et al.*, 2018).

The interconnected nature of water, food, and energy is an important factor in achieving sustainable agriculture (that is, sustaining yields while protecting the environment) (United Nations (UN) Water, 2019). This is due to population increase, industrialisation, urbanisation, economic expansion, and dietary shifts are all driving up the demand for water, food, and energy (UN Water, 2019). Statistics from the Food and Agriculture Organisation show that agriculture consumes 69% of all freshwaters globally, followed by industry and electricity production at 19%, and households at 12%. (Frenken & Gillet, 2012). In 2015, the High-Level Panel of Experts (HLPE) revealed that 60 percent of the world's food supply was grown on rainfed land, while 80 percent of the world's agriculture relied on rain for irrigation (HLPE, 2015). This survey also found that a supplementary irrigation system was required for crops like wheat, sorghum, and maize to provide yields per hectare three times higher than those obtained from traditional rainwater alone (HLPE, 2015). The energy sector accounts for around 75% of all water withdrawals by industry, while the power sector accounts for 90% of total

water use worldwide (United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2014). About 30% of global energy usage goes toward food and supply chain production (FAO, 2011). High demands from industry are expected to raise the worldwide water demand by 55 percent by 2050, which means that more than 40 percent of the population would live in areas where severe water stress is an issue by that year (Organisation for Economic Co-operation and Development [OECD], 2012). According to projections, there will be nine billion people living on Earth by the year 2050; thus, the world's food supply would need to increase by fifty percent (United Nations, 2017).

Major urbanisation has resulted in a centralised food system that favours industrial farms over small urban farms and has effectively eradicated production of food in the cities (Lang & Barling, 2012). The post-industrial concentration of food production, which has pushed food production out of sight of the average city inhabitant, is a contributing factor in the vast gap that exists between food production and consumption (Tornaghi, 2014). The difficulty in conceptualising or implementing a food system that is less centralised and more decentralised is attributable to this perception as the root cause of the problem (Caputo, 2012). To name just a few examples, climate change, food insecurity, obesity, and the security of our energy supply are all issues that Gorgolewski, Komisar, and Nasr (2011) believe are linked to the disconnect between urbanites and their food's origins. The amount of time that passes between the production of food and its consumption in many cities has greatly reduced as a direct result of the surge in popularity of urban farming and gardening in one's own backyard (Howe, Bohn, & Viljoen, 2005). Land plots, school and hospital gardens, community gardens, and urban farms are all examples of urban areas that UA uses (van der Schans & Wiskerke, 2012). The utilization of UA is thought to positively impact urban residents by fostering a greater comprehension of the ecological implications associated with their food choices. (Alkon & Agyeman, 2011; Caputo, 2012).

While UA has the potential to enhance city dwellers' understanding of the environmental impact of their food consumption, solely relying on UA may not ensure consistent production of an adequate food supply in urban areas as a replacement for the conventional system. (Thibert, 2012; Vitiello & Brinkley, 2013). The potential of UA to contribute to the food security of any one person, family, or city can vary substantially depending on factors like as climate, the quantity and kind of land that is accessible, as well as the amount of time, availability, and abilities of practitioners (Grewal & Grewal, 2012). While fresh fruits, vegetables, and herbs from raised garden beds, community garden plots, and small urban farms may certainly help feed people, it is doubtful that these methods alone can meet the protein and

nutritional requirements of individuals, much alone a whole community (Grewal & Grewal, 2012). People who do not have access to land, suitable growing conditions, and the physical capacity and skills necessary to engage in these activities are often excluded from talks on how to enhance food security via UA (Ghose & Pettygrove, 2014; Wekerle & Classens, 2015). When people are already stretched thin by having to work several jobs to make ends meet, they are not likely to have the energy or motivation to devote to gardening on top of everything else they have to juggle just to put food on the table (Grewal & Grewal, 2012). Others argue that the emphasis on UA as a remedy for food insecurity is a distraction from the real causes of hunger, which include things like poverty, poor wages, and income disparities (Pudup, 2008; Weissman, 2015). This line of reasoning simply helps to support self-help and government arguments rather than addressing the fundamental reasons of food poverty, despite the fact that growing one's own food is often promoted as a potential solution to the problem of food insecurity (Andrée, Ballamingie, & Sinclair-Waters, 2014).

2.6.2. Urban Agriculture and the Environment

Due to its ability to function as a windbreak, produce shade, absorb carbon dioxide (CO2), and protect biodiversity, UA offers immense benefits in terms of climate resilience (Konijnendijk, Gauthier, & van Veenhuizen, 2004). The ways in which UA changes urban-vegetation-atmosphere interactions, such as through decreasing the distance that food must travel and minimising the impact of urban heat islands, influence environmental quality (McEldowney 2017, Artmann & Sartison, 2018, Feola *et al.*, 2020). Improvements to the ecology and enhanced food security are only two of the many benefits of UA (Dimitri *et al.*, 2016; Sadler, 2016), and the promotion of healthy eating habits (Sadler, 2016). The diversity of agricultural plant and animal species is directly correlated with food security (Frison *et al.*, 2011). About half of the investigated examples in a study of UA initiatives in 10 European countries favoured biodiversity preservation by growing more than thirty different kinds of crops while the opposite was found for intense monocultural farms like those used for growing vines, where only a little amount of biodiversity was found (Polling *et al.*, 2017). More than a thousand different types of plants were found in 267 private London gardens (Loram *et al.*, 2008), while in a single four hundred square metre allotment garden in Stockholm, 440 distinct species were detected which implies the significance of UA on the environment (Colding *et al.*, 2006). At least one-quarter of the world's bee species may be found in the community gardens of New York City and Vienna, Austria (Lanner *et al.*, 2019), and fifty-four species (13% of the recorded New York State bee fauna) were found in just a handful of allotment gardens

(Matteson *et al.,* 2008). Ladybugs, the primary agents of natural pest management, have benefited from a rise in floral resource availability and plant structural variety in urban contexts (Bazzocchi *et al.,* 2017). Research suggests that locating crops near natural areas improves pollination rates and bee populations across a broad variety of crop types demonstrating the significance of UA in the environment (Ricketts *et al.,* 2008). Agro-ecological gardens employ a network of tiny, natural habitat fragments and cultivated patches across urban zones, which may increase the ability of beneficial insects to remain in the urban environment (Bazzocchi, 2020).

Not only does UA play a significant role in causing climate change, but it also intensifies the effects of global warming (Bazrkar *et al.,* 2015). Greenhouse gas emissions, abrupt shifts in land use that lead to higher temperatures, deteriorating urban water quality, floods, and pollution are only some of the impacts (Miller & Hutchins, 2017). As a result, urban areas are both the cause of, and the focus of climate change and the most impacted groups are the urban poor (UN Habitat, 2013). There is evidence to show the positive effects of crop production and agroforestry in urban centres on urban regeneration and climate improvement in cities, cleaning the air, absorbing carbon dioxide, and expanding the range of local flora and fauna (Cofie *et al.,* 2006; Veenhuizen & Danso, 2007; Nugent, 2000). Lwasa *et al.,* (2014) from Ibadan, Nigeria, and Kampala, Uganda, gave evidence of the possibility of UA contributing to large-scale climate change mitigation. Various sources also attest to UPA's effectiveness in lowering climate change vulnerability (Prain *et al.,* 2010; Lwasa *et al.,* 2009).

There is the possibility that UA may result in unintended consequences (Brown & Jameton, 2000; Wortman & Lovell, 2013). For instance, neighbours of an urban farm can complain about dust and noise from farm equipment, unpleasant scents from organic fertilisers, or worries that pesticides and fertilisers are contaminating their drinking water and air supply (Gallaher *et al.,* 2013). The presence of stagnant water for irrigation can increase the proliferation of mosquitoes, which can spread illness, and certain pests and diseases are polyphagous, meaning they can feed off a wide variety of plant nutrients (Winkler *et al.,* 2010). Wielemaker *et al.,* (2019) reveal favourable attitudes about urban farms may increase with the availability of fresh, local, nutrient-dense food. As a result, the public's opinion of urban farms is crucial to the success of the UA industry (Grebitus *et al.,* 2017). Furthermore, environmental assessments might be of use to UA business owners and urban policymakers so it is important to assess how key resources could influence the long-term viability of UA (Martin & Molin, 2019).

2.6.3. Health Benefits of Urban Agriculture

Community gardens are often associated with increased food security and better diets (Wakefield *et al.,* 2007). It has been shown that people whose health improves due to their involvement in UA also see an increase in the health of their community (Wakefield *et al.,* 2007). Community gardens, for instance, are beneficial to people's health in many ways, including their ability to focus, decreased stress levels and the number of negative emotions as well as their ability to interact with others (Abraham *et al.,* 2010). This indicates that people who cultivate their own food may have greater levels of physical activity and emotional stability in their daily lives because of UA (Kaoy & Dillon, 2020). Community gardening serves a similar purpose by fostering strong bonds within a neighbourhood, which are important to maintaining a healthy way of life (Wakefield *et al.,* 2007, Abraham *et al.,* 2010). Planting and caring for one's own garden provide a natural context for teaching about nutrition via the study of food production and preparation (Davies & Carter, 2014). Due to the alarming increase in youth and young adult obesity and sedentary lifestyles, there is a need to pay attention to UA, as it may serve as a method of promoting healthy eating (Caballero *et al.,* 2007). Also, farmers' exposure to food that may otherwise be in short supply increases their likelihood of eating them once they have been grown (Libman, 2007).

The positive effects of UA on both physical and mental health make it a promising new link in the chain of healthy, environmentally friendly food production (Pollard *et al.,* 2018). UA derived food's estimated contributions to diet and nutrition imply its significance is restricted in scope but not negligible (Ward *et al.,* 2014). It is important to note that UA areas like gardens may have secondary but nevertheless important functions in terms of human nutrition (Jones *et al.,* 2018). There is growing focus on the nutritious and healthy foods provided by UA because of their high standards, increased availability, compatibility with traditional dietary practises, and the potential it possesses to improve national food and nutrition security (Shackleton *et al.,* 2009). There is also evidence that connecting with nature and engaging in physical activity outdoors increases both happiness and well-being (McLain *et al.,* 2014).

Researchers argue the health advantages of UA are primarily seen through increased access to fresh, healthful food (Alaimo *et al.,* 2008; Graham & Zidenberg-Cherr, 2005; Metcalf & Widener, 2011). According to the studies, people who participate in UA learn more about healthy eating habits as adults, and those who live in homes where at least one person farms in a community setting consume more fresh fruits and vegetables than those who live in households where no one participates in UA (Alaimo *et al.,* 2008). Adding to this, research has also shown a correlation between community gardens and decreased incidence of obesity

(Alaimo *et al.,* 2016). In addition to this, UA programme participants reported more willingness to try new types of produce and to diversify their intake of vegetables (Allen *et al.,* 2008). Food cultivation is a form of exercise that is popular with people of all ages, sexes, races, and ethnicities (Park, Shoemaker & Haub, 2009). Hands-on work in the garden, such as weeding, tilling, and the use of other simple tools, has been shown to have positive effects on mental health (Armstrong, 2000; Draper & Freedman, 2010), and may be of particular benefit to people recovering from mental illness or having served time in prison (Bellows & Hamm, 2003).

While UA has many potential benefits, the underlying causes of health disparities, such as economic inequality and poverty, may require more drastic measures (Nogeire-McRae *et al.,* 2018; Audate *et al.,* 2019). In Buffalo, New York, young gardeners from more affluent homes were more likely to eat healthy foods, whereas those from less affluent homes saw no significant improvement in their eating habits (Raj, Raja, & Dukes, 2016). Dangers to human health are caused by UA in low-income areas due to the elevated levels of pollution in the soil, water, and air (Evans & Kantrowitz, 2002; Wortman & Lovell, 2013). Negative health effects have been linked to the high lead absorption levels seen in a study of vegetables produced in soils with high lead contents (Finster, Gray, & Binns, 2004).

2.6.4. Social Benefits of Urban Agriculture

Community gardens, for instance, provide urban residents a place to unwind while also improving their quality of life, the environment, and their sense of pride in their neighbourhood (Armstrong, 2000; Tranel & Handlin, 2006). Participation in community gardens has been associated with reduction in crime, waste dumping, and mental illness, as well as higher rates of voter registration and civic duty (Hagey *et al.,* 2012). Some gardens serve as centres for cultural exchange, bringing together people of different backgrounds to learn from one another and share their experiences with UA. This is especially true for communities with large numbers of migrants, such as African Americans and Latinos, and new immigrants and refugees (Meek & Lloro-Bidart, 2017). Many indigenous people from Mexico worked on farmlands at South Central Farm in Los Angeles, reviving farming practises and heritage seed varieties (Irazábal & Punja, 2009). For local young people, the urban farm was an alternative to gangs and drugs especially in disadvantaged communities, and for the elderly, it was a chance to continue making a difference in their community (Horst *et al.,* 2017).

The long-term inhabitants, many of whom are people of colour living on low incomes, may benefit from community gardens in cities like Detroit and St. Louis (Tranel & Handlin, 2006.

In GS cities, UA has the potential to get involved in gentrification processes; a positive effect of urban agricultural initiatives is a rise in property values in low-income areas that attract immigrants (Cadji & Alkon, 2014). Home values in New York City (NY) have risen in part because of community gardens (Voicu & Been, 2008). McClintock *et al.*, (2016) found a geographical correlation between the spread of home gardens and the development of gentrification in Portland, Oregon. A similar case in Vancouver also exhibits this tendency (Quastel, 2009).

Many academics and activists view UA as a platform from which those who practice can exercise greater autonomy, fight against unfavourable property structures, try out new methods of collective land management, and take part in other political initiatives to enhance the present food system (Levkoe, 2011; Staeheli, Mitchell, & Gibson, 2002; Travaline & Hunold, 2010). Some advocates of UA (McClintock, 2010; McClintock & Simpson, 2018) see their efforts to be an open challenge to the capitalist, corporate food system. Others use UA as a means to claim the right to the city (Purcell & Tyman, 2014), establish new common spaces (Eizenberg, 2012, Roman-Alcalá, 2015), and reclaim urban space (Thibert, 2012). People who worked in the garden at Los Angeles's South-Central Farm used their experience organising there to push for more equitable municipal policies (Irazábal & Punja, 2009). However, not all UA participants draw an explicit link between the food they cultivate and their political ideas or actions (Reynolds & Cohen, 2016).

It is common practise to analyse the long-term viability of UA initiatives in the context of issues of social inclusion and justice (Tornaghi, 2014). As a matter of fact, several initiatives have kicked off because of urban policy, the marginalisation of neighbourhoods, or economic difficulties (Reynolds & Cohen, 2016; Calvet-Mir & March 2019). Thus, the challenge to the capitalist framework of conventional food production is shown in the regeneration of underutilised urban areas and the establishment of community networks for the management and access to food production resources (McClintock, 2010). Gardens have the potential to be places of "collective effectiveness", where people may come together to foster a sense of community, acquire the support they need to resolve disputes and exercise their rights, and generally improve their quality of life (Teig *et al.,* 2009). The UA's dedication to community development through means like social inclusion and empowerment is bolstered by these characteristics (Armstrong, 2000; Wakefield *et al.,* 2007; Teig *et al.,* 2009; Taylor & Taylor Lovell, 2014; Camps-Calvet *et al.,* 2015). The proven success of UA shows that despite the evident societal benefits, the real influence on society will largely rely on the type of initiative (Specht & Sanye-Mengual, 2017). Sanyé-Mengual *et al.,* (2019) found that socially innovative

UA endeavours benefited society in a wide range of ways. However, in business endeavours, financial gain is usually the primary motivation, whereas targeted social concerns are often overlooked (Poulsen, 2017). However, inefficient, and failed programmes might develop when local governments impose UA programmes from on high without consulting the populace or inviting them to take part in shaping the programme (Gasperi *et al.*, 2016).

2.6.5 Training Opportunities

Participating in UA, whether via informal means or more official UA training programmes, has been shown to educate people about the natural space and teach them practical skills in the process of food production (Okvat & Zautra, 2011). Many city dwellers benefit from gardens as they allow them to feel more connected to the food they consume and to the people who grow it (Tidball & Krasny, 2007). Some people believe that those who take part in UA courses would get employable training in green-collar fields like gardening and edible landscaping (Pinderhughes, 2007). It is debatable, however, whether or not UA can always provide a sizable number of living-wage jobs, particularly in regions with high land prices or where consumer markets do not pay enough to cover production and labour costs (Daftary-Steel *et al.*, 2015). Many urban farms depend significantly on unpaid labour due to their inability to pay fair salaries (Biewener, 2016; Cohen & Reynolds, 2015). For example, sixty-six percent of 370 urban farmers in the USA or its territories in 2012 were unable to earn a livelihood, with annual sales of less than $10,000 (Dimitri, Oberholtzer, & Pressman, 2016). The report authors point out that a significant portion of urban farms' operating budgets originate from outside sources including grants, gifts, and non-farming revenue (Dimitri, Oberholtzer, & Pressman, 2016). Additional study is required to determine whether UA may provide substantial economic or employment prospects, especially for underprivileged populations (Dimitri, Oberholtzer, & Pressman, 2016).

2.7. Barriers Associated with Urban Agriculture

The most prevalent criticism against UA and its ability to offer food security for urban poor is that there is insufficient land in cities (Amponsah *et al.*, 2015). The idea is that cities are full of buildings, leaving no room to grow food (Smith *et al.*, 2001). Access to and ownership of land has been cited as a key factor in UA success in a number of sources (Halloran & Magid, 2013; Masvaure, 2016). Critics say that there is not enough free space in a city to grow a lot of food because most modernist ideas about urban planning think that agriculture is separate and outdated and should not be part of the city (Barthel & Isendahl, 2013). However, due to these constraints, urban farmers have had to be inventive; they have grown food in narrow window

ledges, porches and terraces, roofs, cellars, and sidewalls, as well as communal gardens, vacant lots, school playgrounds, sides of roads, and locations close to railroad tracks (Grewal & Grewal, 2012).

The size of the production system was found to increase in tandem with the number of people who had access to and ownership of land (Olumba *et al.,* 2021). The problem stems from the fact that as major cities develop, increased land is needed to accommodate its residents, and as those residents' needs rise, increased farmland is converted to non-farm uses (Yin *et al.,* 2011). Valuable agricultural areas are being taken over by more profitable land uses as a result of growing urbanisation and rising land prices in and around cities (Bonye *et al.,* 2021). This is because in peri-urban regions, which are where cities expand, have land-market regulations that are often unfavourable to UA (Yaro & Hesselberg, 2010). Since small-scale farmers on restricted budgets are incapable of competing effectively in the market for urban land, this undermines the food security of the urban population (Amponsah *et al.,* 2015). Another challenge to UA is posed by the competing uses of urban land and the ongoing process of land-use change. frameworks of tenurial jurisdiction spanning portions of accessible land (Chah *et al.,* 2010; Asadu *et al.,* 2016).

Furthermore, urban farmers in Burkina Faso have cited a lack of agricultural materials and equipment, a shortage of irrigation water and poor soil conditions as three of their most pressing problems (Ouédraogo *et al.,* 2019). Growing evidence suggests that the socioeconomic and gendered environment in which agricultural systems function is crucial to their productivity and sustainability (Hovorka, 2005). An examination of gender inside the UA system is important because it allows for more targeted intervention, which in turn increases productivity and efficiency (Hovorka & Lee-Smith, 2006). There is a general agreement in the research on UA and gender that the experiences of male and female farmers with UA are distinct and not comparable (Adeoti, Cofie & Oladele, 2012; Whitley 2020). As it turns out, UA is also not neutral across the genders; male and female farmers typically have quite different experiences in the urban agricultural sector because of differences in income, access to resources, and interactions with the political and institutional structures in their local communities (Idowu *et al.,* 2012). Studies examining the bias in UA provide insight on gender roles in the workplace and in decision-making, as well as on inequalities in terms of control over resources, legal protections, and economic opportunities (Hovorka *et al.*, 2009). There must be a thorough gender study of UA before it can be used to maintain and fulfil the growing food demand of the expanding urban population (Khateeb *et al.,* 2022).

Some affluent communities tend to prioritise health and wellness, as well as environmentally

conscious consumption practices, when it comes to UA (Hkansson, 2019) while priorities of food security and urban redevelopment are more common in areas where individuals have less disposable income (McClintock *et al.,* 2016). However, despite increasing scientific interest, adaptable and systematic ways to evaluate the effects of UA in diverse cultural contexts are insufficient (Kingsley *et al.,* 2019). Also, there are few organised conceptual evaluations of the benefits of urban sustainability, including the effective implementation of the many areas affected by UA practices (Zasada *et al.,* 2020). Although UA has the potential to support city dwellers and improve food supplies in the GS, the industry faces serious limitations that threaten its long-term viability (Olumba *et al.,* 2021).

The loss of valuable agricultural land in cities due to urbanisation is frequently noted as a challenge to UA (Amponsah *et al.,* 2015; 2016). Especially in the nations of the GS, the fast and unchecked urban population increase, and development has resulted in massive land-use shifts, which has had negative effects on the sustainability of UA (Ayambire *et al.,* 2019). The main problem is that the growing urban population and the construction of new urban districts have raised demand for urban land, resulting in the transfer of farmland to non-farming activities (Wu *et al.,* 2021). In fact, because of rising land prices and increased land competition in and around cities, important agricultural regions are being encroached upon by increasingly competing land uses (Bonye *et al.,* 2021). Furthermore, the inadequate regulatory structure of land markets in peri-urban areas where cities develop often does not support UA, which is at the basis of this problem (Yaro & Hesselberg, 2010). The urban land market has also become more expensive, making it difficult for small-scale farmers to break into (Amponsah *et al.,* 2015). This has the unintended effect of endangering the urban population's food security (Olumba *et al.,* 2021).

Land tenure arrangements surrounding land available spaces are another limitation on UA that develops from competing uses of urban land and land-use change (Chah *et al.,* 2010; Asadu *et al.,* 2016). Farmers trying to acquire access to farmland in urban areas face several socioeconomic and institutional barriers, preventing them from conducting their productive operations to their full potential (Odudu & Omirin, 2012; Olumba *et al.,* 2019).

In addition, restrictions to UA include the lack of access to financing institutions and the risk of theft of farm produce (Asadu *et al.,* 2016). An example is a study by Chah *et al.,* (2010) who found that insufficient extension support was a major barrier to UA among farmers in Enugu metropolitan, Nigeria. Similarly, input scarcity, labour shortages, marketing, economic, and environmental difficulties were identified as important hurdles for UA and peri UA (Rohit *et al.,* 2017). According to research by Ouédraogo *et al.,* (2019), in Burkina Faso, urban farmers

face challenges such as a lack of access to agricultural supplies and equipment, water scarcity for irrigation, and poor soil quality. These challenges cut across all sectors of UA, as high housing, and feed costs, as well as a lack of timely insemination facilities, were identified as important barriers to UA in a study conducted by Rathva *et al.,* (2020) among dairy urban farmers in India. According to Duguma *et al.,* (2016), the key challenges facing urban dairy farming in Ethiopia include a lack of agricultural extension, financial services, improved animal species, and accessibility to assisted reproduction, these challenges all stem from a lack of infrastructure.

2.7.1. Land

A lack of access to land and uncertainty about ownership is one of the major barriers of upscaling UA (Halloran & Magid, 2013; Pulliat, 2015; Assefa, 2016; Menta *et al.,* 2017; Chagomoka *et al.,* 2018; de Medeiros *et al.,* 2019). Due to high land costs and financial constraints, urban farmers have a tough time gaining access to farmland, which is a social and economic problem influencing UA in the GS region (Olumba *et al.,* 2021). Barriers to the growth of UA in Nigeria highlighted by Odudu (2015), Ibitoye *et al.,* (2016), and Edeoghon and Izekor (2017) are consistent with this result. Due to the danger of non-compliance with mandated payments, urban farmers were hesitant to invest since they did not own the land they worked on (Houessou *et al.,* 2020). Odudu (2017) confirms this trend by reporting that urban farmers in Lagos state, Nigeria, work on very small plots of land in order to minimise both competition and potential land use disputes, despite the fact that this has a negative effect on their output. Urban farmers' investment in UA is hindered by the land instability caused by UA operations on vacant lots and along highway centres (Houessou *et al.,* 2020). Chah *et al.,* (2010) further explained that government authorities and plot owners harass urban farmers over UA land, and this may discourage urban farmers from continuing to engage in UA. As a result, they are more inclined to diversify their sources of income away from agriculture and into other fields (Nguyen *et al.,* 2016).

2.7.2. Lack of Government Funding, Incentives and Favourable Policy

A significant challenge to UA is a lack of government funding, with this key barrier being reported in several studies (Lynch *et al.,* 2013; Frayne *et al.,* 2014; Smart *et al.,* 2015; Cadzow & Binns, 2016; Masvaure, 2016; Nchanji *et al.,* 2017). Farmers are unwilling to risk their little earnings knowing that there is the probability of government seizing their property and destroying their crops due to the lack of clarity in urban rules on land usage (Houessou *et al.,*

2020); as land was allocated to land use categories like industry and infrastructures, unsupportive governments rendered UA almost impossible (Houessou *et al.,* 2020). Additionally, limited availability to financing facilities is a significant barrier to UA growth in southeast Nigeria; Edeoghon and Izekor (2017) found that credit restrictions are a barrier to UA. It was stated that urban farmers in Nasarawa state, Nigeria, had similar difficulties due to a lack of financial availability, which severely hampered their UA endeavours (Edeoghon and Izekor, 2017). Most urban farmers, according to studies by Asadu *et al.,* (2016) and Ibitoye *et al.,* (2016), do not have access to loans for investment. One of the most important factors limiting productivity growth is the lack of money to invest in UA inputs and basic equipment (Hoff & Stiglitz, 2001). Lack of collateral to put up for loans, the danger of default, and the difficulty and expense of obtaining information on the prospective borrowers all work against upscaling UA practices (Cabannes, 2012). Bigsten and Shimeles (2011) state that informal businesses in Africa continue to have limited access to loans and this has a negative effect on UA practices.

Policy support promotes the growth of UA (Battersby & Marshak, 2014; Bonatti *et al.,* 2017). Policies in Tanzania, for instance, made it legal for farmers to form interest organisations and lobby government officials for aid (Bonatti *et al.,* 2017). Finding government backing for UA is crucial for UA growth in Vietnam (Pulliat, 2015). Policy support for UA was also prompted by the belief that it would increase both income and food security and by the existence of effective institutional frameworks (Foundjem-Tita *et al.,* 2013). Food is now at the core of urban policy debates, with research problems that go well beyond basic food safety and limited regulatory concerns (Morgan, 2009). Understanding the restrictions of food production, distribution, consumption, and social initiatives (Dawson & Morales, 2016), cultural practises (Hammelman & Hayes-Conroy, 2015), and case studies of each city is made possible by the work of urban food planners and analysts (Cohen & Reynolds, 2014). The need to develop policies that can adapt to the geographical, temporal, and human-environment intricacies of UA social and ecological roles is a significant challenge to UA research (Zimmerer *et al.,* 2021). However, there is a growing body of critical literature indicating that one should be careful of overstating the capacity of any single policy to address the most important concerns confronting society and food systems (Reynolds, 2015; Tornaghi, 2014).

2.7.3. Access to Market Prices and Infrastructural Factors

Urban farmers have been hindered because of the difficulty in accessing market for their produce (Battersby & Marshak, 2014; Crush & Caesar, 2014; Assefa, 2016; Cadzow & Binns, 2016; Menta *et al.,* 2017; Nchanji *et al.,* 2017). Because of the high expense of transportation, commercialising urban farmers' product is often not worthwhile (Houessou *et al.,* 2020). Furthermore, as a consequence of gardeners not working together, an increase in competition occurred which causes a reduction in bargaining power (Houessou *et al.,* 2020). Important problems limiting UA in the region include inadequate processing, storing, transportation, technology to reduce reliance on cheap labour, market infrastructure, and access to inputs to sustain UA activities (Olumba *et al.,* 2021). Consistent with the findings of Katongole *et al.,* (2012), who identified feed shortages as the primary barrier faced by urban producers of cattle in Uganda. Similar to what was said by Salau and Attah (2012), this shortage of input supply was cited as a challenge to UA. According to Mgbenka *et al.,* (2016), many Nigerian farmers lack access to essential modern inputs and resources. Similarly, Edeoghon and Izekor (2017) found that inadequate storage and faraway markets are the major challenges faced by urban farmers in Lagos, Nigeria.

2.7.4. Gender Inequality

There is a pressing need to determine the main causes of the gender gap in UA participation (Simiyu & Foeken, 2013). The several advantages of UA are often highlighted while discussing UA in the literature (Opitz *et al.,* 2016; Shifa & Borel-Saladin, 2019). Researchers examining gender in the context of UA have, until now, glossed over differences between male and female farmers' experiences by focusing mostly on women's perspectives (Adedayo & Tunde, 2013). In Nigeria, for instance, only men possessed the collateral to get loans and pay for the price of buying land outright (Adenegan *et al.,* 2016). Furthermore, gender disparities resulted in land leases being given to males rather than women, which resulted in women having to work on smaller plots and earning less money overall (Frayne *et al.,* 2014).

Ngome and Foeken (2012), Simiyu and Foeken (2014), and Whitley (2020) goes beyond this biased approach by presenting an in-depth critical examination of the distinct roles and desires of male and female urban farmers with relation to the distribution of resources, types of farm operations, and agricultural orientation among UA structures. Another body of research has analysed the ways in which UA helps to ensure people can maintain their current standard of living regardless of their gender (Adeoti, Cofie & Oladele, 2012; Simiyu & Foeken, 2014). Research by these authors indicates that UA helps to ensure that both men and women have

access to nutritious food in their homes (Adeoti, Cofie & Oladele, 2012; Simiyu & Foeken, 2014). Ngome and Foeken (2012) also noted that women's decreased engagement in commercial UA production explains why they earn less from the industry than men do. The research focuses on how men and women vary in their socioeconomic level and availability to resources for UA, and the overall image portrayed shows that males have distinct and perhaps beneficial conditions when compared to women (Adeoti, Cofie & Oladele, 2012; Fletcher & Kubik, 2016; Hovorka *et al.,* 2009). Existing studies on gender and UA have mostly focused on providing analytical descriptions and producing descriptive case studies (Fletcher & Kubik, 2016; Hovorka *et al.,* 2009). Also, it seems especially important that more analytical work be done at a time when UA problems in GS countries are getting a lot of attention (Davies *et al.,* 2021), and there is a global plan to end gender inequality as part of the Sustainable Development Goal (SDG)-5 (United Nations, 2016), so that UA policy and programmes can be planned in a way that takes gender into account.

The successful involvement of urban farmers in UA is hindered by several socio-economic, structural, and institutional hurdles that have been documented in previous research (Davies *et al.,* 2020; Olumba *et al.,* 2019). Gender inequalities in resource access, distribution, and control are discussed extensively (Halliday *et al.,* 2020; Simiyu & Foeken, 2014; Whitley, 2020). Though Hovorka (2005) notes that both male and female farmers participate in UA for economic and social gain, the greater impact on women demonstrates the persistence of gendered perspectives and experiences within the UA system. Women's lower socioeconomic state compared to men is a direct outcome of discriminatory and patriarchal cultural practises that keep them in a subservient position at home and in society at large (Simiyu, 2013). Research of gender roles in UA in Gaborone, Botswana found that urban male farmers who also served as family leaders often had female partners who helped on the farm, giving them an economic advantage over female-headed families (Hovorka, 2005). Another study by Hovorka *et al.,* (2009) suggests that there is a lower probability of women receiving benefits from research or extension services since they are not tailored to their unique needs.

Women's participation in agriculture is further complicated by the fact that they have less traditional and modern land ownership rights than males (Orsini *et al.,* 2013). When it comes to agricultural property, males are more likely to have access to bigger, more costly plots, while women are left with smaller, less secure acres in more inaccessible locations (Hovorka, 2005; Hovorka *et al.,* 2009). Hovorka (2006) also notes that when comparing male and female urban farmers, the males are more likely to have advanced degrees, more access to labour, and better incomes. Research on women in agriculture and development has repeatedly shown that men

and women in GS countries have different levels of control over crucial production resources including land and other non-land facilities, and better technology (Kiptot *et al.*, 2014; Peterman *et al.,* 2014).

Due to patriarchal land systems in place in many SSA countries, men have much more access to land resources and control over women (Melesse & Awel, 2020; Owoo & Boakye-Yiadom, 2015). Women are less likely to have access to credit facilities that require land as collateral because they lack tenure security over the property they run (Dlamini & Masuku, 2011). Women are discouraged from making investments on their plots because of the absence of tenure security, which causes them to worry about losing out on future earnings (Goldstein & Udry, 2008). Farm output and income may be increased with the use of hired labour, which is becoming a more important UA resource, but these opportunities are more limited for women than for men (Chete, 2019). It has been estimated, for instance, that male farmers in Malawi put in 10% more overall labour per acre than female farmers (Chete, 2019). Another resource difference between men and women in agriculture is access to expensive inputs and agricultural technology, such as premium seed varieties and fertilisers (Peterman *et al.,* 2014).

To provide just one example, Sanginga *et al.*, (2007) found that in the southern Guinea savanna of Nigeria, female farmers were less likely to use superior seed innovation than their male counterparts. Furthermore, credit and family income (from both farming and non-farming sources) are important economic elements that might keep individuals involved in UA, and these aspects have gendered dimensions as well (Audate *et al.,* 2021). Research suggests that women are more likely than men to be denied loans or to get lower loan amounts from official and informal lending organisations due to discrimination (Fletschner, 2009; Ali & Awade, 2019).

There is a gender gap in the amount of input credit men (22%) and women (15%) can obtain in certain countries, such as Ethiopia and Tanzania (Melesse & Awel, 2020). According to research, there is a significant gender gap in the educational attainment of men and women farmers (Hovorka, 2001; Kumari & Shirisha, 2021). Gender disparities in literacy are sometimes attributed to bias against girls' education that goes back centuries, which has resulted in less educational chances for girls and women (FAO, 2011). In addition, Swanepoel *et al.,* (2017) found that the dependency ratio in male- and female-headed households among urban farmers in South Africa families in this sector of the economy varied considerably. The research implies that women are at a disadvantage relative to males when it comes to access to social support networks, such as extension services, due to gender-based discrimination (Peterman *et al.,* 2014). Women, for instance, are discouraged from meeting with extension

officers, particularly men, due to a variety of sociocultural hurdles (such as low literacy rates, restricted access to land, reduced freedom of movement for women, and negative preconceptions about women (Mudege *et al.*, 2017). Additionally, the number of women farmers are usually not enough at communal gatherings and demonstration schemes arranged by the trained agents (World Bank & IFPRI, 2010), meaning they miss out on crucial knowledge that may help them increase their output.

2.7.5. Waste and Contamination

Heavy metals may be found in the environment through a variety of manufactured and natural sources, including pesticides, fertilisers, fuel, wastewater, sewage, vehicle exhaust, industrial effluents, and agricultural waste (Gjorgieva-Ackova, 2018). The usage of spray paint, chemical fertiliser, and the burning of tyres have all been cited as sources of heavy metals in urban gardens (Bett *et al.*, 2019; Gabrielyan *et al.*, 2018). Heavy metals may contaminate the environment in a number of different ways, including via storm water runoff, poorly treated wastewater, soil amendments, and the food chain (Carvalho, 2017; Springmann *et al.*, 2018). In nature, materials with atomic weights and densities much higher than water are known as heavy metals (Koller & Saleh, 2018; Tchounwou, 2012). They pose a threat to our food supply and may be the most pressing environmental issue we face today (Rai *et al.*, 2019). Lead and cadmium are both harmful to humans; half of the cadmium in the human body is stored in the liver and kidneys, and their accumulation in the system has been linked to hypertension and cardiovascular disorders (Zhou *et al.*, 2016). Heavy metals from urban pollution end up in nearby farmland soil and food produce (Houngla *et al.*, 2020). Consuming heavy metal polluted vegetables on a regular basis may have severe health consequences in areas where leaded fuel is widely used, even though vegetables are known to boost diets with nutrients such as crude protein, crude fibre, and minerals (Houngla *et al.*, 2020). Thus, heavy metal pollution of the human food chain and the resulting decline in soil quality and health consequences are now unavoidable (Yang *et al.*, 2016). Vegetables that have been contaminated with heavy metals pose a direct risk to human health as they do not break down, so they keep piling up in people's and animals' bodies, where they may do major damage (Shah *et al.*, 2015).

The importance of food production in urban areas, together with the capacity to recycle organic waste and the economic possibilities and market demand that emerge, is acknowledged, especially in low-income nations of the GS (Manka'abusi *et al.*, 2019). Foraging and animal husbandry are common uses for unused land within and next to urban areas (Bellwood-Howard *et al.*, 2018). Produce may be contaminated with heavy metals and faecal microorganisms if it

is grown close to wastewater channels or in regions of industrial point pollution (Dao *et al.,* 2018). This is especially true if wastewater is not treated before being used for irrigation, which is common among farmers due to the high nutritional content of untreated wastewater (Drechsel *et al.,* 2010). Cities also collect resources and waste from end users, in the current linear economic model of "take-make-dispose," cities function as resource sinks (Kisser *et al.,* 2020). With all the human and economic potential, resource accumulation, and societal challenges of ecosystem degradation that are present in urban areas, the tide is turning toward recovery of these resources within the urban infrastructure (Kisser *et al.,* 2020).

However, such UA product contamination hazards are very context-dependent, changing according to the type of crop, the soil it was produced in, and the postharvest treatment it received (Abdu *et al.,* 2011). Despite these concerns, there is a lack of primary research that assesses the dangers of pollution including nutrient streams and balances for whole cities (Houngla *et al.,* 2020). The loss of peri-urban land due to expanding cities is another difficulty (Bren d'Amour *et al.,* 2017). Compost made from solid waste for use in UA in Cuba had cadmium and lead concentrations over upper allowable limits, but organic fertilisers used for the same purpose had concentrations of trace elements with acceptable levels (Alfaro *et al.,* 2017). Only antimony (Sb) accumulated over safe limits in vegetables grown in urban gardens in Recife (Brazil) (Mancarella *et al.,* 2016). In peri-urban regions of Jos (Nigeria), while farmers often use ash from urban areas as a liming material to raise the pH of their soil, the average application rate of 2.6 tonnes per hectare of Pb exceeds EU guidelines (Pasquini & Alexander, 2004).

The use of municipal waste ash, however, did not result in elevated levels of soil-bound heavy metals, leading researchers to conclude that this practise did not pollute the soils in the agricultural region (Pasquini, 2006). The author reached the conclusion that the primary cause of leaf contamination with heavy metals was air pollution (Pasquini, 2006). Heavy metal contamination over the dietary guideline was also found in vegetables grown in urban sack gardening (vertical farming) in Nairobi (Kenya), the source of which was often soil taken from polluted sites (Gallaher *et al.,* 2013).

Heavy metals were found to be enriched on the soil's top and to decrease with soil depth (Abdu *et al.,* 2011). Pb and Zn contents in leaves of crops irrigated with sewage water were also above international limits in Kabul, Afghanistan (Safi & Buerkert, 2011). In areas near cities in Zambia's copper belt, the number of heavy metals in wastewater was higher than what was recommended for watering food crops (Kapungwe, 2011). Untreated effluents from large industrial facilities and copper processing wastes were to blame for this (Kapungwe, 2011). In

Aleppo, Syria, chromium (Cr) and zinc (Zn) concentrations in peri-urban soils irrigated with wastewater were much greater than in regions irrigated with fresh groundwater (Sato *et al.*, 2014). The scientists did point out, however, that the total amount of heavy metals found in soils and crops does not always correlate with their bioavailability (Sato *et al.*, 2014). Research by Boente *et al.*, (2017) in the heavily industrialised peri-urban districts of Gijon, Spain verified these findings. Some trace elements were discovered to be at unsafe levels, namely arsenic (As) and lead (Pb) from atmospheric deposition, although a bioavailability evaluation showed a minimal potential danger to human health (Boente *et al.*, 2017).

Heavy metals in Recife's urban gardens mostly come from vehicles; these researchers also found that the more away from highways a garden was, the less likely it was that the plants' leaves would accumulate any dangerous components (Mancarella *et al.*, 2016). Heavy metal levels in soil in the Kampala, Uganda declined with distance from the road, but Pb levels in vegetables were over the safe limits at all locations (Nabulo *et al.*, 2006). Heavy metal concentrations were highest near to motorways and railways, also the researcher found an association between heavy metal levels in green vegetables and locations used to gather soil for urban sack gardening (Gallaher *et al.*, 2013). The contamination risk of vegetables grown near roadways was also elevated in urban allotment gardens in Bologna, Italy (Antisari *et al.*, 2015).

Some research found that in high-traffic metropolitan regions, leafy vegetables should be cultivated farther than thirty metres away from roadways (Nabulo *et al.*, 2006). In 2015, Antisari *et al.*, argued that urban gardens should be protected from traffic by being placed at least fifty feet away from major highways and surrounded by tree barriers. Local authorities in Cuba have banned the use of composts made from solid wastes unless waste processing centres have devised and implemented methods for lowering the heavy metal content of those composts (Alfaro *et al.*, 2017). This ban was prompted by the first nationwide survey of trace elements in Cuban (Alfaro *et al.*, 2017). Pb, Cd, and Zn concentrations were shown to be greater in leaves than in either the plant's roots or stems in several investigations (Alfaro *et al.*, 2017). Farmers were urged to cultivate crops including maize, pulses, and tubers, all of which include edible components that are shielded from direct aerial deposition (Nabulo *et al.*, 2006). But this will not prevent tuber crops, which are especially vulnerable, from being contaminated by soil particles that float on the top. According to research by Niaz *et al.*, (2015), mung bean stores most of the Cd it absorbs in its roots rather than building it up in its leaves. UA gardeners, who often focus on producing perishable, green vegetables because of strong market demands,

may not find a change in cropping strategies to be a good fit with their reality (Karg *et al.,* 2016).

2.7.6. Other Socioeconomic and Ecological Factors

Several studies have highlighted the growing threat of climate change to UA production activities in GS nations; population growth, widespread poverty, and ineffective leadership are just a few of the societal and environmental pressures that have contributed to this situation (Lwasa, 2014; Lwasa *et al.,* 2014; Revi *et al.,* 2014). Inconsistent rainfall patterns, insect and disease outbreaks, and heat pressures have reduced farm productivity and profitability (Odewumi *et al.,* 2013). Water scarcities, disease outbreaks, and delayed harvest times were identified in their research as detrimental consequences of climate change on UA (Odewumi *et al.,* 2013). These constraints include a lack of land and financial resources; households, such as those in urban areas, may profit from UA if they have access to land and other economic resources (Frayne *et al.,* 2014).

Rapid urbanisation, spurred by rural-urban migration and population expansion, has reduced the amount of prime urban agricultural land accessible (Onyebueke *et al.,* 2020), which may be related to the land access restriction (Taiwo, 2014). This is consistent with the findings of a research by Rimal *et al.,* (2018), which noted that prime farmlands in Nepal's Tarai districts are threatened by land fragmentation and urbanisation fuelled by rural-urban migration and population increase. Bonye *et al.,* (2021) show that the loss of farmland as a result of urban sprawl is a major problem. A possible explanation for the rising popularity of UA and the cultivation of small plot sizes among urban farmers is the loss of farmland as a result of urbanisation (Olumba *et al.,* 2019).

The lack of available labour is cited as a further challenge to UA in the region, with obvious consequences for outputs (Olumba *et al.,* 2021). The lack of farm labour recorded in the research may be related to the widespread belief among young people that they would rather not work on farms (Ayinde *et al.,* 2014). This result corroborates the claims of Egbuna (2009), who cited Nigeria's high labour costs as a key barrier to the development of UA. It has been stated by Salau and Attah (2012) that a high cost of labour may reduce agricultural production, which in turn has a detrimental effect on family income and food security.

According to Frayne *et al.,* (2014), the availability of inputs, production, and marketing infrastructure are necessary before UA can make a meaningful contribution to food security. Governments' timely and supply of subsidised farm inputs is essential to agricultural output and food security (Frayne *et al.,* 2014). Weak extension service delivery to urban regions is

often cited as a barrier to UA (Olumba *et al.,* 2021). These are similar with those of Edeoghon and Izekor (2017), who also found that insufficient knowledge and a dearth of extension services were major barriers to UA in Lagos state, Nigeria. Poor extension service was identified by Salau and Attah (2012) as a barrier to UA in Nigeria's Nasarawa state. If urban farmers do not get enough support from extension services, they could have to resort to outdated country agricultural practises (Tibesigwa & Visser, 2016). Otitoju and Enete (2016) show that farmers' interactions with agricultural extension agents have a significant impact on output, efficiency, and earnings. Agriculture extension agents in Nigeria, however, endure heavy workloads since they are responsible for a disproportionately large number of farmers and this extension agents' miserable working circumstances act as a barrier to their provision of quality extension services to farmers (Fagariba *et al.,* 2018).

Corruption, collusion, and nepotism are pervasive in Nigeria's political system, which has an adverse effect on citizens' ability to get and use food (Olumba *et al.,* 2021). According to Egbutah (2009), most of the money meant for agriculture ends up in the pockets of politicians and bureaucrats instead, leaving a paltry sum that is hardly enough to make a noticeable difference in the agricultural sector. In addition, the region's unequal institutional and administrative framework, which prioritises farming in rural areas while neglecting farmers in urban areas, has impeded UA efforts (Olumba *et al.,* 2021). In line with the findings of Ibitoye *et al.,* (2016), who found that most extension delivery services focused on rural farmers while giving urban farmers comparatively less attention, we find that urban farmers get comparatively less attention. One possible explanation for UA's lack of importance is the widespread belief that operating such a venture is not the proper function of a city (Simatele & Binns, 2008).

2.8. Classification of Urban Agriculture

Goldstein *et al.,* (2016) provided an overview of the many strategies for urban production systems and the potential for developing a typology to examine them. They noted that the most challenging aspect of UA research is the difficulty of reaching a consensual typology that would constitute a strong foundation for establishing fundamental development strategies for each kind of UA, policy creation and action planning (Goldstein *et al.,* 2016). Location and farm size, according to Drechsel and Dongus (2010), are two of the most essential factors in determining how to classify UA. Production goals, predominance of crops, or intensity of production were further suggested to be the appropriate criteria for classifying UA (Barthel & Isendahl, 2013). To better grasp this diversity, some have advocated splitting categories in half

with one set of criteria over another; they listed location and tenure, primary crop and livestock, level of market orientation, production size, and intensity as the single characteristics that determine success (Scott *et al.,* 2010). Accra's numerous criteria were categorised based on the parameters and others, such as proximity to irrigation systems and potential agricultural rotation options (Moustier & Danso, 2006; Veenhuizen & Danso, 2007).

According to Taiwo (2014), the advantages and disadvantages of a certain place depend on factors including how easy it is to get there, how secure one's hold on the property is, how much it costs to go there, how risky the journey is, and how near one is to a market. According to Mougeot (2000), people have long tried to categorise farms as either "intra-urban" or "peri-urban," depending on their proximity to the city centre, accessibility by public transportation, the size of the city, and the number of people living there. UA activities may happen in both the heart of cities and on their peripheries, corresponding to the intra- and peri urban disputes that define the distinct types of urban farming (Agarwal, 2001; Drechsel & Dongus, 2010).

The tenure of the land on which UA is conducted is much more important than the location of the land itself if it is to be successful (Barry & Danso, 2014). However near or far away from the city centre the urban agricultural land may be, Otsuka *et al.,* (2003) suggested that if the tenure is not secure, the farmer would have a hard time diversifying their crops. They went on to say that the tenure of such land is more essential than its location, which is only relevant so far as it affects the accessibility and kind of UA in relation to the developed environment (Otsuka *et al.*, 2003). Therefore, according to Steward (2007), anybody interested in UA should aim for cultivable land that is conveniently situated near transportation nodes and commercial centres, as well as inside the urban core itself. According to Sam (2014) argument, the predominant diet and dietary preferences of a city's residents determine what kinds of UA products will be most in demand there. The climate, culture, soil condition, socio-economic situations, and most particularly the informal networks these individuals worked in all have a role in shaping these dynamics (Ward & Shackleton, 2016). According to Eigenbrod & Gruda (2015), these individuals employ shared labour, which emerged from their informal networks, and they also borrow, share, and replant seeds throughout their networks.

2.9. Gaps in knowledge

This study aims to fill a research need by addressing the fact that UA is under-researched and not enough ideas have been generated from prior studies to mainstream UA practises. Some innovative practices of UA are still very new in certain areas of the GN as there is a greater concentration of literature on UA in GN nations and a dearth of scholarly papers from GS

countries (Cepic, 2017). Martellozzo *et al.,* (2014) found that the potential for food sufficiency in densely populated cities in most GS nations is very minimal, even though agricultural activity has expanded significantly in the GS in recent decades (Hamilton *et al.,* 2014). There must be more data collected on UA in GS nations so that proper analysis, decisions, and planning can be made (Weidner *et al.,* 2019). This research was undertaken in response to inadequate studies comparing UA practises across nations (DiDomenica, 2015). However, despite regional variations, the results, and perspectives from assessing the development in the GN may be duplicated in other regions (Weidner *et al.,* 2019).

Recently, the UK has been increasing formal support for UA practices (Hardman & Larkham, 2014). A growing number of municipalities, counties, and the federal government support the notion of introducing farming to urban areas (Hardman *et al.,* 2018). The Food Futures Strategy for Manchester (2007), which prioritises health, the environment, the economy, and sustainable communities; "Feeding Manchester," which encourages stakeholder participation in UA; and the Kindling Trust, which develops a long-term plan for sustainable food production; are just a few of the many initiatives active in Greater Manchester (Hardman *et al.,* 2018). Charters, which may include a vision or a set of goals, are used and seen as methods to facilitate communication between many stakeholders in the urban food system (Food for Bristol, 2010). These charters have been shown to be useful in sparking interest in UA, particularly at the regional level, and they often precede the development of food policy (Heasman, 2007). The success of UA policy depends on its being well-thought-out and well-executed and assessed for its potential to meet a wide range of social and environmental requirements (Hardman *et al.,* 2018).

The use of UA to address the many environmental and social issues plaguing today's food systems is gaining in popularity (Weidner *et al.,* 2019). However, further study is required before it can be used on a larger scale and more routinely within metropolitan infrastructure (Weidner *et al.,* 2019). Specht *et al.,* (2014) conducted a review of UA with a focus on rooftop gardens, rooftop greenhouses, indoor farms, and other building-related forms and found that UA has a high potential in environmental, social, and economic aspects but that researchers and practitioners need to work together to develop guidelines to enable sustainability of these practises. Mougeot (2000) found that the potential negative and positive effects of UA on the environment were almost equal. The fact that these dangers are so often disregarded contributes to research gaps (Wortman & Lovell, 2013). In particular, the study by Goldstein *et al.,* (2016) found that high yield growing UA methods contributed to food sufficiency but had a negative

effect on the environment. Also, simulated UA training did not improve ecological health by increasing biodiversity (Goldstein *et al.*, 2016).

Armstrong (2000) conducted qualitative research in New York to identify features that might be beneficial to community health and development through community gardens. He found evidence that improved urban land maintenance, as well as increased social network and organisational capacity, were among these features (Armstrong, 2000). The report recommends further investigation on the effects of community gardens on public health (Armstrong, 2000). Less than half of the twenty community gardens chosen for Armstrong's study in 2000 had soil testing done prior to usage; nonetheless, soil testing was performed on ten of the twenty urban farms, and heavy metal pollution from lead and cadmium was reported (Armstrong, 2000). Since most polluted soil might have major health repercussions, this highlights the need of soil testing before using an urban farm or garden for agricultural purposes (Armstrong, 2000).

As shown by Garnett (2000) in London, Detroit, USA (Carmody, 2010), Sofia, Bulgaria (Yoveva *et al.*, 2000), and Hong Kong (Wang *et al.*, 2016), UA is widespread in the GN and GS, with varying degrees of success (People & Planet, 2005). Acceptance of UA may also be seen in Detroit, USA, where the end of the automobile sector led to the loss of many jobs and a subsequent large rise in the amount of empty land (Ackerman, 2012; Nordahl, 2009). Rapid urbanisation resulted in the creation of "food deserts", where residents had limited options for obtaining healthy, nutritious food; in response, many people resorted to growing their own food in urban gardens (Hardman & Larkham, 2014). With over two hundred community gardens and numerous large-scale urban farm sites, the city is now widely recognised as a UA pioneer (Colasanti *et al.*, 2012). Cuba, where UA has been effectively practised for over 20 years, is an excellent example of a country where the technique has been accepted and implemented (Viljoen & Howe, 2005). Accra, Kumasi, Nairobi, Dar es Salaam, and Dakar, among other GS cities, also had similar outcomes (Foeken & Mwangi, 2000; Veenhuizen & Dansa, 2007). Although UA has been widely used in Nigeria and other nations of the GS, it has gone unrecognised, uncoordinated, and unrestricted by policymakers and urban planners (Mohammed *et al.*, 2017).

A study by Olumba *et al.,* (2021) shows that UA in Nigeria is characterised by the cultivation of short-duration crops, owing to the insecurity of land used by the urban farmers in cities (Asadu *et al.*, 2016). Constantly increasing populations, persistent poverty, and inept leadership are significant challenges affecting UA in GS countries (Revi *et al.,* 2014). All these have serious implication on the perception of UA in GS countries hence the need for more data on perception and practice of UA (Colasanti, Hamm & Litjens, 2012). Nigeria has the highest

population in Africa with an estimated value of 215 million and 52% of the population reside in urban areas (UNDESA, 2019). Several urban residents practice UA and despite the concept's potential importance in GS countries, the practise has not yet been comprehensively summarised in global literature (Hamilton *et al.,* 2014; DiDomenica, 2015). It has been suggested that UA may benefit in enhancing both dietary intake and food quality (RUAF foundation, 2015), however, the importance and implication of both small and large-scale UA on food security might still be unknown (Potts, 2009) as well as data on upscaling UA and incorporating it into the urban system (Wiedner *et al.,* 2019). Land access constraint is one the major barriers affecting UA in Nigeria (Frayne *et al.,* 2014; Odudu, 2015; Ibitoye *et al.,* (2016); Edeoghon & Izekor, 2017) which makes it difficult to evaluate the resilience, based on changing circumstances, and sustainability of UA (Yan *et al.,* 2022).

Growing food inside cities has been proposed to improve environmental, social, and human health simultaneously (Wiedner *et al.,* 2019). It has been shown that UA can increase resource productivity (Mohareb *et al.,* 2017), improve self-sufficiency (Clinton *et al.,* 2018), facilitate social advancement and community cohesion (Duchemin *et al.,* 2008). It has also been shown to be able to expand natural ecosystem (Lin *et al.,* 2015) and dietary diversity (Wilkins *et al.,* 2015), in addition to its potential climate change mitigation (Kulak *et al.,* 2013) and ecosystem benefits (Wilhelm & Smith, 2017).

Cultural characteristics, governmental regulations, and private sector norms all play a role in the UA practised in any given major city (Wiedner *et al.,* 2019). Effective and socially beneficial productive urban food systems require supportive legislation and regulation, collaboration among a wide range of stakeholders, standardisation of construction processes, and urban landscape building expertise (Wiedner *et al.,* 2019). Organisations have existed in GN cities since they were first established, and this has allowed their citizens to become self-sufficient (Barthel & Isendahl, 2013). An example is when the Department of Trade provided crop production and food processing training courses locally, the local media was used to raise awareness and garner support, and the City Agriculture Office was established to coordinate actions, educate the public, and organise cooperatives (Potutan *et al.,* 2002). To be successful, UA will need the backing of local governments, integration into existing food and retail systems, the assistance of many participants, volunteer groups, business owners, and investment firms, and the respect of residents. For instance, urban farming is particularly vulnerable to vandalism due to its open nature and the inherent fragility of the plants, which can result from a lack of public acceptance or even intense dislike (Gasperi *et al.,* 2016).

McClintock and Simpson's (2017) research show that as the number of actors increases, the variety of their motivations and, by extension, their visions for the future of urban farms, increases as well. According to the results of their research, UA is a contentious area, with some stakeholders favouring individual and business-oriented solutions and others favouring community and social benefit-oriented approaches. Furthermore, the positive perception of multipurpose UA appears to be driving the public's preference for open access business models over private and closed access ones (Specht *et al.*, 2016a). Based on these findings, policymakers should strike a middle ground between resident wants and societal priorities, such as sustainability and resilience or aesthetics and type of growing practice (Specht *et al.*, 2016b). To achieve this goal, one strategy is to host stakeholder workshops where a wide range of participants can share their perspectives and work together (Specht *et al.*, 2016b).

2.10. Conclusion

In conclusion, this chapter provides a comprehensive overview of various aspects related to UA and its significance in both the Global North (GN) and Global South (GS). The rapid pace of urbanization in different parts of the world, particularly in GS countries, has increased the importance of exploring sustainable methods of food production within urban areas. The chapter discusses different types of UA, including informal practices, community farms and allotment gardens, and high-tech urban farms. It highlights the positive impacts of UA, such as improving food security for low-income urban families in the GS, addressing poverty in African cities, and helping meet the demands of a growing global population. The chapter also acknowledges the challenges posed by the COVID-19 pandemic on food stability and the potential of UA to contribute to climate resilience and environmental sustainability.

Furthermore, the chapter discusses the health, social, and training opportunities associated with UA, emphasizing its potential to improve well-being, community engagement, and skill development. It identifies various barriers to UA, including limited land availability, lack of government funding and favourable policies, difficulties in accessing markets, gender inequality, waste and contamination concerns, and socioeconomic and ecological factors. The chapter highlights the gaps in knowledge and the need for further research to mainstream UA practices and generate innovative ideas. It acknowledges the concentration of UA literature in GN nations and the limited scholarly papers from GS countries, indicating the need for a more inclusive and comprehensive understanding of UA practices worldwide.

Overall, this chapter sets the stage for further exploration and analysis of UA, underscoring its importance in addressing food security, poverty, environmental sustainability, and community

well-being in urban areas. It emphasizes the need for collaborative efforts, policy support, and knowledge exchange between different regions to promote and enhance UA practices globally.

CHAPTER THREE

3.0. Introduction

To investigate the potential of UA and the enabling tools for upscaling UA in Nigeria and the UK, the findings of this research employed a predominantly qualitative approach. The overall research methodology comprises of participant observation, qualitative online surveys, and semi-structured interviews. As per the COVID statement, earlier in this thesis, the original methodology aimed to also collect soil data and other samples; more information around this is available at the beginning of this document. This chapter provides a reflection on the chosen methodology and explains the data gathering methods, analytic procedure, and ethical considerations for the project. In conducting this study, the researcher specifically examined the UA sector in the UK, with a focus on its formalized nature. While the researcher recognises the significance of studying UA within the context of Lagos itself, the decision to narrow the scope to the UK was driven by the formal structures and regulations governing UA practices in the UK. By focusing on a more specific context, the aim was to provide a comprehensive understanding of the formalized UA sector in the UK, shedding light on the unique challenges, opportunities, and ecological implications.

3.1. Research Approach and Case Study Location

This research adopted the use of qualitative methods of data collection. The study employed participant observation, online qualitative surveys, and online interviews to provide an in-depth investigation of the impact of UA, perception of stakeholders involved in UA and to find out the opportunities and challenges for sustaining the practice in Lagos, Nigeria, and general evaluation of the UK. Due to the exploratory nature of the study, quantitative approaches would not have provided the depth of data that was needed (Silverman, 2010). Multiple recent studies have shown that qualitative and participative methods such as observation and interviews are well suited to studying UA initiatives and communities (Colasanti *et al.,* 2012; Hardman & Larkham, 2014; Tompkins, 2014; Kneafsey *et al.*, 2017). Qualitative research techniques provide tools for investigating people's experiences, behaviours, and occurrences; it also offers strategies that may be used to discover and investigate the ways in which interconnected individuals perceive and comprehend certain processes and events (Moen & Middelthon, 2015).

This study used a case study approach with two sites (Lagos and an overview of the UK) to explore the human experiences of UA across factors such as geographical, social, and economic (see figure 8). To obtain a thorough understanding of a topic, event, or occurrence

in its proper real-world setting, the case study method is highly effective (Crowe *et al.*, 2011). Case studies, according to Robson and Berkes (2011), are approaches to study that entail an exploratory analysis of a specific current event inside its real-life setting employing several sources of data. Case studies are well suited to exploratory qualitative research because they gather data from several, diverse sources, enabling the issue under inquiry to be viewed through multiple viewpoints and the procedures and practices to be studied (Meyer, 2001; Baxter & Jack, 2008).

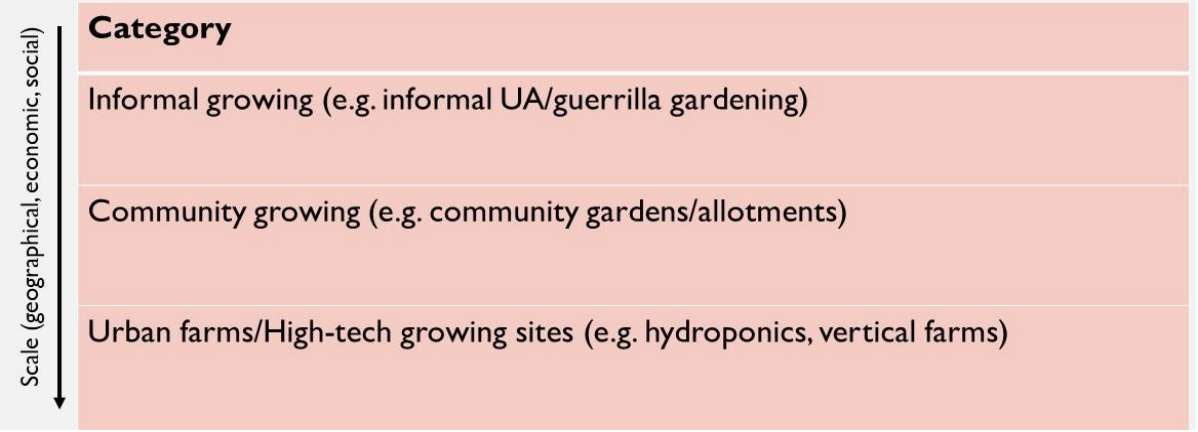


Figure 8: Image depicting the types of farms used by participants.

The focus of the research was to explore the future potential of UA in both locations as well as the factors that can facilitate the upscaling practice of UA. This was to be achieved by exploring current UA practices, understanding the perception of different stakeholders, and enabling policy tools, and the effect of barriers and drivers of UA on food security and upscaling potential. These aspects formed the foundation of the research and are represented in the figure below (see figure 9). Exploring participant perspectives and motives for practise was made possible by the comprehensive overview of UA in both locations, which also improved awareness of the study's goals, activities, and methods of execution. It gave access to a broad range of people and offered context for the two case studies to be studied in connection to the operation of UA generally. This enabled it possible to compare two separate locations in terms of UA site types (discussed in section 2.1), potential barriers, and potential opportunities.

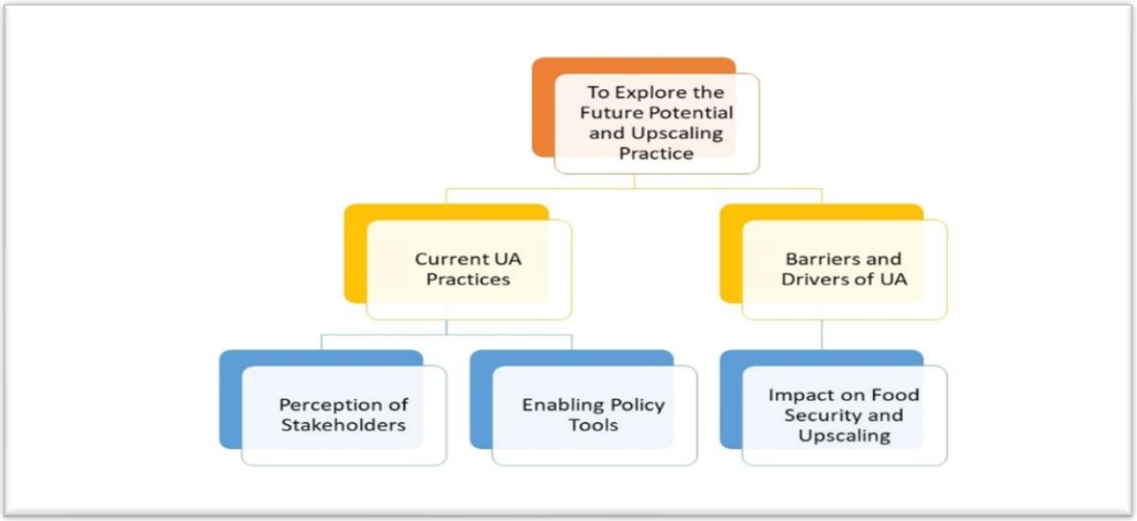


Figure 9: Image showing the focus of the research.

3.2. Research Philosophy

Research philosophy investigates how, where, and why new information is created (Bajpai, 2011). According to Saunders *et al.*, (2009), a research philosophy is the driving force behind the creation of new knowledge in any field. Scientists and academics hold the view that they have a clear understanding on the processes by which new information and understanding are generated (Saunders *et al.*, 2009). According to Hill (1981), no study is conducted without some philosophical underpinnings. All studies have underlying philosophical assumptions, even if they are not stated directly and these convictions motivate or direct the selection of research topics, the selection of research methods, and the evaluation of finished projects (Hill, 1981).

To understand how philosophical assumptions influence research methods, one must first recognise that all observation is theory laden (Hanson, 1965). Norwood Russell Hanson, a philosopher of science, coined this term to describe the idea that each observer has a unique conceptual framework within which their observations are interpreted (Hanson, 1965). Education, social interactions, critical discussions, and exposure to diverse cultures and geographical locations are just some of the many life experiences that can contribute to the development of this framework of assumptions over the course of a person's lifetime (Creswell & Poth, 2017).

According to Bryman and Bell (2011), researchers should be able to clarify what kind of theory they are working with and whether they are using their data to test or build theories based on the relationship between theory and research. Furthermore, Scotland (2012) argues that

researchers need to provide evidence for their claims about how and why things work as they do. Some of the most fundamental and widely used epistemological frameworks in sociological inquiry are positivism and interpretivism (Saunders *et al.*, 2009).

Inspired by what Denzin and Lincoln (2005) call the "Golden Age" of qualitative research, this study is influenced by a grounded theory approach that was invented from Glaser and Strauss's pioneering text, The Discovery of Grounded Theory (Glaser & Strauss, 1967). Realistic, objective, and detached research was emphasised at the time, but the theory has come a long way since then (Birks & Mills, 2015). In contrast to the post-positivism of the '50s and '60s, the analytic procedure used in this study is more in line with Charmaz's (2006) description of constructivist grounded theory (Birks & Mills, 2015).

Auguste Compte (1798-1857), widely regarded as the positivism's originator, argued that first-hand experience is the only reliable source of information (Sonmez, 2010). This view is shared by Habermas (1971), who argues that genuine information can only be generated through the methods of empirical science. However, according to Easterby-Smith *et al.,* (2015), positivism's central idea is the view that knowledge should always be grounded in observations of the external reality of epistemological approach. In addition, according to Saunders *et al.,* (2009), positivist researchers put their trust in the role of objective observer rather than relying on their own biases or preconceptions when drawing conclusions.

The philosophy of interpretivism has been referred to by several different names, including "constructivist," "hermeneutic," and "phenomenology" (Creswell & Tashakkori, 2007). When it comes to knowledge and information, the positivistic tradition which the constructivist approach rejects as "...out there, waiting to be collected and processed" is viewed with suspicion (Hubbard *et al.,* 2002, p.8). A researcher who takes an interpretative stance and, thus, a more subjective approach to social activities, with the intention of deriving a social-scientific framework out of the interpretations, is said to be engaged in interpretivism (Bryman & Bell, 2011).

Research guided by the principle of interpretivism seeks to make sense of how the external world relates to the internal experience of the researcher (Cohen & Manion, 1994). In the interpretivism approach, the researcher does not begin with a theory like positivists do but seeks to develop a theory through inductive means (Bryman & Bell, 2011) and qualitative data collection (Creswell, 2007). As an alternative, it takes an inductive approach to theory formation and rejects the notion that objectivity is required or even desirable in the process of knowledge construction, instead viewing comprehension as a product of collaborative effort between actors located in distinct contexts (Hubbard *et al.,* 2002). With the help of social

constructivism, researchers are free to ask broad questions and gain an understanding of the world that celebrates complexity rather than reducing it to predetermined categories.
When conducting research, even the most experienced professionals should be prepared for the possibility of encountering unforeseen challenges; this means putting in extra time and energy to evaluate and adopt the most reliable and efficient methods during the research design phase (Kulatunga *et al.*, 2006). As was previously mentioned, the study takes an interpretivism stance in which no hypotheses are predetermined, and theory is developed as data is analysed. More information about the analysis procedure is provided in subsection 3.4.

3.3. Research Methods

In seeking to investigate the policy tools and the perception of stakeholders to UA in the UK and Lagos, this study adopted the use of qualitative methods of data collection to conduct the findings. McMillan and Schumacher (1993, p. 479) defined qualitative research as:

"Primarily an inductive process of organising data into categories and identifying patterns (relationships) among categories."

Qualitative research is a scientific term which encompasses holistic methodologies that are narrative and descriptive which can be used to inform the researcher's understanding of a social occurrence (Astalin, 2013). Mason (2002) describes qualitative research approaches as a phenomenon that is based on how research questions is understood, experienced, interpreted and produced. Qualitative methods entail the use of well-grounded and comprehensive descriptions of processes that give an understanding that goes beyond only numbers (Miles & Huberman, 2014). This involves the use of flexible tools which are sufficient to analyse the perception of people involving both verbal and non-verbal interpretations (Creswell, 2013). Qualitative approaches to research help to provide an in-depth understanding of an individual's perception and experiences based on their values and beliefs (Teddlie & Tashakkori, 2003); however, there is a chance that it offers subjective data which makes data analysis time consuming (Robson & McCartan, 2016).
This methodology is used to gain an understanding of people's perspectives and motivations most specially to provide an insight into the research problem (Hammarberg, Kirkman, & De Lacey, 2016). This method was selected and adjusted to fit the tools required for the research. Interviews, recordings, and note taking are methods used to garner significant information portrayed by participants (Trochim & Donnelly, 2007). Furthermore, data gathered from several sources can help to explain the research problem (Trochim & Donnelly, 2007). The

purpose and goals of this study was reviewed (due to the impact of Covid, please see page ix) to arrive at these approaches. Data collected for this study included various sources which was used to find answers to the questions concerning the prospects, challenges, and comparison of urban activities in different regions (Trochim & Donnelly, 2007; Yin, 2009).

To develop theories from the data collected from the study, the sampling strategy was influenced by grounded theory. Theories are sets of new ideas that are developed through a series of relational statements (Hage, 1972) and these are developed from the connections deduced and built from the collected data (Prashant & Astalin, 2013). The theories that emerge are genuinely new findings that can be used to implement models about an experience which can then be applied to tackle existing problems (Prashant & Astalin, 2013). This study approached research by developing themes from data gotten from techniques such as the participant observation, online qualitative survey, interviews as well as literature review. These techniques are suited to exploring the perceptions of UA as it gives room for detailed explanation to be recorded without generalising and making conclusions about the experiences of individuals (Taylor, 2001). The aim is to display a complete account of events that are enough to give a comprehensive description of UA in Lagos and the UK as well as the perceptions of people involved.

The study's background, aim, and implementation have been investigated using observation, an initial online qualitative survey, and online semi-structured interviews. A combination of participant observation, surveys, and interviews were used in the research of two case study settings, Lagos, and UK in general. A diagram depicting research methodologies for each study area is provided in figure 10:

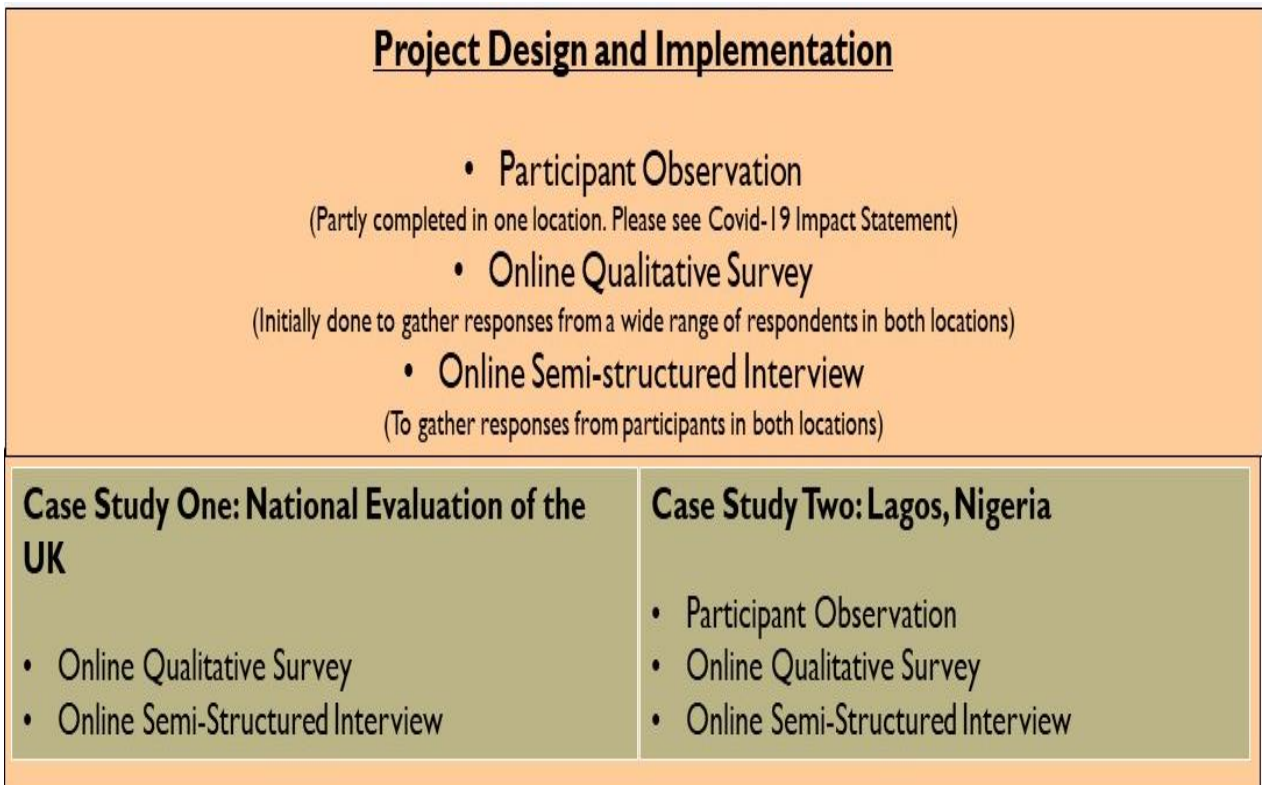


Figure 10: Image showing the project design and research methods.

3.3.1. Participant Observation

Participant observation occurred at various urban sites in Lagos, a more informal approach was used due to the nature of the sites being explored. Since Covid-19 prohibited movement at the time, it was impossible to conduct participant observation in the UK, and the study had to be adjusted to accommodate for this (please see Covid-19 Impact Statement). Participant observation was important in collecting a wide range of data and to gain a better understanding of people's perception by reducing the problem of reactivity (Bernard, 2006). The researcher related with participants and observed participants without the need to conceal the role as an observer as this allowed enough integration to develop an understanding of their various roles and activities. There are various types of participant observation (Hammersley & Atkinson, 2007) and this includes:

- Complete participant: the researcher fully participates in the group, but the researcher's role is hidden

- Participant observer: researcher is fully involved in the group, the researcher's role is hidden, but the observation is the main objective

- Observer as participant: researcher participates in the activities; the group is aware of the researcher's role and observation is the main objective
- Complete observer: researcher is kept secret from the knowledge of the group

For this study, the observer as participant role was more suited for the area of focus as it was not necessary to hide the role of the researcher from the participants. The observer as participant role served as a guide in preparing topics and questions for the online qualitative survey and interviews respectively (DeWalt & DeWalt, 2002). Observation was used in this study in combination with online qualitative surveys and online semi-structured interviews (in the GS only, see figure 11) to increase results validity by reducing the research bias (Zohrabi, 2013). It also helped to give a deeper understanding of the perception of the participants and may enhance interpretation of data collected (Bernard, 2006).

Detailed narratives may be constructed using this method, and no attempt is made to infer the experiences of the participants to the larger population, making it a particularly well-suited method for investigating UA (Taylor, 2001). By allowing for prolonged immersion in the study environment, participant observation helps researchers understand the issue from the participants' points of view, sets the stage for future studies, and familiarises them with the group's behaviours and culture (Bryman, 2008). Incorporating these elements into the study design may help the participants relax during conversations and provide more natural responses, indicating less anxiety about the researcher's presence (Bernard, 2006).

Accordingly, field notes were written to document the setting of the fieldwork, the participants, the dates, the activities, the tasks, and the dialogues. Photographs of the places and data gathered from casual conversations with participants were captured and sent through email in addition to being recorded in the official observation logs. One key informant who was observed and subsequently interviewed gave access to other key stakeholders in the research. Using several data gathering strategies in research, often known as *"methodological triangulation,"* might increase the reliability of the results; methodologies that fall under this category include a mix of qualitative and quantitative approaches, as well as the use of a variety of methods within a same methodological framework, such as the combination of two qualitative research methods (Thurmond, 2001). The purpose of this study was to reduce research bias by using participant observation in combination, online qualitative surveys, and semi-structured interviews to aid in the interpretation process by including diverse viewpoints (Zohrabi, 2013). Using an ethnographically influenced method has helped to learn more about the interviewees, which may provide more credibility to the findings (Bernard,

2006). In addition, several studies have mentioned the use of participant observation and interviews as an effective method of data collection in UA projects (Hardman & Larkham 2014; Tompkins, 2014). Because of the use of an informal unstructured approach for this, written consent was not necessary as no personal information was included although verbal consent was sought, and this has been found to be sufficient (UK Data Archive, 2014). An unstructured interview is used in situations whereby the respondents can express their views in ways they are most comfortable and at their own pace with little restrictions on the respondent's responses (Morse, 2003).

3.3.2. Online Qualitative Survey

An online qualitative survey was used to gather a wide range of responses from stakeholders in UA in both study locations. Surveys have been employed as an effective tool in UA research to garner responses from a wide range of people and to explore people's perception (McClintock & Simpson, 2014; Grebitus & Printezis, 2017). This was conducted prior to data collection via semi-structured interviews. The questions which were open ended in nature, were carefully designed by the researcher to fit into the purpose of the research. It was then distributed through emails, websites and social media UA groups including Facebook and LinkedIn. The research was adapted to use online surveys as the pandemic did not allow for physical interactions hence the need to collect data online. One of the key advantages of online qualitative surveys is in its flexibility in addressing a variety of research questions pertaining to the researcher's interest; it also allows easy access to data from a range of sources resulting in diverse opinions and experiences (Braun *et al.,* 2021).

A unique characteristic of qualitative survey is that it offers a wide range of responses on the subject of interest (Toerien & Wilkinson, 2004). It allows the capability for capturing in detail diverse perception and experiences (Braun *et al.,* 2017). This diversity of response is particularly useful when conducting research in areas that are under explored (Braun *et al.,* 2020). Qualitative surveys primarily encompass a range of open-ended questions designed by the researcher and focused on a particular topic. They are usually administered by the researcher and responses from participants are in their own words giving a rich and detailed account of responses (Braun & Clarke, 2013). Qualitative surveys capture what is important to the participants without going out of context while accessing their inferences and languages (Frith, 2000). However, qualitative surveys continue to portray a relatively new and often concealed method (Vannette & Krosnick, 2018). It has been assumed that surveys are not flexible enough for qualitative research while some think that qualitative surveys must be

augmented with interviews to give data of satisfactory depth and richness, but this is not necessary (Braun *et al.,* 2021). Qualitative surveys are found to be well-suited with research implanted in broadly qualitative research values (Grant & Giddings, 2002).

When conducting qualitative surveys, determining an appropriate sample size may be difficult however Braun and Clarke (2013) provided an appropriate helpful guideline for research studies. Sample sizes tend to be larger than what is typical for qualitative research, with some studies using as few as 20 participants (Grogan & Mechan, 2017; Grogan *et al.,* 2018) and others including as many as 100 (Braun *et al.,* 2013; Frith & Gleeson, 2004; Opperman *et al.,* 2014). According to findings, factors that influence the size of a study's sample include the breadth and depth of the topic being studied; the nature of the research question being asked (whether it be about experiences, perspectives, practises, or discourses); the demographics and diversity of the target population; the interest level of potential respondents; and the quality of their responses (Braun *et al.,* 2021). Not all of them can be predicted in advance (Malterud *et al.,* 2016; Morse, 2000), thus it is more necessary to focus on the depth of your dataset and your capacity to answer your queries than on reaching an exact number (Braun *et al.,* 2021). The purpose of the surveys was to ascertain current practices, opportunities, and barriers to upscaling UA.

3.3.3. (I) Semi-Structured Interviews

The semi-structured interview is the most used technique in qualitative research as it has proven to be generally flexible (Kallio *et al.,* 2016; Ruslin *et al.,* 2022) and can also be used in either individual or group interviews (DiCicco-Bloom & Crabtree, 2006). It ranges from being unstructured, and questions can be altered leading to a more open discussion (Myers & Newman, 2007). The structure can be varied depending on the research purpose and questions (Kelly *et al.,* 2010) and it also allows for an efficient conversation between the interviewer and the participant (Galletta, 2013); giving room for follow up questions adapted from participant's responses (Polit & Beck, 2010).

Qualitative interviews that yield meaningful results requires effort, imagination, and initiative (Mason, 2002). Mason (2002) claims that designing and using a structured questionnaire to ask prepared questions is significantly easier and less time-consuming than preparing and executing a qualitative project. It first needs intensive preparation (Mason, 2002). There is a certain set of abilities needed to conduct a qualitative interview (Ruslin *et al.,* 2022). A combination of these abilities is ideal while conducting an interview, but might not be needed (Mason, 2002; Hermanns, 2004). Rather than relying on interviewing skills, Drever (2003)

recommends that interviewees set a basic timetable and strive to stick to it, phrase questions organically, and utilise a tape recorder (Drever, 2003).

For interviewees to open and share who they really are, Hermanns (2004) says the interviewer must provide a safe environment for doing so. The semi-structured interview is an exploratory interview (Magaldi & Berler, 2020); furthermore, the semi structured interview is based on a guide, and which normally centres on the central issue that gives an overarching pattern (Magaldi & Berler, 2020). Despite predetermined theme paths, the semi-structured interview, nevertheless allows for in-depth exploration (Megaldi & Berler, 2020). Interviewees' perspectives are more likely to be communicated in an open-designed scenario than in a standardised form of dialogue, such in questionnaires, therefore this principle is connected to that expectation (Flick, 2002)

Semi structured interviews are more open-ended than its more rigid counterpart, the structured interview, which relies on a predetermined list of questions to extract information from participants (Ruslin *et al.,* 2022). When conducting a semi-structured interview, the interviewer often has a predetermined set of topics they want to cover (Ruslin *et al.,* 2022). There should be a nice harmony between the primary questions, follow-ups, and probes (Rubin & Rubin, 2005). However, the interviewer should come prepared with a list of questions and a list of themes that they wish to cover (Rubin, 2005).

Interview guides, an informal compilation of themes and questions that an interviewer could address in a variety of ways to various participants, have been recommended by several academics (Lindlof & Taylor, 2002). Researchers are freed from the need to conform to any one specific format, allowing them to better address the issues at hand (Ruslin *et al.,* 2022). With this flexibility, interviewers may craft questions that are specifically relevant to the topic at hand and the individuals being questioned (Lindlof & Taylor, 2002). A semi-structured interview has its own peculiarities, regardless of the approach or tradition used (Ruslin *et al.,* 2022). According to Mason (2002), there are a few universal characteristics of these types of interviews. To begin, an interview is an introspective two-way communication; this necessitates the use of either large-scale interviews or focus groups, as well as one-on-one interviews. It may also happen in-person, over the phone, or online using services like WhatsApp, Instagram, Twitter, and Facebook (Ruslin *et al.,* 2022).

Semi- structured interviews were held with some stakeholders in the GN and GS, building upon reflections and themes from the participant observation and the online qualitative survey. Due to the pandemic which influenced the amendments made to the research, the interviews were all conducted online through Microsoft Teams and occasionally phone calls for participants

who found it difficult or were unwilling to use Teams. Interviews included core themes that varied slightly based on the context, location, and interviewee, but remained open to enable for the talks to be pursued in multiple ways and for new topics to develop. This is to enable them to communicate freely and to get more depth on the research topic. After reflecting on the study goals and reviewing the preliminary analysis of observation and online qualitative data, interview questions were prepared. This made it possible for interviewers to focus on the most important aspects of the study while still being individually tailored.

3.3.3. (II) Telephone Interviews

Conventionally, qualitative interviews have taken place in-person, either one-on-one or in small groups (DiCicco-Bloom, 2006; Rubin *et al.,* 2011). In-person interviews have been deemed the standard in the research literature (McCoyd, 2006). However, in other cases, as the recent pandemic, they are not feasible for reasons of logistics, practicality, or safety (Lobe *et al.,* 2020; Sy *et al.,* 2020; Teti *et al.,* 2020). As a result of the pandemic, several established procedures for doing research have been altered (Nind *et al.,* 2021). Due to these recent barriers, researchers have been compelled to resort to non-direct ways of gathering qualitative data, such as telephone interviews (Azad *et al.,* 2021). Although telephone interviews have been shown to be an effective means of data collection (Johnson *et al.,* 2021), there is still a lack of methodological discussion about their use for certain groups of participants, such as those with common mental disorders like depression, anxiety, and adjustment disorders (Irvine *et al.,* 2013). In the past, qualitative research data collection using telephone interviews was a last option (Hermanowicz, 2002; Novick; 2008; Rubin *et al.,* 2011). The most common issues with conducting interviews over the phone are the potential for a reduction in the depth and quality of the data collected (Hermanowicz, 2002), difficulties in establishing rapport (Glogowska *et al.,* 2011), and the inability to read nonverbal cues such as facial expressions and body language (Irvine *et al.,* 2013).

The inability to gauge the appropriate time to ask clarifying inquiries or mention touchy subjects is another common complaint (Novick, 2008). The conservative perspective, however, is not supported by the rising amount of literature that use telephones as a means of data collection or by research that compare the use of telephones with in-person interviews (Azad *et al.,* 2021). Instead, experts argue that in-depth telephone interviews may serve as a suitable (Ward *et al.,* 2015) and similar alternative to in-person interviews for qualitative research (Cachia & Millward, 2011). Studies reveal that despite the shorter length of telephone interviews (Irvine, 2011), the data they provide is just as rich as that from in-person interviews

(Sturges & Hanrahan, 2004; Vogl, 2013), with only minor changes in depth of data (Krouwel *et al.,* 2019). Research by Johnson *et al.,* (2019) indicated that although in-person interviews are more conversational and thorough than remote techniques, there is no obvious difference in interview evaluations between the two. One researcher (Trier-Bieniek, 2012) argued that interviewees feel more comfortable opening up and providing more detailed responses when they are able to choose when and where the interview takes place, as this helps maintain their anonymity and decreases the likelihood that they will be distracted during the process (Sturges & Hanrahan, 2004).

Considering the reasons both for and against the use of in-depth telephone interviews, researchers have undertaken several efforts to improve the efficacy of this method (Drabble *et al.,* 2016; Farooq & De Villiers, 2017). Using these resources successfully requires adhering to a detailed set of guidelines before, during, and after the interview (Azad *et al.,* 2021). These highlight the necessity of describing the goal of the study in the early stage of the research (either in writing or during the first telephone contact with the participant) and creating rapport via small conversation when initially calling the subject (Drabble *et al.,* 2016). The significance of verbal feedback and follow-up queries is emphasised (Kee & Schrock, 2020) as is the use of vocalisations and explanation to demonstrate response due to the lack of non-verbal indicators and the challenges of interpreting visual emotional expressions (Drabble *et al.,* 2016).

Listening more attentively on both ends may arise from such verbal hints and explored inquiries (Trier-Bieniek, 2012). Positive findings have been found in studies examining the efficacy of telephone interviews from the interviewee's point of view (Azad *et al.,* 2021). For many respondents, the anonymity and ease of doing a telephone interview makes it the method of choice when given the opportunity (Block & Erskine; 2012). Researchers have discovered that interviewees find it simple to create rapport, which runs counter to more conventional views (Ward *et al.,* 2015). As a result, some writers argue that telephone interviews are acceptable for more delicate topics and neglected groups (Drabble *et al.,* 2016; Farooq & De Villiers, 2017; Block & Erskine, 2012).

The interviewer may benefit from telephone interviews too, since doing so might lessen feelings of awkwardness or fear of being judged negatively by the interviewee (Cachia & Millward, 2011). A more equitable distribution of power between researchers and participants is another potential advantage (Vogl, 2013). Telephone interviews have been recommended as a means of improving response rates (Patel *et al.,* 2003), particularly when interviewing people with mental illnesses and barriers related to the consequences of their symptoms, as previous

research has shown that recent illness or present ill health negatively affects research participation (Jones & Cipriani, 2019).

3.4. Overview of Data Collection and Sample Size

This section summarises the whole data collection approach, from early scoping exercises and participant observation through discovering online forums for the qualitative survey, identifying gatekeepers and participants, and explaining protocols followed at each area of interest. Section 3.4, which follows this section, discusses the analytical technique.

3.4.1. Sites for Participant Observation

The first step in conducting a research plan and learning more about the topic at hand is securing access to the relevant locations and sources of information. Access, according to Feldman, Bell, and Berger (2004, p. vii), is *"not something that is achieved once and for all but a process that may be expanded and improved over time"* because it allows the researcher to *"learn from the individuals [they are] talking with and observing."*

In June of 2019, the process of gaining access to urban farms in Nigeria and starting an initial scoping study began to establish rapport with a few stakeholders in Lagos prior to data collection. Due to the researcher's existing relationships with a few urban farmers in Lagos, access to these urban farms was uncomplicated, allowing for the identification of important stakeholders. This preliminary effort was conducted to get a basic awareness of UA practises and to gain access to stakeholders in Lagos. This also gave insight into various obstacles the researcher may face during data collection as well as the timeframe involved. The visits were limited to crop-growing farms within the city, and the location and contact information of urban farmers were gathered; location of these farms was documented, and photographs were taken. These farms were bigger and included some root and tuber crops along with vegetables and grains farmed using a mixed farming method. Due to the high daytime temperature in Lagos, a local supply of well water was used to irrigate the crops (up to 30 degrees Celsius). The farm within the gated space on the other hand was planted in plastic pipes in which small holes were drilled to the sides, filled with soil, and used for planting (see figure 11). This garden can be said to be like a small-scale vertical farm. The crops grown were mostly vegetables alongside some seedlings for transplant. There was a locally made pumping system designed for irrigating the garden which is electricity powered but has not functioned for a while due to lack of constant electricity. Despite having several potential energy sources, Nigeria has one of Africa's lowest rates of individual electric power use (Olaoye *et al.*, 2016; Emovon & Samuel, 2017).

Figure 11: Garden planted in plastic pipes in Lagos (Author's image)

This observation was conducted in Lagos, Nigeria to compare several methods of UA and analyse current UA procedures. This was done to determine the gaps in knowledge on UA in Nigeria, particularly with regards to upscaling practise. This was recorded via the use of notes and photographs where possible.

3.4.2. Overview of the Online Qualitative Survey

Using online qualitative questionnaires, preliminary research was conducted to enable an overview knowledge of UA, the issues influencing the practise, and the perceptions of stakeholders. Despite the potential brevity of individual replies that online survey may give, Grant and Giddings (2002) demonstrate that qualitative survey datasets may give richness and depth when considered as a whole. The survey questions were prepared with care employing open-ended questions which was then coded. The survey link was subsequently disseminated through social media channels within UA Facebook and LinkedIn groups in both locations. After giving evidence concerning the research project, access to the social media groups was obtained by contacting the group's organiser and through supplying the necessary information. Respondents contacted the researcher using the contact information supplied in the information posted on the groups, and links to the surveys were then emailed. The poll included of a total

of thirty questions and addressed pertinent concerns about UA types in both locations including the scale, as well as the perceptions of stakeholders.

Participation by the researcher in the design and administration of the survey enhanced access to important stakeholders, including gatekeepers for the semi-structured interviews. There was a total of 27 and 50 responses from the GN and GS, respectively and these responses were anonymous. Focusing on the depth of the dataset and its ability to answer the research questions is more important than getting a particular number of responses (*Braun et al.*, 2021). Majority of respondents were urban farmers (about 80%), while the others were consumers and urban dwellers, and their responses offered a foundation for a more in-depth examination of the effects of the growing activity. Several responders remained engaged in the research and reached out to clarify some of the replies to the survey questions. The researcher then built a relationship with these respondents. Although the researcher's position was always made clear, this degree of participation allowed for an in-depth understanding of perspectives and experiences. Furthermore, some of the respondents later functioned as gatekeepers to find further suitable participants. The results were then manually coded, categorised into themes, and analysed using NVivo.

3.4.3. Collection of Data using Semi-Structured Interviews

After establishing access to certain respondents through the initial qualitative survey and developing relationships with several urban farmers in Lagos, it was quite easy to gain access to other participants through these gatekeepers. The sample was obtained via the snowball and purposive sampling technique, in which participants in the research helped to find new subjects (Bhattacherjee, 2012) and participants were chosen because they possessed information on UA by virtue of their knowledge or experience (Tongco, 2007). The details of the interview participants are summarised in the table below (see table 1) and discussed further in chapters 4, 5 and 6. Over the course of the research, individual interviews were conducted with 10 and 20 participants in the UK and Lagos, respectively. This is because the research focuses on Nigeria, where little studies on UA exist, this was discussed in detail in Chapter 1.8. Alvesson and Ashcraft (2012) suggest that the number of participants required to collect useful data should be determined by a balance between representativeness (in the broadest sense) and response quality. It is argued that a single qualitative interview (or case) is adequate for certain investigations, such as when determining the plausibility of something or providing a full narrative (Patton 2015). When it is vital to detect similarities or create comparisons, a larger sample size may be required in other situations (Baker & Edwards, 2012). Participants in the

project include a wide range of stakeholders (see tables one & two), including urban farmers, consumers, urban residents, policymakers, governmental organisations, and UA consultants. Some of these stakeholder roles were discovered to overlap, with one stakeholder fitting into two or more categories.

Stakeholder	**Participant Number**
Urban Farmers:	
Informal Growing	Participants 5, 8, 13 & 14
Small – Medium Scale (Urban/Community Farms)	Participants 3, 5, 7, 11, 17
High tech Growing Sites	Participant 1 – Hydroponics Participant 2 – Hydroponics Participant 6 – Greenhouse Participant 9 – Soilless Farm Participant 10 – Hydroponics Participant 12 – Aquaponics Participant 15 – Greenhouse Participant 18 – Hydroponics Participant 20 – Urban Beekeeping
UA Consultant	Participant 13
Urban Resident	Participant 14 & 16
Government Official/ Policy Maker	Participant 15 & 17
Consumer	Participant 19

Table 1: Showing the details of participants interviewed in Lagos.

Stakeholder	Participant Number
Consumers	1 & 2
Urban Resident	3, 4 & 5
Urban Farmers	Participants 3, 4 & 5 – Small scale/ Backyard Garden Participant 8, 9 & 10 – Community/Allotment Gardens
UA Consultant/Policy maker	Participants 6 & 7

Table 2: Showing the details of participants interviewed in the UK.

This research investigated the extent and practises of UA activity in each location using a comprehensive methodology. This aided in informing the data, and data gathering was discontinued when no new information was discovered, indicating that saturation has been reached. The sample size of respondents was influenced by Grounded Theory's principle of saturation, a concept that is commonly used in qualitative research for this purpose (Glaser, 1967; Mason, 2010). Creswell (2007) proposes doing three to five in-depth interviews per case using case-study approaches. Saunders (2012) provides a concise summary of this by noting that four to twelve participants are sufficient when selected from homogeneous populations and that twelve to thirty participants are likely sufficient when selected from heterogeneous populations with the goal of achieving saturation. The data from the interviews and online survey were obtained anonymously because of the nature of the research, which intends to explore the perceptions of stakeholders participating in UA, and to safeguard the identities of stakeholders who would provide their opinions. However, informed consent was obtained prior to data collection via the participant consent form, and participation was voluntary.

3.5. Data Analysis

The researcher used a recorder to record the interviews and afterwards transcribed the data into a text format. This transcription process involved converting audio recordings into written words. This involves transcribing the interviews verbatim, including any pauses, stutters and interruptions. The transcribed data was then cleaned, removing any irrelevant information, correcting spelling errors and ensuring the data was accurate. The researcher then read through the data several times to identify the main ideas of the data (see figure 12). Extensive reading

and comparison promote ongoing engagement with transcripts and the development of theory from facts using emergent rather than predefined codes (Charmaz, 2006). Continuous comparative analysis, a term adapted from grounded theory, informed this kind of study, which was ongoing from the onset of data collection (Birks & Mills, 2015).

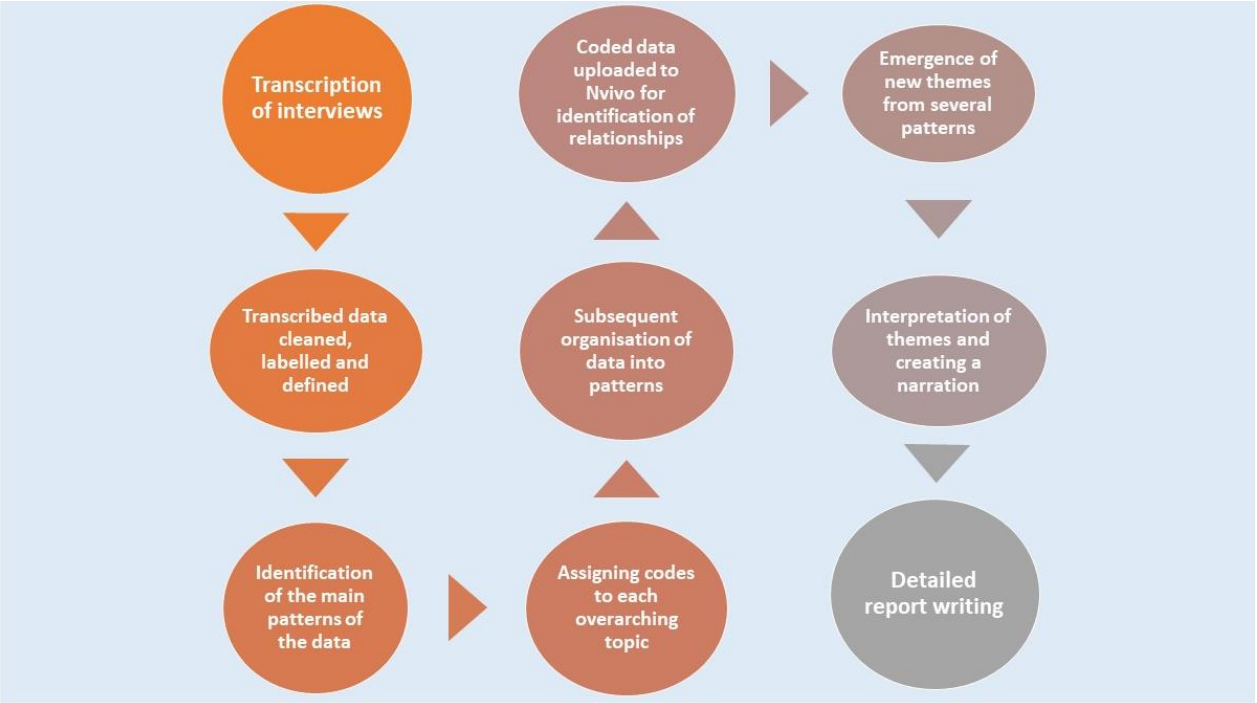


Figure 12: Figure showing the process of Data Analysis (Author's own)

The researcher then assigns codes to each overarching idea identified from the data to create a coding system. This is done by categorizing the data into meaningful chunks. This was done manually, and the researcher reads through the transcripts and assigns codes to different parts of the text that relate to a specific theme or topic. This coding system helped to organise the data into categories for subsequent identification of themes. Initial coding has been used to analyse transcripts, following Charmaz's definition of grounded theory coding, with the goal of leaving the data open to any exploratory routes suggested by the findings (Charmaz, 2006). The researcher then uploads the already coded data to NVivo to identify patterns, themes and connections between the codes. This involves reviewing the coded data to identify patterns and relationships between different codes. These themes were then derived from a combination of several codes. The researcher then interprets the findings from the analysis by taking the most salient themes and using them to craft a narration that delved into the difficulties encountered by UA participants and the motivations that compelled them to get involved. This was done by

examining the relationship between the themes and the research question taking note of any contradictions, biases or assumptions that may have influenced the data. Finally, the researcher reports the findings of the analysis including a detailed implication of the findings for research and broader field of study. The themes throughout the findings and discussion chapters (Chapters 4, 5, 6 & 7) were framed by a combination of participant observation field notes, the qualitative survey responses, and the interviews. Through thematic analysis, it is possible to infer the perspectives of a wide range of individuals by drawing connections between the topics identified (Braun *et al.*, 2019).

3.6. Data Protection and Ethical Consideration

Before interview data collection, a consent letter including crucial information about the project's aim and a participant information sheet that participants were asked to sign were delivered (please see Appendix III). This indicates that the researcher ensured that the participants completely comprehended the research and the intended use of the data obtained. Participants were informed of their ability to decline or withdraw participation, how their privacy will be respected, and the usage of data acquired (Corti, Day & Backhouse, 2000). Each participant was made aware of their right to withdraw at any time, as well as the way their data was gathered, processed, and kept. Due to the nature of the study, which attempts to investigate the perceptions of stakeholders, the survey data was collected anonymously. For surveys or informal interviews where no personal information is collected or where personal identifiers have been deleted, written consent may not be necessary (UK Data Service, 2015). The study project followed the University of Salford's data privacy guidelines, including the eight principles: in accordance with the fifth principle, which specifies that data should not be stored for longer than required, the original data transcripts will be deleted once they have been analysed and included into the report (UK Data Service, 2015). The project ensured compliance with the other standards, from assuring data accuracy to maintaining data security. For example, the data created by this research will be stored on a password-protected, university-approved computer, and only the project's primary researcher will have access to the data. Throughout the experiment, the British Sociological Association (BSA) criteria were adhered to. The BSA's statement provides a comprehensive overview of ethical conduct, including guidelines for professional responsibility, relationships with study subjects, privacy, and confidentiality (British Sociological Association, 2017).

3.7. Summary

In conclusion, this research project employed a case study approach to assess the scalability of UA in Lagos, Nigeria, by comparing it to the UK and identifying successful UA practices that can be replicated. The aim was to gain a comprehensive and in-depth understanding of the perception, potential, challenges, and opportunities for UA in Lagos. To gather rich insights, the study utilized various research techniques, including participant observation (limited to Lagos), online qualitative surveys, and semi-structured interviews. These methods enabled the researchers to directly observe and engage with UA activities in Lagos, as well as gather perspectives from key stakeholders, practitioners, and community members involved in UA.

The case study approach facilitated a holistic examination of UA in Lagos, considering factors such as social, economic, and environmental aspects. By comparing and contrasting UA practices in the UK and Lagos, the study aimed to identify transferable strategies and effective approaches that can be adapted to the local context in Lagos. Through participant observation, the researchers were able to immerse themselves in the UA activities taking place in Lagos, gaining first-hand knowledge of the challenges and opportunities faced by practitioners. Online qualitative surveys and semi-structured interviews provided a platform for stakeholders to express their perspectives, experiences, and insights on UA in Lagos. These methods allowed for a comprehensive exploration of the perception of UA, potential barriers, scaling-up possibilities, and strategies for promoting its acceptance in the local community.

By combining these research techniques, the study aimed to generate a robust understanding of the current state of UA in Lagos and identify practical recommendations for its future development. The research findings will contribute to the existing body of knowledge on UA, inform policy decisions, and support initiatives aimed at enhancing food security, promoting sustainable urban development, and improving the well-being of urban communities in Lagos and beyond.

Chapter Four: Overview of Urban Agriculture in Lagos and the UK

4.0. Introduction

Given the unexpected growth in cities and the adverse effects it has on urban food security, especially in the countries of the GS (Gwan & Kimengsi, 2020), numerous authors have urged intensive studies towards the advancement of UA as a strategic approach for maintaining food supply within urban regions (Diehl *et al.*, 2020). Since UA innovation is quite common in several GN regions, most published works on the topic can be found within this geographical context, while academic publications on UA are few in the GS countries (Cepic, 2017). Although UA activity has increased dramatically in the GS in recent decades prior to Covid (Hamilton *et al.*, 2014), Martellozzo *et al.*, (2014) discovered that the possibility for food sufficiency in densely populated cities in most GS countries is small. Most actors agree that the constant movement of people from rural to urban areas and the resulting drop in average household incomes are the main reasons why UA is growing in GS countries however, it has been hard to figure out exactly how UA has helped reduce poverty (Bryld 2003; Zezza & Tasciotti, 2010). Additional information on UA in GS countries is required for adequate evaluation, choice-making, and proper planning (Weidner *et al.*, 2019). Furthermore, the lack of data allowing for international comparisons of UA practises is one of the reasons prompted by this study (DiDomenica, 2015).

The emergence of the Covid-19 pandemic constituted a substantial threat to human health, with implications in several areas affecting the quality of human life (Sridhar *et al.*, 2022). The fast spread of the virus caused inefficiencies in both the agricultural and industrial sectors resulting in food insecurity (Jámbor *et al.*, 2020). Different national and international agencies, such as the Food and Agricultural Organisation (FAO) and the International Food Policy Research Institute (IFPRI), have endeavoured to maintain the global market's accessibility (Pu & Zhong, 2020). However, the fast spread of the virus caused numerous governments to ban global market and travel, resulting in widespread food deprivation, starvation, and malnutrition (Torero, 2020). Most GS countries, particularly the agricultural and food industries, have been negatively affected; the industry continues to face producer and consumer issues constraints including labour shortages, speed to marketplace, and important purchase of goods (Luckstead *et al.*, 2020; Rajput *et al.*, 2020).

As a result of the ongoing COVID-19 epidemic, the agriculture industry faces significant barriers in meeting the rising demand for food (Sridhar *et al.*, 2022). Since the epidemic, health and nutrition-based foods, improved safety, poverty reduction, and environmental

sustainability have been of critical importance (Christiaensen & Martin 2018; Chatterjee, 2020). During this outbreak, the primary objective has been to expand agricultural output without compromising on food safety or environmental protection (Sridhar *et al.,* 2022) hence this has compelled governments and local authorities to reconsider the diversity of the global food system, local self-sufficiency, and food security in cities (Pulighe & Lupia, 2020). In recent years, there has been a notable increase in demand for urban allotments in GN countries (Pulighe & Lupia, 2020), and it appears that interest in self-production of fruits and vegetables has also increased during the COVID-19 epidemic in the cities (Cockburn, 2020).

In the UK during the pandemic, a critical care nurse noticed supermarket shelves bare at shift's end and had to persuade shoppers to halt their panic shopping because of product shortages (Schoen *et al.,* 2020). As a result of the product shortages, the opportunity was presented for urban farms to increase production to help the needy; the government simplified the laws for allotments and actively encouraged citizens to become involved, resulting in the proliferation of community gardens and farms with the aim of increasing agricultural output (Schoen *et al.,* 2020). Advocates for food and agricultural policies and practises, the UK based charity; Sustain (2020) reported that 39% of gardens and city farms (primarily in London) closed, while the remaining 60% stayed open by using different staffing and social distancing techniques. In 2020, almost 70% of respondents anticipated cultivating and harvesting food crops, with a select minority anticipating even more production (Schoen *et al.,* 2020). The Few Meters Project conducted research documenting how Covid-19 affected community farms in London, revealing how these farms were unable to keep up with the increased demand for food but were able to respond directly to some home delivery orders (Schoen *et al.,* 2020).

The benefits to people's health and well-being are estimated to be three times as great as the costs associated with setting up and maintaining a garden and selling the food grown there (Schoen *et al.,* 2020). Eighty-eight percent of those polled in a study by the National Garden Scheme (2020) said that having access to their garden or other outside area during lockdown helped them relax and feel better emotionally. More than two-thirds (69%) also said that having this option improved their physical health and fitness (National Garden Scheme, 2020). Hence, the need for enhanced food and health system integration into urban policy and planning is recommended (FAO, 2020).

The global coronavirus pandemic had a significant impact on supply chain operations and logistics, both for consumers and producers, because of regional border closures, lockdowns, and transportation restrictions, presenting a grave threat to the availability of fresh, nutritious food (Suryantini *et al.,* 2021). Most growing industries, particularly the agriculture and food

industries, have been negatively affected (Sridhar *et al.,* 2022). Lack of available labour, difficulty gaining access to market, and the prioritisation of commodity purchases are only some of the ongoing challenges faced by the industry's (Luckstead *et al.,* 2020; Rajput *et al.,* 2020). Foods that promote health and nutrition, increased security, alleviating poverty, and maintaining a healthy ecosystem have all taken on increased significance since the pandemic (Chatterjee, 2020). Due to recent events, there has been a significant rise in the productivity of plants and products to meet the rising need for food; simultaneously, concerns about food safety and sustainability have risen to the forefront in the wake of the recent pandemic (Sridhar *et al.,* 2022). UA has been thrown into the limelight because of the outbreak, as evidence suggests there are indications that micro and macro sites have increased production to satisfy rising demand (Social farms & Garden, 2021b).

The participant observation data reveals several key points about UA in Lagos, serving as a baseline for subsequent chapters. Firstly, the farmers face numerous difficulties in cultivation practices, including high rental expenses, limited space for expansion and improved techniques, and unreliable electricity due to inadequate power generation. The lack of government support or incentives further compounds these challenges, leading some farmers to consider relocating to rural areas with lower operating costs and potentially higher profits. Accessing peri-urban areas for research purposes proved challenging due to reliance on gatekeepers and the impact of traffic caused by poor weather conditions.

Additionally, informal urban farms predominantly rely on abandoned land, as obtaining affordable or government-subsidized land is difficult and time-consuming. Farmers often lack knowledge about the landowners or how to apply for land from the government. The observation data also highlights the size limitation of urban farms, typically small to medium-sized due to high rental costs. The inadequate availability of constant electricity in Nigeria poses a significant barrier to the successful operation of radical UA farms. Consequently, urban farmers in Lagos express a preference for relocating to peri-urban areas to access larger land spaces and potentially overcome some of these challenges. Overall, the data underscores the lack of authorization, limited resources, and knowledge gaps that shape UA practices in Lagos.

The purpose of this research was to critically appraise UA activity in the GN and GS, with an explicit focus on Lagos in Nigeria for the latter. This is accomplished in part by comparing strategies for urban food production, identifying enabling policy tools, and characterising different stakeholders' perceptions of UA. Furthermore, the aim was to ascertain barriers affecting UA, assess the impact of UA on food security and UA's potential for upscaling practice. The results of the research will be addressed across three chapters. Chapter 4 presents

an overview of UA in Nigeria and the UK, followed by the perception of the impact of UA on food security. This chapter then goes on to discuss the role of age and gender in UA as well as the reasons for the increased interest in UA with a focus on Nigeria. Chapter 5 examines the current UA practices, the methods of food production, land use tenure policy as well the quality of urban soil and contamination issues. Chapter six focusses on the barriers, upscaling opportunities and future potential of UA.

This chapter provides a comprehensive overview of UA in Nigeria and the UK, highlighting key aspects related to its development and impact. The chapter begins with an introduction that sets the stage for the subsequent discussions. It delves into the reasons behind Nigeria's increased interest in UA, examining the factors that have contributed to its growing prominence in the country. Moreover, the chapter explores the perceptions of the impact of UA on food sustainability and security, delving into the perspectives of various stakeholders. Another crucial aspect covered in this chapter is the role of age and gender in UA, shedding light on how these factors influence participation and outcomes within the sector.

Furthermore, the chapter investigates the perceived benefits of UA, discussing how it contributes to optimum space utilization, greater productivity, community development, and the creation of green spaces. It also examines how UA enhances access to fresh and nutritious food, particularly in areas with limited food access. Lastly, the chapter emphasizes the importance of sustainable practices within UA, exploring strategies that promote environmental conservation and long-term viability. By delving into these diverse aspects, this chapter offers a comprehensive examination of UA in both Nigeria and the UK, shedding light on its significance, challenges, and potential for sustainable food production and community development in urban environments.

Throughout chapters four, five, and six, a comprehensive analysis of UA in Lagos and the UK is presented, weaving together data and insights from both regions to create a cohesive and seamless narrative. Each theme discussed in these chapters will encompass the analysis of data from Lagos, Nigeria, providing a solid foundation for understanding the local context, challenges, and dynamics of UA in the region. Following the exploration of the Nigerian context, the discussion will then shift to include data and perspectives from the UK, providing a valuable comparative lens to examine similarities, differences, and potential lessons between the two settings. While the weaving together of data from both countries will be apparent in themes that demonstrate similarities across locations, it is essential to acknowledge that themes exclusive to a particular region will still be thoroughly discussed. It is noteworthy that due to Lagos being the primary focus of this study, the dataset from this location is considerably more

extensive than the data collected in the UK. Nonetheless, this approach allows for a comprehensive examination of UA in both Nigeria and the UK, fostering a holistic understanding of the subject matter.

4.1. Exploring Increased Interest in Urban Agriculture in Nigeria

Using qualitative analysis as the primary method, this study draws upon a rich dataset derived from interviews conducted with various stakeholders. The findings of this study indicate an increased interest in the practise of UA among Nigeria's young, who make up a significant proportion of the country's population (see figure 12). According to the National Youth Policy (2009), youth are Nigerians between the ages of 18 and 35. Young people make up around 53.77 percent of the overall Nigerian population (UN-DESA, 2019). The survey conducted for this research shows a rising number of young Nigerians, who constitute a large section of the country's population, have indicated an interest in UA. This contradicts previous study findings that indicate Nigerian youngsters have little interest in agriculture of any kind (Igbolekwu *et al.*, 2020). Participants are primarily of the view that the impact of UA on Nigeria's efforts to alleviate food insecurity will be evident in the long run, since the nation has a huge population with a significant number of young people whose interest in the practise is growing. The younger population believes that UA contributes to food production since it can produce high-quality food at a faster rate and on a smaller area (McDougall *et al.*, 2019).

Participants explained that young people in Nigeria were initially not averred to the practice of traditional farming methods since the typical farming methods were deemed stressful due to needing large expanse of land and travelling long distances to rural areas. This finding is supported by a report by Abdulaal (2021), who indicates that African youths are returning to agriculture and UA as the future of agriculture is changing, the knowledge gap among youth is closing, and there are more innovative UA methods in which they are willing and able to participate. Participant 2 explained further that:

"...young people were previously not interested in farming however UA has brought in a lot of young people. Currently, a lot of them are interested in food security and food production... and they said it is not as tedious as what they were doing in the villages." (Participant 2, 2021)

Although this suggests that there may be a risk associated with this greater interest in UA, since most young people may relocate to cities as a result. This may be contrary to the objectives of the Nigerian government, the United Nations, and other international organisations; but the

movement of young and elderly Nigerians is not totally due to UA. In reality, the condition of insecurity in rural regions due to a string of kidnappings, the destruction of crops, and a generally hazardous environment may be the primary cause of migration (Agwu *et al.,* 2021). Findings show that there has however been an increased awareness of the state of food insecurity in the country as well as an increased rate of migration of people from rural to urban areas (see figure 13). This rise in the number of individuals migrating from rural to urban regions coincides with a heightened awareness of the nation's dwindling food supply (United Nations [UN], 2016).

Participants 14 reveal this migration further caused by a myriad of factors including and not limited to *"banditry, increased rate of insurgency, kidnappings, killings, and farms being burnt down during feuds"* and because of this, farmers cannot return to their rural farms because they fear for their lives. Reports from previous studies agrees with this finding that indicates migration is as a result of a wide variety of factors, some of which include but are not limited to banditry, an increase in the rate of insurgency, kidnappings, killings, and feuds that result in the destruction of farms (Johnson & Ifeoma, 2018). A large majority of the people affected by these unfavourable circumstances are farmers who had to leave the rural areas and on getting to urban areas, would choose to continue to grow food in the cities to enable them to provide for their families. Participants further explained this situation 2 and 8 that insecurity is the major reason for rural to urban migration among the youths:

"Farmers are being killed and kidnapped and these farmers would rather go away and relocate to other safe areas in the city." (Participant 8, 2020)

"...in Nigeria, we are experiencing the worst in terms of insurgency, banditry like we have never seen before. People are being kidnapped and asked to pay bandit tax ...So that also has contributed to the surge in migration as seen in cities and increase in UA activities." (Participant 2, 2021)

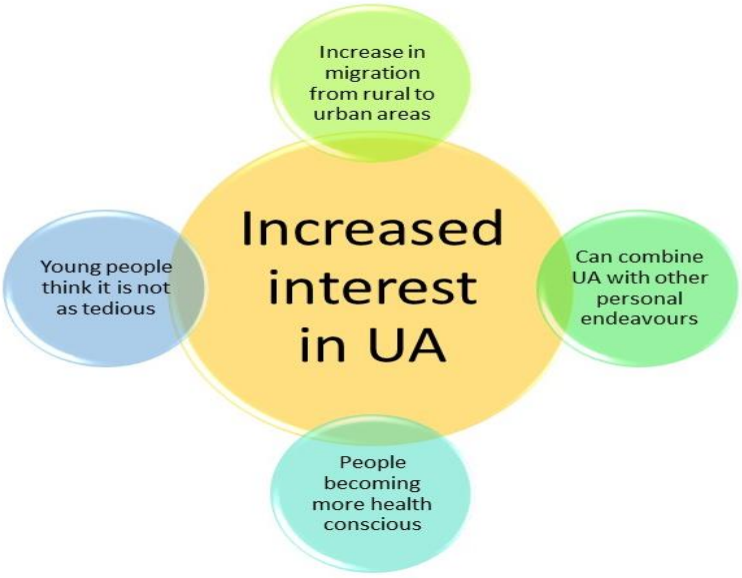


Figure 13: Image showing summary of reasons for increased interest in UA in Lagos

Another important factor driving interest in UA which was raised by participants, was the idea that the concept can easily be combined with other personal endeavours as it requires less time and space. Primarily, there may be a lot of land that could be used for farming, but in areas with a lot of people and limited space as in the cities, no-space, or low-space technologies such as hydroponics and greenhouses can be used to grow crops in small areas (Bohn & Viljoen, 2011; Dubbeling, 2011; Specht *et al.*, 2014). Participant 2 and 15 mentioned the possibility of not being constrained by unfavourable weather conditions such as intense rainfall or drought, both of which can be mitigated through the utilisation of greenhouses. An example are crops grown in a vertical farm; since they are grown in a controlled environment, they are safe from issues like droughts, hail, and floods (Despommier, 2011). Despommier (2011) further explained that one acre of vertical farmland can grow almost as many crops as 30 acres of traditional farmland and this report is based on the number of crops grown each season. For this reason, UA is mostly seen as a tenable alternative to the practice of traditional agriculture as there is little need for a large expanse of land and significantly without the usual stress associated with traditional farming methods as it can be done within proximity of their residence (Chatterjee *et al.*, 2020).

"You do not depend on the rain or weather since it's controlled and all that. So those are some of the things affecting that has influenced the rise and surge in UA" (Participant 2, 2021)

Participant 15 noted that young people who showed interest in UA imply that "*this type of farming won't take too much of their time"* hence can be combined with other personal

activities. In addition to this, participants believe that the practice of UA is perceived by many to be a safer way of practicing agriculture as it can be started on a small scale before upscaling. Furthermore, a crucial point to note based on the findings is that there has been an increase in the dissemination of information, meaning that more people are becoming aware of alternative farming techniques that can be implemented and are generally healthier coupled with people becoming more health conscious. This has encouraged young people to explore alternative ways in which food can be grown and readily made available. Participant 8 reveal that *"because people are more health conscious and [most of the produce from] UA are organically produced; this caused a surge in UA"* (Participant 8). Similar to the findings of this study, Soper (2021) argued that the growth in knowledge of UA is due to people in Nigeria being more informed about healthy eating and preferring foods from UA because most of them are grown organically.

4.2. Perceptions of the Impact of Urban Agriculture on Food Sustainability and Security

This subchapter marks the start of the in-depth discussion surrounding each thematic aspect derived from the data collected in this study. To ensure a structured and coherent analysis, the Nigerian context is consistently presented first, offering a comprehensive examination of UA within the specific context of Lagos. The subsequent section of each theme then transitions to the UK, providing an insightful relative perspective. Signposted by subheadings, the inclusion of the UK data enhances the discussion, allowing for a deeper exploration of similarities, differences, and potential cross-cultural insights. This approach aims to provide a comprehensive and well-rounded analysis of UA, showcasing the significance of both Nigerian and UK contexts.

There are differing views on the effect of UA on food security around the world and these perspectives are influenced by several factors such as production methods, level of technology, development level of countries and support from government (Siborurema, 2019). Although it is generally believed that UA plays a crucial role in alleviating the problem of hunger and poverty, there is inadequate empirical evidence to support this view, particularly in GS countries (Stewart *et al.,* 2013). Several research studies reveal that UA has the capacity to address global food demands as it has shown it can produce significantly higher harvests of fruits and vegetables within a small space achieving greater yield per unit area than rural farms (Berquist, 2010; Reeves *et al.,* 2013; Orsini *et al.,* 2014). To encourage the adoption of UA worldwide, it is important to get the views of stakeholders and what would drive them to

embrace the practice as there are various reasons why people might not show interest (Ahimaz *et al.,* 2021).

Young people and urban farmers in Nigeria see UA as a method to educate the public about healthy eating. Participant 2 explained that the *"UA business is seen as more of an opportunity to raise awareness on healthy eating."* It is also considered as a tool to raise awareness about constructing self-sufficient cities, since participants think it is a safe and profitable way of growing food. More importantly, participant 11 emphasised that the goal is to "*gradually navigate towards cities that are self-sufficient"* especially with some successful examples from the GN countries. This is similar with previous research, which revealed that the primary social advantages experienced by relevant parties participating in UA are equivalent to those evaluated in the literature in areas such as environmental education, social integration, and food and nutrition security. (Nadal *et al.,* 2018; Delgado, 2018; SanyéMengual *et al.,* 2018).

"We are talking about urban inclusion, and we want cities that are self-sufficient..." (Participant 11, 2021)

A subset of affluent urban inhabitants was also discovered; they saw UA as a manner of displaying and emphasising a status signal, which affords them bragging rights among their peers. This group of individuals also see UA as a method of enhancing the aesthetic appeal of their homes and environments. Participant 1 says this group does not view UA as a food source, but rather for aesthetic interests. He further explained that "*They would probably not consider it as a tool to assist cut their food budget as much as a status symbol."*

Some of the participants interviewed stated that some urban residents have raised concerns about the practice of UA, stating "*that it is not healthy and often described as genetically modified"* while others regard it as an "*abomination"* as the food are not grown following the traditional mode of using soil (Participant 2). Another cross-section of consumers is of the opinion that growing food without soil is unhealthy and unsafe as they would rather stick to the known traditional practice of growing their food with soil. Some of these people have voiced opinions highlighting the practice as being contrary to their religious and traditional beliefs and some have even opined that UA increases the likelihood of putting the rural farmers permanently out of business. The perception and acceptability of UA by consumers is crucial to the success of UA (Grebitus *et al.,* 2017).

"So, mindset was one of the major barriers that took a lot to convince people to practice. Anybody that hears soilless farming or urban farming… the first thing that comes to their mind is that it is GMO, they do not even understand." (Participant 2, 2021)

Some of the participants interviewed also alluded to a cross section of people they encountered while educating them on the need to embrace UA as a more sustainable option to traditional farming. A participant explained that while educating people who showed interest in UA, some of their concerns was that UA has the tendency to drive the rural farmers out of market and render them jobless.

"But his argument was how do the farmers survive if we come up with UA and throw them out of the market? We cannot throw them out of the system." (Participant 11, 2020)

Some participants also believe that UA is not an option to be taken seriously and something which can be conducted out of boredom as it would not measure up to large scale production. Even though the role of UA as an effective macro-level food security plan has been questioned (Crush *et al.,* 2017; Davies *et al.,* 2021), many studies highlight its impact to food security at the local level in both the GS (Chiappe Hernández, 2019; Moucheraud *et al.,* 2019) and the GN (Hume *et al.,* 2021). However, the contribution that UA can make to food security goes beyond calculating yields and production potentials per unit of land (Tania *et al.,* 2021). This could be remedied by educational methods, as prior research has demonstrated that individuals lack a strong understanding of UA (Grebitus *et al.,* 2017). Research showed some neighbourhood members may first resist urban farming but with enough resources, it can help solve future food crises (Ramaloo *et al.,* 2018). If UA is properly set up by government and agencies and applied now, it is believed that it will deliver numerous benefits to community inhabitants, who will gradually modify their own thoughts and collaborate to achieve the green community vision (Ramaloo *et al.,* 2018).

Findings from this study reveal that the number of farmers engaging in UA is too little to have a significant impact on food sustainability. Most farmers think getting people interested in urban farming is a major challenge.

"*…The number of people that are interested in urban farming is too low …If we are going to have a sustainable food supply in this country, at least 40% of the population will have small knowledge or exercise in farming."* (Participant 3, 2020).

"*…no, no. It cannot be sufficient to feed the city. You will still need what is gotten from the rural areas. What we have may not be enough to feed the city. But to a large extent it is part of it. It sustains a bit and then probably you have to get the rest from the rural areas."* (Participant 5, 2020)

Another important view is from participant 9 who stated that even though UA has the immense potential to alleviate the issue of food insecurity in Nigeria; the UA sector is currently burdened with the imposition of several government bans which has a negative impact on the importation of materials needed for their practice. Other major problems noted include the expensive cost of starting an urban farm, which many participants feel will affect the amount of time it takes for the full impact of UA to be realised.

"Does it have the potential to tackle food insecurity? Yes, but in Nigeria at the moment, does it? No; because we have a long way to go due to lot of challenges at the moment in respect to government ban on importation" (Participant 9, 2021)

"…and a lot of materials used are imported… thing but when you look at cost and the constant importation of the materials needed, we have a long way to go." (Participant 9, 2021)

Also, respondent 9 believes that it is impossible to grow all of the food that will be consumed because food is perishable and can go bad in a relatively short length of time. This agrees with the research conducted by Costello *et al.,* (2021) who is of the opinion that it would be unlikely that UA can meet the nutritional needs of a city majorly because it is still being practiced in a small scale in cities. Some urban farmers agreed with this, by explaining that they believe UA alone might not be able to tackle food insecurity in Lagos as there is the need for collective efforts from all stakeholders. This is similar to Siegner *et al's* (2018) findings, which shows that it is important to realise that UA might not be the only solution to food insecurity and lack of access to food; in fact, it is a shift of responsibility for policymakers to expect or set up urban farms to be the main source of food for low-income communities and be run by them without any help from the government (Siegner *et al.,* 2018). However, there is a tendency that innovative technology, particularly in packaging, might help extend the shelf life of perishable items (Parfitt *et al.,* 2010). In addition, participants believe there aren't enough UA farmers to guarantee food security in Nigeria in the nearest future but according to Participant 11, if everyone adopted UA within the confines of their own settings, it would only be a matter of time until a noticeable impact could be seen, along with increased awareness and increased engagement by everybody.

"*...we know about the barter system. So, if we can all embrace UA, and grow in the smallest spaces, then something significant can be seen."* (Participant 11, 2021)

Furthermore, increasing the level of awareness might help with increased engagement. For example, participant 1 explained that some people use UA as a form of status symbol, which has unintentionally helped to bring more attention to the practise of UA because it makes other people want something like what was shown. Orsini *et al.*, (2013) revealed it is essential, however, to educate the public on the benefits of UA for its food, economic, and environmental contributions to society, particularly with regards to the cultivation, handling, and processing of food using proper technology.

"...but bottom line is the most important thing for us as farmers is whether they do it for status or not; they are contributing to food security in their own way by raising awareness." (Participant 1, 2020)

Participant 15 who is a government official believes it would be only a matter of time until a significant impact is realised if everyone adopted UA in their own personal settings. As evidenced by stories written throughout history (Wan *et al.*, 2018), where each household grows its own food. Participant 15 states that the government has lately witnessed an increase in interest in the practise of UA as a result of the government running short of input during the most recent planting season.

"...It was a sporadic improvement compared to previous years because of the large turnout of people that really want to go into UA this year alone. The tonnes of seed sold this year alone, we have not sold that in the previous two years." (Participant 15, 2020)

Participants also noted that the influence of UA in coping with food insecurity in the country will be felt because Nigeria is a large country with a large number of young people interested in its practise. They believe these young people are enthusiastic and that UA can assist alleviate the country's food shortages. They claim that UA aids in food production by producing excellent food at a faster rate in a little space. This discovery is consistent with Abdulaal's (2021) observation that youth awakening is spreading throughout Nigeria, which is a fantastic success story, and for the first time in Nigeria, a vast number of young people are connecting to various agricultural opportunities.

Quite a number of respondents (Participants 1, 3, 12, & 13) interviewed are of the opinion that UA has the immense potential to alleviate the issue of food insecurity in Nigeria. The majority of participants believe that UA can contribute to the achievement of food sustainability because

individuals can engage in urban farming on a small scale. These participants also believe that UA can be safely practised at home without the need for much support from the government because it is possible to plant a wide variety of vegetables that can be consumed daily. Participant 12 even thinks that individuals can engage in UA and grow a wide variety of food:

"*I believe the small-scale UA and individual sustainability can be built without government support or policies. Yes, urban farming allows you to grow on a small scale for your house. This means you can grow most of the things yourself in Nigeria as there is not a wide variety of food people eat so most food can be grown...*" (Participant 12, 2021)

This finding suggests that people can provide for themselves and their families in a manner that is neither wasteful nor harmful to the natural environment by cultivating food for themselves and their households. This is true because food security occurs when food is always available to everyone, accessible, nutritious, appropriate in terms of quantity, quality, and diversity, and acceptable within the context of a particular culture (FAO, 2004).

The modern notion of food security has focused more on families and individuals than its availability at international, national, regional, and state levels; however, food security at one level might not imply food security at other levels, i.e., national and household levels (Abu & Soom, 2016). At the individual household level, UA might be able to attain food security, which is defined as having physical and financial access to food that is sufficient in terms of quantity, quality, safety, and cultural accessibility to fulfil each person's requirement (Ingawa, 2002). However, Agbaji *et al.,* (2005) feels that the UA's goal of expanding agricultural food production for self-sufficiency is still a long way off from being achieved. Participant 3 said that the influence of UA may be evident, albeit on a limited scale, due to the fact that if individuals are encouraged to engage in this practise, individual sustainability may be obtained.

"*Yes, it does. The impact might still be little because of the scale that it is."* (Participant 1, 2020)

"…the impact on food security may not be on a large scale, but somehow it has an impact…But somehow, if everyone is encouraged to plant one thing or the other, it would assist in food security." (Participant 3, 2020)

In conclusion, UA presents a unique opportunity for households to achieve individual food sustainability. As studies such as Aduloju *et al.,* (2022) highlight, the adoption of sustainable agriculture practices and the utilization of available resources can contribute significantly to

household food sustainability. As such, UA should be encouraged and supported as part of broader efforts to promote sustainable food systems.

In the UK, some participants believe that the practise of UA does not necessarily increase food security. They believe that *"the UK's food security condition is already good",* and that UA may not be able to contribute. This notion might be false because according to Food Systems Policy Hub (2021), the UK has a lower level of food security compared to other high-income European nations and boosting food output via UA may enhance food security. Also, in a global scale analysis, it is estimated that 25 – 50% of the UK's urban area might be grown to achieve the necessary daily intake of fresh fruits and vegetables for urban residents (Martellozzo *et al.,* 2014). Participant 6 further explains that the government's provision of food banks might be a contributing factor to this line of thinking; as it takes time for plants to grow, food banks acts as a more immediate food source than UA for individuals in desperate need.

"…if you have got people in need now, their first portfolio is the food bank because they are available immediately". (Participant 6)

This finding agrees with the study carried out by Downing and Kennedy (2014) and Lambie-Mumford (2015) that explains that food banks, which are usually run by churches, community groups, and charities, have been formalised, made easier to use, and coordinated at the national level as the main response to rising food poverty and they are shown to be incapable of providing a good and nutritious diet (Poppendieck, 2014). Similarly, participant 7 said that, in addition to the lack of government support for UA in terms of incentives, UA is viewed as a method that requires time to generate a profit, since it is unable to relieve immediate hunger through yield and profit realised from crop sales.

…. if you were saying, okay, look, there is a piece of land there, we could grow stuff on there, we could get it organised. You are probably looking at two or three years down the line before you could produce any meaningful quantity of food for sale and for profit". (Participant 7)

Participant 7 feels that encouraging UA practise can gradually lead to a shift in mindset, which might Impact a reduction in the importation of large quantities of food. This finding is similar to Mead *et al.*, (2021) who explains that anecdotal evidence shows that people in the UK are becoming more interested in growing their own food and this may be accompanied by a change in how people feel about UA (Mead *et al.,* 2021).

"… encourage a shift in culture away from mass import and back to locally grown food, urban growing is a key to this in the UK".

Participant 8 supports this opinion, believing that there is an urgent need to begin to consider ways to produce food in a sustainable manner in cities, as traditional farming methods may be affected by climate change and Brexit, which could result in high food costs if innovative food production is not promoted especially in a country like the UK that relies heavily on imported food. This might be true because studies show that the UK's food supply is especially susceptible to food system shocks such as COVID-19 and Brexit (Lang & McKee, 2018). The UK's food supply is especially vulnerable to food system shocks like COVID-19 and Brexit (Lang & McKee, 2018). This is due to the UK being a net importer of food and relies heavily on imported fruit and vegetables, even from drought-prone countries (Hess & Sutcliffe, 2018) to meet a nationwide demand shortage (de Ruiter *et al*., 2016).

Despite all the beneficial effects that UA appears to have on people, 51.9% of respondents do not believe that UA has the potential to satisfy urban food demands. They believe this cannot be accomplished due to obstacles such as inadequate space in cities, insufficient incentives for local population to engage in urban food production, the possibility that UA could be limited to the production of seasonal foods only, the difficulty of securing allotments, a lack of expertise with innovative UA practises, and exponential growth rates in cities. Most of the problems highlighted by respondents are consistent with what has been examined in the literature, as Thibert, (2012) and Vitiello and Brinkley (2013) demonstrate that UA may be restricted in its capacity to meet nutritional needs. The capacity of UA to contribute to food security for any individual, home, or community varies greatly depending on circumstances like as climate, land availability, and the time, availability, and abilities of participants (Grewal & Grewal, 2012). Elevated garden beds, community garden plots, and small urban farms may be excellent sources of fresh fruits and vegetables, but they are unlikely to provide all an individual households or community's nutritional needs (Hoey, Horst & McClintock, 2017). It is also argued that UA is ineffective as a method for increasing food security for individuals who do not have access to land, appropriate growing conditions, or the physical ability and skills required to engage in these activities (Ghose & Pettygrove, 2014; Wekerle & Classens, 2015). It could be best to think about UA as a supplement to certain households' weekly food needs, rather than as the single action required to totally solve food poverty (Hoey, Horst & McClintock, 2017).

4.3. The Role of Age and Gender in Urban Agriculture

From the study, in Nigeria, the middle-aged (36 to 55 years) have the highest rate of UA participation at 62 percent and this is followed by young adults (18 to 35) with a participation rate of 28% in Nigeria (see figure 14). This suggests that most of the respondents are still in their core part of their work life and are perhaps physically active, which encourages more UA participation (Ogunniyi *et al.*, 2017). The outcome can be compared to a study by Mohammed *et al.*, (2021) who found that most of the farmers who engage in agriculture generally (79.3 percent) are within the active age category of 31 to 50 years. According to a study by Olayiwola (2012), the technical efficiencies of farmers decline as they age. In this sense, individuals should be encouraged to start UA at a youthful age since they will benefit more and its impact on food security might be felt. This is due to young people generally being more inclined to learn new methods of UA that are proven to make efficient use of space and resources; hence more productivity which will thereby impact food security (Olayiwola, 2012). Another benefit of including young people is due to the fact that they are more likely to identify activities that they could see themselves doing and that they see as potential business opportunities (OECD, 2020).

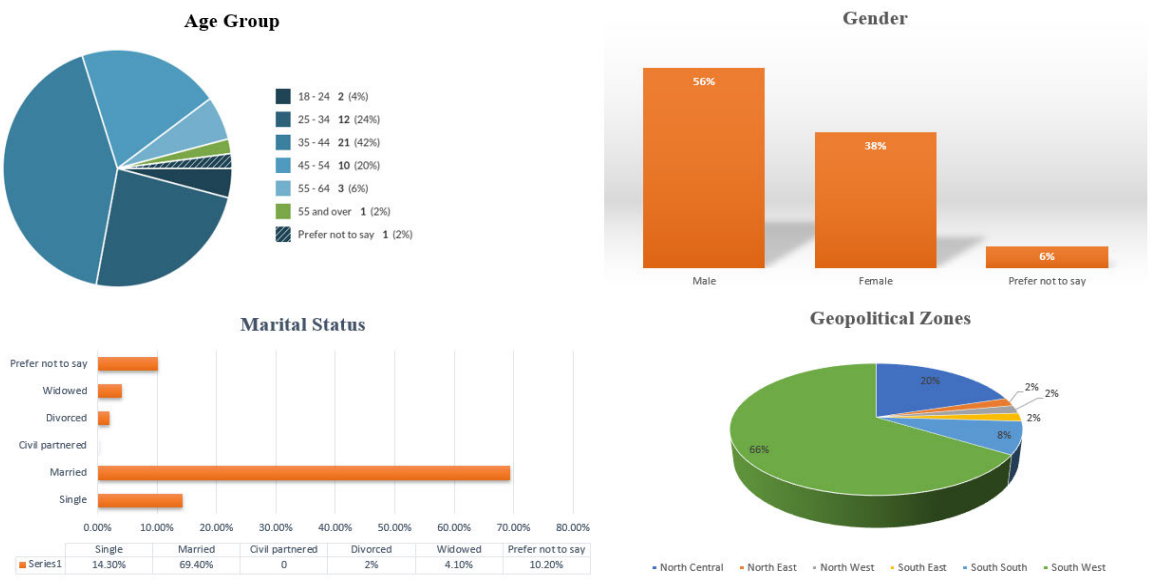


Figure 14: Image showing the demographic information of respondents in Lagos.

In the UK, the middle-aged groups of (25 to 34 years) and (34 to 54 years) have the highest rate of UA participation at 34.6 percent for both groups (see figure 15). According to a report by the Department for Environment, Food and Rural Affairs (DEFRA) (2022), as of 2016,

approximately a third of all farmers in England were over the age of 65, and farmers under the age of 35 make up only 3 percent of the farming population in the UK, indicating that the profession is dominated by an older population (DEFRA, 2022). Even with these numbers, the number of young farming communities is growing (Gould, 2021), and the government has recently requested older farmers to retire (Harrabin, 2021). This might explain why there is a rise in younger farmers who are more interested in innovative methods of farming (Gould, 2021) as seen in the result from this study. Also, the government has plans to make farming better and fairer by helping and encouraging farmers to grow food in a way that is good for the environment and reduces carbon emissions (DEFRA, 2022). Furthermore, there will be a gradual movement toward creating significant advances in agriculture due to the high level of interest among young people in the development of novel farming techniques (Gould, 2021). It is expected that adopting innovative technology will help agriculture reduce its impact on the environment by allowing operations to be done more precisely and with fewer resources (National Farmers Union, 2022).

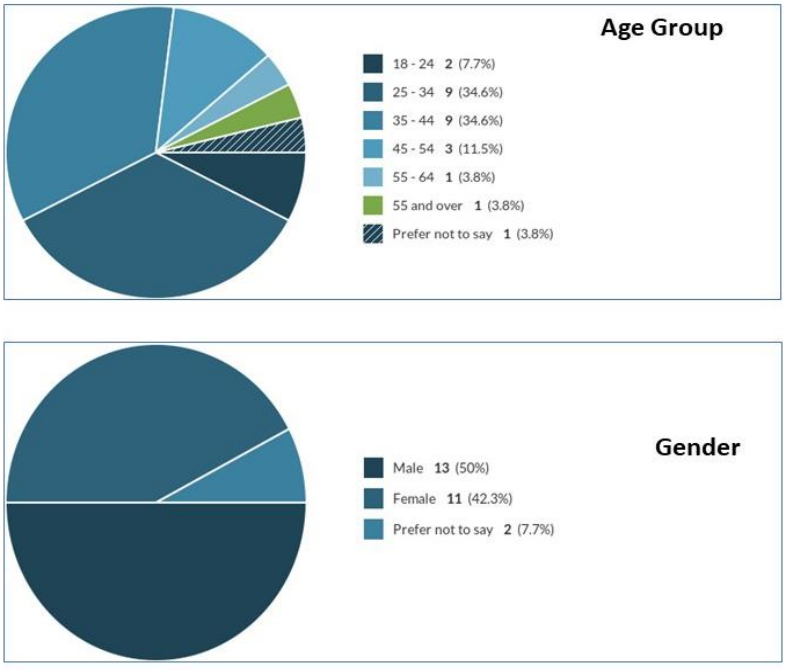


Figure 15: Image showing the age and gender of respondents in UK.

The gender distribution of the respondents in Nigeria, as shown in Figure 14, indicates that 56% of the respondents are males, 38% are female while 6% prefer not to say. Analysing the world through the lens of gender allows us to better understand how men and women are treated in different societies and cultures (Olumba & Alimba, 2022). Most studies in the field of UA

and gender believe that male and female UA experiences are distinct from one another and cannot be directly compared (Whitley 2020). Hovorka (2005) claims that both male and female farmers engage in UA for economic and social growth; nonetheless, gendered possibilities and restrictions become increasingly obvious as women are unfairly impacted, demonstrating the continuation of gendered inequity in the UA system. Cultural and religious factors, economic conditions, economic activity, the production system, size, and geographic location all have an impact on gender ratios represented in different cities in UA (Mougeot, 2000).

In conventional agriculture, women are traditionally responsible for food production and preparation in households; they also tend to have lower levels of education than men and are often not fully integrated into the formal urban workforce all of which contribute to the widespread belief that women are more likely than men to engage in UA in Africa (Foeken & Owuor, 2006). However, a 1997 RUAF study in Ghana revealed that 60% of respondents were male (Armar-Klemusu & Maxwell, 2000). Food production and food security are two areas where rural women farmers play an essential role (Asamu *et al.,* 2020). They make up between 60 and 90 percent of the marketing workforce, 80 percent of the agricultural labour force, and 100 percent of the food processing workforce (Fresco, 1998). Women make up 4 out of every 10 farmers throughout the globe (UN, 1986). Both men and women are fully involved in agriculture, but women face unique challenges in the field; compared to males, they tend to have smaller and less secure plots of land, less opportunities to use physical inputs, fewer opportunities to use labour, and fewer connections to agricultural extension services (Oseni *et al.,* 2013). Accordingly, it should come as no surprise that female farmers earn and produce far less than their male counterparts (Oseni *et al.,* 2013).

The persistent misogynistic and discriminating cultural practises that see women as second-class members of society at large and of the family unit are the root cause of the gender's disproportionate position, which is inextricably linked to their inferior socioeconomic status in comparison to their male counterparts (Simiyu, 2013). This finding agrees with other studies that imply that men and women farmers engage in UA sector on different terms depending on their socioeconomic situation, access to resources as well as the ways in which they are influenced by and interact with the political and organisational framework (Hovorka, 2005; Hovorka *et al.,* 2009). Several research have sought to determine the distinct roles that UA plays for men and women; these studies demonstrate that home food production and money generation are both essential goals for women, although women's attitudes toward UA may vary according on the form of their households (Mkwambisi *et al.,* 2011; Ngome & Foeken, 2012).

The gender distribution of the respondents ***in the UK*** as shown in Figure 13 indicates that 50% of the respondents are males, 42.3% are female and 7.7% prefer not to say. This close range in the figures is similar to a case study in Europe and the US by Kirby *et al.,* (2021) which reported male and female participation in UA as 53% and 46% respectively. Most of the time, gender is only mentioned in papers for GN countries when discussing the demographics of respondents without relating it to any gender related issues or inequality (Olivier & Heinecken, 2017; Grebitus *et al.,* 2017), which shows that this is an under researched area (Nitya *et al.,* 2022). Only 19 of the 86 papers reviewed by Rao *et al.,* (2022) discussed gender issues in detail, whereas papers from GS countries are more likely to discuss gender issues, which could mean that UA is more popular among women in places where it is still an important, but often low-paying, way to make a living. Although it has been reported that women make up about 65% of urban farmers around the world, according to Veenhuizen (2006) and Orsini *et al.,* (2013); however, men tend to be more involved in the commercial aspect of UA (Hovorka *et al.,* 2009). A study by Grebitus *et al.,* (2017) shows that younger age group of people and women had a more positive disposition towards UA meaning they are more likely to grow their own food. This is quite important as the more women engage in UA and when they are in charge, the more attention is paid to gender equality (Zanzi, 2021).

4.4. Perceived Benefits of Urban Agriculture

The participants interviewed in Lagos expressed consistently positive responses regarding UA. They enthusiastically highlighted the beneficial influence of UA and its subsequent impact on food production. Following a consistent approach, this chapter maintains the pattern of exploring data collected in Lagos before delving into the UK context. Under the following subheadings, the most significant aspects will be thoroughly examined to provide a comprehensive understanding of the topic:

4.4.1. Optimum Space Utilisation: Among the arguments addressed by the participants is the fact that the practice of UA needs minimal land and allows for the incorporation of a range of foods, allowing for maximum production while being readily integrated into the environment. Participant 12 believes *UA increases access to a wide variety of food as it is grown easily within the confines of the home.* This relates to numerous past studies that show UA has been found to increase the availability of food in households and dietary variety as a source of food security (Salau & Attah, 2012; Alimba *et al.,* 2018). This was further clarified by participant 13 that UA can be easily *incorporated within the environment as this offers huge benefit for food security"*. This is similar to a recent finding by Grebitus *et al.*, (2020) that due to the availability of fresh, local, nutrient-dense food, which enhances favourable attitudes, urban farms may be favoured. In general, UA has the potential to offer a variety of advantages, such as enhancing local ecology and sustainability (Wakefield *et al.,* 2007), aiding with food security (Dimitri *et al.,* 2016; Sadler, 2016), and promoting healthy eating habits (Zezza & Tasciotti, 2010; Warren *et al.,* 2015).

4.4.2. Greater Productivity: Participants 2 and 11 explain that UA requires less inputs, which produces more outputs or produce since it develops more quickly, while conserving the environment by using less water; hence, the result is always more productive. A significant number of respondents felt that UA can be practised on a small scale and a variety of household foods can be grown with relative ease. Another telling advantage mentioned by participant 10 is that it "*saves a lot of time and manpower as well as resources"*; implying that it (hydroponics) can be combined with other endeavours as the limitation of time is considerably removed "*and the output is better than in traditional farming"*. A study by Lovell (2010) reports similar finding and has demonstrated that UA is a very productive use of land, with each square metre under cultivation comparable to roughly double that amount of rural farming and potentially allowing for land sparing. It is also worthy to note that UA has an extremely

low opportunity cost since it allows for the productive use of land that would otherwise not be put to good use (Ackerman *et al.*, 2014).

"…the output is in some cases more productive; the input is lesser than what we use in the traditional way of farming and the output is in some cases 10 times more... And where we are supposed to have one plant, with vertical farming, we can have 40 now." (Participant 11, 2021)

It has been discovered that some UA production technologies, such as hydroponics and aeroponics, use 70% less water than conventional farming approaches (Despommier, 2010). Agricultural practices in urban centres can also indirectly improve urban water management by allowing precipitation and runoff to flow through the soil, reducing the need for costly storm water pipes and drainage (Lupia & Pulighe, 2015). Likewise, UA production can close nutrient and water cycles in urban areas and prevent agricultural production on less fertile soils and has the potential to lessen the environmental effects associated with conventional agricultural production and the global food supply chains (Bren d'Amour *et al.*, 2017).

Various respondents point out the importance of UA and how it gives control to the farmers (e.g., greenhouses) as they are not affected by adverse environmental factors such as drought and excessive rainfall. Participant 1 and 4 reveal UA ensures predictability of produce which leads to increased success rate as their produce are *readily available all year round* and there is always a ready market available even before the maturation of the crops as there is no off-season. The economic benefits of being able to control the growing space or environment ensures a predictable production system, stable prices, long-term contracts with wholesalers and retailer marketplaces, and high returns (Stein, 2021).

"We also grow with some certain materials to help the plant so significantly; the success rate is even higher because the farmers have lots of control." (Participant 13, 2021)

"When you produce in green houses and also there is a ready market even before the crop matures or before is harvested as there is no off season as there are no favourable weather conditions that will affect them." (Participant 6, 2021)

Generally, indoor urban farms are viewed as a solution to alleviate food insecurity, unemployment, and to make good use of deserted buildings and lots (Thomaier *et al.*, 2015; Al-Kodmany, 2018) as they offer resistance to climate change, flooding, droughts, etc (Stein, 2021). More specifically, the findings demonstrate UA offers a chance to deliver consistent, healthy, and safe food to cities and its environment, especially by utilising the innovative

techniques such as greenhouses, vertical gardening, and other radical solutions. Greenhouse cultivation, as noted by Altes and van Rij (2013), has been found to be successful in literature citing places around Lisbon, Paris, Bordeaux, and Lille (Péron & Geoffriau, 2007), the Lea Valley near London (Garnett, 2001), the area around Copenhagen (Zasada *et al.,* 2011), and Westland, Netherlands, (Altes & van Rij, 2013).

There was also emphasis on how UA helps with the provision of food for the immediate family thereby reducing the amount spent of food, whilst also serving as an extra source of income. According to Mupeta *et al.,* (2020), UA has a considerable beneficial influence on household income. Diverse studies demonstrate and agrees with the result of this study that UA practitioners save household money by augmenting a portion of their food costs (Brown & Carter, 2003; Corrigan, 2011; Gray *et al.,* 2014). The study further highlights the capacity of UA to provide employment opportunities for many members of society, hence assuring a consistent source of income, as crops derived from UA are less dependent on harsh weather conditions and may provide money year-round. This is consistent with those found in the literature (Rahmann *et al.,* 2017; Menyuka *et al.,* 2020), which suggests that UA has the potential to provide new employment possibilities. Ackerman *et al.,* (2014) listed some of the benefits of UA to include, provision of employment, reduction of food costs and increase in household income; even yet the degree to which UA helps augment household income varies widely and often depends on the type of crops grown and the volume at which they are produced.

Interestingly in the UK, a consultant from the study explained after visiting several urban farms that none of the urban farms he visited were able to measure their output because *"they didn't think that was the purpose of establishing an urban farm"(Participant 6);* rather, the primary goal was to encourage outside activity and physical exercise. He adds that certain UA food sold at farmers markets on particular days has *"the type of pricing that a lot of people could not afford (Participant 6),"* prompting inhabitants of some fewer disadvantaged neighbourhoods to be discouraged about buying food from farmer's market as prices are usually expensive.

This differs from what participant 3 has to say; he believes that the practise of UA makes food relatively cheaper and more accessible during the crop season because it fosters an increase in variety at cheaper and more accessible prices; however, this may be contingent on the less deprived areas being more likely to view it as a source of food. Overall, the practice of UA has both benefits and limitations. While it can make food more accessible and promote community engagement, it may also lack the output measurement required for commercial success. It is

important to consider both the social and economic objectives of UA when evaluating its effectiveness.

4.4.3. Community Development and Green Space: Participant 11 (Lagos) reveal UA may also be viewed as a technique that fosters community development, since it increases the desire of the next generation to learn more about the origin of their food when practised within a community. UA has been found to provide access to local food, help the local food industry, educate individuals about food and agriculture, and foster community (Poulsen *et al.,* 2017).

"Bringing food into the neighbourhood, promotes community building. And it's helped the younger generation understand how certain crops grow so UA gets more young minds interested in their environment." (Participant 11, 2021)

Furthermore, in addition to serving as a source for food production, it also beautifies the community as it enhances scenic landscape and greenery. Participant 1 believes it adds to the beautification of the home, providing food and purifying the environment at the same time.

"… but then it will do two things. It will serve as beautification and serve as your food. It also helps as carbon sink, purifies the atmosphere and all that. UA is beyond food production." (Participant 11, 2021)

This has been reported in literature as one of the greatest advantages of UA, which is its contribution to the urban environment, green infrastructure, and the ecosystem services (Viljoen *et al.,* 2005; McEldowney 2017; Golden & Hoghooghi 2018).

This study also confirms the findings from other studies that show UA serves as a form of physical activity for urban residents. This finding is consistent with a review conducted by Dona *et al.,* (2021) who show that the top three benefits of UA in both GN and GS countries include physical activity as it relates to connection with nature. Generally, UA has been recognised for its therapeutic usefulness as a physical activity, particularly for its ability to provide the elderly with opportunities for ecological participation and physical activity (Milligan *et al.,* 2004).

In the UK, this benefit is supported by participants 5 in the UK who noted that UA has a significant influence on the expansion of greenery in the community since its implementation in the UK is viewed as a way to promote physical activity and exercise. Also, serving as a form of physical activity is one vital factor highlighted by respondents. People of all ages, sexes, races, and ethnicities enjoy the health benefits of the physical practice involved in growing

food, such as weeding, tilling, and using hand tools (Park, Shoemaker, & Haub, 2009). Furthermore, UA in the UK is perceived more as a tool for creating social cohesion, a sense of community, and a sense of belonging within a particular community and among its citizens than as a profit-making enterprise (Participant 6). UA has been found in several studies to promote social cohesion and social inclusion, making it possible for advancement and locally tailored solutions for sustainability (White & Stirling, 2013; Chalmin-Pui *et al.,* 2021). Additionally, research suggests that UA can help those with mental health issues (Armstrong, 2000; Draper & Freedman, 2010) or who have been incarcerated feel better overall (Bellows *et al.,* 2003). Participant 3 believes that UA aids in the recovery of persons battling mental illness, since growing food may provide a fresh perspective that may encourage healing. Studies show that pre-existing farmland can be put to good use on social farms, which help people in many ways, including better health as shown by lower anxiety and depression levels (Pedersen *et al.,* 2011), better job and social skills (Hine *et al.,* 2008), and more structure in the lives of those with dementia (De Bruin *et al.,* 2010).

Participation in community gardens has also been associated to decreased rates of crime (both minor and major), littering, and mental illness, according to some studies (Hagey *et al.,* 2012). Farming diversification may also give sustainable incomes while allowing for human engagement with the natural environment, employees and clients both benefit from the caring aspect of these settings (Hemingway *et al.,* 2016).

Post-Covid, one of the most important lessons would be how to establish a resilient system, which may be accomplished by promoting radical UA practises and bolstering them with new financial schemes (Sridhar *et al.,* 2022). In addition, increasing community and home farming may increase the self-sufficiency of people and families, hence influencing healthy eating habits (Sridhar *et al.,* 2022).

Responses also indicate that UA is performed for pleasure and as a means of staying engaged. Smit, Bailkey, and Veenhuizen (2006) explains that UA has often been linked to the therapeutic and educational benefits associated with growing crops. Many recent studies have pointed out the positive effects of UA on the elderly, young people, and children; these studies show that their mental and physical health is better because they spend less time alone and do more physical activities (Othman, Mohamad, & Latip, 2018). Furthermore, UA has become a new socioeconomic term and trend which serves to bring people together, teach about the environment, and for leisure (Camps-Calvet *et al.,* 2015, Coles & Costa, 2018, Hardman *et al.,* 2018).

4.4.4. Increased Access to Fresh Food: The findings indicate that respondents feel UA improves food accessibility, therefore boosting food sufficiency, market proximity, reduction of food miles, and, notably, the monitoring of farms without the need to drive great distances. In general, UA fills a unique economic niche and provides food and livelihood choices to a part of the urban population, particularly the urban poor (Akinnagbe & Ipinmoye, 2022). This agrees with similar findings from literature that shows UA has been recommended as an essential urban element for addressing food shortages in the cities (Yan *et.al.*, 2022). This study also corroborates other investigations that imply UA might help to feed city residents, including timely access to fresh food and the availability of food in the neighbourhood (Sarker *et al.,* 2019).

It was reflected by different participants about the ease of access to healthy food as people can grow their own food and ascertain the quality of what is ingested. This is also similar to previous findings from other studies on UA and how it presents a wonderful chance to provide urban inhabitants with direct access to fresh vegetables (Grebitus *et al.,* 2020). Participant 8 further explains that having an urban farm reduces the burden of travelling to the market to get food as it is readily available within the community. This availability of fresh and nutrient rich foods enhances the interest from people and brings positive impressions about the importance of urban farms (Grebitus *et al.,* 2017). Respondents also indicate that there is improved food security from having their own urban farms as these eliminates scarcity of some food especially during Covid 19 lock down periods where movement was restricted. This finding is consistent with literature that reveals cultivation of UA can boost food access and food security for individuals participating in UA (Horst *et al.,* 2017) and it is especially crucial for food-insecure households (Algert, Baameur, & Renvall, 2014; McClintock & Simpson, 2017).

Participants 1 and 11 noted that food miles become less of a worry as the farms are closer to the cities; thereby bridging the gap between the farm and the market. This invariably solves the problem of transportation and storage of the farm produce as implementing various urban agricultural components into a food system would minimise food miles, enhance biodiversity, strengthen the local economy, and improve social cohesion (Rutledge *et al.,* 2022).

"…*so now UA brings food closer to the people and people will no longer have to worry about logistics*." (Participant 11, 2021)

"We can actually bridge the gap between the farms and the market, which means bringing the farms closer to the city either in the urban region or in the peri urban region, we are able to automatically scale through the issue of transport and storage." (Participant 1, 2020)

UA has the potential to provide several advantages, including boosting sustainability and local ecosystem (Wakefield *et al.,* 2007), promoting food security (Dimitri *et al.,* 2016; Sadler, 2016), and promoting healthy eating habits (Zezza & Tasciotti, 2010; Warren *et al.*, 2015). Additionally, respondents observed an increase in fresh foods, variety, and healthy eating options. UA advocates and academics praise the health advantages of UA which includes increased access to fresh, healthy foods (Alaimo *et al.*, 2008; Graham & Zidenberg-Cherr, 2005; Metcalf & Widener, 2011). Studies indicate that participants in UA noticed a boost in their understanding of nutrition and fresh food (Horst *et al.,* 2017). Consistent with what other researchers have found, Alaimo *et al.,* (2008) reveal adults in families where a person engages in UA consume more fruits and vegetables than adults in nonparticipating households. More recently, a global meta-analysis of agricultural yield shows that vertical farming generated greater yields than horizontal farming, hydroponics produced higher yields than soil-based systems for vegetables, and the crop yields of produce in controlled environment were much higher than open air agriculture; this highlights the need of scaling up UA via the use of new and innovative methods (Payen *et al.,* 2022).

This is supported by participant 5 ***in the UK*** who believes that UA helps to improve healthy eating since the practise of UA greatly enhances the incidence of producing fresh food. Moreover, respondents report increasing availability to homegrown food, which generally reduces feeding expenses. Diverse studies demonstrate that UA practitioners save household money by augmenting a portion of their food costs (Brown & Carter, 2003; Corrigan, 2011; Gray *et al.,* 2013). This is especially crucial for food-insecure households and food deserts (McClintock & Simpson, 2018).

4.4.5. Sustainable Practice

Participants 1 and 17 emphasised on how UA is sustainable and can be seen to be a mode of wealth creation in Lagos especially as agricultural waste can be re-purposed. They believe repurposing of wastes from other agricultural sources generates further means of economic sustainability for the farmer. Studies from literature assume that UA presents an option for controlling organic waste in cities (Whittinghill & Rowe, 2012).

"…there is also the repurposing of waste…two of the major components that we use right now is coconut hull, that's from coconut and rice husk, which is waste from rice." (Participant 1, 2020)

"…so, UA can make sure you achieve wealth while limiting waste because most waste from urban farming can now be used in UA or soilless farming (Participant 17, 2021)

"… amazing ways to grow stuff now, UA alone is productive, sustainable and has the market for it if you are ready to do the work." (Participant 17, 2021)

There is a movement globally with the economic transition occurring in the waste sector, from a waste hierarchy dominated by rubbish collection and disposal to waste minimisation and recycling (Ezeah *et al.*, 2013). The proposed circular resource use concept requires farming systems to limit emissions and waste, emphasise circular economy, and minimise their environmental effect (Barrett & Spataru, 2019). UA may contribute to waste management, food security for households, human resource optimisation, health hygiene, and wealth creation in metropolitan cities if the potential of urban environments is used effectively (Dhital & Joshi, 2016). More importantly, literature findings reveal UA has been found to contribute to the achievement of the sustainable development goals and urban food security (Kuusaana *et.al.*, 2022). It could however be argued that increased food production in cities does not guarantee that persons facing food insecurity will have access to that food, just as increasing global food production does not guarantee an end to hunger (Holt-Giménez & Altieri, 2012) as dissemination and accessibility of food are essential (Horst *et al.*, 2017).

Numerous benefits have been mentioned with regards to the practise of UA in the UK. These advantages, as further highlighted by participants 4 and 5, demonstrate lower transportation costs, which in turn reduces environmental pollution, particularly when innovative UA techniques are used. UA reduces importation expenses on the economy since there is less dependency on food imports because food is locally obtained and farmed within the city and community. There is evidence that UA lowers indoor temperatures (Walters & Midden, 2018), encourages recycling of organic household waste, and reduces the amount of energy used to transport food (Ackerman *et al.*, 2014).

Respondents in the UK also explained that UA helps with the reduction of carbon emissions and preservation of biodiversity. This is similar to previous research which shows that adding more green spaces to a city has a positive effect on the microclimate and biodiversity of the city because trees and ornamental plants can cut down on dust and the number of compounds

like nitrogen dioxide (NO2) that make the air dirty (Harris, 2010). UA has also been linked to creating ecosystems for bees (Goddard *et al.,* 2010); redirecting wastewater, organic matter, and biosolids (de Zeeuw *et al.*, 2011); fixing atmospheric carbon (Beniston & Lal, 2012) which would otherwise impact climate change; and limiting farmland loss caused by peri-urban and urban development (Sorensen *et al.*, 2018). So, UA works to reduce the environmental impact of cities by both managing waste in a sustainable way (Coffey & Coad, 2010) and reducing the emissions that come from transporting, storing, and packaging goods, since the growing areas are close to where the final consumer lives (Ghosh, 2004).

Chapter Five: Evaluation of Current UA Practices in Lagos and the UK

5.0. Introduction

The practice of UA involves a diverse group of stakeholders, including urban farmers, community gardeners, food entrepreneurs, policymakers, and consumers. However, the success of UA largely depends on the knowledge and awareness of these stakeholders, particularly regarding the benefits and challenges of UA, the relevant regulations and policies, and the skills and techniques required for successful urban farming. Therefore, it is crucial to evaluate the current level of knowledge and awareness of urban agricultural stakeholders in order to identify gaps and opportunities for improvement. This can help to promote the development of effective strategies and policies to support and expand UA and enhance the sustainability and resilience of urban food systems.

A large number of respondents (79%) had no idea about institutions responsible for creating awareness for UA in Lagos. Other respondents (20%) made mention of privately owned urban farms in the region and some government agricultural organisations such as International Institute of Tropical Agriculture (IITA), National Institute for Horticultural Research (NIHORT), Agricultural and Rural Management Training Institute (ARMTI), and Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) as organisations that help raise awareness. They explained that these government bodies encourage participation in UA and more specifically, as NIRSAL explained "*who makes frantic efforts to persuade farmers to produce in huge quantities so as to maximise the city's access to surplus food."* As UA is related with knowledge transmission and technical aid, its significance has been hampered by a lack of expertise (Orsini *et al.*, 2013). However, NIRSAL seems to be attempting to raise awareness for agriculture in general by stimulating the flow of affordable finance and investments into the agricultural sector by de-risking the agriculture & agribusiness finance value chain, repairing agricultural value chains, building long-term capacity, and institutionalising incentives for agricultural lending via its five (5) strategic pillars: Risk Sharing, Insurance, Technical Assistance, and Incentives (NIRSAL, 2022).

According to the findings from Lagos, some hired workers lacked the knowledge required for effective farm management and produce handling.

"The staff are also a major issue in UA, maybe they are not well trained or well cultured on how it works…" (Participant 7, 2021)

It is of the utmost importance for new farmers to hire people who are well-versed in the procedures that are associated with the operation of UA (Shamsudin *et al.,* 2014). Possessing the necessary knowledge and skills for UA is essential for achieving the desired results when implementing urban agricultural practices (Zainal & Hamzah, 2017). The results highlight the issue of trustworthiness among trained staff as another persistent problem in the UA industry. Trained staff members could potentially steal or divert the produce for their own financial gain. Also, the study found that there were also occasions in which staff, despite receiving enough training, decided to do things their own way by seeking alternate ways to make their task somewhat easier; this could have had detrimental consequences on the product. Muhammad and Rabu (2015) found that UA specialists with a solid understanding of farming techniques will successfully implement farming systems. In addition, recent research indicates that a farmer's knowledge can influence agriculture development (Aziz, Maso & Man, 2016; Thassananakajit, *et al.,* 2016). Results from the study indicates that there is a need to bridge the knowledge gap by getting people to understand the workings of the new urban techniques. Results also show that there may be a reluctance on the part of seasoned experts or trained personnel to pass on the knowledge they have gained to others.

"There are a few people who practice UA farming in Nigeria, and there are very few people who are willing to train people for UA …So there is really a wide knowledge gap and that definitely has a negative impact on when you're trying to set up…" (Participant 9, 2021)

A new urban farmer in Lagos implied that this could be because they want to keep the information, they possess to themselves because they believe it will help them remain relevant and in demand, which is why they are unwilling to share the knowledge.

5.1.1. Urban Agriculture Methods and Food Production

UA methods and practices vary depending on the location, available resources, and the goals and preferences of urban farmers and other stakeholders involved. it is important to understand the various methods and practices of UA and the factors that contribute to their success or limitations, in order to promote and enhance sustainable and inclusive urban food systems. Figure 16 shows that 80% of the respondents live in urban areas however only 26.5% grows food within the city. The findings also reveal that a substantial number (73.5%) of respondents grow their food in peri urban areas of Lagos state. Urbanisation-induced displacement of prime agricultural land in metropolitan settings is a frequently mentioned barrier to UA (Amponsah *et al.,* 2015, 2016).

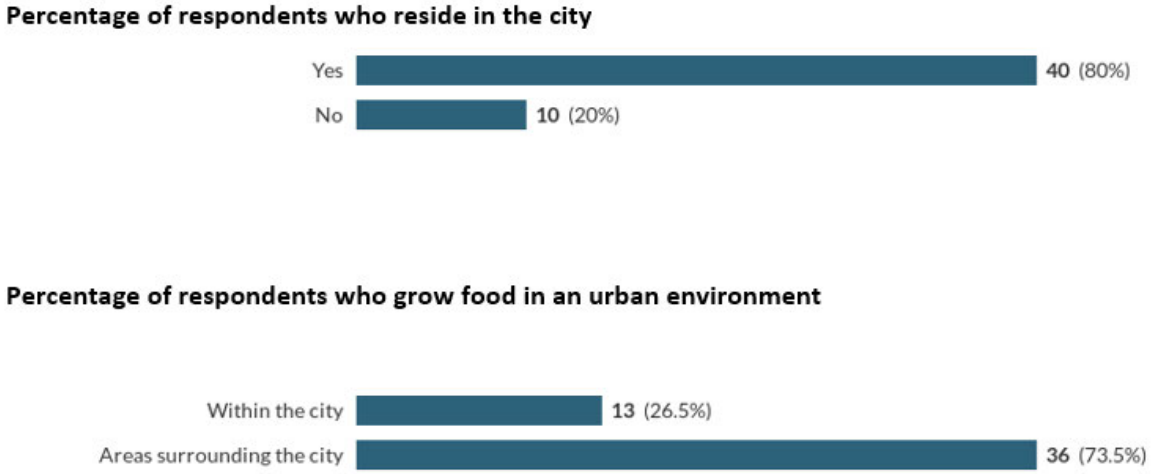


Figure 16: Image showing the percentage of respondents who reside and grow food in Lagos.

This changing land use patterns and availability of land influences the type of food grown in urban areas; the findings (see figure 17) from this study indicates that urban farmers mostly grow vegetables and tuber crops, and this is closely followed by maize. The frequency with which refence was made to each crop is shown in figure 15. 25 out of 50 respondents mentioned growing vegetables, 22 respondents mentioned growing tuber crops such as yam and cassava and 20 respondents mentioned growing maize. There are other respondents who also mentioned growing a mixture of these crops. This result is consistent with findings that revealed vegetables, maize, and cassava are the most widely produced crops throughout Nigeria (Salau & Attah, 2012; Asadu *et al.*, 2016). The dominant crop patterns in large cities shows that farmers prioritised the cultivation of fast-maturing plants which have a short growing season (Olumba *et al.*, 2021).

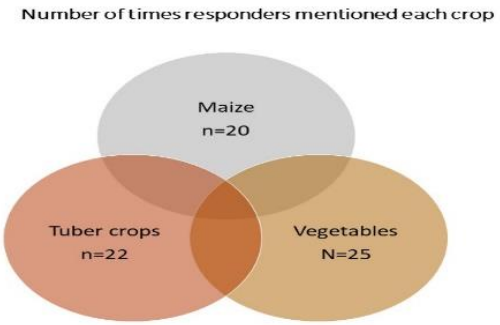


Figure 17: Image depicting the frequency with which respondents referenced each crop.

In the UK, figure 18 shows that 85.2% of respondents live in cities and 74.1% grow food within the city in the UK. This is consistent with findings that showed the UK has a long history of using private gardens and allotments for producing food for personal use (Hardman & Larkham, 2014). Church *et al.*, (2015) examined data from the European Quality of Life Survey to evaluate the incidence of food growing across Europe, and they found that the practise has lately intensified in UK cities. The number of community gardens registered with the Federation of Urban Farms and Community Gardens in the UK grew by 65% between 2010 and 2011, demonstrating a growth in gardening activities across Europe (Church *et al.*, 2015).

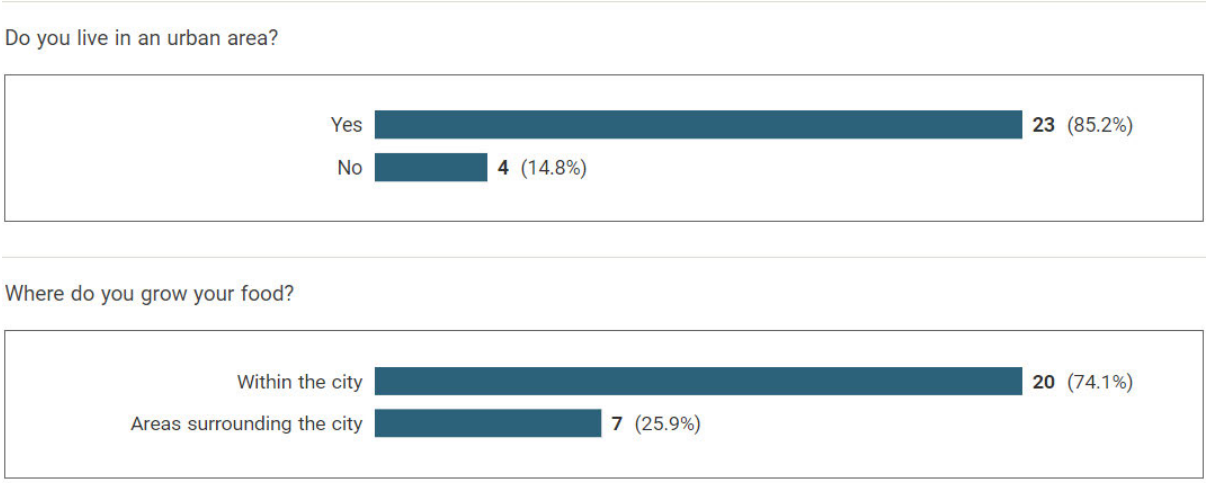


Figure 18: Image showing the percentage of respondents who reside and grow food in the UK.

The study revealed 21 out of 26 respondents (mostly urban farmers) had a small urban farm where they grew fruits and vegetables. This is consistent with the findings from Mok *et al.*, (2014) and Orsini *et al.*, (2013) that fruit and vegetable gardens are best suited to growing in cities in GN countries. Furthermore, greater emphasis on the consumption of plant-based foods, such as fruits and vegetables, may be crucial in achieving more environmentally sustainable food systems in cities (Scheelbeek *et al.*, 2021). Moreover, the nationwide dietary recommendations and other campaigns for eating fruits and vegetables (five a day) have been around for many years and they acknowledge the health and environmental benefits of fruit and vegetables (Willet *et al.*, 2019).

Responses from the survey shows that 16 out of 27 respondents make use of their home garden to grow food using techniques such as *"raised beds"* or *"outdoor pots"*. Other responses were

from people who made use of allotments and communal spaces to achieve same objective. Since the time of the Dig for Victory programme that encouraged people to grow their own food in their gardens and allotments, 18% of the fruit and vegetables consumed in the UK have been grown in allotments and gardens, using 1% of the area of arable farming (DEFRA, 2022). Allotment and residential gardens were also identified as 'hotspots' for pollinators in a recent assessment of habitats in four UK cities (Baldock *et al.,* 2019), while Samuelson *et al.,* (2018) discovered that bumblebee colonies expand and generate more offspring in urban locations than in rural ones. In addition to this, birds, and insects, for example, can benefit from the great plant diversity that is often purposefully maintained in urban gardens and allotments (Colding *et al.,* 2006; Bernholt *et al.,* 2009; Borysiak *et al.,* 2017) for both food and shelter (Lin *et al.,* 2015).

5.1.2. Ownership of Farm Types and Sizes

The findings of this study indicates that most urban farms are individually owned and farmed within residential spaces (34%); while a significant amount are operated on a small scale and often within the community (30%) (see figure 19). Furthermore, the study suggests around 40.5% of respondents cultivate small urban farms while 20% grow on medium farms (see figure 20); this indicates that these farms might be subsistence in nature. Most urban farms in Lagos are privately owned, while some farms are cultivated on a smaller scale in major urban areas (Adedeji & Ademiluyi, 2009)**.** The result agrees with a study conducted by Akinnagbe and Ipinmoye (2022) which revealed that the majority of households in the southwest area of Nigeria own the land they cultivate, and it is cultivated for subsistence purposes. This demonstrates the lack of government support for UA as there have been reports of crop destruction and farmers being kicked off land as recently as 2010 (Olomola, 1998; Ezedinma, 1999; Ukeje, 2004; Chah, *et al.,* 2010). In addition, Ibrahim, Haruna, and Shaibu (2020) indicate that households' access to farmland favourably influences their engagement in UA.

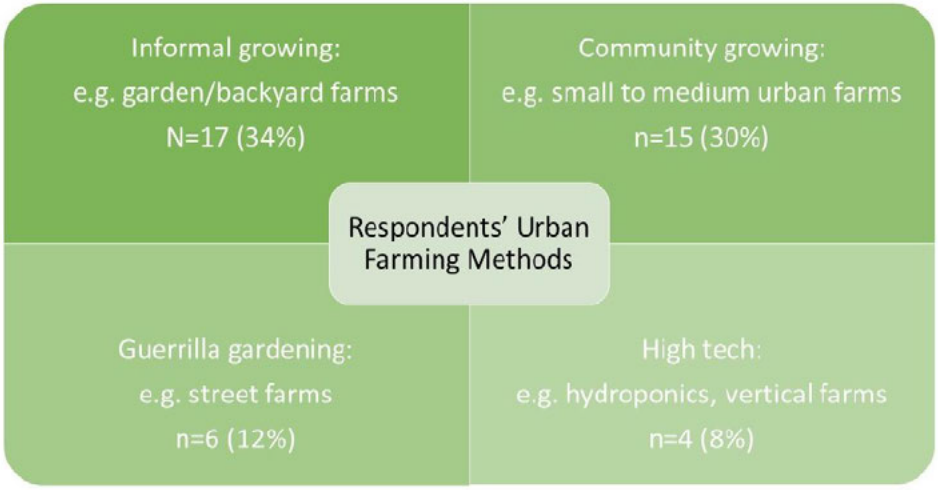


Figure 19: Image showing respondents' urban farming methods.

Figure 20: Image showing respondents' farm size.

In conclusion, this study sheds light on the nature and scale of UA in Lagos, Nigeria. The results indicate that most urban farms are privately owned and operated within residential spaces, with a significant portion also being community-run on a small scale. The findings also suggest that a considerable proportion of these farms may be subsistence oriented. These results are consistent with earlier research that shows that most households in the southwest region of Nigeria own the land they cultivate and that it is cultivated for subsistence purposes. However, the lack of government support for UA and reports of crop destruction and land grabbing demonstrates the need for stronger policy frameworks and institutional support to promote sustainable UA in urban areas. Furthermore, the study highlights the positive influence of household access to farmland on their engagement in UA, which may have important implications for promoting food security and livelihoods in urban area.

5.2. Land Use Tenure Policy

Findings from the study also indicates that around 73.5 percent of respondents participating in UA have been farming for less than 10 years, while 20 percent have been farming for between 11 and 35 years. Despite these years of experience, 58% of respondents were unaware of land usage and land tenure in Lagos. Surprisingly, only 6% of the 40% of respondents who claimed to be familiar with land use were able to identify the Land Use Act of 1978. The Land Use Act often refers to the legislation that grants the right to use land in Nigeria's urban and rural areas; this right encompasses the rights of occupation and development, alienation, and numerous land-related privileges (Uzoamaka *et al.,* 2021). Damilola (2020) noted that the Land Use Act in Nigeria is one of the important legislations that landowners or landowners-to-be must comprehend. The issue is that major objectives and purposes of the Land Use Act of 1978 have been seriously deviated from; the purpose of the Land Use Act was to solve the diversified land policies in Nigeria and ensure easy access to land for all Nigerians, but in today's concept, land is shared among the highest bidders and buyers (Uzoamaka *et al.,* 2021).

Furthermore, the land ownership system in Lagos affects the ability of poor urban farmers to acquire land (Adedeji & Ademiluyi, 2002). Another obstacle to UA stems from tenurial arrangements surrounding suitable land spaces for UA, in addition to the conflicting uses of urban land and the changing land-use patterns (Chah *et al.,* 2010; Asadu *et al.,* 2016).

Results reveal that 67% of respondents were unaware of any policy for UA (discussed in detail in section 2.8.2.), while 33% of respondents who indicated knowledge of UA policies provided examples of crop management techniques, names of major farms around them, or referenced the Land Use Act, indicating a significant knowledge gap. It appears that urban farmers do not seek out formal sources of information, perhaps due to the venture is still viewed as "informal", and this situation calls for policy intervention (Michael & Alufohai, 2020). UA in Nigeria lacks a policy framework due to a dearth of empirical data and facts that could aid in policy decision-making (Michael & Alufohai, 2020). Adetokunbo (2002) stated that Nigeria's food policy has been marked by the unsuitable role of the government in food and agriculture, which has manifested in poorly planned and poorly executed food policies, as well as unintended repercussions and beneficiaries of the food and agricultural policies.

The lack of access to land and unstable tenure in the cities were listed as the major barriers identified by a significant cross section of the participants. The findings from this research corroborates the results from previous studies which indicated access to land is a major challenge of UA (Chagomoka *et al.,* 2018; de Medeiros *et al.,* 2019).

"…I don't know of any policy that supports UA… (Participant 11, 2021)

"No, I don't know any land use policy that supports UA maybe because policies are not something people talk about in Nigeria in fact, I had to start digging out for research to read about policies because this is not something you hear on the streets, nobody talks about it. (Participant 12, 2021)

A cross section of the participants generally identified the fact that they were not aware of any land use policies in relation to UA. This might be due to the fact that policies are not general topics of discussion in Nigeria due to the overwhelming lack of trust in the government. Some of the participants who made mention of their awareness of government policies, stated that government policies largely covered agriculture in general as it relates to land mostly in rural areas. And even though these policies exist for agriculture in general, they are usually transient (Ajulor & Etim, 2019). Another school of thought from the study is regarding government policies in which they believe that such policies are open to interpretation in that, there is no restriction on the use of any land in urban areas.

"We don't really have any for or against directly. Again, because the law is open to interpretation" (Participant 9, 2021)

"Policy from the government for land use is basically not for urban, it's basically for the rural areas, or semi-urban." (Participant 17, 2021)

Uncertain urban land use policies have in fact discouraged investment since farmers are unwilling to take the chance of losing their relatively tiny revenue if authorities seize the property and destroy their crops; besides when land was allocated to land use categories like industry and infrastructures, unsupportive governments rendered urban farming practically impossible (Frayne *et al.,* 2014; Nchanji *et al.,* 2017; Chagomoka *et al.,* 2018). Urban areas have a limited supply of land available for the practice of UA because the spaces that are available are insufficient for the practice of this endeavour to be carried out in a sustainable manner and are also very expensive (Appiah *et al.,* 2017). Most of the land that is available in urban areas is classed as peri urban because these areas are transitional zones between rural and urban and are located on the periphery of urban areas (Cobbinah & Aboagye, 2017). Lower population concentrations, comparatively weak infrastructure, and more land available for agriculture are characteristics of peri-urban areas (Opitz *et al.,* 2016).

The study reflects some of the opinions of participant about the government's unwillingness to take UA seriously in relation to it being included in city planning. The government prefers real estate as they are seen as more economical, and the profit margin ability is considerably higher due to the high influx of people into these urban centres, which is seen as a hub for economic growth (Onyebueke *et al.,* 2020). Also, rather than seeing the city as a location for farming, most urban residents view it as a place for living and other urban economic activities (Brown-Luthango, 2011). The participants revealed that increase in civilisation and urbanisation is seen to be a big deterrent to the practice of UA.

"It has always been the norm that when civilisation comes, agriculture is pushed out of the region because number one, it's not as profitable as the new development." (Participant 1, 2020)

In addition to this, the study shows that land owned by families in the communities is largely unstable as they are not governed by government policy, hence they tend to do whatever they want with their land. One of the urban farmers complained that:

"It's the people that dictate how they want to operate on their land... There's no standard policy to hold them to..." (Participant 16, 2021)

Urban farmers are usually in a state of land insecurity since they often did not own the land they worked on, which limited their ability to invest due to the danger of failing to make the required reimbursements (Houessou *et al.,* 2020). Another significant point to note from the study which affect UA is the issue of patriarchy and land ownership in Nigeria. The ability of a woman to own family land is very often dimmed by the practice of patriarchy which ensures that all family land is duly passed to the male heirs of the family.

"The problem because there is a game that is played against women in terms of land. So, if it's her husband's land and her husband is willing to give off the land 100%, then you are having a case whereby her family will be like, she does not have any inheritance regarding land" (Participant 16, 2021)

This is in line with different studies that reported concerns with inequalities hampering the growth of UA (Cadzow & Binns, 2016) particularly when unequal access to productive resources devalued women's attempts to engage in urban farming and improve their standard of life. For instance, only men could afford to buy land and offer their assets as collateral for

loans in Nigeria (Adenegan *et al.*, 2016). Additionally, because of gender disparities, men were given preference in property leases, which forced women into smaller plots and reduced their income relative to men (Frayne *et al.*, 2014). There were incidences cited by participants where a woman would have gained the trust of an international organisation in the establishment of a farm with the only criteria being access to family land.

"… based on different family rules, it is difficult for women to own lands in this country. Most of the lands are usually inherited by men…" (Participant 18)

The result of this is that the male members of the family will almost never permit the woman to have access to such family land, and in the extremely rare instances in which the woman is allowed access to family land, she is made aware of the fact that she is merely being loaned access to the land. In addition, she is reminded that the consent to use the land can be withdrawn at any time, because she is seen as more of an outsider who would transfer their family's wealth to another family (her husband's family). Landowners and property owners also have an impact on the practice of UA as some of them usually would not allow the practice of UA on their land. They are of the common opinion that farming would encourage the invasion of snakes; hence their refusal in allowing the practice of UA.

"…even some landlords they don't encourage farming in their compound, that's also a major challenge…we have issues of some household owners and some other community build trying to frustrate other people." (Participant 17, 2021)

"…some landlords believe that practicing UA within the home leads to snakes' infestation and would not want to take the risk" (Participant 20)

In the absence of absolute or nonderivative property rights, farming households are unable to produce crops, hence reducing their income-generating potential (Odoemelam *et al.*, 2013). As the population continues to rise and agricultural land becomes scarce, food security becomes difficult (Federal Ministry of Agriculture and Rural Development, 2015).

The government, in a bid to improve the state of insecurity in the state endeavours to make land available to farmers who belong to registered societies. Participant 15 reveal that the Lagos State Agricultural Lands Holding Authority oversees the allocation and leasing of lands to eligible farmers. Since they are in possession of all agricultural land available and are saddled with the responsibility of providing farmlands with the aim of achieving food security for the people, they supervise the allocation of land (LSALHA, 2022).

"There is a department called Lagos state lands holding which is the department saddled with that responsibility, you know they are the ones that allocate land, they lease and give land to farmers, to eligible farmers." (Participant 15, 2020)

Findings from the study also show some private organisations have also formed an alliance in which they contact owners of vacant land spaces within the community and offer to pay for the space to use for farming. This idea is in a response to increase availability of land in the state. The results show that the government is also in partnership with private organisations who help to see to the provision of training to interested farmers. This is evidenced by a report written by Akinfewa (2022) where government paid landowners to acquire the crops grown with the land to reduce poverty in the state. Participant 13 further explained a project he is currently working on in partnership with the government which is meant to utilise vacant lands in the city for UA.

"… I'm working on a project where we tend to use any available space, especially uncompleted units in the environment… so farmers can negotiate and get those spaces to grow their crops …" (Participant 13, 2021)

The government has also encouraged urban farmers to practice their farming by marking out land in urban areas specifically for farming and inviting these farmers to relocate their greenhouses to these mapped land(s).

"It is interesting to know that the government seems to be showing interest in UA now through provision of safe urban land after so long…" (Participant 17)

Participant 4 explains how the government alongside the chamber of commerce mapped out land for urban farmers just to provide security for the farms and to prevent *"unsolicited persons from encroaching into the land".* It is common for farmers in most GS countries to often use their own property, hired land, vacant abandoned land, roadside spaces, or community allocated farms to grow food (Mougeot, 2005; Mkwambisi *et al.*, 2011).

In the UK, boroughs and local authorities are responsible for allotment provision and administration, however, it is becoming increasingly usual for these to delegate management of allotment sites to an independent organisation under "designated management" (Fletcher &Collins, 2020). Although, in many medium-high population cities across the world, including London, allotments comprise the greatest geographical area allocated to UA (Breuste, 2010; Garnett, 2000). Also, over 50% of respondents did not know of land use policies supporting

UA. This might be because most recent policy developments such as the Environment Act (2021), England Tree Action Plan (2021), and the Environmental Land Management Scheme (2020) are for agriculture in general and are not targeted towards UA (People Land Policy, 2022). This is not surprising as just recently, in a panel encouraging food growing in the cities, McAllister and Logan (2021), joined a discussion with other food practitioners on how UA can be included in Land Policy Reform.

5.3. Legal Access to Farmland in Lagos

Approximately 53.1% of respondents indicate they do not farm with permission, 20.4% believe it is not applicable to them and 26.5% stated they farm with permission (see figure 21), citing reasons for their responses. 6 of 10 respondents who believe it is not applicable grow food on their residential property, while 2 others believe there is no law or significant regulation forbidding urban farming. In general, farming in African cities takes place on land owned by the farmers, rented/leased private or public land, abandoned land and community allocated land (Bryld, 2003; Mougeot, 2005, Mkwambisi *et al.*, 2011).

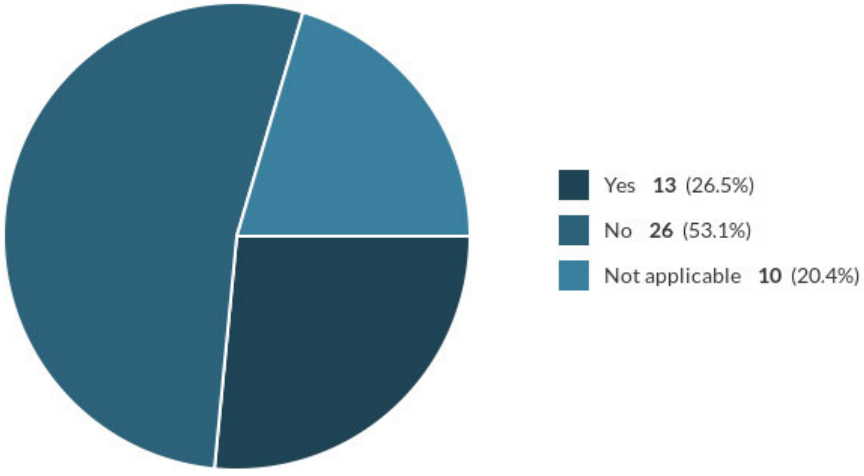


Figure 21: Image depicting the percentage of respondents that farm with and without permission in Lagos.

Approximately over half (51.9%) of respondents indicate that they farm with permission on the spaces they use (see figure 22) and 33.3% feels it is not applicable to them citing reasons such as growing *"within their own home"* and *"small garden"* as the major reasons.

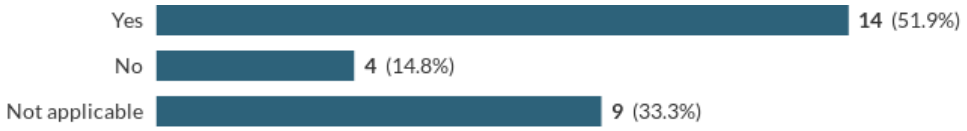


Figure 22: Image showing responses demonstrating permission to farm.

Concerning land use policy, although the respondents indicated that they mostly farm with permission, 14 out of 26 (54%) have no idea of land tenure use in their region.

5.4. Quality of Urban Soil and Environmental Contamination

The findings show that 59 percent of respondents believe that the quality of urban soil is good, 20 percent believe that it can be managed or improved, and 20 percent believe that it is poor and contaminated. This difference in this finding from earlier research on soil quality may be attributable to the fact that most respondents farm on a small plot of land within home gardens, using raised beds, and perhaps also due to soilless UA rather than the conventional methods. Previous literature shows that one of the most significant threats to food security is the deterioration of soil quality; in sub-Saharan Africa (SSA), for example, over 65 percent of the total arable lands have already lost their capacity to sustain viable food production (Montpellier Panel, 2010).

A staggering 62.76 percent of Nigeria's farmland has had its production significantly hampered by the issue of soil degradation (FAO, 2001). This may be ascribed in large part to population growth, which has led to the conversion of natural areas into farmland, and to the widespread adoption of unsustainable soil management methods by farmers (Anyanwu *et al.*, 2015; Borelli *et al.*, 2017).While there have been many initiatives to boost food production in Nigeria, most of these strategies have focused on expanding the size of arable land rather than its productivity (Adeyolanu *et al.*, 2018). Unfortunately, this has resulted in the destruction and desertification of agricultural land in Nigeria (Brown, 2005). Sources and types of pollutants that can be found in urban areas have been discussed in detail in section 2.8.5.

Respondents who believe urban soil quality is good often mentioned the fact that they felt UA has a more organic and sustainable approach to soil, particularly regarding the use of few or no chemicals for the soil. Most emerging UA techniques, such hydroponics and aeroponics, do not require soil and are grown in controlled environments, which, according to these respondents, means that the issue of pollution in urban soil may be overcome. In addition to this, land unsuitable for conventional soil-based farming can be used in hydroponic systems, as soil preparation and weed management are unnecessary (Verdoliva *et al.*, 2021). There are

several potential advantages to soil-less agriculture, including the fact that harvested crops include less soil particles, resulting in less soil-borne illness and fewer washing procedures, which saves water and energy. Closed hydroponic systems can also help lessen the burden on natural water supplies by decreasing the need for irrigation and fertiliser (Bar-Yosef, 2008).

Some respondents believed that urban soil can be managed or salvaged using different composting techniques or by the addition of organic fertilizer to make it usable for growing food. Findings revealed that none of the respondents made references to soil testing before growing food in the spaces. However, it is important to note that there is the tendency for vegetable roots to quickly absorb heavy metals, and even at low levels, heavy metals in soil may accumulate to dangerously high concentrations in the edible parts of crops (Yang *et al.,* 2009; Jolly *et al.,* 2013). Vegetables are often contaminated with heavy metals in many parts of the world, leading to potential health problems for those who eat them (Zhou *et al.,* 2016). Soil amendments, such as compost and mulch, improve soil health, increase the variety of soil biota, and decrease the bioavailability of heavy metals and organic contaminants (Lal, 2020) which helps to enhance soil quality, functioning and reduce soil-related constraints. Sustainable management of soils using UA may concurrently improve humanity's culture, civilisation, way of life, and health (Minami, 2009) and foster the development of sustainable communities (Kuo & Sullivan, 2001).

The category of respondents who think the use of urban soil should not be used for growing cited several reasons for this perceived barrier. One significant reason, cited in one of the open fields within the survey mentioned "*contamination from pollutants caused by heavy human traffic".* When it comes to growing food in urban areas, pollution is one of the key issues; soil contamination in urban areas is a serious problem in part due to human activities and the wide range of environmental contaminants that pollute it (Shahid *et al.,* 2019; Menefee & Hettiarachichi, 2018). This finding agrees with Lal (2020)'s study, which highlights that excessive human traffic causes soil compaction, which may be reduced by enhancing and preserving the surface soil structure by mulching and the application of compost to promote earthworm and other biota activity. Another respondent added to this by stating that "*soil contamination due to heavy metals and toxic chemicals"* is a major problem associated with urban soil. The findings indicate that respondents are aware of the potential issues surrounding soil contamination and that it could pose a significant risk to their health however there is the lack of awareness of how to measure the risk and what to do about it. This is interesting as other authors are saying soil contamination is a huge barrier, but practitioners are still growing food on lands that may be contaminated meaning it has not actually stopped them from growing

food. Agricultural practises generate volatile organic compounds, pesticides, and fertilisers, combined with inorganic pollution from sources including car exhaust and factory contaminants found most often on city farms (Mombo *et al.,* 2016). Industrial processes also generate and disperse vast quantities of rubbish and pollutant-laden particles (Shahid *et al.,* 2012), which can lead to a variety of adverse health effects from a build-up in the food chain (Schreck *et al.,* 2012).

The majority of the participants practicing the new methods of UA such as hydroponics or aquaponics feel urban soil is preserved during UA practice. Each year, 24 billion tonnes of rich soil are lost to erosion worldwide (United Nations, 2017) and as a result, hydroponics and other UA techniques that do not need soil might be required to combat the global soil fertility issue (Cameron, 2019). The respondents are of the opinion that these UA methods not only use less or no soil in growing, produces little waste but also repurposes waste from other agricultural sectors thereby reducing environmental pollution and contamination. This agrees with Fussy and Papenbrock (2022) that explains that UA techniques such as soilless farming can lessen the requirement to build rich soils to gain additional food production areas. This is also in line with (FAO, 2011) who reports that simple hydroponics optimises water conservation by recycling and purification of water for plant growth in regions with poor climate, soil, space, and water conditions.

Participant 12 likened UA to a closed working system where waste from one sector is being repurposed by another sector. He explained how nothing goes to waste, soil and water contamination is reduced, how waste serves as an indirect source of income for urban farmers and how important it is to accentuate UA from this point of view. Moreover, it is important to highlight that participant 1 believes that persons who sell wastes from other agriculture production methods may not be "*directly involved in food production, but their revenue allows them to purchase food"*. UA production techniques has been found to be able to close nutrient and water cycles in urban areas and prevent agricultural production on less fertile soils, it also has the potential to reduce the environmental effects associated with conventional agricultural production and the global food supply chains (Bren d'Amour *et al.,* 2017).

Participant 1 explains that the contamination in urban farms is mostly from visitors trooping in to see and learn about the new system. He stated that because the "*technology is new*", this attracts a lot of people to the farm. In general, it is assumed that hydroponic food is safe for human consumption and poses negligible risk of microbial transmission (Lopez-Galvez *et al.,* 2014; Allende & Monaghan, 2015; Putra & Yuliando, 2015). Furthermore, some participants

think most UA practices are organic meaning urban soil does not get contaminated from the excessive use of fertilisers, pesticides etc.

Generally, due to several reasons, urban soil is polluted with effluents from industries, urbanisation, and transportation and this greatly reduces the soil fertility (Jin *et al.,* 2019; Nazarpour *et al.,* 2019). According to respondent 8, even though there's a regulation on waste and pollution in the cities but it might not be properly enforced.

"…the federal and state ministry of environment do regulate but the enforcement is not what I'm sure about." (Participant 8, 2020)

Participant 4 explained further that there are also other farming practices such as bush burning which affects the appearance and quality of the soil. The effects of this on the soil is usually long term and farmers sometimes rent such land for use without knowing the history of the land or conducting soil tests, which most farmers cannot afford.

"*But Most farmers don't have that knowledge of conducting soil test…even some people that might want to conduct such soil test cannot afford it because it is quite expensive to do…so those are some of the things that puts some farmers off….*" (Participant 4, 2021)

In the UK, diverse responses were received in response to the question regarding contamination issues associated with food production in urban areas, with an emphasis on urban soil; however, approximately 56% of respondents believe it is a significant challenge that can be addressed through a variety of methods. The majority of comments expressing worry about the topic include pollution concerns with water, automobile emissions, and heavy metal contamination such as lead in the soil. In addition, they suggested that despite this problem, the soil may be maintained, regenerated, and used for planting. Trace metal contamination is quite common in urban soils, which makes it hard to grow food in cities (Gupta *et al.,* 2019). In addition to lead, pesticides, petroleum products, industrial waste, tars, and carbon monoxide are all contaminants that can be found in urban soils (see section 2.8.5.) (Alloway, 2004). Soils that are polluted can lead to plants that are polluted, which people then eat (Rai *et al.,* 2019). Many books and articles have been written about trace element pollution (Hough *et al.,* 2004; Pelfrêne *et al.,* 2013; Bidar *et al.,* 2020), as well as how to reduce the health risks of gardening and eating backyard produce. However, most people might not know or understand the real risks of urban gardening (Burghardt *et al.,* 2015; Bidar *et al.,* 2020).

Chapter Six: Barriers, Upscaling Opportunities and Future Potential of UA

6.0. Introduction

During the study, the major challenge that was prominently brought to light by the farmers was the high rate of poverty that is currently prevalent throughout the nation. The World Bank's poverty assessment for Nigeria in 2022 found a 6.7 percent increase in the country's overall level of poverty, which is expected to bring the total number of people living in poverty to 95.1 million in 2022. It was speculated that the rise in population and the aftermath of Covid-19 both played a role in contributing to this surge (World Bank Group, 2022). According to the National Bureau of Statistics (2020), forty percent of the total population lives below the poverty line of the country, which is determined to be $381.75 per year for an individual. In addition to this, due to the presence of various factors that function as constraints (See figure 21), Nigeria was also classified as a region that does not necessarily provide an environment that is favourable to the practice of UA on a large scale. The practice of UA is consequently viewed to improve the person(s)' survival rather than for commercial purposes, as opposed to the large-scale production of food that is economically feasible and has the potential to draw a boom in economic turnover (Yusuf *et al.,* 2015).

Findings from the study show that UA has become increasingly popular in Nigeria as a means of providing food and income for urban populations. However, despite its potential benefits, the nutritional value of UA has often been overlooked. This indifference towards the nutritional value of UA in Nigeria can have serious consequences for public health, as a lack of access to nutrient-rich foods can contribute to malnutrition and other diet-related health problems. In the UK, this study demonstrates that there is a less resilient attitude towards new UA practices as well as a reluctance to adopt new approaches and technologies that could further enhance the productivity and sustainability of UA initiatives. This may be due to a lack of awareness of new practices, a preference for traditional approaches, or a fear of failure. It is important to explore the reasons behind this indifference and less resilient attitude to develop strategies for promotion of UA initiatives.

6.1. Limiting Factors Associated with Urban Agricultural Practice

This section will explore some of the most significant barriers (Figure 23) to the successful implementation of UA initiatives. These barriers are categorized into several headings and by understanding the challenges presented by these barriers, it is possible to develop strategies that can help to overcome them and promote the growth and sustainability of UA projects.

Findings suggest that large-scale UA may be more realistic than literature shows and may have a bright future within Lagos. However, the reality reveals that it is more subsistent in practice than at large-scale at present. A study conducted by Taylor (2020) reveals that UA on a modest scale in the countries of the GS has the potential to be very productive, but this is not currently the case. Furthermore, this research found that the practise of UA in Nigeria is hampered by the fact that people farm for calories rather than nutritional value, which is one of the reasons UA is promoted.

"*In this part of the world, we think [of] calories over nutrition. One is just interested in filling up his stomach and doesn't care whether what he's eating has any benefits it's adding to his body."* (Participant 2)

The fact that people just want to eat and not because they want to eat for its nutritional value is one of the biggest problems that UA in Nigeria must deal with (Morgan and Fanzo, 2020). There is a common statement that differentiates between the questions *"have you eaten?"* and *"are you satisfied with the quality of what you have eaten?"* This fact clearly shows how big the limiting factors are that always affect both the quality of the food produced and how much of it is made. When all people, always, have access to food that is safe and nutritious for them to eat to live a healthy life, we can say that we have achieved food security (Idachaba, 2006).

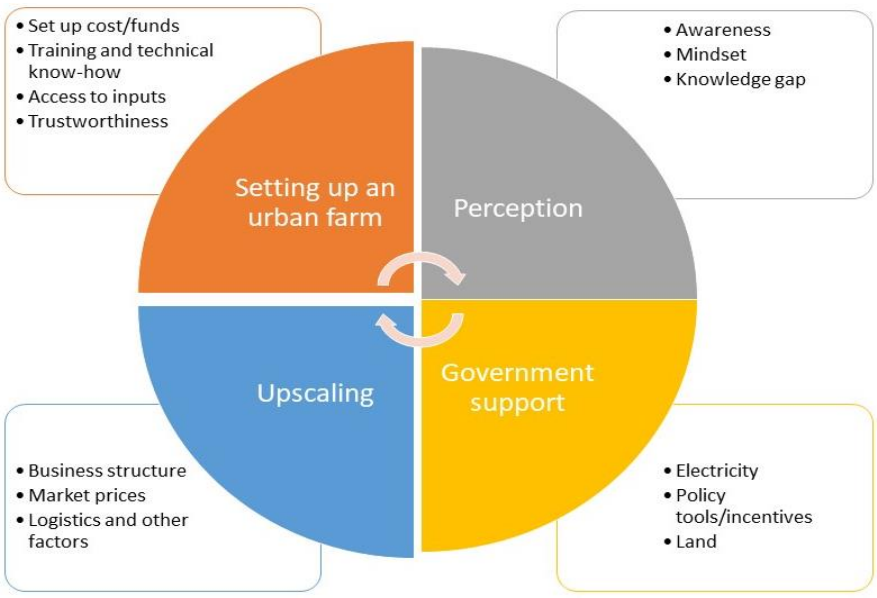


Figure 23: Image showing a summary of barriers affecting UA practice in Nigeria (Author's own)

During this research, several disadvantages were highlighted in the UK. One of the paramount disadvantages discovered is that several participants talked about access to space as being a major limiting factor in the practice of UA. Participants 3, 4, and 5 emphasised that living in cities and towns with very little or no access to land and for people living in rental space especially as they found it difficult to convince their landlords. This is similar to studies that show that potentially accessible land area determines the productivity of large-scale UA within a city (Haberman *et al.,* 2014; Saha & Eckelman, 2017).

Participant 6 reveals that encouraging people to participate in UA was difficult because it was viewed as a new and unfamiliar method, causing most communities to have a less resilient attitude towards the practise of UA. Because some UA practises are viewed as an innovative activity, the majority of people prefer to engage in activities with which they are more familiar and comfortable.

"… If it's something as new as aquaponics or microgreens, people are much less willing to try it." (Participant 6)

Participant 7 claimed that gaining access to funding has been challenging. Due to their inability to classify the practise of UA, gaining access to funding and government backing is somewhat difficult, according to his assertion. Further, he emphasised that there are several varieties of UA, making it impossible to pinpoint the precise group under which their practise fits because there are few case studies available for each category.

"Categorisation for the sector of the industry is difficult. When forming the business, I struggled to allocate it into any groups. Related to this, for small UA businesses there are few demonstration models that can be used e.g., to establish size of market, costs of growth it is such a new concept for businesses that there are not many case studies in the UK." (Participant 7)

In terms of function, labour, and management, as well as the integration of various markets, UA takes many forms (Yan *et al.,* 2022). Due to the possibility of overlap, it is difficult to neatly assign each instance of UA to a single category (McClintock, 2014). Consequently, the definition of UA is not standardised, many experts believe that UA is a kind of contemporary agriculture, highlighting its numerous purposes in guaranteeing food security, sustaining urban ecosystem services, and enhancing urban living quality (Ackerman *et al.,* 2014; Langemeyer *et al.,* 2021).

6.2. Set up Costs

Most urban farmers from the study complained that setting up an urban farm is capital intensive as there is need for the importation of materials which are not sourced locally. There is a significant barrier presented by a lack of financial resources when it comes to developing and maintaining UA operations (Hagley *et al.*, 2012; Daftary-Steel *et al.*, 2015). The process of financing UA is both complicated and ever-changing and it includes not only monetary but also non-monetary resource mobilisation, in addition to savings and subsidies (Cabannes, 2012).

"*...the cost tends to be a bit high because of the materials used in setting up... but setting it up requires some certain efforts, which is one of the major drawbacks."* (Participant 6, 13, 2021)

"Well, I know that one of the biggest challenges is the fact that the materials for setting up UA is very expensive." (Participant 10, 2021)

Farmers, whether they are just starting out or have been farming for a while, often face problems such as the high costs and infrastructure needed to start, run, and keep an UA business operational (Akaeze & Nandwani, 2020). When it comes to most urban farmers, the inability to secure adequate financial backing represents a significant barrier to their ability to maintain and increase the scope of their activities, as well as, more generally, the potential for scaling up production of food at an affordable price in urban areas (Egbuna, 2009). Participant 11 argued that most of the funds provided by the government are mismanaged by the intermediaries leaving the farmers with little to no funding for their businesses. The findings indicated that the government makes provisions for the distribution of funds to farmers; nevertheless, these funds are easily taken by the intermediaries who are responsible with distributing them to the right parties; hence, they are lost while in transit.

"*They disburse funds which they do not get to the farmers…"* (Participant 11, 2021)

Furthermore, there are illiterate urban farmers who may need a mediator. After getting access to the farmers' finances, these intermediaries often take a commission or completely take the whole amount. Participant 5 describes how some middlemen divert payments to their own accounts and then utilise the funds for another purpose, leaving the farmers with no money.

And those mediators would, first of all, direct those funds to some certain account assigned by government or to their own bank account. So, the moment that fund gets to a certain account it will be redirected for another purpose." (Participant 5, 2021)

One reason for this could be that banks and lending institutions see a significant risk in the large number of unbanked smallholder urban farmers in Nigeria, making it difficult for them to obtain formal financial services, such as digital payments and credit, to reinvest in their farms and increase crop quality and yields (Zechner *et al.,* 2022). Cash payments for agricultural purchases encourage theft and fraud, compel farmers to travel great distances to get cash as payment, and add to inefficiencies and a lack of transparency along the value chain (Zechner *et al.,* 2022). This prevalent situation leads to the production of low-quality setups because the funds that eventually get to the farmers will have been truncated and diminished, leaving room for truly very little to be done thus resulting in rise in poverty (Phiri, 2009).
Another important point is the difficulty in finding grants to apply for and tedious processes involved in applying for one. The findings indicated that there is a lack of easily accessible information regarding the procedures for obtaining grants and the amounts that can be obtained from them. Furthermore, participant 12 reveals that even when they are accessible, these incentives are sometimes accompanied by several complicated and time-consuming restrictions, making it difficult for farmers to obtain and utilise them.

"*The major issue is that most people often get discouraged by the tedious processes involved in applying for a grant and some have short deadlines.*" (Participant 12, 2021)

"… the process of applying for a grant is so long that one might lose interest in the process." (Participant 20)

These laborious procedures and the short timeframes within which the farmers would need to complete them to qualify for such grants frequently discourage the farmers (Cabannes, 2012). The findings also highlight that some farmers' reliance on grants to launch and operate their farms on a large scale is not helped by the cumbersome application process or by intermediaries' mismanagement of resources which subsequently leads to a loss of interest in the venture. Likewise, some think starting on a large scale is what UA entails forgetting that UA on a large scale is different from UA on a medium or small scale as it requires the skills and organisation of a well-established corporation and employs highly qualified personnel to operate its facilities (Bosschaert, 2012).

6.3. Access To Input

Findings reveal inputs used in UA, such as seeds and seedlings, are typically exotic and are not easily accessible in Nigeria. As a result, these inputs must be imported into Nigeria, which makes them unaffordable for the country's urban farmers.

"…but we have a problem with seeds. Most of these seeds are imported…" (Participant 9, 2021)

"We import most of our quality cocoa peats…" (Participant 4, 2021)

"That means we might probably have to import some of these seedlings …" (Participant 6, 2021)

A study by Katongole *et al.,* (2012) found that a shortage of feed was the primary challenge facing urban farmers in Uganda who wanted to raise cattle. This finding is consistent with the limited availability of inputs demonstrated in this study. It was also emphasised by Salau and Attah (2012) that a lack of input supply is a major problem for UA. In addition, it has been shown that most Nigerian farmers have little to no access to modern inputs and other resources (Mgbenka *et al.,* 2016). Shortage of resources, reduced availability of labour, marketing, financial, and environmental issues are the key obstacles for urban farming (Rohit *et al.,* 2017). Similarly, Ouédraogo *et al.,* (2019) found that urban farmers face severe challenges due to input shortages because there are very few or even no local companies that produce these seeds, local farmers are therefore forced to rely on the importation of exotic seed varieties. In some cases, such as Nigeria, importation of these exotic materials is restricted due to government restrictions (Oyekanmi & Moliki, 2021). This has been found to affect the availability of specific materials required by urban farmers, and the situation has been made worse by the pandemic, which has disrupted the supply chain.

"[The] major thing is getting access to inputs as it is difficult, nutrient is different from the normal fertiliser, and they have placed a ban on fertiliser. So, it has become very difficult to import these nutrients and it's a struggle trying to explain to them... Sometimes you must pay extra to bring in these nutrients and unfortunately a large percentage of the materials used are not produced in the country, so we still have to rely on importation" (Participant 9, 2021)

The current Nigerian government administration prohibited and restricted the importation of various food items after coming into office in 2015; this is a continuation of an already existing policy however more items continue to be added to list of banned goods (Falayi, 2019). The

goal of the restriction was to encourage domestic production and consumption, especially considering that an excessive reliance on imports can threaten a nation's economic stability (Falayi, 2019); however, findings reveal it has indirectly restricted some production inputs (such as nutrients required in hydroponics) needed by urban farmers for establishing and running their urban farms.

"...we have a lot of challenges now in respect to the ban and a lot of materials used are imported so we are trying to balance costs. Even for young farmers who are quite enthusiastic, it is a struggle ...when you look at cost and the constant importation of the materials needed, we have a long way to go." (Participant 9, 2021)

Significantly, the study revealed that the government ban on mineral or chemical fertilisers also resulted in a ban on the mineral nutrient used in hydroponics, as it was classified as fertiliser. The reason for this is that their composition is similar (Fernandez, 2020), so farmers are forced to pay additional fees or provide detailed explanations to claim their products. This produced undue stress, increased the already high cost of constructing the farm, delayed the urban farm's establishment and operation and negatively impacted their businesses.

6.4. Market Pricing, Structure and Upscaling in Lagos

Some farmers in the study cited market pricing as a significant obstacle for UA owing to the tendency of their food to be priced slightly higher than that of others due to the capital-intensive nature of its production. Furthermore, when having to take their produce to a different market location, participant 17 complains about the produce being sold for less than its value.

"Marketing issue is also a very big problem because you are aware that farming with a greenhouse is capital intensive hence the prices of produce are higher than others." (Participant 4, 2021)

"Pricing in terms of location is a big problem. Sometimes when I take some of the products out to a different location, the price they buy the produce is sometimes lower than its market price and I sometimes have no option but to sell them." (Participant 17, 2021)

Due to the very strong tendency of urban farmers' produce to be substantially more expensive than that of rural farmers, there is competition among buyers on the open market (Alemu & Grebitus, 2020). Having access to open markets is one of the most crucial elements that influences how much urban farmers charge for the food they produce since they compete with farmers in rural areas; and this makes it difficult to market their products (Kolaj *et al.*, 2019).

When food is marketed in different regions, it is expected to conform to certain size and quality standards. Participant 17 explained how some regions would prefer certain food items to look a certain way in terms of its size and when this is not the case, it affects the price of the food. Compared to their rural counterparts, urban-produced commodities are distributed through shorter marketing chains; short marketing chains provide for minimal pricing disparities between the farm and the consumer (de Bon *et al.*, 2010). This is illustrated by the fact that the same produce can be sold for a comparatively high price in urban areas but must be sold for a relatively lower price in rural regions.

Price fluctuations have substantial consequences for farmers, whether they are producers or net food buyers (Asibey *et al.*, 2019). According to the study, there is a wide range of prices that are set by urban farmers, all of whom are vying to outdo one another. This leads to a fluctuation in market prices which is frequently influenced by the way these farmers established the foundation of their farms.

"Farmers sometimes are not cooperative in Nigeria as each individual sometimes sets his or her own market prices which is probably influenced by the way he produced his crops or the difficulty he faced or the target market he has access to." (Participant 7, 2021)

In addition, there are some farmers who would prefer to set their own prices which is usually considerably higher than other urban farmers. Urban farmers' prices can be variable and unequal, and it is commonly believed that oil prices determine commodity prices on both international and domestic markets (FAO, 2011). In relation to pricing, findings reveal there is also the problem of a lack of structure and cooperation among farmers, which frequently results in farmers setting prices that are not uniform across the board.

"Farmers sometimes are not cooperative in Nigeria as each individual sometimes sets his or her own market prices which is probably influenced by the way he produced his crops or the difficulty he faced or the target market he has access to." (Participant 18, 2021)

Another issue that is noticeable is the fact that a good number of these urban farmers usually start off on a small scale without any identifiable structure in place. This usually becomes a problem once the farmers attempt to start producing on a large scale as it very often fails since they have very little understanding on how to structure their business.

"…there is no proper structure in place that all of them understands, but the issue might be from the business model itself..." (Participant 7, 2021)

Due to the lack of structure in the majority of urban farms, UA upscaling is relatively on a very small scale (Viljoen & Bohn, 2015), and this seems no meaningful impact will be made on food insecurity overall. Frayne *et al.*, (2014) imply that manufacturing and distribution networks are crucial prerequisites for UA to potentially contribute to food.

6.5. Logistics

There are instances cited by farmers from the study in which the produce is managed carelessly by the courier company that is contracted to convey the goods, leading to a huge loss of products. Participant 9 explained how his produce got stuck on the road for days before getting to its consumers leaving most of the produce rotten and unfit for sale. He complained mostly about the bad transport infrastructure as an issue in logistics. Also, for intra state transportation, some logistics drivers do not handle the products well which overall has a negative effect on the business.

"One of my biggest challenges going into business so far being in this industry is logistics." (Participant 11, 2021)

"...People in the transportation business are not well cultured/trained ...they don't handle the products well which led to losses..." (Participant 17, 2021)

It is difficult to locate literature on the logistical difficulties of launching an urban farm that focuses on the local market in an inner city to city perimeter area. Trienekens *et al.,* (2003) found that it is challenging to become a supplier in the retail market sector due to small production numbers, the difficulty to supply year-round, and non-transparent farming practices. These aspects of UA provide logistic issues, as most food distribution networks for local food and localised farmer's markets are rather inefficient and fragmented, with individual enterprises operating their own vans and small trucks (Bosona & Gebresenbet 2011).

In addition, the study shows courier firms charge high prices, which always drives up overall expenses because they are frequently confronted with many infrastructural factors enroute to the destination where the item is delivered. Due to transport limitations, a lack of technology that helps to reduce labour, an absence of adequate market facilities, and an absence of adequate input supplies, have emerged as significant factors limiting UA (Olumba *et al.*, 2021). An example of these unplanned occurrences is the prolonged presence of unlawful police checkpoints on the roadways, which are staffed by Federal Government personnel and require the payment of a toll to permit passage. These tolls, which are normally paid to an undetermined

number of police officers, would be added to the overall bill, which would then be delivered to the farmer at an exorbitant overcharge. As a direct result, the final pricing of the product would have been drastically adjusted and made significantly more expensive due to the present circumstances.

"You know the number of checkpoints we will have. So, if you see some of these logistics company just increasing price of delivering items, you cannot blame them, government agency on the road is frustrating them …even the security men guarding estates too request for payment before delivery guys can deliver in that area. So, after sorting all these people, how much are you really taking back home?" (Participant 4, 2021)

The study also highlights the problem of widespread poor road infrastructure, which makes it increasingly difficult for goods to be transported from their point of origin to the end users of those goods. Improvements to the road infrastructure, for instance, are anticipated to raise the output price of producers and cut production costs by reducing the cost of transporting goods and services (Kiprono & Matsumoto, 2014). Products that have a short shelf life are at an increased risk of spoiling, being thrown away entirely, or falling victim to highway bandits who cruise the roads in search of vulnerable motorists and passengers. This gap between food sources and markets can be bridged efficiently by minimising the travel distance, which in turn decreases the transportation of perishable food and this reduction in food miles reduces both transaction costs and the amount of produce lost (Kenneth *et al.*, 2013).

6.6. Government Policy and Support

Participants generally believed that the perceived benefits and the obligations were the two factors that determined the value of UA, noting that policies were given little weight. For instance, it was unclear who should be held accountable for the success of UA, with some participants emphasising that "*it was the government's duty to allot land to ensure food security for its citizens, while others insisted that farmers were entrepreneurs who were accountable for their own success."* (Participant 6). Additionally, although the benefits of UA, such as the contribution to food security, healthy and affordable food, income and employment, and social cohesion were indicated, about half of the participants claimed that the benefits were largely unremarked by the government; as a result, the government was reluctant to make changes.

The Federal Government of Nigeria has not been very effective at supplying its citizens with products and services (OECD, 2012; Dibie, 2018). Inequality in the income distribution across the nation is a significant barrier to Nigeria's economic progress (Fagbemi & Abogun, 2014).

In general, over 90 percent of the participants who were interviewed stated that they were unaware of any government policy and incentives supporting UA. This could be because policies are not generally topics of discussion in Nigeria due to the overwhelming lack of trust in the government.

"Here in Nigeria the government is not encouraging UA. All the laws that are being made is not helping urban farmers to be sincere…. And there is not any policy, there is not any provision. In fact, they do not even care, they do not even bother. We look for land ourselves. The disheartening thing about the issue of this land allotment for farming and like is that even government." (Participant 5, 2021)

The study reveals that the government often makes policies but seldom enforce these policies; there are also instances where policies created often have adverse effects on previously formulated policies while trying to protect other sectors.

"...you put one policy in place that will affect another sector... You are trying to protect one sector, and once you put that policy in place, you can affect every other sector in the agriculture sector." (Participant 3, 2020)

Figure 24: Image showing a small roadside urban farm in Lagos.

However, they did not limit themselves to just this explanation as it is common for the government to develop new policies, but they are rarely put into effect. Sometimes newly developed policies frequently have unintended consequences for those that came before them, even as they are intended to shield other areas of the economy from harm (Adenubi *et al.*, 2021). Also, the introduction of a new administration, a lack of enthusiasm, or the introduction

of a new policy and program may result in a conflict of roles between several programs and initiatives (Iwachukwu & Igbokwe, 2012). Every new government that is formed or elected appears to abandon the previous administration's policies and implement its own plans to fulfil the election program (Mpigi, 2020). Many of the most visible and compelling research challenges on UA governance are policy issues (Zimmerer *et al.,* 2021).

Few participants who were aware of government policies and incentives stated that such incentives were typically not sufficient. They alluded to several reasons, one of which was the fact that the individuals in charge of the distribution of these incentives would have misappropriated them for their own personal use, thereby diminishing the impact of what the government had distributed.

"And those policies would direct those funds to some certain account or to some certain bank assigned by government to oversee to agricultural practices. So, the moment that fund gets to a certain account it will be redirected for another purpose." (Participant 5, 2021)

Corruption arises in the allocation of government-subsidised credits because government officials are aware that the agricultural sector of any developing nation needs have access to finance to prosper (Godson-Ibeji *et al.,* 2016). The study discovered the issue of corrupt government officials requesting payment after the release of government issued policies and incentives; this discourages many farmers from applying to the government for programs because they lack the means to pay the exorbitant fees demanded by corrupt officials. Most prevalent corruption involves excessive fees and percentages especially when issuing credits, government personnel are compensated through payments (Godson-Ibeji *et al.,* 2016).

On the other hand, the study reveals there are recipients of government loans and incentives who, after getting aid from the government, resell the assistance they received. This is typically apparent when the government conducts a second inspection based on the inputs processed and finds the farmer has done little or nothing. Similarly, there are instances in which some of these recipients who have sought for loans and funding channel these funds into other avenues, such as cryptocurrencies and Ponzi schemes. Most of the time, they are left with nothing, as they would have invested the full of the monies obtained into these projects, leaving them with nothing when they fail.

"That is just one of cases. I know some persons that collected grants and then they travelled with funds that you collected for a business because it is grants… others might collect government loan and move it into forex and cryptocurrency." (Participant 11, 2021)

According to Egbutah (2009), much of the money intended for the agriculture industry ends up being mismanaged and stolen by politicians and other government officials leaving a pitiful amount of funds that are scarcely sufficient to have a significant impact on agriculture. High levels of corruption, collusion, and nepotism in Nigerian politics and governance have a negative impact on people's food access to and utilisation (Olumba *et al.*, 2021). Findings from the study revealed there have been bans on the importation of goods which have been implemented by the government; the issue is that most of the inputs required for the effective running of UA are not produced locally, hence, the farmers often pay heavily to force the importation of the required inputs into the country by resorting to paying security agencies to allow the safe passage of their inputs into the country. Nigeria has been focusing on a policy called "backward integration"; through licenses and quotas, this method limits the number of companies that can bring in certain products and as these companies increase their local production, they gradually get rid of their import licenses (Odijie & Karkare, 2022).

According to the study, the government frequently strives to promote the cultivation of native plants at the expense of other imported crops, as this is the defining characteristic of UA, as most foods grown are imported. Participants reveal that the reliance on the government to develop a market for native plants frequently places UA at a significant disadvantage. In contrast, affluent individuals with close relationships to government officials frequently receive preferential treatment and are exempt from the limit on importation. As a result, they have easy access to importation and are not subject to the restriction. This creates an unfair advantage, which farmers with no government links do their hardest to take advantage of to keep their business afloat.

The study demonstrates that the government frequently encourages young people to engage in UA but fails to give the required and beneficial support for the practice to grow. In general, the inadequacies and lack of infrastructure facilities, good transportation systems, improved technology, inadequate marketing structure, and inadequate resources to aid UA activities in Nigeria have become apparent as significant limiting constraints (Olumba *et al.*, 2021). In Nigeria, electricity is a persistent problem since the government is incapable of addressing the issue. Numerous farmers have resorted to the use of generators, which is not cost-effective since it requires regular fuel; diesel or gasoline, which is not economically sustainable because, frequently, both the capital and profit would have been used to keep the farm operating. For instance, some interviewed urban farmers stated that they tend to avoid aquaponics, a recirculation system that is extremely dependent on a consistent power supply.

Due to the increased interest in UA as an option to tackling food insecurity issues, the government have been trying to devise ways to encourage participation in UA. According to Participant 17, the Lagos state government opted to provide 70% of agricultural equipment and 30% of running expenditures to entice more people to participate in UA and to avoid some of the problems and incidences of inappropriate use of money and incentives.

"The government now decided that instead of giving people funds, they would rather ask what the cost of the materials is, then provide 70% farm implements and 30% operational cost." (Participant 17, 2021)

Participants explained that this is to combat the pervasive issue of improper diversification of government aid, which is an ongoing fight as some of the recipients remain stuck in their old habits and continue to find a method to redirect the assistance provided to other initiatives. Diversification of funds is particularly common in the cities or urban areas where there are more possibilities to engage with several types of public officials, bribes may be more required than in less densely populated places for overcoming bottlenecks and easing the delivery of services by public officials in Nigeria (United Nations Office on Drugs and Crime [UNODC], 2019). In recent times, participants reveal the government has made available the provision of inputs to urban farmers at incredibly subsidised rates or no cost to help foster continued farming practices. Based on findings revealed by participants 7 and 15, the government has also partnered with private organisations who have assisted with providing training programs for urban farmers,

"*Subsidise inputs for farmers, offer advice on how to utilise them, educate them on what to buy, and provide them with agricultural services".* (Participant 15, 2021)

"...there are farmers association that you can join that will allow you access to these government incentives which are usually safer and faster… sometimes this year Lagos state government was giving a lot of processing equipment to farmers such as drying machine, fertilizers etc and these are usually handed to farmers who are part of these associations as these associations act as intermediaries." (Participant 7, 2021)

One of the other ways in which the government is trying to encourage UA participation is by provision of farm inputs in kind and cash. One of the programmes, mentioned by participant 8 is the Anchor Borrowers' programme aimed at increasing financing to the agricultural sector,

creating new generation of farmers and assisting small holder farmers to upscale (Development Finance Department Central Bank of Nigeria, 2017).

"…the government introduced the grower's program, and it is a sort of intervention from government to small holder farmers…this loan comes in form of seeds, input, pesticides, fertiliser etc. The farmer will then farm with the provision of all these items, and in the end, when the off-taker off-takes, money will be given to the farmer's bank account, from which the bank will subtract debts and refund profit to the farmer." (Participant 8, 2020)

Participant 15 who works with the government also mention the option of renting out urban lands to farmers at ridiculously low prices, with the only stipulation being that the farmers must belong to members of a cooperative organisation so that they can be easily identified. This was done to promote access to food, create infrastructure for food processing and delivery, and boost farmers' incomes (Essiet, 2022).

"…Lagos state does empowerment program where we give inputs and make land available to farmers, but we give them conditions like maybe belong to a cooperative society and all that for you to be eligible." (Participant 15, 2021)

The government has also encouraged urban farmers to practice their farming by marking out land in urban areas specifically for farming and inviting these farmers to relocate their greenhouses to this mapped land. Participant 6 explained that it is to ensure security of their produce from invasion by several factors such as bandits and migrating herdsmen who very often prey on farms to feed their cattle.

"There are some governments reserved land or areas set aside for this farming. The option was there to rent for as many years as possible and this was done to encourage people to go into farming… and they were promoting indigenous plants as well." (Participant 6, 2021)

In addition to all of these, in November 2021, the Nigerian government considered the formulation of an initiative; "Operation Feed Yourself". Participant 2 reveal the aim of the proposed initiative is to tackle malnutrition by encouraging the starting of urban farms and small home gardens. This initiative was in partnership with the United Nations (UN-Backed Food systems dialogues), UNICEF, Foundations such as the Bill and Melinda Gates Foundation, The Aliko Dangote Foundation amongst others as well as Governors of individual States in conjunction with the Federal Government of Nigeria (Adeyemi *et al.,* 2022).

"…And the emphasis was on encouraging everyone to start a home garden, so there is now a policy in place, and it is being fine-tuned, but the government has begun it and it encourages UA." (Participant 2, 2021)

The aim of this initiative is to help individuals and families grow their food and have excess which will be sold to others as this will generally improve food security in the country. The Government also recommends the establishment of farm estates with integrated farming arrangements as this is envisaged to have a greater impact on food and nutrition security (Akpata & Ojo, 2022).

In the UK, regarding support from local bodies, participant 6 explained that local councils occasionally express an interest in the practise of UA, but this practise has been deemed impractical due to their lack of access to the resources and funding necessary to ensure the continuity of training and community education on the significance of UA. Evidence from research shows that the local government has a big part to play in the creation of tax benefits, investments in infrastructure, rules and regulations, and training programmes, all of which can directly or indirectly affect the state of UA in a city (Halloran & Magid, 2013). Lovell (2010) reveals that institutional support is an important part of promoting UA and local food systems implying a top-down approach might be the best for UA ensuring multifunctional benefits.

Participant 7 believes that those who are hesitant to begin UA should be encouraged to do so independent of government support, because "*individual micro-levels of UA practise can have a significant impact on day-to-day food security".* Studies from literature confirms this that growing food at home increases the amount of food a family has access to and can help stop hunger and malnutrition (Stuart *et al.,* 2013). Also, scaling up UA in the UK has been found to be a holistic, long-term way to improve access to and availability of healthy food for households and communities that are food insecure (Mead, 2021). The urban environment, which includes the city region, is a key place to think about scaling up UA as a way to get to a more sustainable and fair food future (Nicol, 2020).

The main way to scale up is to change policies and laws, bring in more revenue, and build up the capacity of institutions (Pitt & Jones, 2016). Recognising "culture has a critical influence in transforming problem-domains" and "transformation must be deeply anchored in people, relationships, communities, and cultures" are at the heart of the scaling-deep approach (Moore *et al.,* 2015). Scaling out is often thought of as a horizontal form of scaling; It involves increasing the number of people or communities affected or involved and spreading the reach of a project across a larger area by copying or spreading it (Moore *et al.,* 2015).

A significant proportion of participants are of the opinion that UA has no direct effect on food security, as most UA practitioners in the UK do so for social cohesion. Participant 6 explained that while attempting to train some members of the community on new UA methods, with the hope that they would go on to implement them in their communities, he discovered that the majority were already involved in community gardens and viewed UA as an extension of that, which made them less interested in the innovative training methods. More importantly, Participant 6 thinks that most policies from the government does not favour UA or the environment as some of these policies goes against making the current practices better for the environment. Therefore, according to respondent 7, UA policies revolving around net zero carbon are the most well-connected ones and by extension, "*the benefits of UA and the needs to achieve net zero are very aligned".* Physical exercise, less stress via increased mental and social well-being, and a smaller carbon footprint can all be achieved through UA (Ambius, 2014). Growing food at home and bringing it to market in less packaging has a significant impact on carbon emissions (Puigdueta, *et al.,* 2021). Furthermore, a team of London-based researchers found that traditional urban green areas, including parks, offer lower rates of carbon sequestration than food production in peri urban areas (Barnard, 2022).

Participant 6 believes that the practise of UA may be fostered to ensure a sustainable future by greatly improving training and continuity. He emphasised that the trainees might be positively impacted further if they have access to additional resources and assistance. This agrees with a study from Arnold and Roge (2018) that shows that UA can be secure if it has a lot of financial and institutional support. Participant 7 feels that policy reforms should be implemented to encourage the practise of all facets of UA and to make resources readily accessible to urban farmers. In addition, he believes that urban small-scale farmers should be encouraged to produce more to promote a greater uptake in subsistence agriculture. The fact that cities are trying to be more involved in food policy in ways other than growing food is a substantial change that reflects a new way of thinking; previously, state-led food policies focused on food production in rural areas (Gourichon, 2019). These policies can also help to deal with problems like access to food, making sure it is safe and secure, public health, climate change, food waste, and how it affects the local economy (International Panel of Experts on Sustainable Food Systems, 2017). Also, as participant 10 noted, the practise of UA should be more clearly defined, with correct categorisation of all parts of UA and information readily available to all urban farmers, so that they are aware of the extent and intricacies of their practise.

6.7. Urban Agriculture and Support from Non-Governmental Organisations

The majority of interviewees mentioned assistance from non-governmental groups with primarily foreign origins. The assistance received as reported by participants consisted of training, seeds, and funds that aided in the establishment of their business. Participant 12 explained that these NGOs usually train locals on alternative or new UA techniques and then proceeds to help set up their businesses. Generally, NGOs offers integrating tasks by connecting farmers to public institutions and markets, which facilitates access to land (Kanosvamhira, 2019).

"*...think it is just one NGO that I have seen helping UA practice …they brought in people and taught them how to use aquaponics and the uses of the water which can be used for planting vegetables or a soilless farm…and they pay them to help grow their beds, seeds, seedlings; everything they need to set up.*" (Participant 12, 2021)

Participants also mention that they have access to receive grants from universities, foundations, embassies, multi-millionaires, and private organisations *and that "Most corporations or private groups that rely on agricultural goods to thrive provide subsidies to farmers in order to increase their own access to raw materials."* (Participant 12, 2021). This access is only made possible through the role of NGOs as intermediaries, home farmers and informal organisations as this helps to create bridging and connecting capital, establish trust, and access official resources from organisations (Merino *et al.*, 2021).

Other ways mentioned by participants in which non-governmental organisations help urban farmers is by the importation of exotic seeds and seedlings as well as with funds while also helping them with getting suitable markets for their produce. In all case studies done by Merino *et al.*, (2021), NGOs was found to play a crucial role in the UA sector, linking farmers to markets and different government departments and providing training and ongoing capacity building.

"But some NGOs are helping by importing exotic species…" (Participant 6, 2021)

"*...support is there from NGOs as well, where they sponsor people to start up their farms by supporting with cash and offtake etc. but very few…"* (Participant 9, 2021)

Participants complained that some research institutes only collaborate with international farmers and are under contract with international bodies, and thus do not always aid local

farmers because they are required to deliver under the terms of their employment by these foreign organisations.

"*All those research Institutes. They are not there for us, the average farmers. They have a kind of contract with some big international affluent farmers that can get what they want for them. So those are the people they work for…"* (Participant 5, 2021)

Participants also mentioned that some NGOs are prepared to assist, but they have specific requirements that the farmer must meet before they can help. Some of the conditions include having access to land (participant 3, 2020); if the farmer does not have access to land, he may lose access to other incentives. As a result, there is a need for stakeholders to innovate and collaborate in order to enhance these processes (Gajjar, 2020). Furthermore, some of these NGOs also offer grants to farmers, however the farmers are often inundated with *"tedious and complex processes associated with obtaining these grants which are usually offered within an extremely limited time."* (Participant 12, 2021). This might be because despite making a larger contribution to GDP than other businesses, the agriculture industry obtains the least amount of credit from banks (Nevin *et al.,* 2019; Osabohien *et al.*, 2018a, Osabohien *et al.,* 2018b).

In the UK, Participant 6 reveal that a good measure of support which has been received in the practice of UA has been mostly from NGOs. He further stated that there has been occasional support from the local community, however in small measure compared to that which is received from NGOs. Some case studies conclude that UA is empowering but that a crucial variable, the NGO, has not been accounted for, as NGOs have been active and spent a great deal of time and money educating farmers and linking them to networks that may be of assistance (Olivier, 2018). Participant 9 pointed out that there is no massive interest from local authorities as the interest shown is majorly promoted as a means for community gathering and physical activity and not for food as very little thought is given to the issue of sustaining food security.

… "But I think in terms of the food situation and food security, there is very little thought given to it" (Participant 9).

Participant 7 also agreed that there is tremendous assistance from NGOs, which is supported by the government and local municipalities. He said it is crucial to emphasise, however, that "*this support is not available to the average day to day urban growers; the support is mainly available at business level".* This might be because NGOs are the most important players in

helping growers get around economic and political problems (Slater, 2001; Hovorka, 2005, 2006; Gallaher, 2017).

6.8. Upscaling Potential: Adapting Urban Agriculture Growing Systems

To tackle the issue of setting up an urban farm such as the excessive cost or purchase and importation of materials as well as limited access to funds, participants devised several ways of using and adapting locally sourced and available materials to set up their schemes. Reports from literature reveal several GS countries have demonstrated that simplified systems adapted to local materials and resources are feasible and profitable (Bradley & Marulanda, 2000). There are ongoing studies aimed at creating and constructing inexpensive aquaponics systems that employ locally accessible recyclable materials to reduce capital expenses (Obirikorang *et al.*, 2021). Due to the inaccessibility of materials for setting up their farms, urban farmers in Lagos were forced to look for alternative ways to replicate the urban growing system to ensure continuity in their businesses. Participants 18 explained that one of the driving mindsets of this traditional innovation is that it creates an alternative there by reducing the total reliance on importing the technology. This is similar to some aquaponics systems in Egypt where bulk containers are being used as fish culture and water treatments unit to minimise cost of importing materials for setting up (Obirikorang *et al.*, 2021). He further explained that it also creates an avenue to raise awareness as people are more inclined to show interest when familiar materials are used and when they see the extent of what can be achieved using locally available materials. An example is how participant 18 adapted a system from Grow box using "*a paint bucket as reservoir to ensure there is consistent water for the plants".*

Participant 18 also made mention of how grow media used in most hydroponic systems are being imported into the country however through waste repurposing from other agricultural sectors, farmers have now come up with their own mix of grow media. So essentially, farmers do not necessarily have to import grow media anymore as they have devised means to used waste products from other agricultural processes to formulate a grow medium.

"We have a special grow mix but we also added some organic components grow mix into all those things. So, you can just use that to plant…" (Participant 18, 2021)

Because the UA community is still very small, it can be challenging for farmers to locate and connect with other farms engaging in similar practises. A consultant (participant 13) who is also an urban farmer has built an app to address this issue. The software serves several functions, including fostering a community of urban farmers and bridging the knowledge gap

for novice farmers. The formation of this community has also enabled farmers to seek collective assistance from private organisations or foundations in the form of loans or grants for their community. Participant 13 explains that the most important thing is making information available and accessible to urban farmers.

"…there was no system in place or a community anywhere so there is no definite place to go access information for all farmers in different localities or community. A community helps to make things easier to give information but most of them are not online. Reason for the app… so when you come and enrol for a training or course, you get access to a database where you can see other people doing similar things like you." (Participant 13, 2021)

Other farmers have also come up with ways to reduce the heavy reliance on electricity in the country as availability of constant electricity is still a major problem in Nigeria, and it is not sustainable to power generators for these growing systems, so some farmers have developed systems that are zero dependent on power. According to a poll performed by NOI Polls Ltd in 2013, about 130 million Nigerians out of a total population of 160 million rely only on the standby generating set to meet their electricity needs (IseOlorunkanmi, 2014). The usage of generators by people resulted in significant operating costs for businesses (Emovon *et al.*, 2018). Some participants also reveal that have had to rely on solar power for their aquaponics systems while devising ways to make the business profitable. Participant 1 designed a hydroponics system where the plants are only given just enough water needed to avoid the need for electricity to recycle the water back to the reservoir.

"…the hydroponics system is zero dependent on power. Water is not recycled. However, we only give as much water that the plant can take per day. So, the reason for that is if we have to recycle the water, it means we would need electricity to take the water back to whatever the reservoir." (Participant 1, 2020)

Some of these designs have been found to have evolved more than the original designs thereby increasing efficiency and productivity as well as reducing growing time and stress for the farmers. In urban locations with limited space, research shows food security may be improved by adopting more efficient agricultural techniques, such as vertical farming (Khandaker & Kotzen, 2018). Participant 13 provided an example in which a customised container was designed to always make water available to plants and has been proven to shorten growth time.

"… we developed a special container where there is a water reservoir and plant are grown on top of it. So, this way you can actually fertigate the water. We then created a kind of declining system into the water that has contact with the soil and the soil at the top. So, there's always water for the plant. This reduces the growing time, especially for harvest because water is always available as long as there is water in the reservoir… so it doubles productivity and reduces growing time." (Participant 13, 2021).

In conclusion, the development and implementation of UA growing systems can be a sustainable solution to the challenge of producing fresh, locally grown food in urban areas. However, the cost of materials and limited access to funds can be significant barriers to scaling up these systems. Nevertheless, by adapting and using locally sourced and available materials, it is possible to create cost-effective and profitable urban farming schemes. Ongoing studies, such as those focused on creating inexpensive aquaponics systems, are essential in discovering and utilizing the most appropriate materials to reduce capital expenses. By leveraging these innovative techniques, we can create a more sustainable, resilient, and equitable food system for urban communities.

CHAPTER SEVEN: DISCUSSION

7.0. Introduction

This chapter presents a comprehensive analysis of the research findings in relation to the objectives of the study. It brings together the information gathered from both the GN and GS to assess the progress made in the field of UA and the potential for scaling up UA practices. The research focused primarily on Lagos, Nigeria, conducting an in-depth examination of the UA landscape in the city. Additionally, a national evaluation of the UK was carried out to gain insights and lessons that could be applicable to Lagos. By comparing these two contexts, the study aimed to draw meaningful conclusions and recommendations.

The findings of this research were rigorously analysed by considering the concepts discussed in earlier chapters, namely chapters four, five, and six. Through this analysis, the study shed light on various aspects of UA, including its impact on food security, the challenges and opportunities associated with scaling up UA practices, the role of policy tools and stakeholders' perceptions towards UA. By examining the data collected from both Lagos and the UK, the research uncovered significant insights and made substantial contributions to the existing knowledge on UA. The study explored the feasibility of scaling up UA to address the issue of food insecurity, with a specific focus on Lagos and the wider GS. It identified strategies, best practices, and potential barriers that need to be addressed to facilitate the successful implementation and expansion of UA in urban settings.

In conclusion, this research project has provided valuable insights into the potential of UA and its scalability in addressing food insecurity. The analysis of the findings from Lagos and the UK offers a comprehensive understanding of the challenges and opportunities associated with UA in different contexts. The research outcomes contribute to the existing knowledge base on UA and provide practical recommendations for policymakers, practitioners, and stakeholders involved in promoting sustainable food production and urban development.

Enabling UA in the GN and GS presents the potential to alleviate some food insecurity problems by boosting food supply through sustainable practices, especially in the cities. There are some similarities and some differences between UA in the GN and GS; the topic of food insecurity is discussed in diverse ways in urban areas (Opitz *et al.*, 2016). While urban food insecurity and UA have resurfaced in the GN, in the GS they were never really eradicated (Bryld, 2003). Poverty, food insecurity, and unemployment all increased in the urban populations as a result of the rapid, sometimes unchecked growth of some of these cities (FAO, 2007; Dubbeling *et al.*, 2010). Many individuals in GS nations rely on UA not as a lifestyle

choice but as a necessity, since they help them to not only survive but also to make a livelihood (Smit & Nasr, 1992; Hamilton *et al.,* 2014). Producing perishable goods near to city areas is essential since many people still do not have access to technology like distribution cold chains (Opitz *et al.,* 2015). Sustainable development initiatives for UA are often addressed and promoted (FAO, 2007; De Bon *et al.,* 2010) and are often labelled as a single entity in the GN (FAO, 2007; De Zeeuw *et al.,* 2011). According to Dubbeling *et al.,* (2010), UA practices in the GS is characterised by the following traits: it is both subsistence and market-oriented; it often occurs in polluted surroundings (De Bon *et al.,* 2010); health hazards are prevalent as a result of ineffective administration and the deterioration of natural resources (Hamilton *et al.,* 2014), it frequently lacks formal recognition (Bryld, 2003), and it usually involves recreational activities (Cabannes, 2006).

This study therefore examines UA activity in Lagos, Nigeria and the UK through the research objectives which are:

- Comparing existing methods of UA
- Identifying enabling policy tools
- Stakeholder perception of UA
- Barriers affecting UA.
- UA's impact on food security and upscaling

Chapter 2 identified various knowledge gaps that this study attempts to address. These knowledge gaps include:

- More research needed on the benefits and potential impact of UA on the community (Armstrong, 2000)
- Significant gap in knowledge on the perception and practice of UA (Colasanti, Hamm & Litjens, 2012)
- Inadequate research data on relationship between UA and food security (Tornaghi, 2014)
- Lack of data on comparisons of UA in different countries (DiDomenica, 2015)
- Inadequate literature, lack of scientific articles and not enough theories from GS countries (Cepic, 2017)
- Increased research data on UA, upscaling UA and incorporating it into the urban system (Wiedner *et al.,* 2019)

These knowledge gaps and the study's objectives will both be reflected on throughout this chapter.

7.1. Comparing Existing Methods of UA in the GN and GS

This study demonstrates that the size and methods of UA vary by region, which is affected by the availability of land and the ease of acquiring land, both of which are influenced by the land use legislation governing that region. Land acquisition is difficult in Lagos, which may be exacerbated by a lack of government support, resulting in the rise of small, privately held farms and informal farms, with the latter driving the UA industry. This result is consistent with Zeunert's (2018) assertion that UA practises vary globally. However, due to governmental restrictions that make it difficult to legally acquire land (Udoekanem *et al.,* 2014), this increases the time and money costs, including informal costs such as bribes or gifts (Ikejiofor, 2009), resulting in a small number of people legally acquiring land and developing the land they have. Due to this, the urban environment is filled with unlawful, unplanned, or prohibited developments (Egbu *et al.,* 2008; Ikejiofor, 2009). Adedeji and Ademiluyi (2009) argue that urban farmers in Lagos have difficulty acquiring property due to the city's land ownership structure, which renders urban farming an informal sector activity that is primarily accessible to low-income urban residents (Odudu, 2015). In the UK, practices are different in nature and often more formalised. Even though home gardens are common, urban farmers usually have access to community gardens and allotments provided by local councils and there seems to be a legal process to follow to get access to these spaces. As confirmed by Niala (2021), in several European countries and the UK, the local governments are mandated by law to grant allotments. This provides a bit of structure and support for intending urban farmers, a condition which is almost non-existent in Nigeria.

In this study, the UK served as an "established" case study, providing a well-documented and recognized framework for understanding UA practices. The choice to include the UK as a comparative reference allowed for insights into established policies, regulations, and successful strategies employed in an urban context. However, it is important to note that Lagos, Nigeria, was the primary focus of the study. Lagos, being a rapidly growing city with unique socio-economic and environmental characteristics, presented a compelling case for investigating the role and impact of UA in a developing urban setting. By focusing on Lagos, the study aimed to explore the specific challenges, opportunities, and dynamics surrounding UA within the context of a rapidly urbanizing city in Nigeria.

The study demonstrates that, due to the informal nature of urban farms in Lagos and the fact that fewer farmers own the land they cultivate, this affect the types of crops that can be grown, as most farmers choose to cultivate crops with a short life cycle due to the possibility of land seizure by landowners or the government. Consistent with the literature, UA is frequently land-

dependent, and land is typically out of reach for urban farmers because they cannot afford to purchase it or compete with other land uses (Veehuizen, 2006); hence, the need to cultivate rapidly maturing crops which is largely the production of fruits and vegetable crops (Mok *et al.,* 2014; Orsini *et al.,* 2013; Asadu *et al.,* 2016). Similarly, in the UK, this result indicates that crops with a short turnover time, such as vegetables and fruits, are often grown, however the reasons for cultivating such foods vary. This may be due to the UK focussing on promoting the consumption of healthy foods while still being concerned with environmental protection. This conclusion corroborates the findings of Scheelbeek *et al.,* (2021), who note that fruits and vegetables, along with other plant-based foods, are gaining growing attention as a potential key to developing ecologically sustainable food systems in urban areas. In addition, the health and environmental benefits of fruits and vegetables are now acknowledged in national dietary guidelines and other publications (Willet *et al.,* 2019).

In the GN, "guerrilla gardeners" is the term for those who grow food without permission from the authorities or a private landowner (McKay, 2011; Tornaghi, 2014). Although the practices are similar, the driver behind the action and lack of formal option is quite different in Lagos as the informal nature of the farms in the Lagos seems like the only avenue available to them. Most people associate the term "guerrilla gardening" with small-scale, backyard gardens but it can also be large-scale, unauthorised communal gardens and urban farms (Hardman & Larkham, 2014). While some North Americans and Europeans partake for the sake of trend, others do so for economic reasons in Africa and other GS nations (Adams *et al.,* 2014). Because of considerable disapproval at the local and national levels, most UA of this kind in Africa is informal (Chipungu *et al.,* 2015).

It is interesting to note from the results that most of these farmers in Nigeria farm on unoccupied land without obtaining official authorisation prior to using these vacant lands; this can be attributed to the ineffective laws for land use and lack of favourable policies supporting UA, as well as the overwhelming demand for diverse land uses activities due to the ever-growing population. This is even though land use regulation, which was created in part to reduce the excessive cost of land for agricultural activities in general, is seldom followed and has not been updated to accommodate UA. Most obstacles to the development of UA were associated with issues of regulation and government, as well as with the ownership and use of land (Castellarini, 2022). These findings are consistent with those of Odudu (2015), who discovered that there is no official land use zoning for activities in the informal sector, that UA as an informal sector activity is not regarded in the larger scheme of things and has no official land use zoning. FAO (2007) noted that policymakers typically maintained a naïve view of UA

as a fleeting phenomenon or a residue from the migration of rural farmers to the city that would disappear over time owing to, among other causes, the prevalent stance on urban planning and lack of access to research data.

The data indicates that there is a steady increase in the adoption of high-tech farms such as hydroponics and aquaponics, the UA sector is still predominantly comprised of garden or backyard farms, street farms, and community farms, all of which are subsistence in nature or located in the peri-urban area. According to previous studies, the expansion of farms into peri-urban areas is mostly the result of a deficient institutional planning system (Cobbinah & Amoako, 2012; Andreasen *et al.*, 2017). In addition, farmers are always hesitant to seek official sources of information from government organisations, since they perceive UA to be unrecognised and informal, with no classification. In the UK, on the other hand, most farmers who live in cities also have farms there, either in the form of allotments or community gardens. This could be because they have better access to land or green spaces near where they live, which have usually been planned for and built into the area. Literature shows that in recent years, the demand for local authority-rented land in the form of allotment plots in the UK has increased (Campbell & Campbell, 2011) and reached a new level of popularity in recent years, coinciding with a rise in environmental and health consciousness (Speak *et al.*, 2015; Niala, 2021).

7.2. Enabling Policy Tools

One of the goals of the study was to identify policy tools that enable UA in both regions. Contrary to expectations, the finding suggests that the Nigerian government now encourages participation in UA, particularly among youth, to reduce food insecurity in the country; however, these efforts may be hampered by the high rate of poverty and the country's major electricity problem, as most innovative UA methods rely on electricity. This may appear to be implausible, but the study demonstrates how the government became interested in UA after individuals with urban farms in Nigeria gained international recognition for their innovative UA (hydroponics) farms. These farms gained recognition in particular for their capacity to operate such a large farm or business without total reliance on electricity by devising ways to avoid this and by using local materials.

The research highlights many measures undertaken by the government to give assistance for UA, such as the provision of inputs at discounted rates, training programmes for urban farmers, demarcated land specifically dedicated for urban farming, and the provision of year-round off takers, to name a few. The most recent launch was the formation of "Operation Feed Yourself",

a project that encourages citizens to have urban farms and home gardens. A recent global analysis study by Filippini *et al.,* (2019) supports this finding and showed that cities are developing urban food policies and measures that are being added to cities' policy agendas to make sure people have enough food. Merino *et al.,* (2021) also shows how some cities, mostly in the GN, were able to create and put into place comprehensive policies on food security in cities. So, the formation of the programme "Operation Feed Yourself" shows that there might be prospects for UA in Nigeria. Furthermore, to combat corruption among its workers, who occasionally misappropriate government funds, the results describe how the Nigerian government has taken notable steps, such as giving farmers 30 percent of their start-up costs and 70 percent of the necessary equipment.

Findings also emphasise that some aid is available from NGOs in Nigeria in the form of assistance with exotic seed imports, guidance in establishing a business, and product promotion. While it is important that farmers have easy access to the materials, they need to set up their farms, one begins to wonder if the importation of these materials is more detrimental to the environment than beneficial. Because UA has the potential to reduce carbon emissions by reducing food miles is one of its driving forces. Langemeyer *et al.,* (2021) believes that while sustainability is at the forefront of many cities' development agendas, the hidden complexities of urban food supply and the teleconnections (Seto *et al.,* 2012) of environmental externalities that food imports embody are seldom considered. On the other hand, the study reveals that there is a bit of support from NGOs in the UK in terms of education and awareness, but the government shows little interest. This may be because UA is pushed as a way of social bonding and physical activity more than for food sustainability in the UK. The analysis reveals that most policies appear to focus on agriculture in general, and while there have been recent discussions about how to include UA into policy design, nothing is definite currently.

In addition, the data suggest that the partnership between the Nigerian government and private organisations is a significant discovery; they reach out to owners of abandoned property in urban areas to compensate them and designate the land for agricultural use. This action is identical to what is implemented in other places, like Sao Paulo, where vacant land is made available to individuals interested in vegetable cultivation (FAO & Agriculture Research for Development [CIRAD], 2021). Literature demonstrates that urban food security necessitates integrated governance and the coordinated efforts of institutions and stakeholders from numerous economic sectors, such as agriculture, environment, health, and education (Mbow *et al.,* 2019). It is commonly believed that it is the responsibility of numerous government

agencies, some of which may not be effective at implementing clear regulations or keeping it under control, and some of which may have conflicting goals (Smits, 2018) which is one of the challenges of managing food security in cities (Merino *et al.*, 2021).

7.3. Stakeholder Perception

It is important to understand the viewpoints of stakeholders on UA, and it came as a surprise to discover from the research that young people are more interested in UA, contrary to previous studies that indicated the opposite. A study by Igbolekwu *et al.*, (2020) supports this finding and he demonstrates that young people are more interested in UA in recent years. Abdulaal (2021) corroborates this observation, arguing that young Africans are re-entering agriculture in general and UA since the industry is evolving especially as there are new and exciting ways to practise UA. This may also be owing to their perception that it is less stressful than traditional farming methods, that it can be combined with other personal activities, and, most importantly, that it is not affected by inclement weather, leading in a more efficient use of time and space. However, this increased interest in UA could present a threat, as many young people may leave rural areas for urban centres as a result. Despite the goals of the Nigerian government, the UN, and other international organisations to reduce rural to urban migration, not all of the migration of young Nigerians can be attributed to UA. In fact, instability in rural areas due to a surge of kidnappings, crop devastation, and a generally hazardous environment may be the primary cause of migration.

In this study, urban farmers in Nigeria perceive UA as a means of educating the general population about the usefulness of innovative UA and how to make healthy food choices. Often, UA is viewed as a promoter of new forms of social involvement, giving avenue for challenging assumptions, communicating knowledge, and eliminating social barriers (Corcoran & Kettle, 2015). In addition, the study shows that urban farmers believe that UA can contribute significantly to urban food production, as evidenced in certain regions of the GN and GS. For example, in Cuba, UA generates around 50 percent of the island's fresh food on an area of 56,000 hectares (Altieri & Nicholls, 2018). Also, in cities with dense populations such as Cairo, Dhaka, Singapore, and Tokyo, rooftop gardening and vertical farming are becoming increasingly popular (Pengue, 2022).

Some affluent urban homeowners in Lagos, Nigeria regard UA to beautify their homes and as a status symbol and bragging right because they were the first in the neighbourhood to implement the innovative method. However, this has shown to be an effective approach of indirectly promoting UA, as it piques people's curiosity in these techniques. Another point to

note is that, based on their own religious and cultural views, some residents believe that food produced by new methods of UA is unhealthy as it is not grown using soil and according to another school of thought, it would cause urban farmers to lose their jobs and leave the industry. Some urban residents in the UK argue that UA may not be required because food banks provide faster access to food. Since it is believed that the UK has a good level of food security, therefore they feel there is no need to promote or support UA as a means of increasing food security. This impression effects how communities view UA, which may be a reasonable explanation for why they might be less receptive to learning or implementing novel UA approaches.

7.4. Barriers affecting Urban Agriculture

This research indicates that high start-up costs, restricted access to materials and land, and a high poverty rate are the most significant obstacles to scaling up UA in Nigeria. It is important to highlight that limiting access to inputs poses a significant difficulty because most UA materials required for establishing and operating a successful firm are imported. These difficulties have been demonstrated numerous times in earlier publications (Amponsah *et al.,* 2015; Ayambire *et al.,* 2019; Ouedraogo *et al.,* 2019; Bonye *et al.,* 2021). It is important to think about how this data presents the possibility that UA, which is intended to minimise supply chain utilisation and contribute to lower carbon emissions, may not necessarily demonstrate this, given the reliance on imports.

Findings indicate Nigeria lacks an environment conducive for the growth of UA; this might be due to the promotion of local and indigenous products, the import embargo placed by the government also restricted the importation of materials required for UA. Although this measure may be beneficial for the environment, it has also prompted local farmers to seek alternate methods and use locally available materials as substitutes. As an alternative to entire reliance on imports, this study illustrates many methods through which farmers have adapted and modified locally sourced resources to plan and construct their farms. Unanswered by the study is whether there is sufficient awareness of this and whether it can become the favoured strategy eventually.

A noteworthy finding is that in Nigeria, UA is not pushed as a means of lowering carbon emissions, but rather because of its high productivity and effective use of small spaces. An explanation for this could be the country's high poverty rate, in contrast to the GN, where food security seems to have a steadier outlook (Agriculture and Horticulture Development Board, [AHDB], 2022). To further support the promotion of UA as a means of food provision, it is quite interesting to note in this study that contamination was not perceived as a problem, despite

the fact that other residents and farmers who grow food within the home and abandoned spaces within the city are aware of the potential contamination issues pertaining to the use of the soil in the city but do not appear concerned as to whether or not this is a significant risk. This might be because the aftermath or effect of consuming such food from polluted soil might not be immediate, so this influences the level of risk they give to the use of the soil. They also believe that the soil may be contaminated and pose a concern, but they are unaware of how to quantify the risk and what to do about it. Contrary to what prior studies suggests about contamination being a significant barrier (Ogunkunle *et al.*, 2015, 2016; Anyanwu *et al.*, 2018; Edogbo *et al.*, 2020), practitioners in Nigeria continue to cultivate food on potentially polluted soils, indicating that contamination has not prevented people from cultivating food. In addition, most farmers using innovative methods such as hydroponics state that they do not need soil to grow their food, as contamination on the farm was caused by other reasons, such as visitors flocking to the farm to see the new ways. For this this reason, it can be considered that modern UA techniques offer a solution to urban soil pollution problems. The study further reveals how waste from other UA farms is reclaimed, used by other industries, and reintroduced into the UA system without harming the environment while earning a supplementary income. This was cited as one of the strategies to reduce waste pollution in urban areas and is supported by previous studies as well (Veenhuizen, 2006; Siegner *et al.*, 2018).

Due to the number of people living below the poverty line and the poverty rate in Nigeria, findings show that many individuals eat for survival and calories rather than nutritious value. This is a significant problem for UA because most of its produce consists of vegetables and fruits, which the typical consumer may not find sufficient. As healthy eating is emphasised in GN countries (NHS, 2019; Wiliet *et al.*, 2019), educating the public about it is one strategy for addressing the problem which might change one's thinking and can also help ignite interest in UA especially in GS countries.

Even though the study demonstrates that the government is attempting to encourage and support more individuals to start their own urban farms, the support remains insufficient, and interest remains low. However, until UA is integrated into urban planning, it cannot be regarded seriously. Whether it is a national, provincial, or local policy, the goal of UA policy is to create an integrated framework and clear implementation to help UA (Menyuka *et al.*, 2020). Additionally, creating and enforcing helpful policies is a way to demonstrate complete support. One major issue the finding reveal is the lack of zeal on the part of the new leadership to ensure policy continuity. Notable is the fact that policy incentives are occasionally misappropriated by government employees, preventing recipients from obtaining payments. For example, the

Anchor Borrowers' Program, designed to provide financial support to smallholder farmers, has faced challenges with misappropriation. Some farmers have reported difficulties in accessing the funds and inputs allocated to them, as corrupt practices within the system hinder the proper disbursement of resources. Similarly, the Growth Enhancement Support Scheme (GESS), aimed at providing subsidized inputs to farmers, has encountered cases where government officials divert or sell the inputs meant for farmers, depriving them of the intended benefits. These instances of misappropriation underscore the need for transparency, accountability, and effective monitoring mechanisms to ensure that agricultural policy incentives reach their intended beneficiaries in Nigeria.

Even though UA require less space, land is still required and remains a significant barrier due to the absence of policies designed expressly for UA. This is comparable to the situation in the UK, where the majority of policies support agriculture in general, and findings indicate that it is difficult to classify UA since most of its qualities overlap and can be placed in distinct categories, making funding difficult and inaccessible. Hunold *et al.*, (2017) shared a similar point of view, saying that most urban farming policies do not include small-scale farmers in cities; Instead, they tend to focus on commercial farmers who can grow crops and sell them on the market. Another problem that was highlighted is how policy grant procedures can be cumbersome and difficult for the typical farmer to navigate. This might be a particular issue for farmers who are not tech savvy.

7.5. UA's Impact on Food Security and Potential to Upscale

The study reveals that there is an increase in rural-to-urban migration; while this is not a new phenomenon, the reason for it is, as most migrants are farmers fleeing cases of insecurity in the rural areas and the need to continue to feed their families after moving to the cities hence UA. Urban farmers and youth, on the other hand, are influenced by the need to increase food production to alleviate food insecurity in the nation. As previously indicated, the motivation for both groups are primarily economic rather than environmental or health related. Findings indicate that there is a strong belief that UA can have a significant impact on food security, but it does not ignore significant obstacles that have a significant impact on its success, such as government support with incentives and funding, as well as increased awareness of its significance and potential to contribute to households.

Figure 25: Setting up a hydroponic farm, Lagos (Participant 10)

Despite this strong belief, it is possible to assert that UA has the capacity to support individual households, either by increasing access to a wider variety of nutritious foods or by creating additional income for households; thus, it is possible to argue that UA can contribute to the sustainability of individual households with little or no government support. This finding is similar to what was perceived in the UK as well and is supported by past studies (Attah, 2012; Alimba *et al.*, 2018; Binns & Nel, 2019).

The finding indicates that improved food accessibility led to an increase in food sufficiency, market proximity for both farmers and consumers, a reduction in food miles, and easy farm monitoring, all of which decreased the scarcity of fresh food and increased food diversity. The data also indicate that UA can ensure the predictability of produce with the use of modern technologies, hence facilitating the delivery of consistent, safe, and healthy foods to cities. Despite all these obstacles, scaling up UA is difficult since most farmers lack the skills necessary to build and manage a business structure. Moreover, there are typically price fluctuations of food, with some farmers selling their produce for greater market prices than others, which may affect the rate at which the produce is sold; this is primarily due to the amount of capital required to launch their business.

7.6. Similarities and Differences

In this study, several similarities and differences are visible (see Table 3). These were explored in preceding parts, but this section will briefly highlight the differences and similarities.

UK	Lagos
Urban farmers live and farm in the cities	Urban farmers live in the cities but have farms in the peri-urban areas
Farm types are mostly community spaces and allotment farms	Farm types are mostly vacant, abandoned land spaces
Urban farms are mostly cultivated with permission and legal access to land	Urban farms are cultivated unlawfully with no ownership or legal rights to farm
UA is viewed as a means of social cohesion and physical activity or leisure and to reduce carbon emissions (environmental)	UA is viewed as a means of increasing access to food and for its high productivity (economic)
Inability to fit UA into a category which makes access to grants and funding difficult	Access to funding is difficult due to inadequate information for grants as well as the cumbersome and tedious process
Growth of fruits and vegetables due to the increased awareness on nutritional eating	Growth of fruits and vegetables due to the use of unowned available land, hence the need for foods that mature faster
People don't see UA as a way to get food right away because there are food banks and the UK is food secure	UA is seen as a potential means that can help to achieve food security and household sustainability

Table 3: Image showing differences in UA in the UK and Lagos, Nigeria

Similarities in this study include age, specific policies for UA, and the fact that the government is not doing enough to help with UA, among other things. The study shows that young people are the most involved in UA in Lagos. This is similar to what is happening in the UK, where the government recently set up a programme that pays older farmers to retire to get younger people to farm in a more sustainable way. In both the GN and the GS, there does not seem to be a policy made just for UA, and both show that urban farms are made up of small farms that grow mostly fruits and vegetables. Also, in both places, it was concluded that people can grow their own food without help from the government to make their homes sustainable, since they will only do this on a small scale.

7.7. Key Contributions to Knowledge

The present study seeks to address several gaps and provides significant contributions as a result. Based on the identified research gaps described in Chapter 2, the following contributions to research are identified.

1. Young people or youth are among the driving forces for UA in Lagos, Nigeria.

2. The core challenges affecting UA such as unsecure land access, inadequate government funding and support as well as lack of favourable policies persists.

3. Despite government intervention and a rise in youth engagement in UA, the informal sector continues to dominate UA in Nigeria.

4. UA is typically promoted, particularly in GN countries, as capable of lowering supply chain utilisation and, thus, carbon emissions; however, in the GS, the substantial reliance on imports may render this difficult.

5. The gender disparity in access to land in traditional agriculture is evident, but this study demonstrates that UA can minimise this disparity because more women can now access urban spaces through the practice.

6. The emphasis on UA in the GN and GS is different. In Nigeria, the promotion of UA is more economically driven (food security and high productivity) than in the UK, where it is more environmentally driven (reduction of carbon emissions)

7. There is awareness of the possible risks associated with soil contamination in Nigeria, but these risks are insufficient to prevent farming

8. In Nigeria, people tend to feed for calories rather than nutritious benefit probably because of the poverty situation in the country.

CHAPTER EIGHT: CONCLUSION

8.0. Introduction

In conclusion, this research has achieved the goals stated at the beginning of the document by conducting a complete review of the relevant literature to identify areas of interest and knowledge gaps, which were described in chapter 2. Through interviews and the online survey, the first objective of gaining an understanding of UA practises in the GS was accomplished, as evidenced in Chapters 4, 5, and 6. This chapter delves into assumptions related to UA in both locations, participant experiences, and key themes generated by the research to position them within a growing body of literature. The research compares the various existing methods of UA in both locations and reveals that in Nigeria, the practice is still predominantly driven by the informal sector, leading people to rely on unauthorized land for farming. This is mainly due to the difficulty in accessing land in urban areas, with no policies or official zoning for UA. In contrast, in the GN, access to a variety of community spaces and allotment farms makes acquiring land easier. The lack of access to land in Lagos also affects the type of crops grown, which are typically short-maturity crops, such as fruits and vegetables. Similarly, fruits and vegetables are the most common crops grown on urban farms in the UK, but for different reasons, such as the promotion of healthy and nutritious food consumption.

Despite the Nigerian government's endorsement of UA and its efforts to provide incentives, the prevalence of poverty in the country hinders the growth of UA. The government has also launched urban food programs aimed at encouraging individuals and households to participate in UA, but the most successful urban farmers in the country have achieved recognition without government support. In Lagos state, the government provides urban farmers with seeds, incentives, and some funding opportunities; however, much of this assistance may be lost to intermediaries who demand a portion of the proceeds. Additionally, the Lagos state government has set aside secure locations where urban farmers can establish their greenhouses. In Lagos, UA is primarily motivated by its high productivity, whereas other important aspects such as reducing carbon emissions and promoting access to nutritious food are often overlooked. On the other hand, in GN countries, UA is often promoted for its potential to improve social cohesiveness and physical activity. In contrast, in the GS, the focus is on ensuring food sustainability.

The study provides new insights into the perspectives of Nigerian stakeholders, who view young people as the key drivers of UA in Nigeria, which contradicts earlier research. The findings also demonstrate how young people are using UA to educate the public on healthy

eating habits and raise awareness of the potential of UA to address the nation's food insecurity. In contrast, in the UK, there is a perception that UA may not be necessary or practical due to the existence of food banks and the assumption that the country is already food secure. This may account for the less enthusiastic attitude towards adopting innovative UA practices.

There are several challenges hindering the expansion of UA in Nigeria, such as high initial investment costs, limited access to land and essential resources, and the requirement to import most UA materials, which could have a detrimental environmental impact. However, to boost the economy, the Nigerian government recently imposed restrictions on the importation of some food products, including certain UA materials. While this may pose a challenge in the short term, it has encouraged urban farmers to develop creative solutions by adapting locally available resources and developing innovative UA methods. Despite the awareness of soil contamination in urban areas, farmers continue to grow crops, possibly due to a lack of knowledge about the soil testing process and a lack of immediate risks associated with contaminated soil usage.

To begin with, in the GN, the main challenge seems to be related to the classification of UA, as its varied approaches often make it difficult to fit into a specific category, hindering access to funding opportunities. In Nigeria, the youth, motivated by economic concerns and the need to enhance food production, are the driving force behind UA. This is also fuelled by rural insecurity and rural-to-urban migration. While UA has demonstrated the potential to achieve household sustainability, its contribution to food security may take some time and require collaboration among all stakeholders. It is essential to note that UA has the potential to enhance predictability in crop yields, but its success will depend on the cooperation of all parties involved.

8.1. Three Main Contributions to Knowledge

- The existing literature on UA in Nigeria suggests that young people are not interested in this practice. However, contrary to this belief, our research has found that young people are actively engaged in and are the driving force behind UA initiatives in Nigeria. This newfound interest can be attributed to the significant increase in rural to urban migration, as well as the youth's growing awareness of and desire to address the food insecurity challenges facing the country.
- The Nigerian government has also demonstrated an interest in supporting UA by providing incentives and designing initiatives aimed at encouraging urban residents to

adopt new practices. This is a positive development that can further promote the growth and sustainability of UA initiatives in Nigeria.

- Although there is an awareness of the potential risks associated with soil contamination in Nigeria, such as heavy metals and other pollutants, these risks are not sufficient to deter farming activities. This is due to the high rate of poverty and the pressing need to ensure food security, which take precedence over the risks associated with consuming contaminated food. Furthermore, the impacts of consuming contaminated food may not be immediately apparent or physically observable.

Overall, this research suggests that there is a growing interest in and support for UA initiatives in Nigeria, particularly among young people, despite some potential risks and challenges associated with this practice. These findings provide valuable insights into the current state of UA in Nigeria and can inform future policy and practice aimed at promoting the growth and sustainability of this sector.

8.2. Limitations of the Study

The limitations of the results reported in this thesis can be grouped into several categories:

- **Time and Covid-related limitations:** The research project was subject to time limitations imposed by the PhD program, and the COVID-19 pandemic further restricted physical movement to collect data. As a result, the results presented in this thesis can only represent a snapshot of the actions occurring during the period of data collection, and additional advances that have occurred since then are not captured. Additionally, the research's time restrictions prevented soil testing of certain urban farms, which is a crucial topic of interest.
- **Sampling limitations:** Due to the disparity in the number of responses, comparisons between the two places (GS and GN) may have been difficult. However, given the lack of study data in this subject, especially in the GS, the focus was on the GS. This allowed the chance to investigate and evaluate the effects of UA and motivations at two places and with existing literature. While an intriguing comparison could be made through the investigation of a UA project from its inception to its scaling up, the research study provided a major comparison between the various ways and obstacles associated with establishing UA in the GS and the GN.

- **Methodological limitations:** The combination of numerous research methods, including observations, semi-structured interviews, and a qualitative online survey, was intended to eliminate researcher bias. However, the travel restrictions imposed by the epidemic reduced the number of observations that could be conducted in the GS. In addition, an online qualitative survey was conducted as an alternative to focus groups, and the number of replies yielded a variety of ideas and insights that were expanded upon in the interviews. The limitations of these methods include potential bias introduced by self-reported data and limited depth of understanding that can be obtained. Furthermore, while online surveys offer a convenient and cost-effective way to gather data, they can exclude certain segments of the population, such as older people who may not have access to or be comfortable with technology. As a result, the sample of respondents may not be fully representative of the population being studied. It is therefore important to consider this limitation and ensure that other methods, such as phone or in-person interviews, are also used to capture a more diverse range of perspectives.
- **Access limitations:** Although gaining access to some stakeholders, such as urban farmers, urban dwellers, and consumers, was straightforward in the GS, gaining access to others, such as local government, urban planners, and other government departments, was highly challenging and this issue was encountered in the GN as well. There were occasions in which scheduled interviews were subsequently cancelled due to multiple delays and changes in circumstances, hampering the research's ability to provide a more robust perspective of this group.
- **Limited generalizability:** The use of non-random sampling techniques and a small sample size limits the generalizability of the study's findings. The sample may not be representative of the larger population, making it difficult to apply the study's results to other contexts or populations, the comparison between Lagos and the UK. While this comparison provides some interesting insights, it may have been more effective to compare Lagos with a more similar city in terms of size, demographics, and economic development. For example, a comparison between Lagos and Manchester or another city in the UK may have provided more nuanced and relevant findings. This is because cities in different countries can have vastly different socio-economic and political contexts, which can impact the viability and effectiveness of UA practices.

- **Potential bias:** The use of self-reported data through online surveys and telephone interviews can introduce bias into the study's results. Participants may provide socially desirable responses or may not accurately recall or report their experiences or perspectives.

Overall, while the use of participant observation, online qualitative survey, and telephone interviews can provide valuable insights into the research topic, it is essential to acknowledge and consider the limitations of these methods when interpreting the study's results. Future research may benefit from incorporating multiple methods and approaches to address these limitations and provide a more comprehensive understanding of the research topic.

In conclusion, these limitations should be acknowledged when interpreting the study's results. Alternative research methods, such as in-person or phone interviews, can be employed to capture a more diverse range of perspectives. Additionally, when conducting cross-country comparisons, it is important to consider the unique contexts and socio-economic factors of each location to ensure that the findings are relevant and applicable. Despite these limitations, the study provides valuable insights into the challenges and opportunities associated with UA in Nigeria and can serve as a basis for future research in this area.

8.3. Recommendations

To promote the uptake and sustainability of UA, a number of recommendations have been developed based on research findings. These recommendations are aimed at policymakers and urban planners, and are grouped into several categories:

1. Training, Resources, and Business Support: To support urban farmers and young people interested in UA, it is recommended to enhance training opportunities, provide access to resources (inputs), and offer business support. This should include assistance during the establishment and expansion of farms to ensure continuity.
2. Land Access: Providing safe, protected, and lawfully owned land in urban areas is important to facilitate and encourage the uptake of UA. This will increase access to land for farming activities and promote the integration of agriculture into urban planning.
3. Education and Awareness: Educating communities on the significance of healthy eating and the benefit of UA is important to create awareness and promote uptake of UA in urban areas. This should emphasize how UA can address gaps in access to healthy food.
4. Regulation and Policy Reform: Creating regulations that promote easy access to land and farming in cities and implementing policies to support and include UA in planning, is important to increase the availability of land for farming activities and promote the

integration of agriculture into urban planning. A comprehensive policy reform to encourage UA and its incorporation into zoning is also recommended.

5. Categorisation of UA Methods: Developing a clear categorisation of UA methods and approaches that demonstrates the scope and complexities of each UA practice is important to help policymakers make informed decisions about which approaches to adopt in specific urban contexts.
6. Information and Support: Establishing channels, in collaboration with private organizations, to provide aspiring urban farmers with credible information on how to access grants and incentives is important to promote the uptake of UA by providing the necessary information and support to farmers.
7. Use of Local Materials: Encouraging the use of local materials for UA set up to minimize overall costs, boost the economy by minimizing imports, and reduce the environmental impact of carbon emissions is important to make UA more sustainable and promote its adoption in urban areas.
8. Urban Food Policy Programs: Facilitating more urban food policy programs to support and boost UA participation is important to provide more opportunities for farmers to engage in UA and promote its sustainability.
9. Soil Management: Ensuring that farmers are aware of the impact of soil pollution on food production, and that sufficient soil testing facilities and procedures are in place, is important to enable farmers to make informed decisions about soil management and prevent contamination of food produced through UA.
10. Waste Management: Encouraging waste repurposing with UA and providing ways to facilitate the process of waste reduction in urban areas is important to promote the adoption of sustainable waste management practices and create opportunities for farmers to use waste as a resource.
11. Awareness of Benefits: Creating awareness of UA as a tool for achieving food security in urban areas, its significance in reducing carbon emissions, and its potential to reduce the gender disparity bias in agriculture and promote healthy living is important to promote the uptake of UA by creating awareness of its benefits and potential impact on urban communities.

8.4. Further work

The section discusses the need for further research in several areas related to UA in Nigeria. Firstly, it identifies the government's critical role in maintaining food security, particularly given the high level of poverty in the country. As such, the study suggests that additional research focusing on the government's perspective can shed more light on the issues encountered by this group. The section then points out the need for further research on the effects of rural-to-urban migration among farming households in Nigeria. The study acknowledges the apparent reasons for this migration and the need for UA among relocated farmers in cities. However, more research is necessary to determine the impacts of this migration on the households and how it affects their food security and income.

Moreover, the section highlights the importance of addressing the underlying causes of certain behaviours related to UA and healthy eating in Nigeria. It is necessary to increase understanding about innovative UA techniques and the significance of nutritious foods to improve the adoption and sustainability of UA. Finally, the section recommends further research on the contribution of UA to households' food security and income. This will help to determine the extent to which UA can combat food poverty in Nigeria and promote household income. Overall, the section emphasizes the need for further research to address the various challenges and opportunities related to UA in Nigeria. By exploring these research areas, policymakers and stakeholders can better understand the impacts and potential of UA and develop effective strategies to promote its adoption and sustainability.

APPENDIX IA: Ethical Approval

University of Salford MANCHESTER

Research, Innovation and Academic Engagement Ethical Approval Panel

Doctoral & Research Support
Research and Knowledge Exchange,
Room 827, Maxwell Building
University of Salford
Manchester
M5 4WT

T +44(0)161 295 5278

www.salford.ac.uk/

17 July 2019

Tayo Ajisope

Dear Tayo

RE: ETHICS APPLICATION STR1819-53 – Enabling Urban Agriculture in the Global North and South: A Comparative Study of the UK and Nigeria

Based on the information you provided, I am pleased to inform you that your application STR1819-53 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

Dr Devi Prasad Tumula
Deputy Chair of the Science & Technology Research Ethics Panel

Appendix IB: Amended Ethics Application

University of Salford MANCHESTER

Amendment Notification Form

Title of Project:		
Enabling Urban Agriculture in the Global North and South: A Comparative Study of the UK and Nigeria		
Name of Lead Applicant:	**School:**	
Tayo Ajisope	Environment and Life Sciences	
Are you the original Principal Investigator (PI) for this study?		Yes
If you have selected 'NO', please explain why you are applying for the amendment:		
Date original approval obtained:	**Reference No:**	**Externally funded project?**
17/07/2019	STR1819-53	No
Please outline the proposed changes to the project. *NB. If the changes require any amendments to the PIS, Consent Form(s) or recruitment material, then please submit these with this form highlighting where the changes have been made:*		
Project design: Online/virtual interviews and surveys		
Please say whether the proposed changes present any new ethical issues or changes to ethical issues that were identified in the original ethics review, and provide details of how these will be addressed:		
The proposed changes do not present any new ethical issues that was previously identified as research data will now be collected remotely		

Amendment Approved:	**YES**	***Date of Approval:***	**20/10/2020**

Chair's Signature:

Once completed you should submit this form and any additional documentation to the relevant Ethics Panel that reviewed the original proposal:

School of Health & Society	Health-ResearchEthics@Salford.ac.uk
School of Health Sciences	
School of Built Environment	
School of Environment & Life Sciences	S&T-ResearchEthics@salford.ac.uk
School of Computing Science and Engineering	
Salford Business School	SBS-ResearchEthics@salford.ac.uk
School of Arts & Media	A&M-ResearchEthics@salford.ac.uk

Version 3.0 – Nov 2018

APPENDIX II: Interview Questions

- Tell me about your involvement or role in urban agriculture
- As a stakeholder in urban agriculture, do you think the types of urban agriculture practiced in Nigeria/UK can directly impact food security?
- Can you mention and explain some land use policies that supports urban agriculture?
- Do you think that there are policy tools available to enhance urban agriculture practice in Nigeria/UK?
- Is there support from government or NGOs in encouraging urban agriculture practice?
- What is your perception of urban agriculture in enhancing food sustainability?
- Can you highlight some of the barriers you have faced during your urban agriculture practice
- What do you think about the quality of urban soil and contamination issues in the city?
- Do you think urban agriculture has the capacity to achieve individual consumption needs?
- Do you think there is a future for urban agriculture?

APPENDIX III: Participant Information and Consent Form

Participant information sheet

Research Title – Enabling Urban Agriculture (UA) in the Global North and South: A comparative Study of the UK and Nigeria

I would like to invite you to take part in a research study. Before you decide, you need to understand why the research is being done and what it involves for you. Please take time to read the following information carefully. Ask questions if more clarity is needed or if you would like more information.

This study is mainly for educational purposes as it is a partial fulfilment of the requirements for the degree of study (PhD Environmental Studies) at University of Salford, United Kingdom. Due to the rising population in major cities all over the world and an estimated 10 billion people by the year 2050, there arose the need for production of food in the urban areas to supplement the food produced from the rural areas. One of the ways to do this is by engaging in Urban Agriculture (UA) however this practice is constrained by policy changes, urban planning, and land availability.

This study plans to develop a framework that might serve as a guide for policy makers in the design of relevant policies that will aid UA practice in the Global North and South context. You have been chosen to partake in this study because you are one of the stakeholders in UA and your view matters based on your experience and challenges you might be facing with city food growing. With your permission, the interview will be audio recorded to facilitate the collection of information, and later transcribed for analysis. All information will be kept strictly confidential with your name and other details removed so that you cannot be recognised. Electronic data will be stored on a computer protected by a password known only by the researcher and hard paper/taped data will be stored in a locked cabinet within a locked office accessed only by the researcher.

There are no known or anticipated risks to you as a participant in this study. In addition, taking part in this interview is voluntary. I will then ask you to sign an interview consent form. You are free to withdraw at any time, without giving a reason. If you withdraw from the study, all information, and data (including the audio-recorded interviews) will be destroyed, and your name removed from all the study files. I would like to assure you that this study has received ethics clearance through the Research Ethics Review Board at University of Salford, United Kingdom.

The final decision about participation is yours however, information obtained from this study might help to improve sustainability of food among the urban poor. Thank you in advance for your assistance in this project.

If you have any concerns about this study, please contact me at (+44 (0)7424594078) or by e-mail at (t.a.ajisope@edu.salford.ac.uk).

Participant Consent Form

Research Title – Enabling Urban Agriculture in the Global North and South: A comparative Study of the UK and Nigeria

Please tick the appropriate boxes	**Yes**	**No**
I have read and understood the project information sheet for the above study	☐	☐
I have been given the opportunity to ask questions (face to face, via telephone or e-mail)	☐	☐
I agree to take part in the interview.	☐	☐
I agree to the interview being tape recorded	☐	☐
I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason.	☐	☐
I understand my personal details will not be revealed to people outside the project.	☐	☐
I understand that my words may be quoted in publications, reports, webpages and other research outputs.	☐	☐

_____ _____ _____

Name of participant *Signature* *Date*

Contact Details:
Researcher: Tayo Ajisope
Email: t.a.ajisope@pgrs.salford.ac.uk
Address: 110, Peel Building, University of Salford, Manchester M5 4WT
Tel: +44 (0) 7424594078

Supervisors:
Dr Mike Hardman
Email: M.Hardman@salford.ac.uk
Address: 033, Peel Building, University of Salford, Manchester M5 4WT
Tel: +44 (0) 0161 295 2201

Andrew Clark
Email: A.P.Clark@salford.ac.uk
Address: Room G36, Peel Building, University of Salford, Salford M5 4WT
Tel: +44 (0) 0161 295 708

APPENDIX IV: Online Qualitative Survey Questions

Online Survey Questions (Nigeria)

1. Privacy Notice: Please take time to read the following information carefully. This study is mainly for educational purposes as it is a partial fulfilment of the requirements for the degree of study (PhD Environmental Studies) at University of Salford, United Kingdom. This study plans to develop a framework that might serve as a guide for policy makers in the design of relevant policies that will aid Urban Agriculture practice in the Global North and South. You have been chosen to partake in this study because you are one of the stakeholders in Urban Agriculture and your view matters based on your experience and the challenges you might be facing with city food growing. All information will be kept strictly confidential with your details removed so that you cannot be recognized. Electronic data will be stored on a computer protected by a password known only by the researcher and hard paper will be stored in a locked cabinet within locked office accessed only by the researcher. There are no known or anticipated risks to you as a participant in this study. In addition, taking part in this interview is voluntary. You are free to withdraw at any time, without giving a reason. If you withdraw from the study, all information and data will be destroyed. There is no compensation for participation in this study. However, information obtained from this study might help to improve sustainability of food among the urban poor. Thank you in advance for your assistance in this project. I consent to participate in this survey.

- Yes
- No

2. What category below includes your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 55 and over
- Prefer not to say

3. What is your gender?

- Male
- Female
- Prefer not to say

4. What is your marital status?

- Single
- Married
- Civil partnered
- Divorced
- Widowed
- Prefer not to say

5a. Which zone best describes where you are?

- North Central
- North East
- North West
- South East
- South South
- South West

5b. What state?

6. Do you live in an urban area?

- Yes
- No

7. Where do you grow your food?
- Within the city
- Areas surrounding the city

8. What type of crop do you grow?

9. What urban farming technique do you use?

10a. Is this done with permission or formally?
- Yes
- No
- Not applicable

10b. If you selected “Not applicable”, please explain further

11. How large is your city farm?
- Small (0-100 square meter)
- Medium (100-1000 square meter)
- Large (1000-10000 square meter)
- Very large (more than 10000 square meter)

12. Give a short description of your farm's characteristics

13. How long have you produced in the city?

14. Are there records of land use and land tenure in your region?

15. Can you name some existing land use policies that recognizes the practice of urban agriculture?

16. Do you know of any institution responsible for the awareness of city food growing?

17. Is there any regulation on the prices of food produced in the city?

18. Why do you grow food in the city?

19. Can you mention some advantages you have realized from city food growing?

20a. Do you think urban agriculture has the capacity to meet the food demands in the cities?
- Yes
- No

20b. Please explain

21. Do you think that one can earn a living from producing food in the city?

22a. Do you believe that growing of food within the city has had a positive impact on your life?
- Yes
- No

22b. Please explain

23. What is your perception about possible contamination issues (contaminants from soil, water, and air) often associated with growing food in the city?

24. What do you think about the quality of urban soil?

25. How much food do you grow?

26. Do you sell any of the food you produce?

- Yes
- No

27a. Do you think that producing food in the urban area increases access to nutritious and fresh food?

- Yes
- No

27b. Please explain

28. Do you think city food growing is enough to meet the growing urban consumption needs?

- Yes
- No

29. Do you think the food grown in the city is of high quality and nutritional value?

30. Which marketing channels do you use to hand out products and services to clients?

Thank you for taking the time to complete this survey. We truly value the information you have provided, and we are extremely grateful to you for contributing your valuable time towards the success of this research.

Online Survey Questions (UK data)

1. Privacy Notice: Please take time to read the following information carefully. This study is mainly for educational purposes as it is a partial fulfilment of the requirements for the degree of study (PhD Environmental Studies) at University of Salford, United Kingdom. This study plans to develop a framework that might serve as a guide for policy makers in the design of relevant policies that will aid Urban Agriculture practice in the Global North and South. You have been chosen to partake in this study because you are one of the stakeholders in Urban Agriculture and your view matters based on your experience and the challenges you might be facing with city food growing. All information will be kept strictly confidential with your details removed so that you cannot be recognized. Electronic data will be stored on a computer protected by a password known only by the researcher and hard paper will be stored in a locked cabinet within locked office accessed only by the researcher. There are no known or anticipated risks to you as a participant in this study. In addition, taking part in this interview is voluntary. You are free to withdraw at any time, without giving a reason. If you withdraw from the study, all information and data will be destroyed. There is no compensation for participation in this study. However, information obtained from this study might help to improve sustainability of food among the urban poor. Thank you in advance for your assistance in this project. I consent to participate in this survey.

- Yes
- No

2. What category below includes your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 55 and over
- Prefer not to say

3. What is your gender?

- Male
- Female
- Prefer not to say

4. What is your ethnic group?

- White

- Mixed or Multiple Ethnic Groups
- Asian
- Black, African, or Caribbean
- Other Ethnic Groups

5. What is your marital status?
   - Single
   - Married
   - Civil partnered
   - Divorced
   - Widowed
   - Prefer not to say

6. Which region best describes where you are?
   - North America
   - Europe
   - Middle East
   - Asia/Pacific
   - Latin America
   - Africa

7. Do you live in an urban area?
   - Yes
   - No

8. Where do you grow your food?
   - Within the city
   - Areas surrounding the city

9. What type of crop do you grow?

10. What urban farming method do you use?

11a. Is this done with permission or formally?
   - Yes
   - No
   - Not applicable

11b. If you selected “Not applicable”, please explain further

12. How large is your city farm?
   - Small (0-100 square meter)
   - Medium (100-1000 square meter)
   - Large (1000-10000 square meter)
   - Very large (more than 10000 square meter)

13. Give a short description of your farm's characteristics

14. How long have you produced in the city?

15. Are there records of land use and land tenure in your region?

16. Can you name some existing land use policies that recognizes the practice of urban agriculture?

17. Do you know of any institution responsible for the awareness of city food growing?

18. Is there any regulation on the prices of food produced in the city?

19. Why do you grow food in the city?

20. Can you mention some advantages you have realized from city food growing?

21a. Do you think urban agriculture has the capacity to meet the food demands in the cities?

- Yes
- No

21b. Please explain

22. Do you think that one can earn a living from producing food in the city?

23a. Do you believe that growing of food within the city has had a positive impact on your life?

- Yes
- No

23b. Please explain

24. What is your perception about possible contamination issues (contaminants from soil, water, and air) often associated with growing food in the city?

25. What do you think about the quality of urban soil?

26. How much food do you grow?

27. Do you sell any of the food you produce?

- Yes
- No

28a. Do you think that producing food in the urban area increases access to nutritious and fresh food?

- Yes
- No

28b. Please explain

29. Do you think city food growing is enough to meet the growing urban consumption needs?

- Yes
- No

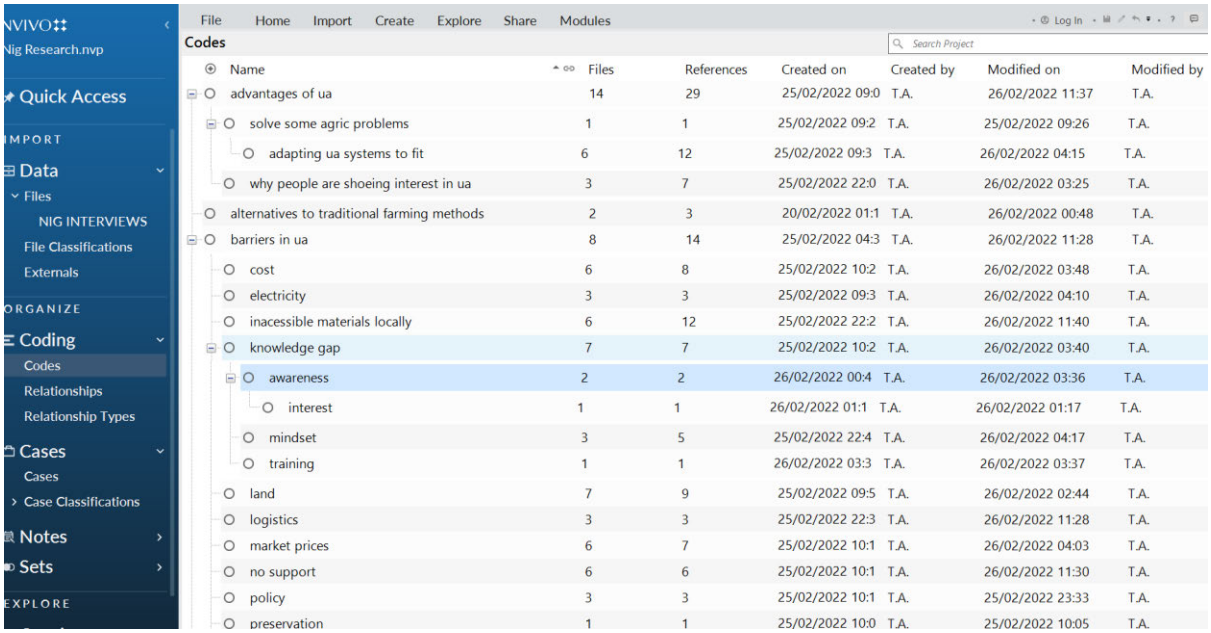
30. Do you think the food grown in the city is of high quality and nutritional value?

31. Which marketing channels do you use to hand out products and services to clients?

Thank you for taking the time to complete this survey. We truly value the information you have provided, and we are extremely grateful to you for contributing your valuable time towards the success of this research.

APPENDIX V: Codes derived from the Study

The themes from the study were derived from the initial codes which were later grouped into themes. An image from NVIVO showing these codes is inserted below:



Name	Files	References	Created on	Created by	Modified on	Modified by
advantages of ua	14	29	25/02/2022 09:0	T.A.	26/02/2022 11:37	T.A.
solve some agric problems	1	1	25/02/2022 09:2	T.A.	25/02/2022 09:26	T.A.
adapting ua systems to fit	6	12	25/02/2022 09:3	T.A.	26/02/2022 04:15	T.A.
why people are shoeing interest in ua	3	7	25/02/2022 22:0	T.A.	26/02/2022 03:25	T.A.
alternatives to traditional farming methods	2	3	20/02/2022 01:1	T.A.	26/02/2022 00:48	T.A.
barriers in ua	8	14	25/02/2022 04:3	T.A.	26/02/2022 11:28	T.A.
cost	6	8	25/02/2022 10:2	T.A.	26/02/2022 03:48	T.A.
electricity	3	3	25/02/2022 09:3	T.A.	26/02/2022 04:10	T.A.
inacessible materials locally	6	12	25/02/2022 22:2	T.A.	26/02/2022 11:40	T.A.
knowledge gap	7	7	25/02/2022 10:2	T.A.	26/02/2022 03:40	T.A.
awareness	2	2	26/02/2022 00:4	T.A.	26/02/2022 03:36	T.A.
interest	1	1	26/02/2022 01:1	T.A.	26/02/2022 01:17	T.A.
mindset	3	5	25/02/2022 22:4	T.A.	26/02/2022 04:17	T.A.
training	1	1	26/02/2022 03:3	T.A.	26/02/2022 03:37	T.A.
land	7	9	25/02/2022 09:5	T.A.	26/02/2022 02:44	T.A.
logistics	3	3	25/02/2022 22:3	T.A.	26/02/2022 11:28	T.A.
market prices	6	7	25/02/2022 10:1	T.A.	26/02/2022 04:03	T.A.
no support	6	6	25/02/2022 10:1	T.A.	26/02/2022 11:30	T.A.
policy	3	3	25/02/2022 10:1	T.A.	25/02/2022 23:33	T.A.
preservation	1	1	25/02/2022 10:0	T.A.	25/02/2022 10:05	T.A.

The main themes derived from the codes shown in the image above are listed below:

- Reasons for increased interest in UA
- Perception of stakeholders
- Advantages of UA
- Types of UA methods
- Land use tenure policy
- Quality of urban soil and contamination issues
- Barriers affecting upscaling of UA
- The opportunities for upscaling and future potential of UA

References

Abdu, N., Agbenin, J. O., & Buerkert, A. (2011). Phytoavailability, human risk assessment and transfer characteristics of cadmium and zinc contamination from urban gardens in Kano, Nigeria. Journal of the Science of Food and Agriculture, 91(15), 2722-2730.

Abdulaal, M. (2021). New Faces of Farmers: Bringing African Youth Back to Agriculture. Accessed https://egyptianstreets.com/2021/04/22/new-faces-of-farmers-bringing-african-youth-back-to-agriculture/

Abdulkadir, A., Amadou, H., Dossa, L. H., Lompo, D. J. P., & Schlecht, E. (2012). A comparison between urban livestock production strategies in Burkina Faso, Mali, and Nigeria in West Africa. Tropical Animal Health and Production, 44(7), 1631-1642. doi:10.1007/s11250-012-0118-0

Abraham, A., Sommerhalder, K., & Abel, T. (2010). Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments. International journal of public health, 55(1), 59-69.

Abu, G. A., & Soom, A. (2016). Analysis of factors affecting food security in rural and urban farming households of Benue State, Nigeria. International Journal of Food and Agricultural Economics (IJFAEC), 4(1128-2016-92107), 55-68.

Ackerman, K., Conard, M., Culligan, P., Plunz, R., Sutto, M. P., & Whittinghill, L. (2014). Sustainable food systems for future cities: The potential of urban agriculture. The economic and social review, 45(2, Summer), 189-206.

Ackerman, K., E. Dahlgren, and X. XU. (2012). Sustainable Urban Agriculture: Confirming Viable Scenarios for Production, prepared for the New York State Energy Research and Development Authority, Retrieved from: http://www.nyserda.ny.gov/Publications/Research-and-Development-Technical Reports/Environmental-Reports.aspx.

Adams, D., Hardman, M., & Larkham, P. (2014). Exploring guerrilla gardening: gauging public views on the. GeoForum, 39(3), 1228-1240.

Adebayo B. Aromolaran and Milu Muyanga (2020) Impact of COVID-19 on agriculture, food systems and rural livelihoods in Nigeria. https://doi.org/10.19088/APRA.2020.005

Adedayo A and Tunde A.M. (2012). Motivations for Women Involvement in Urban Agriculture in Nigeria, Asian Journal of Agriculture and Rural Development, 2, (3):337-343. DOI:10.22004/ag.econ.197979

Adedayo, A. and Tunde, A. M. (2013). Challenges of Women in Urban Agriculture in Kwara State, Nigeria. Sustainable Agriculture Research vol 2(3). Canadian Center of Science and Education. 8p

Adedeji, O. H. & Ademiluyi, I. A. (2009). Urban agriculture and urban land use planning: Need for a synthesis in metropolitan Lagos, Nigeria. Journal of Geography and Regional Planning, 2 (3), 43-50.

Adenegan, K. O., Balogun, O. L., & Yusuf, T. O. (2016). Initial household assets and profitability of urban farming. International Journal of Vegetable Science, 22(2), 153-160.

Adenubi, O. T., Adebowale, O. O., Oloye, A. A., Bankole, N. O., Ayo-Ajayi, P. O., & Akinloye, A. K. (2021). University community-based survey on the knowledge, attitude, and perception about COVID-19 pandemic: The Federal University of Agriculture, Abeokuta, Nigeria as a case study. Journal of Preventive Medicine and Hygiene, 62(3), E575.

Adeogun, O.A., Ogunbadejo, H. K., Ayinla, O.A., Oresegun, A., Oguntade, O.R., Tanko, A and Williams (2007). Urban aquaculture: producer perceptions and practices in Lagos state, Nigeria. Middle East Journal of Scientific Research 2 (1): 21-27. Retrieved from https://www.researchgate.net/profile/Oludare_Adeogun/publication/238681623 _

Adeoti, A. I., Cofie, O., & Oladele, O. I. (2012). Gender analysis of the contribution of urban agriculture to sustainable livelihoods in Accra, Ghana. Journal of Sustainable Agriculture, 36(2), 236-248.

Adetokunbo, l.D. (2002). The Structure of Urban Growth in Sub-saharan Africa. Annual Guest Lecture, University ofIbadan

Adeyemi, F. M., Wahab, A. A., Oyelami, C. A., Oyedara, O. O., Titilawo, M. A., Adebunmi, A. A., & Awoniyi, I. O. (2022). Hydrology survey and water quality assessment of water sources in three selected towns in Osun State, Southwest Nigeria. International Journal of Energy and Water Resources, 1-14.

Adeyemi, T. O. A., & Idowu, O. D. (2017). Biochar: promoting crop yield, improving soil fertility, mitigating climate change, and restoring polluted soils. World News of Natural Sciences, 8.

Adeyemo, R., Ogunleye, A. S., Kehinde, A. D., & Ayodele, O. A. (2017). Urban Agriculture (UA) and its effects on poverty alleviation: a case study of vegetable farming in Ibadan Metropolis, Nigeria. American Journal of Environmental Science and Engineering, 1(3), 68-73.

Adeyolanu, O. D., ADELANA, A. O., OLUWATOSİN, G. A., DENTON, O. A., ANDE, O. T., EGBETOKUN, O., ... & ADEDİRAN, J. A. (2018). Assessing Soil Quality Issues for Crop Production Function Based on Farmers' Perception: An Experience from Itapaji Watershed in Southwestern Nigeria. Eurasian Journal of Soil Science, 7(4), 337-345.

Aduloju, O. T. B., Bako, A. I., & Anofi, A. O. (2022). Specifics knowledge links between COVID-19 and urban food systems in Nigeria. Contemporary Social Science, 17(2), 157-172.

Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. World development, 29(10), 1623-1648.

Agbaji, G.O., Ogunsumi, L.O, Oluoku & Akinlosotu, T.A. (2005). Survey of Yam Production system and the impact of government policies in Southwestern Nigeria. Journal of Food Agriculture and Environment 3(2): 222-229

Agriculture and Horticulture Development Board, [AHDB], (2022). Food Security in the UK. Available online at https://ahdb.org.uk/news/food-security-in-the-uk

Agwu, A. E., Anugwa, I. Q., & Ifeonu, C. F. (2021). Stemming rural-urban migration through agricultural development: Can Nigeria apply the lessons from the COVID-19 pandemic? Agro-Science, 20(4), 36-45.

Ahimaz, D., Arulanandam, B. V., & Ivascu, L. (2021). The Perception and The Degree of Adoption by Urbanites Towards Urban Farming.

Aina, O. S., Oladapo, A., Adebosin, W. G., & Ajijola, S. (2012). Urban livelihood: urban agriculture implication in food security, a case study of Ibadan Metropolis. Journal of Applied Phytotechnology in environmental sanitation, 1(4).

Aina, O.S., Oladapo, A., Adebosin, W.G. and Ajilola, S. (2012). Urban livelihood: Urban agriculture implication in food security, A case study of Ibadan metropolis. Journal of Applied Phytotechnology in EnvironmentalSanitation.1(4):155-161.Retrieved from https://web.b.ebscohost.com/abstract?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=20886586&asa=Y&AN=76126152&h=ytNMdL%2b6aSUwibZy8bfKHSfKXZFbYm886OmLQQdE7LiUmWP5IdnP8nftXEbfHRc1BW%2bmsjrQ8in5QYozxHzT8g%3d%3d&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCrlNotAuth&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrnl%3d2 0886586%26asa%3dY%26AN%3d76126152

Ajulor, O. V., & Etim, E. (2019). Innovative agricultural policy and rural poverty reduction in Nigeria. Lasu Journal of Engineering, Science & Technology, 1(2), 39-47.

Akaeze, O., & Nandwani, D. (2020). Urban agriculture in Asia to meet the food production challenges of urbanization: A review. Urban Agriculture & Regional Food Systems, 5(1), e20002.

Akinfenwa, G. (Reporter) (2022, April 10). CBN's anchor borrowers' scheme on the slab. The Guardian. Available: https://guardian.ng

Akinnagbe, O. M., & Ipinmoye, O. E. (2022). Urban Agriculture Practices and Households' Livelihoods in Ondo State, Nigeria. Journal of Agricultural Extension, 26(3), 60-73.

Akintayo, O., & Oyewole, B. (2013). Productive Potential of Urban Agriculture Towards Food Security: Evidence from Southwest Nigeria. In Sustainable Food Security in the Era of Local and Global Environmental Change (pp. 159-174). Springer, Dordrecht.

Akpan, N. S. (2012). From agriculture to petroleum oil production: What has changed about Nigeria's rural development? International Journal of Developing Societies, 1(3), 97-106.

Akpata J. and Ojo M. (2022). Nigeria On the Path to Food Systems Transformation. Retrieved from https://www.gainhealth.org/sites/default/files/publications/documents/GAIN-Policy-Brief-Nigeria-on-the-path-to-food-systems-transformation.pdf

Alaimo, K., Beavers, A. W., Crawford, C., Snyder, E. H., & Litt, J. S. (2016). Amplifying health through community gardens: A framework for advancing multicomponent, behaviorally based neighborhood interventions. Current environmental health reports, 3(3), 302-312.

Alaimo, K., Packnett, E., Miles, R. A., & Kruger, D. J. (2008). Fruit and vegetable intake among urban community gardeners. Journal of nutrition education and behavior, 40(2), 94-101.

Alaimo, K., T. Reischl, and J. Ober Allen. 2010. Community gardening, neighbourhood meetings, and social capital. Journal of Community Psychology 38(4): 497–514. https://doi.org/10.1002/jcop.20378

Alemu, M. H., & Grebitus, C. (2020). Towards sustainable urban food systems: Analyzing contextual and intrapsychic drivers of growing food in small-scale urban agriculture. PloS one, 15(12), e0243949.

Alfaro, M. R., Do Nascimento, C. W. A., Ugarte, O. M., Álvarez, A. M., de Aguiar Accioly, A. M., Martín, B. C., ... & Aguilar, M. G. (2017). First national-wide survey of trace elements in Cuban urban agriculture. Agronomy for sustainable development, 37(4), 1-7.

Algert, S. J., Baameur, A., & Renvall, M. J. (2014). Vegetable output and cost savings of community gardens in San Jose, California. Journal of the Academy of Nutrition and Dietetics, 114(7), 1072-1076.

Ali E, Awade NE (2019) Credit constraints and soybean farmers' welfare in subsistence agriculture in Togo. Heliyon 5(4): e01550

Alimba JO, Olumba CC, Onunka CN (2018) Assessing how food production in urban areas contribute to household food security in Southeast Nigeria. Paper presented at the 2nd International conference on food security and hidden hunger, 8–10 October 2018. Alex-Ewueme Federal University, Ndufu Alike, Ebonyi State, Nigeria

Al-Kodmany, K. (2018). The sustainable city: practical planning and design approaches. Journal of Urban Technology, 25(4), 95-100.

Alkon, A.H., and J. Agyeman, eds. (2011). Cultivating food justice: race, class, and sustainability. Cambridge, MA: The MIT Press.

Allen, A., Frediani, A. A., & Wood-Hill, M. (2014). Land and planning for urban agriculture in Accra: Sustained urban agriculture or sustainable urbanization. Irrigated Urban Vegetable Production in Ghana, 161.

Allende, A., & Monaghan, J. (2015). Irrigation water quality for leafy crops: a perspective of risks and potential solutions. International journal of environmental research and public health, 12(7), 7457-7477.

Alloway, B. J. (2004). Contamination of soils in domestic gardens and allotments: a brief overview. Land contamination and reclamation, 12(3), 179-187.

Altes, W. K. K., & van Rij, E. (2013). Planning the horticultural sector: Managing greenhouse sprawl in the Netherlands. Land Use Policy, 31, 486-497.

Altieri, M. A., & Nicholls, C. I. (2018). Urban agroecology: designing biodiverse, productive, and resilient city farms. Agro Sur, 46(2), 49-60.

Altieri, M. A., & Nicholls, C. I. (2020). Agroecology and the reconstruction of a post-COVID-19 agriculture. The Journal of Peasant Studies, 47(5), 881-898.

Alvesson, M., and K. L. Ashcraft (2012). 'Interviews'. In G. Symon and C. Cassell (eds), Qualitative Organizational Re-search: Core Methods and Current Challenges, pp. 239–257.London: Sage

Amaza P.S, Umeh, J. C. J. Helsen & Adejobi, A. O. 2006). Determinants and Measurement of food insecurity in Nigeria: some Empirical policy Guide, int'l Association of Agricultural Economics Conference, gold coast, Australia. August 12 – 18, 2006. Pp 1 – 15.

Ambali, O. I., Adegbite, D. A., Ayinde, I. A., & Oyeyinka, R. A. (2012). Comparative analysis of technical efficiency of beneficiary and non-beneficiary food crop farmers of Bank of Agriculture in Ogun State, Nigeria. ARPN Journal of Agricultural and Biological Science, 7, 1038-1047.

Ambius (2014). Urban Gardening Tips. Available online at https://www.ambius.com/blog/urban-gardening-tips/>

Ambrose, G., Das, K., Fan, Y., & Ramaswami, A. (2020). Is gardening associated with greater happiness of urban residents? A multi-activity, dynamic assessment in the Twin-Cities region, USA. Landscape and Urban Planning, 198, 103776.

Amponsah O, Håkan V, Schou TW, Braimah I, Abaidoo RC (2016) The impact of farmers' participation in field trials in creating awareness and stimulating compliance with the World Health Organization's farm-based multiple-barrier approach. Environ Dev Sustain 18(4):1059–1079. https://doi.org/10.1007/s10668-015-9686-2

Amponsah O, Vigre H, Schou TW, Boateng ES, Braimah I, Abaidoo RC (2015) Assessing low quality water use policy framework: case study from Ghana. Resour Conserv Recycl 97:1–15. https://doi.org/10.1016/j.resconrec.2015.01.009

Andreasen, M. H., Agergaard, J., Kiunsi, R. B., & Namangaya, A. H. (2017). Urban transformations, migration, and residential mobility patterns in African secondary cities. Geografisk Tidsskrift-Danish Journal of Geography, 117(2), 93-104.

Andrée, P., P. Ballamingie, and B. Sinclair-Waters. 2014. "Neoliberalism and the Making of Food Politics in Eastern Ontario." Local Environment. doi:10.1080/13549839 .2014.908277

Andres, L., & Lebailly, P. (2011). Peri-urban agriculture: The case of market gardening in Niamey, Niger. African Review of Economics and Finance, 3(1), 69-79. Retrieved from https://www.ajol.info/index.php/aref/article/view/86962/76741

Anyanwu, B. O., Ezejiofor, A. N., Igweze, Z. N., & Orisakwe, O. E. (2018). Heavy metal mixture exposure and effects in developing nations: an update. Toxics, 6(4), 65.

Anyanwu, I. N., & Semple, K. T. (2015). Fate and behaviour of nitrogen-containing polycyclic aromatic hydrocarbons in soil. Environmental Technology & Innovation, 3, 108-120.

Appiah, D. O., Forkuo, E. K., Bugri, J. T., & Apreku, T. O. (2017). Geospatial analysis of land use and land cover transitions from 1986–2014 in a peri-urban Ghana. Geosciences, 7(4), 125.

Arbolino R, De Simone L, Carlucci F, Yigitcanlar T, Ioppolo G (2018) Towards a sustainable industrial ecology: implementation of a novel approach in the performance evaluation of Italian regions. J Clean Prod 178:220–236

Argenti, O., 2000, Food for the cities: food supply and distribution policies to reduce food insecurity. Available online at http://www.ifpri.org/2020/focus/focus03/focus03_05.asp

Armanda, D. T., Guinée, J. B., & Tukker, A. (2019). The second green revolution: Innovative urban agriculture's contribution to food security and sustainability–A review. Global Food Security, 22, 13-24.

Armar-Klemesu, M., & Maxwell, D. (2001). Accra: Urban Agriculture as an asset strategy, supplementing income and diets, A case study of Accra. Growing cities, growing food: Urban agriculture on the policy agenda. A reader on urban agriculture. DSE, Feldafing.

Armstrong, A., Brockett, B., Eustice, T., Lorentzon, A., O'Brien, L., and Williams, S. (2021). Why Society Needs Nature Lessons from Research During Covid-19. Available online at: https://www.forestresearch.gov.uk/documents/8053/Why_Society_Needs_Nature.PDF (accessed September 14, 2021).

Armstrong, D. (2000). A survey of community gardens in upstate New York: Implications for health promotion and community development. Health and Place, 6, 319–327. https://doi.org/10.1016/S1353-8292(00)00013-7

Arndt, C., Benfica, R., Maximiano, N., Nucifora, A. M., & Thurlow, J. T. (2008). Higher fuel and food prices: impacts and responses for Mozambique. Agricultural Economics, 39, 497-511.

Arnold, J., & Rogé, P. (2018). Indicators of land insecurity for urban farms: Institutional affiliation, investment, and location. Sustainability, 10(6), 1963.

Artmann M, Sartison K (2018) The role of urban agriculture as a nature-based solution: a review for developing a systemic assessment framework. Sustainability 10(6):1937

Asadu, A., Enwelu, I. A., Ifejika, P. I., & Igbokwe, E. M. (2016). Gender Roles in Livestock Production among Urban Farming Households in Southeast Nigeria. International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EES), 6(2), 107-112.

Asamu, F. F., Odagwe, M. C., Rasak, B., Arisukwu, O., & Igbolekwu, C. (2020, February). Gender issues and women's participation in agricultural production in Warri South Local Government area of Delta State, Nigeria. In IOP Conference Series: Earth and Environmental Science (Vol. 445, No. 1, p. 012049). IOP Publishing.

Asibey, M. O., Abubakari, M., & Peprah, C. (2019). Vulnerability and urban farming: Coping with price volatility in Ejisu-Juaben municipality, Ghana. Cogent Food & Agriculture, 5(1), 1594504.

Assefa Tuji, A. (2016). Constraints and opportunities in peri-urban and urban agriculture system in Addis Ababa, Ethiopia. African Journal of Rural Development (AFJRD), 1(1978-2017-2069), 107-114.

Astalin, P. K. (2013). Qualitative research designs: A conceptual framework. International Journal of Social Science and Interdisciplinary Research, 2(1), 118-124. Retrieved from https://pdfs.semanticscholar.org/baa7/c8f5577b0b1798b5e9f559f5cbae32bf1a36.pdf

Attah, A. W. (2012). Food security in Nigeria: The role of peasant farmers in Nigeria. African Research Review, 6(4), 173-190.

Audate PP, Cloutier G, Lebel A (2021) The motivations of urban agriculture practitioners in deprived neighborhoods: a comparative study of Montreal and Quito. Urban for Urban Green 62:127171

Audate, P. P., Fernandez, M. A., Cloutier, G., & Lebel, A. (2019). Scoping review of the impacts of urban agriculture on the determinants of health. BMC Public Health, 19(1), 1-14.

Ayambire, R. A., Amponsah, O., Peprah, C., & Takyi, S. A. (2019). A review of practices for sustaining urban and peri-urban agriculture: Implications for land use planning in rapidly urbanising Ghanaian cities. Land Use Policy, 84, 260-277.

Ayinde, J. O., Torimiro, D. O., & Koledoye, G. F. (2014). Youth migration and agricultural production: analysis of farming communities of Osun State, Nigeria. Journal of Agricultural Extension, 18(1), 121-129.

Azad, A., Sernbo, E., Svärd, V., Holmlund, L., & Björk Brämberg, E. (2021). Conducting in-depth interviews via mobile phone with persons with common mental disorders and multimorbidity: the challenges and advantages as experienced by participants and researchers. International Journal of Environmental Research and Public Health, 18(22), 11828.

Aziz Masso, W.Y., & Man, N., (2016). Identify the Knowledge Level of Rural Leaders towards Paddy Farming Technologies in Muda Agriculture Development Authority (MADAMALAYSIA). Indian Journal of Science and Technology. 9(15):0974-5645.

Azunre, G. A., Amponsah, O., Peprah, C., Takyi, S. A., & Braimah, I. (2019). A review of the role of urban agriculture in the sustainable city discourse. Cities, 93, 104-119.

Bajpai, N. (2011). Business research methods. Pearson Education India.

Baker, S. E., & Edwards, R. (2012). How many qualitative interviews is enough.

Baldock, K. C., Goddard, M. A., Hicks, D. M., Kunin, W. E., Mitschunas, N., Morse, H., ... & Memmott, J. (2019). A systems approach reveals urban pollinator hotspots and conservation opportunities. Nature ecology & evolution, 3(3), 363-373.

Balmer, K., Gill, J., Kaplinger, H., Miller, J., Peterson, M., Rhoads, A., ... & Wall, T. (2005). The diggable city: Making urban agriculture a planning priority.

Barbosa, R. R. L., Sánchez-Alonso, S., & Sicilia-Urban, M. A. (2015). Evaluating hotels rating prediction based on sentiment analysis services. Aslib Journal of Information Management.

Barnard, J. (2022). Dudley. [online] Virtual Zero Carbon Hub. Available at: <https://zerocarbonhubs.co.uk/how-can-urban-agriculture-help-us-achieve-net-zero.html> [Accessed 2 April 2022].

Barrett, M., & Spataru, C. (2013). Optimizing building energy systems and controls for energy and environment policy. In Sustainability in Energy and Buildings (pp. 413-423). Springer, Berlin, Heidelberg.

Barry, M., & Danso, E. K. (2014). Tenure security, land registration and customary tenure in a peri-urban Accra community. Land use policy, 39, 358-365.

Barry, V., & Blythe, C. (2018). Growing pathways to well-being through community gardens and greenspace: Case studies from Birmingham and the West Midlands, UK. In Pathways to Well-Being in Design (pp. 76-96). Routledge.

Barthel, S., & Isendahl, C. (2013). Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities. Ecological economics, 86, 224-234.

Barthel, S., Parker, J., & Ernstson, H. (2015). Food and green space in cities: A resilience lens on gardens and urban environmental movements. Urban studies, 52(7), 1321-1338.

Bar-Yosef, B. (2008). Fertigation management and crops response to solution recycling in semi-closed greenhouses. Soilless culture: Theory and practice, 343-424.

Batitucci, T. D. O., Cortines, E., Almeida, F. S., & ALMEIDA, Â. A. D. (2019). Agriculture in urban ecosystems: a step to cities sustainability. Ambiente & Sociedade, 22.

Battersby, J. et al. (2014) 'Household Food Insecurity and Survival in Harare: 2008 and Beyond', Urban Forum, (January), pp. 1–12.

Battersby, J., & Marshak, M. (2013, December). Growing communities: Integrating the social and economic benefits of urban agriculture in Cape Town. In Urban Forum (Vol. 24, No. 4, pp. 447-461). Springer Netherlands.

Batty, M. (2008). The size, scale, and shape of cities. science, 319(5864), 769-771. DOI: 10.1126/science.1151419

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. The qualitative report, 13(4), 544-559.

Bazrkar, M. H., Zamani, N., & Eslamian, S. (2015). Evaluation of socioeconomic impacts of urban water reuse using system dynamics approach. Urban Water Reuse Handbook, 331-340.

Bazzocchi, G. G. (2020). Pest management for urban agriculture. In Achieving sustainable urban agriculture (pp. 199-220). Burleigh Dodds Science Publishing.

Bazzocchi, G., & Maini, S. (2017). Sustainable Pest Management. In Rooftop Urban Agriculture (pp. 167-193). Springer, Cham.

BBC News (2020). Coronavirus Doctor's Diary: How Gardening Could Help in the Fight Against Obesity. Available online at: https://www.bbc.co.uk/news/health-53601941 (accessed August 2, 2020).

Bell, C. D., McMillan, S. K., Clinton, S. M., & Jefferson, A. J. (2016). Hydrologic response to stormwater control measures in urban watersheds. Journal of Hydrology, 541, 1488-1500.

Bell, S., Fox-Kämper, R., Keshavarz, N., Benson, M., Caputo, S., Noori, S., et al. (2016). Urban Allotment Gardens in Europe. 1st Edn. London: Routledge. doi: 10.4324/9781315686608

Bellows, A. C., & Hamm, M. W. (2003). International effects on and inspiration for community food security policies and practices in the USA. Critical Public Health, 13(2), 107-123.

Bellwood-Howard, I., Shakya, M., Korbeogo, G., & Schlesinger, J. (2018). The role of backyard farms in two West African urban landscapes. Landscape and Urban Planning, 170, 34-47.

Benages-Albert M, Di Masso A, Porcel S et al (2015) Revisiting the appropriation of space in metropolitan river corridors. J Environ Psychol 42:1–15. https://doi.org/10.1016/J.JENVP.2015.01.002

Beniston, J., & Lal, R. (2012). Improving soil quality for urban agriculture in the North Central US. In Carbon sequestration in urban ecosystems (pp. 279-313). Springer, Dordrecht.

Benson, T., Mugarura, S., & Wanda, K. (2008). Impacts in Uganda of rising global food prices: the role of diversified staples and limited price transmission. Agricultural Economics, 39, 513-524.

Berazneva, J., & Lee, D. R. (2013). Explaining the African food riots of 2007–2008: An empirical analysis. Food policy, 39, 28-39.

Berg, A. E., & Custers, M. H. (2011). Gardening promotes neuroendocrine and affective restoration from stress. Journal of health psychology, 16(1), 3-11. https://doi.org/10.1177/1359105310365577

Berg, A. E., van Winsum-Westra, S. M., De Vries, S., & van Dillen, S. M. E. (2010). Allotment Gardening and Health: A comparative study among allotment gardeners and their neighbours without an allotment. Environmental Health, 9,74. Retrieved from https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-9-74

Bernard, H. (2006). Research methods in anthropology: Qualitative and quantitative approaches (4th ed.). New York: Alta Mira Press.

Bernholt, H., Kehlenbeck, K., Gebauer, J., & Buerkert, A. (2009). Plant species richness and diversity in urban and peri-urban gardens of Niamey, Niger. Agroforestry Systems, 77(3), 159-179.

Berquist, E. (2010). Early anti-slavery sentiment in the Spanish Atlantic world, 1765–1817. Slavery and Abolition, 31(2), 181-205.

Bett, L., Ongera, G., Wangila, P., & Mule, S. (2019). Determination of some heavy metals in soils and vegetables samples from Kericho West Sub- County, Kenya.

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices.

Bidar, G., Pelfrêne, A., Schwartz, C., Waterlot, C., Sahmer, K., Marot, F., & Douay, F. (2020). Urban kitchen gardens: Effect of the soil contamination and parameters on the trace element accumulation in vegetables–A review. Science of the Total Environment, 738, 139569.

Biewener, A. A. (2016). Locomotion as an emergent property of muscle contractile dynamics. Journal of Experimental Biology, 219(2), 285-294.

Bigsten, A., & Shimeles, A. (2011). The persistence of urban poverty in Ethiopia: A tale of two measurements. Applied Economics Letters, 18(9), 835-839.

Binns, T., & Nel, E. (2019). Urban Agriculture in Zambia. In Rural Areas Between Regional Needs and Global Challenges (pp. 227-242). Springer, Cham.

Birks, M., & Mills, J. (2015). Grounded theory: A practical guide. London: Sage

Bisaga, I., Parikh, P., & Loggia, C. (2019). Challenges and opportunities for sustainable urban farming in South African low-income settlements: A case study in Durban. Sustainability, 11(20), 5660.

Bisoffi, S., Ahrné, L., Aschemann-Witzel, J., Báldi, A., Cuhls, K., DeClerck, F., ... & Brunori, G. (2021). COVID-19 and sustainable food systems: What should we learn before the next emergency. Frontiers in Sustainable Food Systems, 5, 650987.

Blair, S. N. (2009). Physical inactivity: the biggest public health problem of the 21st century. British journal of sports medicine, 43(1), 1-2

Block, E. S., & Erskine, L. (2012). Interviewing by telephone: Specific considerations, opportunities, and challenges. International journal of qualitative methods, 11(4), 428-445.

Boente C, Matanzas N, García-González N, Rodríguez-Valdés E, Gallego JR (2017) Trace elements of concern affecting urban agriculture in industrialized areas: a multivariate approach. Chemosphere 183:546–556

Bohn, K., and A. Viljoen. 2011. The edible city: Envisioning the continuous productive urban landscape (CPUL). Field Journal 4(1): 149–161.

Borelli, J. L., Nelson-Coffey, S. K., River, L. M., Birken, S. A., & Moss-Racusin, C. (2017). Bringing work home: Gender and parenting correlates of work-family guilt among parents of toddlers. Journal of Child and Family Studies, 26(6), 1734-1745.

Borysiak, J., Mizgajski, A., & Speak, A. (2017). Floral biodiversity of allotment gardens and its contribution to urban green infrastructure. Urban Ecosystems, 20(2), 323-335.

Bosona, T. G., & Gebresenbet, G. (2011). Cluster building and coordination network integration of local food supply chain. Biosystems engineering, 108(4), 293-302.

Bosschaert, T. (2012). Large scale urban agriculture. Rotterdam: Except Integrated Sustainability Netherlands.

Boukharaeva, L. M., & Marloie, M. (2015). Family urban agriculture in Russia: Lessons and prospects. Springer.

Bowyer-Bower, T. A. S. and Shiva, V. (1996) Staying Alive: Women, Ecology and Development, The Geographical Journal.

Bradley, P., & Marulanda, C. (2000, May). Simplified hydroponics to reduce global hunger. In World Congress on Soilless Culture: Agriculture in the Coming Millennium 554 (pp. 289-296).

Bradley, K., & Galt, R. E. (2013). Practicing food justice at Dig Deep Farms & Produce, East Bay Area, California: Self-determination as a guiding value and intersections with foodie logics. Local Environment, 1–15. doi:10.1080/13549839.2013.790350

Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, C. (2021). The online survey as a qualitative research tool. International Journal of Social Research Methodology, 24(6), 641-654.

Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic analysis. Handbook of Research Methods in Health Social Sciences,843-860. https://link.springer.com/referenceworkentry/10.1007%2F978-981-10-5251-4_103

Braun, V., Clarke, V., & Gray, D. (2017). Collecting textual, media and virtual data in qualitative research. In V. Braun, V. Clarke, & D. Gray (Eds.), Innovative methods for qualitative data collection: A practical guide to textual and virtual techniques (pp. 1–12). Cambridge University Press.

Brearley, F. Q. & A. D. Thomas (Eds.). Land-Use change impacts on soil processes: Tropical and Savannah ecosystems. Wallingford: CABI.

Bren d'Amour, C., Reitsma, F., Baiocchi, G., Barthel, S., Güneralp, B., Erb, K. H., ... & Seto, K. C. (2017). Future urban land expansion and implications for global croplands. Proceedings of the National Academy of Sciences, 114(34), 8939-8944.

Breuste, J. H. (2010). Allotment gardens as part of urban green infrastructure: actual trends and perspectives in Central Europe. Urban biodiversity and design, 463-475.

British Sociological Association. (2017). BSA Statement of Ethical Practice. Durham: British Sociological Association.

Brock, A. 2008. Room to grow: Participatory landscapes and urban agriculture at NYU. New York: New York University. Return to ref 2008 in article

Broom D. and K. Breene, (2020), "This is why food security matters now more than ever", World Economic Forum, 23-24 November https://www.weforum.org/agenda/2020/11/food-security-why-it-matters/

Brown KH, Carter A (2003) Urban agriculture and community food security in the United States: farming from the City Center to the urban fringe. A primer prepared by the Community Food Security Coalition's North American Urban Agriculture Committee (29 pp)

Brown, K. H., & Jameton, A. L. (2000). Public health implications of urban agriculture. Journal of public health policy, 21(1), 20-39.

Brown, T. (2005). Contestation, confusion, and corruption: Market-based land reform in Zambia. In Competing Jurisdictions (pp. 79-102). Brill.

Brown-Luthango, M. (2011, February). Capturing land value increment to finance infrastructure investment—possibilities for South Africa. In Urban Forum (Vol. 22, No. 1, pp. 37-52). Springer Netherlands.

Bryant, R. C. (2012). Keynotes: discovery of Urban Agriculture. In COST Action Urban Agriculture Europe: Documentation of 1st Working Group Meeting (pp. 5–9). Aachen: COST, ESF, RWTH Aachen University

Bryld, E. (2003). Potentials, problems, and policy implications for urban agriculture in developing countries. Agriculture and human values, 20(1), 79-86.

Bryman, A. (2008). Social research methods (3rd ed. ed.). Oxford: Oxford University Press.

Bryman, A., and Bell, E. (2011). Business Research Methods. 3 rd Edition. Oxford: Oxford University Press.

Bu, F., Steptoe, A., Mak, H. W., and Fancourt, D. (2020). Time-use and mental health during the COVID-19 pandemic: a panel analysis of 55,204 adults followed across 11 weeks of lockdown in the UK. medRxiv [Preprint]. doi: 10.1101/2020.08.18.20177345

Buck, D. (2016). Gardens and Health Implications for Policy and Practice. London: The King's Fund.

Burghardt, W., Morel, J. L., & Zhang, G. L. (2015). Development of the soil research about urban, industrial, traffic, mining, and military areas (SUITMA). Soil science and plant nutrition, 61(sup1), 3-21.

Busby, M. (2020). How coronavirus has led to a UK boom in community food growing. The Guardian. Available online at: https://www.theguardian.com/world/2020/aug/24/how-coronavirus-has-led-to-a-uk-boom-in-community-food-growing (accessed August 24, 2020).

Bush, R. (2010). Food riots: Poverty, power, and protest 1. Journal of Agrarian Change, 10(1), 119-129.

Caballero-Mellado, J., Onofre-Lemus, J., Estrada-De Los Santos, P., & Martínez-Aguilar, L. (2007). The tomato rhizosphere, an environment rich in nitrogen fixing Burkholderia species with capabilities of interest for agriculture and bioremediation. Applied and environmental microbiology, 73(16), 5308-5319.

Cabannes, Y. (2012). Financing urban agriculture. Environment and Urbanization, 24(2), 665-683.

Cabannes, Y. and Raposo, I. (2013) 'Peri-urban agriculture, social inclusion of migrant population and Right to the City', City: analysis of urban trends, culture, theory, policy, action, 17, pp. 235–250.

Cabannes, Y., & Marocchino, C. (2018). Food and urban planning. Integrating Food into Urban Planning, 18.

Cabannes, Y., & Raposo, I. (2013). Peri-urban agriculture, social inclusion of migrant population and Right to the City: Practices in Lisbon and London. City, 17(2), 235-250.

Cabral, I., Costa, S., Weiland, U., & Bonn, A. (2017). Urban gardens as multifunctional nature-based solutions for societal goals in a changing climate. In Nature-Based Solutions to Climate Change Adaptation in Urban Areas (pp. 237-253). Springer, Cham.

Cachia, M., & Millward, L. (2011). The telephone medium and semi-structured interviews: a complementary fit. Qualitative Research in Organizations and Management: An International Journal.

Cadji, J., & Alkon, A. (2014). One day, the white people are going to want these houses again. Incomplete streets: Processes, practices, and possibilities, 154-175.

Cadzow, H., & Binns, T. (2016). Empowering Freetown's women farmers. Applied Geography, 74, 1-11.

Calvet-Mir, L., & March, H. (2019). Crisis and post-crisis urban gardening initiatives from a Southern European perspective: The case of Barcelona. European Urban and Regional Studies, 26(1), 97-112.

Cameron, R. E. (2019). The perplexity of desert preservation in a threatening world. In Earthcare: Global Protection of Natural Areas (pp. 411-442). Routledge.

Campbell, M. & Campbell, I. (2011). Allotment waiting lists in England. Transition Town West Kirkby in conjunction with the National Society of Allotment and Leisure Gardens. www.transitiontownwestkirkby.org.uk

Campbell, M., Campbell, I., & Kirby, T. T. W. (2013). Allotment waiting lists in England 2013. Transition Town West Kirby and The National Allotment Society.

Camps-Calvet, M., Langemeyer, J., Calvet-Mir, L., Gómez-Baggethun, E., & March, H. (2015). Sowing resilience and contestation in times of crises: The case of urban gardening movements in Barcelona.

Caplow, T. 2009. Building integrated agriculture: Philosophy and practice. In Urban futures 2030: Urban development and urban lifestyles of the future, ed. Heinrich Böll Foundation, 54–58. Berlin, Germany: Heinrich-Böll-Stiftung.

Caputo, Paola, Federica Zagarella, Maria Anna Cusenza, Marina Mistretta, and Maurizio Cellura. "Energy-environmental assessment of the UIA-OpenAgri case study as urban regeneration project through agriculture." Science of the Total Environment 729 (2020): 138819.

Caputo, S. (2012). 'The Purpose of Urban Food Production in Developed Countries' in: Viljoen, A. and Wiskerke J. S. C. (Eds.) Sustain- able Food Planning: Evolving Theory and Practice, Wageningen: Wageningen Academic Publishers

Carmody, P. R. (2010). Globalization in Africa: recolonization or renaissance? (p. 196). Boulder: Lynne Rienner Publishers.

Carvalho, F. P. (2017). Pesticides, environment, and food safety. Food and energy security, 6(2), 48-60.

Castellarini, F. (2022). Urban agriculture in Latin America: a green culture beyond growing and feeding. Frontiers in Sustainable Cities, 164.

Central bank of Nigeria (2004): Annual Report and Statement of Account Abuja, CBN.

Čepić, S. (2017). Urban community and allotment gardens: research trends and a look ahead. Agriculture & Forestry/Poljoprivreda i Sumarstvo, 63(4).

Cepic, S., Tomicevic-Dubljevic, J., & Zivojinovic, I. (2020). Is there a demand for collective urban gardens? Needs and motivations of potential gardeners in Belgrade. Urban Forestry & Urban Greening, 53, 126716.

Chagomoka, T., Drescher, A., Glaser, R., Marschner, B., Schlesinger, J., Abizari, A. R., ... & Nyandoro, G. (2018). Urban and peri-urban agriculture and its implication on food and nutrition insecurity in northern Ghana: a socio-spatial analysis along the urban–rural continuum. Population and Environment, 40(1), 27-46.

Chah JM, Onwubuya EA, Asadu AN (2010) An assessment of the contribution of urban crop agriculture in Nigerian cities: a case study of Enugu metropolis, Enugu State, Nigeria. J Agric Food Inf 11(3):233–247. https://doi.org/10.1080/10496505.2010.492024

Chalmin-Pui, L. S., Griffiths, A., Roe, J., Heaton, T., & Cameron, R. (2021). Why garden? –Attitudes and the perceived health benefits of home gardening. Cities, 112, 103118.

Chan, K. H., & Guénard, B. (2020). Ecological and socio-economic impacts of the red import fire ant, Solenopsis invicta (Hymenoptera: Formicidae), on urban agricultural ecosystems. Urban Ecosystems, 23(1), 1-12.

Chan, M., Han, S. C., Kelly, S., Tamimi, M., Giglio, B., & Lewis, A. (2020). A case series of Guillain-Barré Syndrome following Covid-19 infection in New York. Neurology: Clinical Practice.

Charmaz, K. (2006). Constructing grounded theory. London; Thousand Oaks, Calif.: Sage Publications.

Chatterjee, A., Debnath, S., & Pal, H. (2020). Implication of urban agriculture and vertical farming for future sustainability. In Urban Horticulture-Necessity of the future. IntechOpen.

Chete OB (2019) Gender and agricultural practice in developing countries: literature review. South Asian J Soc Stud Econom 1:1–11. https://doi.org/10.9734/sajsse/2019/v5i230142

Chiappe, H. (2019). Evaluation of sustainability indicators for urban agriculture. Acta Horticulturae, (1246), 83-91.

Chilowa, W. (1998) 'The impact of agricultural liberalisation on food security in Malawi', 263 Food Policy, 23, pp. 553–569.

Chipungu, L., Magidimisha, H. H., Hardman, M., & Beesley, L. (2015). The importance of soil quality in the safe practice of urban agriculture in Zimbabwe, Kenya, and South Africa. In

Christiaensen, L., & Martin, W. (2018). Agriculture, structural transformation, and poverty reduction: Eight new insights. World Development, 109, 413-416.

Church, A., Mitchell, R., Ravenscroft, N., & Stapleton, L. M. (2015). 'Growing your own': A multi-level modelling approach to understanding personal food growing trends and motivations in Europe. Ecological Economics, 110, 71-80.

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. The psychologist, 26(2).

Clarke, V., & Demetriou, E. (2016). 'Not a big deal'? exploring the accounts of adult children of lesbian, gay and trans parents. Psychology & Sexuality, 7(2), 131-148.

Clausen, M. (2015). Urban agriculture between pioneer use and urban land grabbing: The case of “Prinzessinnengarten” Berlin. Cities and the Environment (CATE), 8(2), 15.

Clinton, N., Stuhlmacher, M., Miles, A., Uludere Aragon, N., Wagner, M., Georgescu, M., ... & Gong, P. (2018). A global geospatial ecosystem services estimate of urban agriculture. Earth's Future, 6(1), 40-60.

Cobbinah, P. B., & Aboagye, H. N. (2017). A Ghanaian twist to urban sprawl. Land Use Policy, 61, 231-241.

Cobbinah, P. B., & Amoako, C. (2012). Urban sprawl and the loss of peri-urban land in Kumasi, Ghana. International Journal of Social and Human Sciences, 6(388), e397.

Cockburn, H. (2020). As gardeners turn to growing own food, research reveals dramatic decline in urban allotments over last 50 years. The Independent. Available at: https://www.independent.co.uk/climate-change/news/grow-food-coronavirus-urban-allotments-fruit-vegetables-a9431051.html (accessed March 27, 2020).

Coffey M, Coad A (2010) Collection of municipal solid waste in developing countries. United Nations Human Settlements Programme, UN-HABITAT, Nairobi

Cofie, O. O., Agbottah, S., Strauss, M., Esseku, H., Montangero, A., Awuah, E., & Kone, D. (2006). Solid–liquid separation of faecal sludge using drying beds in Ghana: Implications for nutrient recycling in urban agriculture. Water research, 40(1), 75-82.

Cohen, L., & Manion, L. (1994). The interview. Cohen L. & Manion L. Reseacrh Methods in Education: Fourth Edition, London: Routledge.

Cohen, M. J., & Garrett, J. L. (2010). The food price crisis and urban food (in) security. Environment and Urbanization, 22(2), 467-482.

Cohen, N., & Reynolds, K. (2014). Urban agriculture policy making in New York’s “New Political Spaces” strategizing for a participatory and representative system. Journal of Planning Education and Research, 34(2), 221-234.

Cohen, N., & Reynolds, K. (2015). Resource needs for a socially just and sustainable urban agriculture system: Lessons from New York City. Renewable Agriculture and Food Systems, 30(1), 103-114.

Colasanti, K. J., Hamm, M. W., & Litjens, C. M. (2012). The city as an" agricultural powerhouse"? perspectives on expanding urban agriculture from Detroit, Michigan. Urban Geography, 33(3), 348-369. https://doi.org/10.2747/0272-3638.33.3.348

Colding, J., Lundberg, J., & Folke, C. (2006). Incorporating green-area user groups in urban ecosystem management. AMBIO: A Journal of the Human Environment, 35(5), 237-244.

Coles, R., & Costa, S. (2018). Food growing in the city: Exploring the productive urban landscape as a new paradigm for inclusive approaches to the design and planning of future urban open spaces. Landscape and Urban Planning, 170, 1-5.

Commons (2022). Category: Maps of Nigeria. Retrieved from https://commons.wikimedia.org/wiki/Category:Maps_of_Nigeria

Consultancy.asia (2020) Covid-19’s impact on India’s agricultural sector. Accessed July 2020 from https://www.consultancy.asia/news/3364/covid-19s-impact-on-indias-agricultural-sector

Corcoran, M. P., & Kettle, P. C. (2015). Urban agriculture, civil interfaces and moving beyond difference: the experiences of plot holders in Dublin and Belfast. Local Environment, 20(10), 1215-1230.

Corley, J., Okely, J. A., Taylor, A. M., Page, D., Welstead, M., Skarabela, B., et al. (2021). Home garden use during COVID-19: associations with physical and mental wellbeing in older adults. J. Environ. Psychol. 73:101545. doi: 10.1016/j.jenvp.2020.101545

Corntassel, J., & Hardbarger, T. (2019). Educate to perpetuate: Land-based pedagogies and community resurgence. International Review of Education, 65(1), 87-116.

Corrigan, M. P. (2011). Growing what you eat: Developing community gardens in Baltimore, Maryland. Applied Geography, 31, 1232–1241. doi: 10.1016/j.apgeog.2011.01.017

Corti, L., Day, A., & Backhouse, G. (2000). Confidentiality and informed consent: Issues for consideration in the preservation of and provision of access to qualitative data archives. Qualitative Social Research (Vol. 1, No. 3). http://dx.doi.org/10.17169/fqs-1.3.1024

Corti, L., Day, A., & Backhouse, G. (2000, December). Confidentiality and informed consent: Issues for consideration in the preservation of and provision of access to qualitative data archives. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 1, No. 3).

Costello, C., Oveysi, Z., Dundar, B., & McGarvey, R. (2021). Assessment of the effect of urban agriculture on achieving a localized food system centered on Chicago, IL using robust optimization. Environmental Science & Technology, 55(4), 2684-2694.

Crane A., Viswanathan, L. and Whitelaw, G. (2012) Sustainability through Intervention: A Case Study of Guerrilla Gardening in

Crane, A. (2011) Intervening with Agriculture: A Participatory Action Case Study of Guerrilla Gardening in Kingston, Ontario, Unpublished Masters Dissertation, Queen's University, Canada

Creswell, J. W., & Poth, C. N. (2017). Qualitative inquiry and research design: Choosing among five approaches. London: Sage publications.

Creswell, J. W., & Tashakkori, A. (2007). Differing perspectives on mixed methods research. Journal of mixed methods research, 1(4), 303-308.

Creswell, J.W. (2013). Qualitative Inquiry & Research Design: Choosing among Five Approaches. Los Angeles, CA: Sage.

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. BMC medical research methodology, 11(1), 1-9.

Crush, J., & Caesar, M. (2014, June). City without choice: Urban food insecurity in Msunduzi, South Africa. In Urban Forum (Vol. 25, No. 2, pp. 165-175). Springer Netherlands.

Crush, J., & Frayne, B. (2011). Supermarket expansion and the informal food economy in Southern African cities: implications for urban food security. Journal of Southern African Studies, 37(4), 781-807.

Crush, J., Hovorka, A., & Tevera, D. (2011). Food security in Southern African cities: The place of urban agriculture. Progress in development studies, 11(4), 285-305.

Crush, J., Hovorka, A., & Tevera, D. (2017). Farming the city: The broken promise of urban agriculture. In Food and nutrition security in Southern African cities (pp. 101-117). Routledge.

Da Silva, I. M., Fernandes, C. O., Castiglione, B., & Costa, L. (2016). Characteristics and motivations of potential users of urban allotment gardens: The case of Vila Nova de Gaia municipal network of urban allotment gardens. Urban forestry & urban greening, 20, 56-64.

Daftary-Steel, S., Herrera, H., & Porter, C. M. (2015). The unattainable trifecta of urban agriculture. Journal of Agriculture, Food Systems, and Community Development, 6(1), 19-32.

Damilola, A. (2020). Land Use Act in Nigeria – Title to Improvements on Land in Nigeria. Benin: Ernslee Ltd.

Dao, J., Stenchly, K., Traoré, O., Amoah, P., & Buerkert, A. (2018). Effects of water quality and post-harvest handling on microbiological contamination of lettuce at urban and peri-urban locations of Ouagadougou, Burkina Faso. Foods, 7(12), 206.

Davies, J., Hannah, C., Guido, Z., Zimmer, A., McCann, L., Battersby, J., & Evans, T. (2021). Barriers to urban agriculture in Sub-Saharan Africa. Food Policy, 103, 101999.

Davies, Z. G., Edmondson, J. L., Heinemeyer, A., Leake, J. R., & Gaston, K. J. (2011). Mapping an urban ecosystem service: quantifying above-ground carbon storage at a city-wide scale. Journal of applied ecology, 48(5), 1125-1134.

Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quinones, E., Zezza, A., Stamoulis, K., Azzarri, C., DiGiuseppe, S., 2010. A cross-country comparison of rural income generating activities. World Development 38 (1), 48–63. https://doi.org/10.1016/j.worlddev.2009.01.003

Davis, D., & Carter, J. (2014). Finding common ground in weed management: peri-urban farming, environmental and lifestyle values and practices in southeast Queensland, Australia. The Geographical Journal, 180(4), 342-352.

Dawson, J. C., & Morales, A. (Eds.). (2016). Cities of farmers: Urban agricultural practices and processes. University of Iowa Press.

De Bon, H., Parrot, L., & Moustier, P. (2010). Sustainable urban agriculture in developing countries. A review. Agronomy for sustainable development, 30(1), 21-32.

De Bruin, S., Oosting, S., van der Zijpp, A., Enders-Slegers, M. J., & Schols, J. (2010). The concept of green care farms for older people with dementia: An integrative framework. dementia, 9(1), 79-128.

De Janvry, A., & Sadoulet, E. (2008). The global food crisis: Identification of the vulnerable and policy responses. Agricultural and Research Economics Update, Special Issue: Causes and Consequences of the Food Price Crisis, 12(2), 18-21.

De Medeiros, E. V., Notaro, K. D. A., de Barros, J. A., Duda, G. P., Moraes, M. D. C. H. D. S., Ambrósio, M. M. D. Q., & Sales Júnior, R. (2019). Soils from intercropped fields have a higher capacity to suppress black root rot in cassava, caused by Scytalidium lignicola. Journal of Phytopathology, 167(4), 209–217. https://doi.org/10.1111/jph.12788

de Ruiter, H., Macdiarmid, J. I., Matthews, R. B., Kastner, T., & Smith, P. (2016). Global cropland and greenhouse gas impacts of UK food supply is increasingly located overseas. Journal of The Royal Society Interface, 13(114), 20151001.

De Zeeuw, H., Van Veenhuizen, R., & Dubbeling, M. (2011). The role of urban agriculture in building resilient cities in developing countries. The Journal of Agricultural Science, 149(S1), 153-163.

DEFRA (2022). Agriculture in the UK Evidence Pack. September 2022 update. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1106562/AUK_Evidence_Pack_2021_Sept22.pdf

Defra 2010. Farm Practices Survey 2010 - England. Available at: http://www.fao.org/fileadmin/templates/ess/ess_test_folder/World_Census_Agriculture/Country_info_2010/Reports/Reports_2/UK_ENG_REPc_2010.pdf; accessed 29/7/2015

DEFRA project report (2006). Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities: Defra project report IS0205. Retrieved from http://randd. defra. gov.uk/Default.aspx.

Delgado, C. (2018). Contrasting practices and perceptions of urban agriculture in Portugal. International Journal of Urban Sustainable Development, 10(2), 170-185.

Denzel, N. K., & Lincoln, Y. S. (2005). Introduction: The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), The SAGE handbook of qualitative research (3rd edition, pp. 1 - 32). Thousand Oaks, CA: Sage

Despommier, D. (2010). The vertical farm: feeding the world in the 21st century. Macmillan.

Despommier, D. (2011). The vertical farm: controlled environment agriculture carried out in tall buildings would create greater food safety and security for large urban populations. Journal für Verbraucherschutz und Lebensmittelsicherheit, 6(2), 233-236.

Despommier, D. (2013). Farming up the city: the rise of urban vertical farms. Trends Biotechnol, 31(7), 388-389.

Dessus, S., Herrera, S., & De Hoyos, R. (2008). The impact of food inflation on urban poverty and its monetary cost: some back-of-the-envelope calculations. Agricultural Economics, 39, 417-429. DOI10.1111/j.1574-0862.2008. 00348.x

Development Finance Department Central Bank of Nigeria (2017). Anchor Borrowers' Programme (ABP) Guidelines. Retrieved from https://www.cbn.gov.ng/Out/2021/CCD/ABP%20Guidelines%20October%2013%202021%20-%20Final%20(002).pdf

DeWalt, K.M. and DeWalt, B.R. (2002). Participant Observation: A guide for fieldworkers. Walnut Creek, CA: Altamira Press.

Dhital, P. R., & Joshi, N. R. (2016). Factors affecting adoption of recommended cauliflower production technology in Nepal. Turkish Journal of Agriculture-Food Science and Technology, 4(5), 378-383.

Dibie, R. (2018). Public management and sustainable development in Nigeria: Military–bureaucracy relationship. Routledge.

DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interviews. Medical education, 40(4), 314-321.

DiDomenica, B. (2015). Food policy: Urban farming as a supplemental food source (Doctoral dissertation, Walden University).

Diehl, J. A., Sweeney, E., Wong, B., Sia, C. S., Yao, H., & Prabhudesai, M. (2020). Feeding cities: Singapore's approach to land use planning for urban agriculture. Global Food Security, 26, 100377.

Dimitri, C., Oberholtzer, L., & Pressman, A. (2016). Urban agriculture: connecting producers with consumers. British Food Journal.

Dlamini DD, Masuku MB (2011) Land tenure and land productivity: a case of maize production in Swaziland. Asian J Agric Sci 3(4):301–307

Dona, W., C. G., Mohan, G., & Fukushi, K. (2021). Promoting urban agriculture and its opportunities and challenges—a global review. Sustainability, 13(17), 9609.

Dos Santos, M. J. P. L. (2016). Smart cities and urban areas—Aquaponics as innovative urban agriculture. Urban forestry & urban greening, 20, 402-406.

Dossa, L. H., Buerkert, A., & Schlecht, E. (2011). Cross-location analysis of the impact of household socioeconomic status on participation in urban and peri-urban agriculture in West Africa. Human Ecology, 39(5), 569. Retrieved from https://link.springer.com/article/10.1007/s10745-011-9421-z

Downing, E., Kennedy, S., & Fell, M. (2014). Food banks and food poverty. House of Commons Library SN06657, 9.

Drabble, L., Trocki, K. F., Salcedo, B., Walker, P. C., & Korcha, R. A. (2016). Conducting qualitative interviews by telephone: Lessons learned from a study of alcohol use among sexual minority and heterosexual women. Qualitative Social Work, 15(1), 118-133.

Drakakis-Smith D Bowyer-Bower T & Tevera D. (1995). Urban poverty and urban agriculture: an overview of the linkages in Harare. Habitat International 19 (2): 183-193. https://doi.org/10.1016/0197-3975(94)00065-A

Draper, C., & Freedman, D. (2010). Review and analysis of the benefits, purposes, and motivations associated with community gardening in the United States. Journal of Community Practice, 18(4), 458-492.

Draus, P. J., Roddy, J., & McDuffie, A. (2014). 'We don't have no neighbourhood': Advanced marginality and urban agriculture in Detroit. Urban Studies, 51(12), 2523-2538.

Drechsel, P., & Dongus, S. (2010). Dynamics and sustainability of urban agriculture: examples from sub-Saharan Africa. Sustainability Science, 5(1), 69-78.

Drechsel, P., & Kunze, D. (Eds.). (2001). Waste composting for urban and peri-urban agriculture: Closing the rural-urban nutrient cycle in sub-Saharan Africa. CABI.

Drechsel, P., Bahri, A., Raschid-Sally, L., & Redwood, M. (Eds.). (2010). Wastewater irrigation and health: assessing and mitigating risk in low-income countries. IWMI.

Drechsel, P., Graefe, S., Sonou, M., & Cofie, O. O. (2006). Informal irrigation in urban West Africa: An overview.

Drescher, A. W., Holmer, R. J., & Iaquinta, D. L. (2006). Urban homegardens and allotment gardens for sustainable livelihoods: Management strategies and institutional environments. In Tropical homegardens (pp. 317-338). Springer, Dordrecht.

Drever, E. (2003) Using Semi-structured Interviews in Small-Scale Research: A Teacher's Guide. Glasgow: the SCRE Centre, University of Glasgow.

Dubbeling (2013). Urban and Peri-Urban Agriculture for Resilient City-Regional Food Systems. Retrieved from https://peoplefoodandnature.org/blog/dubbeling_urban-ag/

Dubbeling, M. (2011) 'Integrating urban agriculture in the urban landscape', Urban Agriculture Magazine, (25), pp. 43–46

Dubbeling, M. (2016). Policy review for urban and peri-urban Agriculture development in Namibia. RUAF Foundation: Windhoek, Namibia.

Dubbeling, M., Zeeuw, H. D., & Veenhuizen, R. V. (2010). Cities, poverty, and food: multi-stakeholder policy and planning in urban agriculture. Practical Action Publishing.

Duchemin, E., Wegmuller, F., & Legault, A. M. (2008). Urban agriculture: multi-dimensional tools for social development in poor neighbourhoods. Field Actions Science Reports. The Journal of Field Actions, 1.

Duchin, F., & Sinha, A. (1999). Structural economics and the quality of life. Feminist Economics, 5(2), 125-132. https://doi.org/10.1080/135457099338049

Duguma, B., & Janssens, G. P. J. (2016). Assessment of feed resources, feeding practices and coping strategies to feed scarcity by smallholder urban dairy producers in Jimma town, Ethiopia. SpringerPlus, 5(1), 1-10.

Dyer, M., Mills, R., Conradie, B., & Piesse, J. (2015). Harvest of Hope: The contribution of peri-urban agriculture in South African townships. Agrekon, 54(4), 73-86.

Dymek, D., Wilkaniec, A., Bednorz, L., & Szczepańska, M. (2021). Significance of Allotment Gardens in Urban Green Space Systems and Their Classification for Spatial Planning Purposes: A Case Study of Poznań, Poland. Sustainability, 13(19), 11044.

Easterby-Smith, M., Thorpe, R., & Jackson, P. R. (2015). MANAGEMENT AND BUSINESS RESEARCH (5th ed.). London: Sage Publications.

ECOWAS Comission. 2020. Final Communique. Extraordinary session of the ECOWAS authority of heads of State and government. In: Ecowas [online]. Abuja. [Cited on 31 May 2020] https://www.ecowas.int/wp-content/uploads/2020/04/uk2020-04-23- Communique%CC%81_Extraordinary_Summit_Coronavirus_V2-1.pdf

Edeoghon, C. O., & Izekor, B. (2017). Food accessibility, distribution, and production constraints of urban farmers in Ikorodu Metropolis, Lagos State, Nigeria. J Agric Vet Sci, 10(3), 8-15.

Edmondson, J. L., Childs, D. Z., Dobson, M. C., Gaston, K. J., Warren, P. H., & Leake, J. R. (2020). Feeding a city–Leicester as a case study of the importance of allotments for horticultural production in the UK. Science of the Total Environment, 705, 135930.

Edmondson, J. L., Davies, Z. G., Gaston, K. J., & Leake, J. R. (2014). Urban cultivation in allotments maintains soil qualities adversely affected by conventional agriculture. Journal of Applied Ecology, 51(4), 880-889. https://doi.org/10.1111/1365-2664.12254

Edogbo, B., Okolocha, E., Maikai, B., Aluwong, T., & Uchendu, C. (2020). Risk analysis of heavy metal contamination in soil, vegetables, and fish around Challawa area in Kano State, Nigeria. Scientific African, 7, e00281.

EEA (2006). Urban sprawl in Europe. The ignored challenge. Report No. 10. European Environment Agency, Copenhagen.

Egbu, A. U., Olomolaiye, P., & Gameson, R. (2008). A neo-institutional economic critique of the system for allocating urban land and development rights in Nigeria. Habitat International, 32(1), 121-135.

Egbuna, N. E. (2009). Urban agriculture: a strategy for poverty reduction in Nigeria. In www.cbn.org

Egbuna, N. E. (2009). Urban Agriculture: A strategy for poverty reduction in Nigeria. Retrieved from http://www. docstoc. com/d ocs/34548910/URBAN-AGRIC-AS-ASTRATEGY-POVERTY-REDUCTION-INNIGERIA

Egbutah EU (2009) Food security in Nigeria: concept and strategies for improvement. Voice Teach 1:1–4

Egerer, M. H., Liere, H., Lin, B. B., Jha, S., Bichier, P., & Philpott, S. M. (2018). Herbivore regulation in urban agroecosystems: Direct and indirect effects. Basic and Applied Ecology, 29, 44-54.

Eigenbrod, C., & Gruda, N. (2015). Urban vegetable for food security in cities. A review. Agronomy for Sustainable Development, 35(2), 483-498.

Eizenberg, E. (2012). Actually, existing commons: Three moments of space of community gardens in New York City. Antipode, 44(3), 764-782.

El Khateeb, S., Saber, M., & Shawket, I. M. (2022). Urban reflections through home gardening; Does Gender Matter? Ain Shams Engineering Journal, 101885.

Eldridge, B. M., Manzoni, L. R., Graham, C. A., Rodgers, B., Farmer, J. R., & Dodd, A. N. (2020). Getting to the roots of aeroponic indoor farming. New Phytologist, 228(4), 1183-1192.

Ellis, F., & Sumberg, J. (1998). Food production, urban areas, and policy responses. World Development, 26(2), 213-225. https://doi.org/10.1016/S0305-750X(97)10042-0

Emovon, I., & Samuel, O. D. (2017). Prioritising alternative solutions to power generation problems using MCDM techniques: Nigeria as case study. International Journal of Integrated Engineering, 9(3).

Emovon, I., Samuel, O. D., Mgbemena, C. O., & Adeyeri, M. K. (2018). Electric Power generation crisis in Nigeria: A Review of causes and solutions. International Journal of Integrated Engineering, 10(1).

Evans, D and Davies, J (2020). Urban farming: four reasons it should flourish post-pandemic. Retrieved from https://eprints.lancs.ac.uk/id/eprint/146837

Evans, G. W., & Kantrowitz, E. (2002). Socioeconomic status and health: the potential role of environmental risk exposure. Annual review of public health, 23(1), 303-331.

Ezeah, C., Fazakerley, J. A., & Roberts, C. L. (2013). Emerging trends in informal sector recycling in developing and transition countries. Waste management, 33(11), 2509-2519.

Ezedinma C. and Chukuezi C (1999). A comparative Analysis of Urban Agriculture Enterprises in Lagos and Port Harcourt, Nigeria. Environment and Urbanization. 11(2): 135-144. https://doi.org/10.1177/095624789901100212

Fagariba, C. J., Song, S., & Soule, S. (2018). Factors influencing farmers' climate change adaptation in Northern Ghana: Evidence from subsistence farmers in sissala west, Ghana. Journal of Environmental Science and Management, 21(1).

Fagbemi, T. O., & Abogun, S. (2014). Factors influencing voluntary tax compliance of small and medium scale enterprises in Kwara State Nigeria. Entrepreneurial Journal of Management Science, 32(1), 98-127.

Falayi, K. (2019). Why Nigeria has restricted food imports. BBC News.

FAO (2003) The informal food sector. Municipal support policies for operators, vol 4. Food in cities collection. FAO, Rome. ftp://ftp.fao.org/docrep/fao/009/y4312e/y4312e00.pdf

FAO (2009). How to Feed the World 2050, Rome: Food and Agriculture Organization of the United Nations North.

FAO (2011). Recent trends in world food commodity prices: costs and benefits. Retrieved from https://www.fao.org/3/i2330e/i2330e03.pdf

FAO (2013) The state of food and agriculture.

FAO (2019). The State of Food Security and Nutrition in the World 2019. Retrieved from www.fao.org/publications

FAO (2020). The state of Food Security and Nutrition in the world. Retrieved July 2022 from https://www.unicef.org/media/72676/file/SOFI-2020-full-report.pdf

FAO (2020b). Food Security Indicators (FAO, 2020); http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.XiYStoh7mcw

FAO 2021 Urban Food Agenda (Food and Agriculture Organisation) available at: www.fao.org/urban-food-agenda/en/(Accessed 21 June 2021)

FAO and CIRAD (2021). Fruit and vegetables – Opportunities and Challenges for Small-Scale Sustainable Farming. Rome.

FAO Gender (2011). http://www.fao.org/gender/.

FAO Greener Cities (2012) International seminar on urban and peri-urban agriculture. http://www.fao.org/ag/agp/greenercities/en/events/

FAO, (2007) Spotlight: School Children, Street Food and Micronutrient Deficiencies in Tanzania. Rome: Italy.

FAO, 2004, The state of food insecurity in the world. Monitoring progress towards the World Food Summit and Millennium Development Goals. Available online http://www.fao.org/docrep/007/y5650e/y5650e00.htm

FAO, Alliance of Bioversity International and CIAT and Editora da UFRGS, 2021. Public food procurement for sustainable food systems and healthy diets – Volume 1. Rome.

FAO, Committee on Agriculture – COAG/FAO. 1999. Urban and peri-urban agriculture. COAG/99/10. Presented at Fifteenth Session of the COAG. 25-29 January. Rome: FAO.

FAO, I., IMF, O., & UNCTAD, W. (2011). The World Bank, the WTO, IFPRI and the UN

FAO-FCIT (2011) Food for the cities. http://www.fao.org/fcit/fcit-home/en/

Farhangi, H., M., Turvani, M. E., van der Valk, A., & Carsjens, G. J. (2020). High-tech urban agriculture in Amsterdam: An actor network analysis. Sustainability, 12(10), 3955.

Farhangi, M., Farhangi, S., van de Vlasakker, P. C., & Carsjens, G. J. (2021). The role of urban agriculture technologies in transformation toward participatory local urban planning in rafsanjan. Land, 10(8), 830.

Farooq, M. B., & De Villiers, C. (2017). Telephonic qualitative research interviews: When to consider them and how to do them. Meditari Accountancy Research.

Federal Ministry of Agriculture and Rural Development (2015) National Agriculture Resilience Framework (NARF). In: Adegoke J, Ibe C, Araba A (eds) A report by the advisory committee on agricultural resilience in Nigeria. Retrieved from https://data.gov.ng/search/download-file?file=15-05-2019_6824_National+Agricultural+Resilience+Framework.pdf checked 4/10/2020

Feldman, M. S., Bell, J., & Berger, M. T. (2004). Gaining access: A practical and theoretical guide for qualitative researchers. Rowman Altamira.

Feola, G., Suzunaga, J., Soler, J., & Wilson, A. (2020). Peri-urban agriculture as quiet sustainability: Challenging the urban development discourse in Sogamoso, Colombia. Journal of Rural Studies, 80, 1-12.

Fernández Martín, M. (2020). Aquaponics, a system that combines aquaculture with hydroponics in a symbiotic environment.

Ferris, J., Norman, C. & Sempik, J. 2001. People, land, and sustainability: Community gardens and the social dimension of sustainable development. Social Policy and Administration 35, 559–568. doi: 10.1111/1467-9515.t01-1-00253

Filippini, R., Mazzocchi, C., & Corsi, S. (2019). The contribution of Urban Food Policies toward food security in developing and developed countries: A network analysis approach. Sustainable Cities and Society, 47, 101506.

Finster, M. E., Gray, K. A., & Binns, H. J. (2004). Lead levels of edibles grown in contaminated residential soils: a field survey. Science of the Total Environment, 320(2-3), 245-257.

Fletcher, A. J., & Kubik, W. (Eds.). (2016). Women in Agriculture Worldwide: Key issues and practical approaches. Routledge.

Fletcher, E. I., & Collins, C. M. (2020). Urban agriculture: Declining opportunity and increasing demand—How observations from London, UK, can inform effective response, strategy, and policy on a wide scale. Urban Forestry & Urban Greening, 55, 126823.

Fletschner D (2009) Rural women's access to credit: market imperfections and intra-household dynamics. World Dev 37(3):618–631

Flick, U. (2002). An introduction to qualitative research (2nd ed.). London: Sage Publications.

Foeken, D (ed) (2006). To subsidise my income: urban farming in an East-African town, Africa Studies Centre, no. 7, The Netherlands.

Foeken, D. and Mwangi, A. (2000). Increasing food security through urban farming in Nairobi. In: Hovorka et al.(eds). Women Feeding Cities: Mainstreaming gender in urban agriculture and food security. Practical Action Publishing UK. Pp 143- 150.

Food and Agriculture Organization of the United Nations (2011) The state of food and agriculture 2010–2011: women in agriculture: closing the gender gap for development. FAO, Rome

Food and Agriculture Organization of United Nations FAO (2014). Building a common vision for sustainable food and agriculture: principles and approaches

Food for Bristol (2010) Food Charter, Bristol: Bristol City Council.

Food Futures Manchester (2007) A Food Strategy for Manchester, Manchester: Manchester City Council

Food Systems Policy Hub (2021). Our Review of the National Food Strategy Final Report. Retrieved from https://policyhub.n8agrifood.ac.uk/wp-content/uploads/2021/11/NFS-Food-Systems-Policy-Hub-Response.pdf

Foster, G., Royer, D. & Lunt, D. Future climate forcing potentially without precedent in the last 420 million years. Nat Commun 8, 14845 (2017). https://doi.org/10.1038/ncomms14845

Foundjem-Tita, D., Tchoundjeu, Z., Speelman, S., D'Haese, M., Degrande, A., Asaah, E., ... & Ndoye, O. (2013). Policy and legal frameworks governing trees: incentives or disincentives for smallholder tree planting decisions in Cameroon? Small-scale Forestry, 12(3), 489-505.

Fox-Kämper, R., Wesener, A., Münderlein, D., Sondermann, M., McWilliam, W., & Kirk, N. (2018). Urban community gardens: An evaluation of governance approaches and related enablers and barriers at different development stages. Landscape and Urban Planning, 170, 59-68.

Frayne, B., McCordic, C., & Shilomboleni, H. (2014, June). Growing out of poverty: Does urban agriculture contribute to household food security in Southern African cities? In Urban forum (Vol. 25, No. 2, pp. 177-189). Springer Netherlands.

Frenken, K., & Gillet, V., (2012). Irrigation Water Requirement and Water Withdrawal by Country. AQUASTAT, FAO. http://www.fao.org/nr/water/aquastat/water_use_agr/index.stm

Fresco, L.O., 1998. Higher Agricultural Education: An opportunity in rural development for women. Sustainable development department, Food and Agricultural Organisation (FAO), for the United Nations, pp: 4.

Frison EA, Cherfas J, Hodgkin T (2011) Agricultural biodiversity is essential for a sustainable improvement in food and nutrition security. Sustainability 3:238–253

Frith, H. (2000). Focusing on sex: Using focus groups in sex research. Sexualities, 3(3), 275-297.

Frith, H., & Gleeson, K. (2004). Clothing and embodiment: Men managing body image and appearance. Psychology of men & masculinity, 5(1), 40.

FSIN (2020). Global Report on Food Crisis. Retrieved from https://docs.wfp.org/api/documents/WFP-0000114546/download/?_ga=2.171557545.862426670.1667820525-439584337.1667820525

Fussy, A., & Papenbrock, J. (2022). An Overview of Soil and Soilless Cultivation Techniques—Chances, Challenges, and the Neglected Question of Sustainability. Plants, 11(9), 1153.

Gabrielyan, A. V., Shahnazaryan, G. A., & Minasyan, S. H. (2018). Distribution and identification of sources of heavy metals in the Voghji River basin impacted by mining activities (Armenia). Journal of Chemistry, 2018.

Gajjar, S. (2020). Nature-based Solutions to Climate Change in Coastal Cities.

Gallaher, C. M. (2017). Regreening Kibera: How urban agriculture changed the physical and social environment of a large slum in Kenya. Global urban agriculture, 171-183.

Gallaher, C. M., Kerr, J. M., Njenga, M., Karanja, N. K., & WinklerPrins, A. M. (2013). Urban agriculture, social capital, and food security in the Kibera slums of Nairobi, Kenya. Agriculture and human values, 30(3), 389-404.

Galletta, A. (2013). Mastering the Semi-Structured Interview and Beyond: From Research Design to Analysis and Publication, New York University Press, New York, NY, and London.

Gao, J., & O'Neill, B. C. (2020). Mapping global urban land for the 21st century with data-driven simulations and Shared Socioeconomic Pathways. Nature communications, 11(1), 1-12.

Garnett, T. (2000). Urban agriculture in London: rethinking our food economy. Growing Cities, Growing Food. German Foundation for International Development, Feldafing, Germany, 477-500.

Garnett, T. 2001. Urban agriculture in London: Rethinking our food economy. In Growing cities, growing food: Urban agriculture on the policy agenda, ed. N. Bakker, M. Dubbeling, S. Gündel, U. Sabel-Koschella, and H. De Zeeuw, 477–500. Feldafing: DSE/Zentralstelle für Ernährung und Landwirtschaft.

Gasperi, D., Pennisi, G., Rizzati, N., Magrefi, F., Bazzocchi, G., Mezzacapo, U., ... & Gianquinto, G. (2016). Towards regenerated and productive vacant areas through urban horticulture: Lessons from Bologna, Italy. Sustainability, 8(12), 1347.

Gbadegesin, A., & Olajiire-Ajayi, B. (2020). Beyond COVID-19: turning crisis to opportunity in Nigeria through urban agriculture. Journal of Agriculture, Food Systems, and Community Development, 9(4), 171-174.

Genter, C., Roberts, A., Richardson, J., & Sheaff, M. (2015). The contribution of allotment gardening to health and wellbeing: A systematic review of the literature. British Journal of Occupational Therapy, 78(10), 593-605.

Ghisa, V., Popescu, I. V., Belc, M., & Ene, A. (2008). Study of Some Roman Brooches Discovered at Tomis-Constanta, by X-Ray Fluorescence Technique. Romanian Journal of Physics, 53(3-4), 557-562.

Ghose, R., & Pettygrove, M. (2014). Urban community gardens as spaces of citizenship. Antipode, 46(4), 1092-1112.

Ghosh, S. (2002, September). Food production in cities. In International Conference on Urban Horticulture 643 (pp. 233-239).

Gibas, P., & Boumová, I. (2020). The urbanization of nature in a (post) socialist metropolis: An urban political ecology of allotment gardening. International Journal of Urban and Regional Research, 44(1), 18-37.

Gillam, S. J., Siriwardena, A. N., & Steel, N. (2012). Pay-for-performance in the United Kingdom: impact of the quality and outcomes framework—a systematic review. The Annals of Family Medicine, 10(5),461-468. Retrieved from http://www.annfammed.org/content/10/5/461.full

Gjorgieva Ackova, D. (2018). Heavy metals and their general toxicity on plants. Plant Science Today, 5(1), 15-19.

Glaser, B. G., & Strauss, A. L. (1967). The constant comparative method of qualitative analysis. The discovery of grounded theory: Strategies for qualitative research, 101, 158.

Glavan, M., Schmutz, U., Williams, S., Corsi, S., Monaco, F., Kneafsey, M., ... & Pintar, M. (2018). The economic performance of urban gardening in three European cities–examples from Ljubljana, Milan, and London. Urban Forestry & Urban Greening, 36, 100-122.

Glogowska, M., Young, P., & Lockyer, L. (2011). Propriety, process, and purpose: Considerations of the use of the telephone interview method in an educational research study. Higher Education, 62(1), 17-26.

Glover, T. D., 2003, The story of the Queen Anne memorial garden: Resisting a dominant cultural narrative. Journal of Leisure Research, Vol. 35, 190–212

Glover, T. D., Parry, D. C., & Shinew, K. J. (2005). Building relationships, accessing resources: Mobilizing social capital in community garden contexts. Journal of Leisure Research, 37(4), 450-474. https://doi.org/10.1080/00222216.2005.11950062

Goddard, M. A., Dougill, A. J., & Benton, T. G. (2010). Scaling up from gardens: biodiversity conservation in urban environments. Trends in ecology & evolution, 25(2), 90-98.

Godfray, H. C. J., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., Nisbett, N., ... & Whiteley, R. (2010). The future of the global food system. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1554), 2769-2777.

Godson-ibeji, C. C., & Chikaire, J. U. (2016). Consequences of environmental pollution on agricultural productivity in developing countries: A case of Nigeria. International Journal of Agricultural and Food Research, 5(3).

Golden, H. E., & Hoghooghi, N. (2018). Green infrastructure and its catchment-scale effects: an emerging science. Wiley Interdisciplinary Reviews: Water, 5(1), e1254.

Golden, S. (2013). Urban agriculture impacts: social, health, and economic: An annotated bibliography.

Goldstein M, Udry C (2008) The profits of power: land rights and agricultural investment in Ghana. J Polit Econ 116(6):981–1022

Goldstein, B., Hauschild, M., Fernandez, J., & Birkved, M. (2016). Testing the environmental performance of urban agriculture as a food supply in northern climates. Journal of Cleaner Production, 135, 984-994. https://doi.org/10.1016/j.jclepro.2016.07.004

Gorgolewski, M., Komisar, J. and Nasr, J. (2011) Carrot City: Creating Places for Urban Agriculture, New York: Monacelli Press

Gould, D., & Caplow, T. (2012). Building-integrated agriculture: a new approach to food production. In Metropolitan sustainability (pp. 147-170). Woodhead Publishing.

Gould, J. A. (2021). Fragile Dreams: Tales of Liberalism and Power in Central Europe. University of Michigan Press.

Gould, M. (2021). How Millennial Farmers Are Redefining the UK Agricultural Industry. Accessed September 2022 from https://www.delish.com/uk/food-news/a38091459/millennial-farmers/

Gourichon, H. (2019). Analysis of public expenditure in support of food and agriculture in Malawi, 2006-2013. Gates Open Res, 3(339), 339.

Graefe, S., Buerkert, A., & Schlecht, E. (2019). Trends and gaps in scholarly literature on urban and peri-urban agriculture. Nutrient Cycling in Agroecosystems, 115(2), 143-158.

Graham, H., & Zidenberg-Cherr, S. (2005). California teachers perceive school gardens as an effective nutritional tool to promote healthful eating habits. Journal of the American Dietetic Association, 105(11), 1797-1800.

Grant, B. M., & Giddings, L. S. (2002). Making sense of methodologies: A paradigm framework for the novice researcher. Contemporary nurse, 13(1), 10-28.

Gray M, Gordon JE, Brown EJ. 2013. Geodiversity and the ecosystem approach: the contribution of geoscience in delivering integrated environmental management. Proceedings of the Geologists' Association 124:659–673.

Gray, L., Guzman, P., Glowa, K. M., & Drevno, A. G. (2014). Can home gardens scale up into movements for social change? The role of home gardens in providing food security and community change in San Jose, California. Local Environment, 19(2), 187-203.

Grebitus, C., Chenarides, L., Muenich, R., & Mahalov, A. (2020). Consumers' perception of urban farming—An exploratory study. Frontiers in Sustainable Food Systems, 4, 79.

Grebitus, C., Printezis, I., & Printezis, A. (2017). Relationship between consumer behavior and success of urban agriculture. Ecological Economics, 136, 189-200.

Gregorioa, G. B., & Ancog, R. C. (2020). Assessing the impact of the COVID-19 pandemic on agricultural production in Southeast Asia: Toward transformative change in agricultural food systems. Asian Journal of Agriculture and Development, 17(1362-2020-1097), 1-13.

Grewal, S. S., & Grewal, P. S. (2012). Can cities become self-reliant in food? Cities, 29(1), 1-11.

Grogan, S., & Mechan, J. (2017). Body image after mastectomy: A thematic analysis of younger women's written accounts. Journal of health psychology, 22(11), 1480-1490.

Guitart D, Pickering C, Byrne J (2012) Past results and future directions in urban community gardens research. Urban For Urban Green 11:364–373

Gupta, N., Gedam, V. V., Moghe, C., & Labhasetwar, P. (2019). Comparative assessment of batch and column leaching studies for heavy metals release from Coal Fly Ash Bricks and Clay Bricks. Environmental Technology & Innovation, 16, 100461.

Gupta, R., & Gangopadhyay, S. G. (2006). Peri-urban agriculture and aquaculture. Economic and Political weekly, 1757-1760.

Gwan, A. S., & Kimengsi, J. N. (2020). Urban expansion and the dynamics of farmers' livelihoods: Evidence from Bamenda, Cameroon. Sustainability, 12(14), 5788.

Haberman, D., Gillies, L., Canter, A., Rinner, V., Pancrazi, L., & Martellozzo, F. (2014). The potential of urban agriculture in Montréal: a quantitative assessment. ISPRS International Journal of Geo-Information, 3(3), 1101-1117.

Habermas, J. (1971). Toward a rational society: Student protest, science, and politics (Vol. 404). Beacon Press.

Habitat, U. N. (2013). State of the world's cities 2012/2013: Prosperity of cities. Routledge.

Hage, J. (1972). Techniques and problems of theory construction in sociology. John Wiley & Sons.

Hagey, A., Rice, S., & Flournoy, R. (2012). Growing urban agriculture: Equitable strategies and policies for improving access to healthy food and revitalizing communities. Report by PolicyLink, Oakland, CA, 1-52.

Hagley, A, Rice, S and Flournoy, R (2012) Growing Urban Agriculture: Equitable Strategies and Policies for Improving Access to Healthy Food and Revitalizing Communities. Oakland, CA: PolicyLink, p. 52. Available at http://www.policylink.org/sites/default/files/URBAN_AG_FULLREPORT.PDF

Hakansson, I. (2019). Urban sustainability experiments in their socio-economic milieux: A quantitative approach. Journal of Cleaner Production, 209, 515-527.

Halliday, J., Joshi, D., Young, L., & Veenhuizen, R. V. (2020). Gender in urban food systems.

Halloran, A., & Magid, J. (2013). Planning the unplanned: incorporating agriculture as an urban land use into the Dar es Salaam master plan and beyond. Environment and Urbanization, 25(2), 541-558.

Halvey, M. R., Santo, R. E., Lupolt, S. N., Dilka, T. J., Kim, B. F., Bachman, G. H., ... & Nachman, K. E. (2021). Beyond backyard chickens: a framework for understanding municipal urban agriculture policies in the United States. Food Policy, 103, 102013.

Hamilton, A. J., Burry, K., Mok, H., Barker, S. F., Grove, J. R., & Williamson, V. G. (2014). Give peas a chance? Urban agriculture in developing countries. A review. Agronomy for Sustainable Development, 34,45–73. https://doi.org/10.1007/s13593-013-0155-8

Hammarberg, K., Kirkman, M., & de Lacey, S. (2016). Qualitative research methods: when to use them and how to judge them. Human reproduction, 31(3), 498-501. https://doi.org/10.1093/humrep/dev334

Hammelman, C., & Hayes-Conroy, A. (2015). Understanding cultural acceptability for urban food policy. Journal of Planning Literature, 30(1), 37-48.

Hammersley, Martyn and Atkinson, Paul (2007). Ethnography: Principles in Practice (3rd Edition) London: Routledge

Hanson, N. R. (1965). Patterns of discovery: An inquiry into the conceptual foundations of science. Cambridge: CUP Archive.

Hardman, M., & Larkham, P. J. (2014). Informal urban agriculture. Springer.

Hardman, M., Chipungu, L., Magidimisha, H., Larkham, P. J., Scott, A. J., & Armitage, R. P. (2018). Guerrilla gardening and green activism: Rethinking the informal urban growing movement. Landscape and Urban Planning, 170, 6-14. https://doi.org/10.1016/j.landurbplan.2017.08.015

Hardman, M., Clark, A., & Sherriff, G. (2022). Mainstreaming urban agriculture: opportunities and barriers to upscaling city farming. Agronomy, 12(3), 601.

Harrabin (2021). UK government to pay older farmers to retire. Accessed September 2022 from https://www.bbc.co.uk/news/science-environment-57149744

Harris, T. B. (2010). Nitrogen Dioxide in the Urban Forest: Exposure and Uptake.

Harrison, M., Baker, J., Twinamatsiko, M., & Milner-Gulland, E. J. (2015). Profiling unauthorized natural resource users for better targeting of conservation interventions. Conservation Biology, 29(6), 1636-1646. https://doi.org/10.1111/cobi.12575

He, B., & Zhu, J. (2018). Constructing community gardens? Residents' attitude and behaviour towards edible landscapes in emerging urban communities of China. Urban Forestry & Urban Greening, 34, 154-165.

Headey, D., & Fan, S. (2008). Anatomy of a crisis: the causes and consequences of surging food prices. Agricultural economics, 39, 375-391.

Heasman, M. (2008) Evaluation Report, Manitoba: Food Matters Manitoba IET.

Hemingway, A., Ellis-Hill, C., & Norton, E. (2016). What does care farming provide for clients? The views of care farm staff. NJAS: Wageningen Journal of Life Sciences, 79(1), 23-29.

Henderson, B. R., & Hartsfield, K. (2009). Is getting into the community garden business a good way to engage citizens in local government? National Civic Review, 98(4), 12-17. https://doi.org/10.1002/ncr.271

Henderson, B. R., & Hartsfield, K. (2009). Is getting into the community garden business a good way to engage citizens in local government? National Civic Review, 98(4), 12-18.

Hermanns, H. (2004). Interviewing as an activity. A companion to qualitative research, 1.

Hermanowicz, J. C. (2002). The great interview: 25 strategies for studying people in bed. Qualitative sociology, 25(4), 479-499.

Herrmann, M. M. (2015). The modern day "Victory Garden." Procedia Eng. 118, 647–653. doi: 10.1016/j.proeng.2015.08.498

Hess, T., & Sutcliffe, C. (2018). The exposure of a fresh fruit and vegetable supply chain to global water-related risks. Water international, 43(6), 746-761.

Hewitt-Taylor, J. (2001). Use of constant comparative analysis in qualitative research. Nursing Standard (through 2013), 15(42), 39. Retrieved from https://search.proquest.com/openview/6ee38173e91642bb31a5d2ffae54ea5a/1?pq-origsite=gscholar&cbl=30130

Hill, M. R. (1981). Positivism: a'hidden'philosophy in geography. In M. Harvey & B. Holly (Eds.), Themes in Geographic Thought. Oxford: Routledge.

Hine, R., Peacock, J., & Pretty, J. (2008). Care farming in the UK: contexts, benefits, and links with therapeutic communities. Therapeutic communities, 29(3), 245-260.

HLPE (2015). Water for food security and nutrition. Sustainable sanitation alliance. Retrieved from https://www.susana.org/_resources/documents/default/3-2444-16-1456360348.pdf

HLTF (2011). Price Volatility in Food and Agricultural Markets: Policy Responses. Rome, FAO.

Holland, J. M. (2004). The environmental consequences of adopting conservation tillage in Europe: reviewing the evidence. Agriculture, ecosystems & environment, 103(1), 1-25.

Holmer, R. J., & Drescher, A. W. (2005). Allotment gardens of Cagayan de Oro: Their contribution to food security and urban environmental management. Urban and Peri-Urban Developments—Structures, Processes and Solutions, 149-155.

Holt-Giménez, E., Shattuck, A., Altieri, M., Herren, H., & Gliessman, S. (2012). We already grow enough food for 10 billion people… and still can't end hunger. Journal of Sustainable Agriculture, 36(6), 595-598.

Honey-Rosés, J., Anguelovski, I., Chireh, V. K., Daher, C., Konijnendijk van den Bosch, C., Litt, J. S., et al. (2020). The impact of COVID-19 on public space: an early review of the emerging questions – design, perceptions, and inequities. Cities Health 1–17. doi: 10.1080/23748834.2020.1780074

Hoornweg, D., & Munro-Faure, P. (2008). Urban agriculture for sustainable poverty alleviation and food security. Position paper, FAO. Africa.

Hopkins, R. (2008). The Transition Handbook: From Oil Dependency to Local Resilience. Green Books, London.

Horst, M., & Gaolach, B. (2015). The potential of local food systems in North America: A review of foodshed analyses. Renewable Agriculture and Food Systems, 30(5), 399-407.

Horst, M., McClintock, N., & Hoey, L. (2017). The intersection of planning, urban agriculture, and food justice: A review of the literature. Journal of the American Planning Association, 83(3), 277-295.

Houessou, M. D., van de Louw, M., & Sonneveld, B. G. (2020). What constraints the expansion of urban agriculture in Benin? Sustainability, 12(14), 5774.

Hough, R. L., Breward, N., Young, S. D., Crout, N. M., Tye, A. M., Moir, A. M., & Thornton, I. (2004). Assessing potential risk of heavy metal exposure from consumption of home-produced vegetables by urban populations. Environmental health perspectives, 112(2), 215-221.

Houngla, E. J. H., Gbankoto, A., Mizehoun-Adissoda, C., Anani, C. B. L., Edorh, P. A., Moutaïrou, K., & Sohounhloué, D. C. (2020). Nutrient Composition and Heavy Metals Content of Three Leafy Vegetables (Amaranthus Cruentus L., Lactuca Sativa L., Solanum Macrocarpon L.) in Porto-Novo, Republic of Benin. Journal of Food and Nutrition Research, 8(2), 80-86.

Hovorka A (2001) Gender and urban agriculture: emerging trends and areas for future research. Clark University, Graduate School of Geography, Worcester

Hovorka, A and D Lee-Smith (2006), "Gendering the urban agriculture agenda", in van Veenhuizen (editor) (2006)

Hovorka, A. (2008). Transspecies urban theory: chickens in an African city. Cultural Geographies, 15, 95–117.

Hovorka, A. 2003: Gender and urban agriculture: Emerging trends and areas for future research. In Bruinsma, W. and Hertog, W., editors, Annotated bibliography on urban agriculture. ETC – Urban Agriculture Programme in cooperation with TUAN and other organizations, 281–85.

Hovorka, A. J. (2005). The (re) production of gendered positionality in Botswana's commercial urban agriculture sector. Annals of the Association of American Geographers, 95(2), 294-313.

Hovorka, A. J. (2006). The No. 1 Ladies' Poultry Farm: A feminist political ecology of urban agriculture in Botswana. Gender, Place & Culture, 13(3), 207-225.

Hovorka, A., Zeeuw, H. D., & Njenga, M. (2009). Women feeding cities: Mainstreaming gender in urban agriculture and food security. CTA/Practical Action.

Howarth, C., Bryant, P., Corner, A., Fankhauser, S., Gouldson, A., Whitmarsh, L., & Willis, R. (2020). Building a social mandate for climate action: Lessons from COVID-19. Environmental and Resource Economics, 76(4), 1107-1115.

Howe, J., & Wheeler, P. (1999). Urban food growing: the experience of two UK cities. Sustainable Development, 7(1), 13–24. http://dx.doi.org/10.1002/(SICI)1099-1719(199902)7:1<13: AID-SD100>3.0. CO;2-B

Howe, J., & Wheeler, P. (1999). Urban food growing: The experience of two UK cities. Sustainable development, 7(1), 13-24.

Howe, J., Bohn, K. and Viljoen, A. (2005). "Food in Time: The History of English Open Urban Space as a European Example". In CPULs: Continuous Productive Urban Landscapes, Edited by: Viljoen, A. Oxford: Architectural Press.

Hubbard, P., Bartley, B., Fuller, D., & Kitchin, R. (2002). Thinking geographically: Space, theory, and contemporary human geography. A&C Black.

Hughes, D. W., & Boys, K. A. (2015). What we know and don't know about the economic development benefits of local food systems. Choices, 30(316-2016-7751).

Hume, I. V., Summers, D. M., & Cavagnaro, T. R. (2021). Self-sufficiency through urban agriculture: nice idea or plausible reality? Sustainable Cities and Society, 68, 102770.

Hunold, C., Sorunmu, Y., Lindy, R., Spatari, S., & Gurian, P. L. (2017). Is urban agriculture financially sustainable? An exploratory study of small-scale market farming in Philadelphia, Pennsylvania. Journal of Agriculture, Food Systems, and Community Development, 7(2), 51-67.

Ibitoye, S. J., Shaibu, U. M., Sale, F. A., & Frank, O. E. (2016). Assessment of the influence of urban agriculture on household income: evidence from Kogi State, Nigeria. International Journal of Agricultural and Veterinary Sciences, 2(3), 107-115.

Ibrahim, M. K., Haruna, M., & Shaibu, U. M. (2020). Analysis of Household Participation in Urban Agriculture: Empirical Evidence from Urban Households in Kogi State, Nigeria.

Idachaba, F. S. (2006). Strategic and Policies for Food Security and Economic Development in Nigeria. Lagos: CBN

Idowu, O., Cofie, O., & Adeoti, A. (2012). Gender analysis of land use for urban agriculture and sustainability of livelihoods in Freetown, Sierra Leone. African Journal of Agricultural Research, 7(5), 676-683.

Igbolekwu, C. O., Arisukwu, O., Rasak, B., Ake, M., & Onireti, O. M. (2020, February). Awareness and willingness of youths to participate in agriculture among undergraduates in southwest Nigeria. In IOP Conference Series: Earth and Environmental Science (Vol. 445, No. 1, p. 012048). IOP Publishing.

Ikejima, Y. (2019). Measuring Elderly People's Food Access in Urban Food Environments: The Potential Benefits of Urban Agriculture. The International Journal of Sociology of Agriculture and Food, 25(1).

Ikejiofor, U. C. (2009). Planning within a context of informality: issues and trends in land delivery in Enugu, Nigeria. Case study prepared for Revisiting Urban Planning: Global Report on Human Settlements.

IMF (2018). External Sector Report: Tackling Global Imbalances amid Rising Trade Tensions.

Independent (2020). Interest in allotments soars in England during coronavirus pandemic. Accessed March 2020 from https://www.theguardian.com/lifeandstyle/2020/aug/10/interest-in-allotments-soars-in-england-during-coronavirus-pandemic

Inegbedion, G., & Islam, M. M. (2021). Willingness and motivation of Nigerian youth to pursue agricultural careers after graduation. International Journal of Agricultural Science, Research and Technology (IJASRT) in Extension and Education Systems, 11(1), 55-69.

Ingawa, S. A. (2002). Keynote address at the 8th Annual conference of the Agricultural Extension society of Nigeria held in Benin City, 16–19 September. Proceedings of the Agricultural Extension society of Nigeria.

Insights W (2020) Impact of COVID-19 on smallholder farmers – insights from India. https://www.wbcsd.org/Overview/News-Insights/WBCSD-insights/Impact-of-COVID-19-on-smallholder-farmers-in-India. Accessed June 2020

International Panel of Experts on Sustainable Food Systems (2017). iPES-Food. Unravelling the Food–Health Nexus: Addressing practices, political economy, and power relations to build healthier food systems. Brussels: The Global Alliance for the Future of Food and International Panel of Experts on Sustainable Food Systems; 2017. October 2017. http://www.ipes-food.org/images/Reports/Health_FullReport.pdf

IPCC 2018 ed V Masson-delmotte (Switzerland: IPCC) Global warming of 1.5 °C. An IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty 616 et al accepted available at: www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

Irazábal, C., & Punja, A. (2009). Cultivating just planning and legal institutions: A critical assessment of the South-Central Farm struggle in Los Angeles. Journal of Urban Affairs, 31(1), 1-23.

Irvine, A. (2011). Duration, dominance and depth in telephone and face-to-face interviews: A comparative exploration. International Journal of Qualitative Methods, 10(3), 202-220.

Irvine, A., Drew, P., & Sainsbury, R. (2013). 'Am I not answering your questions properly?'Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews. Qualitative research, 13(1), 87-106.

Iseolorunkanmi, J. (2014). Decentralization, local governance, and public goods delivery in Nigeria. International Journal of Public Administration and Management Research (IJPAMR, 2(2), 48-55.

Issa, F. O., Aminu, A. B., Abdullahi, A. Y., & Abdulazeez, M. A. (2014). Role of the Three Tiers of Government in the Provision of Sustainable Agricultural Extension Service in Nigeria. Journal of Agricultural Extension, 18(1), 1-12.

Ivanic, M., & Martin, W. (2008). Implications of higher global food prices for poverty in low-income countries 1. Agricultural economics, 39, 405-416.

Iwachukwu, J. C. & Igbokwe E. M. (2012). Lessons from Agricultural Policies and Programmes in Nigeria. Journal of Law, Policy, and Globalization, 5, 11-21 Retrieved from www.iiste.org

Jámbor A, Czine P, Balogh P (2020) The impact of the coronavirus on agriculture: first evidence based on global newspapers. Sustain 12:1–10. https://doi.org/10.3390/su12114535

Jámbor, A., Czine, P., & Balogh, P. (2020). The impact of the coronavirus on agriculture: first evidence based on global newspapers. Sustainability, 12(11), 4535.

James P, Magee L, Scerri A, Steger M (2015) Urban sustainability in theory and practice: circles of sustainability. Routledge, London

Jensen, J. L., & Sørensen, E. B. (2020). Recreation, cultivation, and environmental concerns: Exploring the materiality and leisure experience of contemporary allotment gardening. Leisure Studies, 39(3), 322-340.

Jin, Z., Chen, C., Chen, X., Hopkins, I., Zhang, X., Han, Z., ... & Billy, G. (2019). The crucial factors of soil fertility and rapeseed yield-A five-year field trial with biochar addition in upland red soil, China. Science of the Total Environment, 649, 1467-1480.

Johnson K. and Ifeoma U. (2018). Rural development as a panacea for rural-urban migration in Nigeria. Art Human. Open Acc. J., 2 (5), 241-244. DOI: 10.15406/ahoaj.2018.02.00065

Johnson, D. R., Scheitle, C. P., & Ecklund, E. H. (2021). Beyond the in-person interview? How interview quality varies across in-person, telephone, and Skype interviews. Social Science Computer Review, 39(6), 1142-1158.

Johnson, L. (2011) City Farmer: Adventures in Growing Urban Food, Vancouver: Greystone Books

Johnson-Mallard, V., Jones, R., Coffman, M., Gauda, J., Deming, K., Pacheco, M., & Campbell, J. (2019). The Robert Wood Johnson nurse faculty scholar's diversity and inclusion research. Health equity, 3(1), 297-303.

Jolly, Y. N., Islam, A., & Akbar, S. (2013). Transfer of metals from soil to vegetables and possible health risk assessment. SpringerPlus, 2(1), 1-8.

Jones, H., & Cipriani, A. (2019). Barriers and incentives to recruitment in mental health clinical trials. Evidence-based mental health, 22(2), 49-50.

Jones, P., Maryati, S., & Suhartini, N. (2018). The form of the informal-understanding Lebak Siliwangi, Bandung, Indonesia.

Kabisch, N., & Haase, D. (2014). Green justice or just green? Provision of urban green spaces in Berlin, Germany. Landscape and urban planning, 122, 129-139.

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. Journal of advanced nursing, 72(12), 2954-2965. https://doi.org/10.1111/jan.13031

Kam, M. C., & Siu, A. M. (2010). Evaluation of a horticultural activity programme for persons with psychiatric illness. Hong Kong journal of occupational therapy, 20(2), 80-86.

Kamer Aksoy, Ö. (2022). Predicting the Potential Distribution Area of the Platanus orientalis L. in Turkey Today and in the Future. Sustainability, 14(18), 11706.

Kanosvamhira, T. P. (2019). The organisation of urban agriculture in Cape Town, South Africa: A social capital perspective. Development Southern Africa, 36(3), 283-294.

Kapungwe, E. M. (2011). Industrial land use and heavy metal contaminated wastewater used for irrigation in periurban Zambia. Singapore Journal of Tropical Geography, 32(1), 71-84.

Kareem, R.O and Raheem, K.A (2012). A review of urban agriculture as a tool for building food security in Nigeria: challenges and policy options. Journal of sustainable development in Africa 14(3), 526-542. Retrieved from http://www.jsd-africa.com/Jsda/Vol14No3-Summer2012A/PDF/A%20Review%20of%20Urban%20Agriculture%20as%20a%20Tool%20for%20Building.Kareem%20Rasaki.pdf

Karg, H., Drechsel, P., Akoto-Danso, E. K., Glaser, R., Nyarko, G., & Buerkert, A. (2016). Foodsheds and city region food systems in two West African cities. Sustainability, 8(12), 1175.

Karkare, P., Odijie, M., Ukaoha, K., & van Seters, J. (2022). Inconsistent policies or political realities?

Katongole, C. B., Nambi-Kasozi, J., Lumu, R., Bareeba, F., Presto, M., Ivarsson, E., & Lindberg, J. E. (2012). Strategies for coping with feed scarcity among urban and peri-urban livestock farmers in Kampala, Uganda. Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS), 113(2), 165-174.

Kee, K. F., & Schrock, A. R. (2020). Telephone interviewing as a qualitative methodology for researching cyberinfrastructure and virtual organizations. Second international handbook of internet research, 351-365.

Keep, M. (2009) Agriculture: historical statistics. Standard note SN/SG/3339. House of Commons Library, London.

Kelly, S. E. (2010). Qualitative interviewing techniques and styles. The SAGE handbook of qualitative methods in health research, 307-326.

Kelly, S. E., Bourgeault, I., & Dingwall, R. (2010). Qualitative interviewing techniques and styles. The SAGE handbook of qualitative methods in health research, 307-326.

Kerton, S., & Sinclair, A. J. (2010). Buying local organic food: A pathway to transformative learning. Agriculture and Human Values, 27(4), 401-413.

Khan, M. M., Akram, M. T., Janke, R., Qadri, R. W. K., Al-Sadi, A. M., & Farooque, A. A. (2020). Urban horticulture for food secure cities through and beyond COVID-19. Sustainability, 12(22), 9592.

Khandaker, M., & Kotzen, B. (2018). The potential for combining living wall and vertical farming systems with aquaponics with special emphasis on substrates. Aquaculture research, 49(4), 1454-1468.

Kihara, J., Bolo, P., Kinyua, M., Nyawira, S. S., & Sommer, R. (2020). Soil health and ecosystem services: Lessons from sub-Sahara Africa (SSA). Geoderma, 370, 114342.

Kingsley, J., Egerer, M., Nuttman, S., Keniger, L., Pettitt, P., Frantzeskaki, N., ... & Marsh, P. (2021). Urban agriculture as a nature-based solution to address socio-ecological challenges in Australian cities. Urban Forestry & Urban Greening, 60, 127059.

Kingston, Ontario, Local Environment: The International Journal of Justice and Sustainability, 18: 71-90

Kiprono, P., & Matsumoto, T. (2014, March). Roads and farming: The effect of infrastructure improvement on agricultural input use, farm productivity and market participation in Kenya. In CSAE conference (pp. 23-25).

Kiptot E, Franzel S, Degrande A (2014) Gender, agroforestry, and food security in Africa. Curr Opin Environ Sustain 6:104–109

Kirby, C. K., Specht, K., Fox-Kämper, R., Hawes, J. K., Cohen, N., Caputo, S., ... & Blythe, C. (2021). Differences in motivations and social impacts across urban agriculture types: Case studies in Europe and the US. Landscape and Urban Planning, 212, 104110.

Kisser, J., Wirth, M., De Gusseme, B., Van Eekert, M., Zeeman, G., Schoenborn, A., ... & Beesley, L. (2020). A review of nature-based solutions for resource recovery in cities. Blue-Green Systems, 2(1), 138-172.

Kneafsey, M., Owen, L., Bos, E., Broughton, K., & Lennartsson, M. (2017). Capacity building for food justice in England: The contribution of charity-led community food initiatives. Local Environment, 22(5), 621-634.

Koay, W. I., & Dillon, D. (2020). Community gardening: Stress, well-being, and resilience potentials. International Journal of Environmental Research and Public Health, 17(18), 6740.

Kolaj, R., Osmani, M., Borisov, P., & Skunca, D. (2019). Empowering partnering links as opportunities for development of the regions: can PPPs work in agriculture? Bulgarian Journal of Agricultural Science, 25(3), 468-473.

Koller, M., & Saleh, H. M. (2018). Introductory chapter: Introducing heavy metals. Heavy metals, 1, 3-11.

Konijnendijk, C., Gauthier, M., & Van Veenhuizen, R. (2004). Trees and cities: growing together. Urban Agriculture Magazine, 13, 1-5.

Kortright, R., & Wakefield, S. (2011). Edible backyards: a qualitative study of household food growing and its contributions to food security. Agriculture and Human Values, 28(1), 39-53.

Kortright, R., and S. Wakefield. (2010). Edible backyards: a qualitative study of household food growing and its contributions to food security. Agriculture and Human Values 28: 39–53. Retrieved from https://link.springer.com/article/10.1007/s10460-009-9254-1

Koscica, M. (2014). Agropolis: the role of urban agriculture in addressing food insecurity in developing cities. Journal of International Affairs, 177-186.

Krasny, M., & Doyle, R. (2002). Participatory Approaches to Program Development and Engaging Youth in Research: The Case of an Inter-Generational Urban Community Gardening Program. Journal of Extension, 40(5), n5.

Krishnan, S., Nandwani, D., Smith, G., & Kankarta, V. (2016). Sustainable urban agriculture: A growing solution to urban food deserts. In Organic farming for sustainable agriculture (pp. 325-340). Springer, Cham.

Krouwel, M., Jolly, K., & Greenfield, S. (2019). Comparing Skype (video calling) and in-person qualitative interview modes in a study of people with irritable bowel syndrome–an exploratory comparative analysis. BMC medical research methodology, 19(1), 1-9.

Krueger, R. A. Focus groups: the practical guide goes applied research. Thousand Oaks: SAGE Publications, 2nd. Ed., 1994.

Kulak, M., Graves, A., & Chatterton, J. (2013). Reducing greenhouse gas emissions with urban agriculture: A Life Cycle Assessment perspective. Landscape and urban planning, 111, 68-78.

Kulatunga, U., Amaratunga, D., & Haigh, R. (2006). Construction innovation: a literature review on current research.

Kumari V, Shirisha J (2021) Socio-economic profile and expenditure pattern of the practitioners of urban agriculture. Young 11(9):20

Kuo, F. E., & Sullivan, W. C. (2001). Environment and crime in the inner city: Do vegetation reduce crime? Environment and behavior, 33(3), 343-367.

Kuusaana, E. D., Ayurienga, I., Abdulai, I. A., Eledi Kuusaana, J. A., & Kidido, J. K. (2022). Challenges and sustainability dynamics of urban agriculture in the savannah ecological zone of Ghana: A study of Bolgatanga Municipality. Frontiers in Sustainable Food Systems, 4.

LaCroix, C. J. (2010). Urban agriculture and other green uses: Remaking the shrinking city. The Urban Lawyer, 225-285.Retrieved from https://www.jstor.org/stable/27895787?seq=1#page_scan_tab_contents

Lades, L. K., Laffan, K., Daly, M., and Delaney, L. (2020). Daily emotional well-being during the COVID-19 pandemic. Br. J. Health Psychol. 25, 902–911. doi: 10.1111/bjhp.12450

Lal, R. (2020). Regenerative agriculture for food and climate. Journal of soil and water conservation, 75(5), 123A-124A.

Lambie-Mumford, H. (2015). Addressing food poverty in the UK: Charity, rights, and welfare. SPERI Paper, 18.

Lang, T. (2010). Crisis? What crisis? The normality of the current food crisis Journal of Agrarian Change 10 87–97. https://doi.org/10.1111/j.1471-0366.2009.00250.x

Lang, T. (2020). Feeding Britain: Our food problems and how to fix them. Penguin UK.

Lang, T., & Barling, D. (2012). Food security and food sustainability: reformulating the debate. The Geographical Journal, 178(4), 313-326. https://doi.org/10.1111/j.1475-4959.2012.00480.x

Lang, T., & McKee, M. (2018). Brexit poses serious threats to the availability and affordability of food in the United Kingdom. Journal of public health, 40(4), e608-e610.

Langemeyer, J., Madrid-Lopez, C., Beltran, A. M., & Mendez, G. V. (2021). Urban agriculture—A necessary pathway towards urban resilience and global sustainability? Landscape and Urban Planning, 210, 104055.

Lanner, J., Curto, M., Pachinger, B., Neumüller, U., & Meimberg, H. (2019). Illumina midi-barcodes: quality proof and applications. Mitochondrial Dna Part A, 30(3), 490-499.

Lawson, L. 2005. City bountiful: A century of community gardening in America. Berkley, CA: University of California Press.

Leake, J. R., Adam-Bradford, A., & Rigby, J. E. (2009). Health benefits of' grow your own food in urban areas: implications for contaminated land risk assessment and risk management? Environmental Health, 8(1), S6. Retrieved from https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-8-S1-S6

Lee-Smith, D., 2013. Which way for UPA in Africa? City, 17(1), pp.69–84.

Levkoe, C. Z. (2011). Towards a transformative food politics. Local Environment, 16(7), 687-705.

Lewis, A. C. (2018). The changing face of urban air pollution. Science, 359(6377), 744-745.

Lewis, T. (2012) 'There Grows the Neighbourhood': Green Citizenship, Creativity and Life Politics on Eco-TV, International Journal of Cultural Studies, 15 (3): 315 – 326

Libman, A. (2007). Regionalisation and regionalism in the post-Soviet space: Current status and implications for institutional development. Europe-Asia Studies, 59(3), 401-430.

Lin, B. B., & Egerer, M. H. (2017). Urban agriculture: an opportunity for biodiversity and food provision in urban landscapes. In Urban Biodiversity (pp. 71-86). Routledge.

Lin, B. B., Philpott, S. M., & Jha, S. (2015). The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. Basic and applied ecology, 16(3), 189-201.

Lindlof, T. R., & Taylor, B. C. (2002). Qualitative communication research methods (2nd ed.). Thousand Oaks, CA: Sage.

Lobe, B., Morgan, D., & Hoffman, K. A. (2020). Qualitative data collection in an era of social distancing. International journal of qualitative methods, 19, 1609406920937875.

Lopez-Galvez, F., Allende, A., Pedrero-Salcedo, F., Alarcon, J. J., & Gil, M. I. (2014). Safety assessment of greenhouse hydroponic tomatoes irrigated with reclaimed and surface water. International journal of food microbiology, 191, 97-102.

Loram, A., Warren, P. H., & Gaston, K. J. (2008). Urban domestic gardens (XIV): the characteristics of gardens in five cities. Environmental Management, 42(3), 361-376.

Love, D. C., Fry, J. P., Li, X., Hill, E. S., Genello, L., Semmens, K., & Thompson, R. E. (2015). Commercial aquaponics production and profitability: Findings from an international survey. Aquaculture, 435, 67-74.

Lovell, S. T. (2010). Multifunctional urban agriculture for sustainable land use planning in the United States. Sustainability, 2(8), 2499-2522.

LSALHA (2022). Lagos State Agricultural Lands Holding Authority. https://agriculture.lagosstate.gov.ng/departments/lagos-state-agricultural-land-holding-authority

Luckstead, Jeff and Nayga, Rodolfo M. and Snell, Heather, U.S. Domestic Workers' Willingness to Accept Agricultural Field Jobs Before and During COVID-19 (September 23, 2020). Available at SSRN: https://ssrn.com/abstract=3698183 or http://dx.doi.org/10.2139/ssrn.3698183

Lupia, F., & Pulighe, G. (2015). Water use and urban agriculture: Estimation and water saving scenarios for residential kitchen gardens. Agriculture and agricultural science procedia, 4, 50-58.

Lwasa, S. (2014). Managing African urbanization in the context of environmental change. Interdisciplina, 2(2).

Lwasa, S., Mugagga, F., Wahab, B., Simon, D., Connors, J., & Griffith, C. (2014). Urban and peri-urban agriculture and forestry: Transcending poverty alleviation to climate change mitigation and adaptation. Urban Climate, 7, 92-106.

Lwasa, S., Tenywa, M., Mwanjalolo, G. M., Sengendo, H., & Prain, G. (2009, February). Enhancing adaptation of poor urban dwellers to the effects of climate variability and change. In IOP Conference Series. Earth and Environmental Science (Vol. 6, No. 33). IOP Publishing.

Lynch, K. (1995). Sustainability and urban food supply in Africa. Sustainable Development, 3(2), 79-88.

Lynch, K., Maconachie, R., Binns, T., Tengbe, P., & Bangura, K. (2013). Meeting the urban challenge? Urban agriculture and food security in post-conflict Freetown, Sierra Leone. Applied Geography, 36, 31-39.

Ma, E, Cai, J, Lin, J, et al. (2020). Spatio-temporal evolution of global food security pattern and its influencing factors in 2000-2014 [2000-2014年全球粮食安全格局的 时空演化及影响因素]. Dili Xuebao/Acta Geographica Sinica, 75(2), 332–347. https:// doi.org/10.11821/dlxb202002009

Mabogunje, A. L. (2005). Global urban poverty research agenda: The African case. Global Urban Poverty: Setting the Research Agenda, 28.

Maconachie, R., Binns, T., Tengbe, P. (2012). Urban farming associations, youth and food security in post-war Freetown, Sierra Leone. In: Cities, Vol 29, pp 192-200. https://doi.org/10.1016/j.cities.2011.09.001

MacRae, R. J., Lynch, D., & Martin, R. C. (2010). Improving energy efficiency and GHG mitigation potentials in Canadian organic farming systems. Journal of Sustainable Agriculture, 34(5), 549-580.

Magaldi, D., & Berler, M. (2020). Semi-structured interviews. Encyclopaedia of personality and individual differences, 4825-4830.

Mahajan, K., & Tomar, S. (2020). Here today, gone tomorrow: COVID-19 and supply chain disruptions. Forthcoming, American Journal of Agricultural Economics.

Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: guided by information power. Qualitative health research, 26(13), 1753-1760.

Mancarella, S., Pennisi, G., Gasperi, D., Marchetti, L., Loges, V., Orsini, F., ... & Antisari, L. V. (2016). Antimony accumulation risk in lettuce grown in Brazilian urban gardens. Eqa-International Journal of Environmental Quality, 20, 35-47.

Manka'abusi, D., Steiner, C., Akoto-Danso, E. K., Lompo, D. J., Haering, V., Werner, S., ... & Buerkert, A. (2019). Biochar application and wastewater irrigation in urban vegetable production of Ouagadougou, Burkina Faso. Nutrient cycling in agroecosystems, 115(2), 263-279.

Marsden, T. (2010). Food 2030: Towards a Redefinition of Food? A Commentary on the New United Kingdom Government Food Strategy, The Political Quarterly, 81 (3): 443-446. https://doi.org/10.1111/j.1467-923X.2010.02096.x

Martellozzo, F., Landry, J. S., Plouffe, D., Seufert, V., Rowhani, P., & Ramankutty, N. (2014). Urban agriculture: a global analysis of the space constraint to meet urban vegetable demand. Environmental Research Letters, 9(6), 064025. http://dx.doi.org/10.1088/1748-9326/9/6/064025

Martin, G. M., Kandasamy, B., DiMaio, F., Yoshioka, C., & Shyng, S. L. (2017). Anti-diabetic drug binding site in a mammalian KATP channel revealed by Cryo-EM. Elife, 6, e31054.

Martin, M., & Molin, E. (2019). Environmental assessment of an urban vertical hydroponic farming system in Sweden. Sustainability, 11(15), 4124.

Martin, R. & Marsden, T., (1999). Food for urban spaces: the development of urban food production in England and Wales. International Planning Studies, 4(3), pp.389-412. https://doi.org/10.1080/13563479908721749

Mason, J. (2002). Qualitative Researching (2nd edn) London: Sage Publications.

Mason, M. (2010, August). Sample size and saturation in PhD studies using qualitative interviews. qualitative social research (Vol. 11, No. 3). http://dx.doi.org/10.17169/fqs-11.3.1428

Masvaure, S. (2016). Coping with food poverty in cities: The case of urban agriculture in Glen Norah Township in Harare. Renewable agriculture and food systems, 31(3), 202-213.

Matteson, K. C., Ascher, J. S., & Langellotto, G. A. (2008). Bee richness and abundance in New York City urban gardens. Annals of the Entomological Society of America, 101(1), 140-150.

Maxwell DG. 2001. The Importance of Urban Agriculture to Food and Nutrition. Annotated biography by ETC-RUAF. CTA Publishers: Wageningen, Netherlands.

Maxwell, D. (1995) Alternative Food Security Strategy: A Household Analysis of Urban Agriculture in Kampala. World Development 23, 1669–1681. https://doi.org/10.1016/0305-750X(95)00073-L

Maxwell, D. (1999) 'The political economy of urban food security in Sub-Saharan Africa', World Development, 27(11), pp. 1939–1953.

Maxwell, D., Levin, C., & Csete, J. (1998). Does urban agriculture help prevent malnutrition? Evidence from Kampala. Food policy, 23(5), 411-424. https://doi.org/10.1016/S0306-9192(98)00047-5

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. Journal of environmental psychology, 24(4), 503-515.

Mbow, C., Rosenzweig, C., Barioni, L. G., Benton, T. G., Herrero, M., Krishnapillai, M., ... & Xu, Y. (2019). Food security.

McAllister and Logan (2021). Urban agriculture and land justice reform in the UK. Accessed July 2022 from https://www.sustainweb.org/news/urban-agriculture-land-justice-policy/

McClintock, N. (2010). Why farms the city? Theorizing urban agriculture through a lens of metabolic rift. Cambridge journal of regions, Economy, and Society, 3(2), 191-207.

McClintock, N. (2014). Radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture's contradictions. Local Environment, 19(2), 147-171.

McClintock, N., & Simpson, M. (2018). Stacking functions: identifying motivational frames guiding urban agriculture organizations and businesses in the United States and Canada. Agriculture and Human Values, 35(1), 19-39.

McClintock, N., Cooper, J., & Khandeshi, S. (2013). Assessing the potential contribution of vacant land to urban vegetable production and consumption in Oakland, California. Landscape and Urban Planning, 111,46–58. https://doi.org/10.1016/j.landurbplan.2012.12.009

McClintock, N., Mahmoudi, D., Simpson, M., & Santos, J. P. (2016). Socio-spatial differentiation in the Sustainable City: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. Landscape and Urban Planning, 148, 1-16.

McCoyd, J. L., & Kerson, T. S. (2006). Conducting intensive interviews using email: A serendipitous comparative opportunity. Qualitative social work, 5(3), 389-406.

McDougall, R., Kristiansen, P., & Rader, R. (2019). Small-scale urban agriculture results in high yields but requires judicious management of inputs to achieve sustainability. Proceedings of the National Academy of Sciences, 116(1), 129-134.

McEldowney J. 2017 Urban Agriculture in Europe: Patterns, Challenges and Policies. In-Depth Analysis. Report European Parliament, EPRS (European Parliamentary Research Service), Brussels. PE 614.641. doi:10.2861/413185

McKay, G. (2011) Radical Gardening: Politics, Idealism and Rebellion in the Garden, London: Frances, Lincoln

McLain, R. J., Hurley, P. T., Emery, M. R., & Poe, M. R. (2014). Gathering "wild" food in the city: rethinking the role of foraging in urban ecosystem planning and management. Local environment, 19(2), 220-240.

McMillan, J. H. & Schumacher, S. (1993). Research in education: A conceptual understanding. New York: HaprerCollins.

Mead, B. R., Christiansen, P., Davies, J. A., Falagán, N., Kourmpetli, S., Liu, L., ... & Hardman, C. A. (2021). Is urban growing of fruit and vegetables associated with better diet quality and what mediates this relationship? Evidence from a cross-sectional survey. Appetite, 163, 105218.

Mead, B. R., Davies, E. B., Davies, J., Falagán, N., Kourmpetli, S., Liu, L., ... & Hardman, C. A. (2021). A qualitative analysis of perceived opportunities and barriers to engaging in urban agriculture. Appetite, 157, 104878.

Meek, D., & Lloro-Bidart, T. (2017). Introduction: Synthesizing a political ecology of education. The Journal of Environmental Education, 48(4), 213-225.

Meenar, M., & Hoover, B. (2012). Community food security via urban agriculture: Understanding people, place, economy, and accessibility from a food justice perspective.

Melesse TM, Awel YM (2020) Land tenure, gender, and productivity in Ethiopia and Tanzania. In: Konte M, Tirivayi N (eds) Women and sustainable human development. Gender, development, and social change. Palgrave Macmillan, Cham

Menconi, M. E., Heland, L., & Grohmann, D. (2020). Learning from the gardeners of the oldest community garden in Seattle: Resilience explained through ecosystem services analysis. Urban Forestry & Urban Greening, 56, 126878.

Menefee, D. S., & Hettiarachichi, G. M. (2018). Contaminants in urban soils: Biodiversity and transfer. Urban Soils, 175-187.

Menta, C., Bonati, B., Staffilani, F., & Conti, F. D. (2017). Agriculture management and soil fauna monitoring: The case of Emilia-Romagna region (Italy). Agric. Res. Technol, 4(5), 1-3.

Menyuka, N. N., Sibanda, M., & Bob, U. (2020). Perceptions of the challenges and opportunities of utilising organic waste through urban agriculture in the durban south basin. International journal of environmental research and public health, 17(4), 1158.

Metcalf, S. S., & Widener, M. J. (2011). Growing Buffalo's capacity for local food: A systems framework for sustainable agriculture. Applied Geography, 31(4), 1242-1251.

Meyer, C. B. (2001). A case in case study methodology. Field methods, 13(4), 329-352.

Mfune, J. K. (2013). International joint MSC Programme: University of Namibia and Humboldt University, Germany.

Mgbenka, R. N., Mbah, E. N., & Ezeano, C. I. (2016). A review of smallholder farming in Nigeria: Need for transformation. International Journal of Agricultural Extension and Rural Development Studies, 3(2), 43-54.

Michael, C., & Alufohai, G. (2020). Comparative Analysis of Status of Urban Agriculture in Edo and Oyo States, Nigeria. Ethiopian Journal of Environmental Studies & Management, 13(4).

Miles, M. B., & Huberman, A. (2014). M., & Saldana, J. (2014). Qualitative data analysis: A methods sourcebook, 3.

Miličić, V., Thorarinsdottir, R., Santos, M., & Hančič, M. (2017). Commercial aquaponics approaching the European market: to consumers' perceptions of aquaponics products in Europe. Water, 9(2), 80. https://doi.org/10.3390/w9020080

Miller, J. D., & Hutchins, M. (2017). The impacts of urbanisation and climate change on urban flooding and urban water quality: A review of the evidence concerning the United Kingdom. Journal of Hydrology: Regional Studies, 12, 345-362.

Milligan, C., Gatrell, A., & Bingley, A. (2004). 'Cultivating health': therapeutic landscapes and older people in northern England. Social science & medicine, 58(9), 1781-1793.

Minami, K. (2009). Soil and humanity: Culture, civilization, livelihood, and health. Soil science and plant nutrition, 55(5), 603-615.

Mkwambisi, D. D., Fraser, E. D. G. and Dougill, A. J. (2011) 'Urban agriculture and poverty reduction: Evaluating how food production in cities contributes to food security, employment and income in Malawi', Journal of International Development, 23, pp. 181–203.

Moen, K., & Middelthon, A. L. (2015). Qualitative research methods. In Research in medical and biological sciences (pp. 321-378). Academic Press.

Mohammed, A. T., Mmom, P. C., Etela, I., Obafemi, A. A., & Babatunde, B. B. (2017). Assessing the Status of Urban Agriculture in Greater Port Harcourt City Towards Evidence Based Policy Support for Urban Food Production. Retrieved from http://www.academix.ng/documents/papers/1523886388_9835.pdf

Mohammed, S. G., Halliru, M., Jibrin, J. M., Kapran, I., & Ajeigbe, H. A. (2021). Impact assessment of developing sustainable and impact-oriented groundnut seed system under the tropical legumes (III) project in Northern Nigeria. In Enhancing Smallholder Farmers' Access to Seed of Improved Legume Varieties Through Multi-Stakeholder Platforms (pp. 81-96). Springer, Singapore.

Mohareb, E., Heller, M., Novak, P., Goldstein, B., Fonoll, X., & Raskin, L. (2017). Considerations for reducing food system energy demand while scaling up urban agriculture. Environmental Research Letters, 12(12), 125004.

Mok, H. F., Williamson, V. G., Grove, J. R., Burry, K., Barker, S. F., & Hamilton, A. J. (2014). Strawberry fields forever? Urban agriculture in developed countries: a review. Agronomy for sustainable development, 34(1), 21-43

Molteno, S. (2020). How does your city grow? Lockdown illuminates urban farming and gardening's potential. Rapid Transition Alliance Story. Available online at: https://www.rapidtransition.org/stories/how-does-your-city-grow-lockdown-illuminates-urban-farming-and-gardenings-potential/ (accessed May 14, 2020).

Mombo, S., Foucault, Y., Deola, F., Gaillard, I., Goix, S., Shahid, M., ... & Dumat, C. (2016). Management of human health risk in the context of kitchen gardens polluted by lead and cadmium near a lead recycling company. Journal of soils and sediments, 16(4), 1214-1224.

Montpellier Panel (2010). The Montpellier Panel Report Africa and Europe: Partnerships for Agricultural Development. Retrieved from https://www.mamopanel.org/media/uploads/files/AFRICA_AND_EUROPE-_PARTNERSHIPS_FOR_AGRICULTURAL_DEVELOPMENT_2010.pdf

Moore, S. A., Wilson, J., Kelly-Richards, S., & Marston, S. A. (2015). School gardens as sites for forging progressive socioecological futures. Annals of the Association of American Geographers, 105(2), 407-415.

Morgan, A. E., & Fanzo, J. (2020). Nutrition transition and climate risks in Nigeria: moving towards food systems policy coherence. Current Environmental Health Reports, 7(4), 392-403.

Morgan, K. (2009). Feeding the city: The challenge of urban food planning. International planning studies, 14(4), 341-348.

Morse, J. M. (1994). Designing funded qualitative research. In Denizin, N. K. & Lincoln, Y. S., Handbook of qualitative research (2nd Ed). Thousand Oaks, CA: Sage.

Morse, J. M. (2000). Determining sample size. Qualitative health research, 10(1), 3-5.

Morse, J. M. (2003). A review committee's guide for evaluating qualitative proposals. Qualitative health research, 13(6), 833-851. https://doi.org/10.1177/1049732303013006005

Moskalonek, Ż., Połom, M., & Puzdrakiewicz, K. (2020). Changes in the function of allotment gardens in an attractive location based on the example of tri-city in Poland. Land, 9(11), 464.

Moucheraud, C., Chandyo, R. K., Henjum, S., Strand, T. A., Ulak, M., Fawzi, W. W., ... & Thorne-Lyman, A. L. (2019). Engagement in agriculture protects against food insecurity and malnutrition in peri-urban Nepal. Current Developments in Nutrition, 3(1), nzy078.

Mougeot, L. J. (1999). For self-reliant cities: urban food production in a globalizing South. For hunger-proof cities: Sustainable urban food systems.

Mougeot, L. J. (2006). Growing better cities: Urban agriculture for sustainable development. IDRC.

Mougeot, L. J. (Ed.). (2005). Agropolis: The social, political, and environmental dimensions of urban agriculture. IDRC.

Mougeot, L.J., (2000). The Hidden Significance of Urban Agriculture. 2020 Vision. Focus 3, Brief 6 of 10, August. IFPRI, Washington, DC.

Moustier, P., & Danso, G. (2006). Local economic development and marketing of urban produced food.

Mpigi, G. L. (2020). The Social Network of Urban Agriculture: Livelihood Diversification as a System of Provision in Port Harcourt City Nigeria (Doctoral dissertation, UCL (University College London)).

Mudege NN, Mdege N, Abidin PE, Bhatasara S (2017) The role of gender norms in access to agricultural training in Chikwawa and Phalombe, Malawi. Gend Place Cult 24(12):1689–1710

Muhammad, R.M., & Rabu, M.R., (2015). The Potential of Urban Farming Technology in Malaysia: Policy Intervention. Economic & Technology management Research Centre. MARDI.

Muhammad-Lawal, A., & Atte, O. A. (2016). An analysis of agricultural production in Nigeria. African Journal of General Agriculture, 2(1). Retrieved from http://www.ojs.klobexjournals.com/index.php/ajga/article/view/20/26

Mupeta, M., Kuntashula, E., & Kalinda, T. (2020). Impact of urban agriculture on household income in Zambia: An economic analysis. Asian Journal of Agriculture and Rural Development, 10(2), 550-562.

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. Information and organization, 17(1), 2-26. https://doi.org/10.1016/j.infoandorg.2006.11.001

Nabulo, G., Oryem-Origa, H., & Diamond, M. (2006). Assessment of lead, cadmium, and zinc contamination of roadside soils, surface films, and vegetables in Kampala City, Uganda. Environmental Research, 101(1), 42-52.

Nadal, A., Pons, O., Cuerva, E., Rieradevall, J., & Josa, A. (2018). Rooftop greenhouses in educational centers: A sustainability assessment of urban agriculture in compact cities. Science of the total environment, 626, 1319-1331.

National Bureau of Statistics (2020). Nigerian Living Standards Survey. Retrieved from file:///C:/Users/tayoa/OneDrive/Desktop/Nigeria%20Living%20Standards%20Survey%202018%20-%202019.pdf

National Farmers Union (2022). Agri-Tech Report. Retrieved from https://www.nfumutual.co.uk/globalassets/farming/agri-tech/agri-tech-report-2022.pdf

National Garden Scheme (2020). Gardens and Coronavirus 2020: New National Garden Scheme report highlights the importance of gardens and outdoor spaces during lockdown https://ngs.org.uk/new-report-gardens-and-coronavirus-2020/

National Youth Policy (2009). Second National Youth Policy Document of the Federal Republic of Nigeria 2009. Retrieved from https://www.youthpolicy.org/national/Nigeria_2009_National_Youth_Policy.pdf

Nazarpour, A., Watts, M. J., Madhani, A., & Elahi, S. (2019). Source, spatial distribution, and pollution assessment of Pb, Zn, Cu, and Pb, isotopes in urban soils of Ahvaz City, a semi-arid metropolis in southwest Iran. Scientific reports, 9(1), 1-11.

Nchanji, E. B., Bellwood-Howard, I., Schareika, N., Chagomoka, T., Schlesinger, J., Axel, D., & Rüdiger, G. (2017). Assessing the sustainability of vegetable production practices in northern Ghana. International Journal of Agricultural Sustainability, 15(3), 321-337.

Netherlands Ministry of Agriculture, Nature, and Food Quality (2022). Urban Farming: Dutch Technology Feeding the City. Retrieved from https://www.agroberichtenbuitenland.nl/actueel/nieuws/2022/02/08/urban-farming-dutch-technology-feeding-the-city

Nevin, A. S., Oyaniran, T., & Onomia, O. (2019). Feeding 398 million people in Africa's largest economy by 2050 food security challenges and agricultural innovations. PricewaterhouseCoopers (PWC) Limited.

Ng'ombe JN, Kalinda TH, Tembo G (2017) Does adoption of conservation farming practices result in increased crop revenue? Evidence from Zambia. Agrekon 56(2):205–221. https://doi.org/10.1080/03031853.2017.1312467

Ngome I, Foeken D (2012) "My garden is a great help": gender and urban gardening in Buea. Cameroon Geojournal 77(1):103–118. https://doi.org/10.1007/s10708-010-9389-z

Nguyen THT, Bui QT, Man QH, de Vries Walter T (2016) Socio-economic effects of agricultural land conversion for urban development: case study of Hanoi, Vietnam. Land Use Policy 54:583–592. https://doi.org/10.1016/j.landusepol.2016.02.032

Nguyen, P., Nguyen, T., & Nguyen, M. (2020). An analysis of factors affecting residents' perception of peri-urban agriculture in Hanoi, Vietnam. Management Science Letters, 10(15), 3469-3476.

NHS (2019). Statistics on Obesity, Physical Activity and Diet, England, 2019. Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/statistics-on-obesity-physical-activity-and-diet/statistics-on-obesity-physical-activity-and-diet-england-2019/part-6-diet

Niala, J. C. (2021). Dig for vitality: UK urban allotments as a health-promoting response to COVID-19. Cities & health, 5(sup1), S227-S231.

Niaz, A., Sial, R. A., Iqbal, M. M., Naz, T., Ghafoor, A., & Murtaza, G. (2015). Growth, tissue concentration and bioaccumulation of cadmium by different mungbean cultivars in a hydroponic study. Pakistan Journal of Agricultural Sciences, 52(4).

Nicholls, E., Ely, A., Birkin, L., Basu, P., & Goulson, D. (2020). The contribution of small-scale food production in urban areas to the sustainable development goals: A review and case study. Sustainability Science, 15(6), 1585-1599.

Nickle, A. (2020a). How the coronavirus is affecting the produce industry. The Packer. Retrieved from https://www.thepacker.com/article/how-coronavirus-affecting-produce-industry?

Nicol, P. (2020). Pathways to scaling agroecology in the city region: scaling out, scaling up and scaling deep through community-led trade. Sustainability, 12(19), 7842.

Nigeria Bureau of Statistic (2016) Unemployment Report Third Quarter, 1(1): 6-12

Nind, M., Coverdale, A., & Meckin, R. (2021). Changing social research practices in the context of Covid-19: rapid evidence reviews.

NIRSAL (2022). https://nirsal.com/credit-risk-guarantee/#!/loan-facilitation

Nitya, R. A. O., Patil, S., Singh, C., Parama, R. O. Y., Pryor, C., Poonacha, P., & Genes, M. (2022). Cultivating sustainable and healthy cities: A systematic literature review of the outcomes of urban and peri-urban agriculture. Sustainable Cities and Society, 104063.

Nogeire-McRae, T., Ryan, E. P., Jablonski, B. B., Carolan, M., Arathi, H. S., Brown, C. S., ... & Schipanski, M. E. (2018). The role of urban agriculture in a secure, healthy, and sustainable food system. BioScience, 68(10), 748-759.

Nordahl, D. (2009). Public produce: The new urban agriculture. Island Press.

Novick, G. (2008). Is there a bias against telephone interviews in qualitative research? Research in nursing & health, 31(4), 391-398.

Nugent, R. (2000). The impact of urban agriculture on the household and local economies. Bakker N., Dubbeling M., Gündel S., Sabel-Koshella U., de Zeeuw H. Growing cities, growing food. Urban agriculture on the policy agenda. Feldafing, Germany: Zentralstelle für Ernährung und Landwirtschaft (ZEL), 67-95.

O'Sullivan, C. A., McIntyre, C. L., Dry, I. B., Hani, S. M., Hochman, Z., & Bonnett, G. D. (2020). Vertical farms bear fruit. Nature biotechnology, 38(2), 160-162.

Obirikorang, K. A., Sekey, W., Gyampoh, B. A., Ashiagbor, G., & Asante, W. (2021). Aquaponics for Improved Food Security in Africa: A Review. Front. Sustain. Food Syst. 5: 705549. doi: 10.3389/fsufs.

Odewumi, S. G., Awoyemi, O. K., Iwara, A. I., & Ogundele, F. O. (2013). Farmer's perception on the effect of climate change and variation on urban agriculture in Ibadan Metropolis, South-western Nigeria. Journal of Geography and Regional Planning, 6(6), 209.

Odoemelam, L. E., Osahon, E., & Nechedo, E. (2013). Effect of tenure security on livelihood activities of women farmers in Anambra state, Nigeria. Journal of Agriculture and Social Research (JASR), 13(2), 94-100.

Odudu CO (2017) Evaluating competition constraint on land accessibility by urban crop farmers in Lagos. Niger J Environ Sci Technol 1(1):90–98. https://doi.org/10.36263/nijest.2017.01.0031

Odudu, C. O., & Omirin, M. M. (2012). Evaluating the constraints affecting land access among urban crop farmers in metropolitan Lagos. Journal of Agribusiness in Developing and Emerging Economies.

Odudu, C.O. (2015). Land accessibility among urban crop farmers in the informal sector, Lagos, Nigeria. Ethiopian Journal of Environmental Studies & Management 8(2): 182 – 195. doi: http://dx.doi.org/10.4314/ejesm.v8i2.8

Odularu, G. O. (2008). Nigeria-US trade relations in the non-oil sector. Universal-Publishers.

OECD (2020). COVID-19 and the food and agriculture sector: Issues and policy responses. Retrieved from https://read.oecd-ilibrary.org/view/?ref=130_130816-9uut45lj4q&title=Covid-19-and-the-food-and-agriculture-sector-Issues-and-policy-responses

OECD (Organisation for Economic Co-operation and Development) (2012). OECD Environmental Outlook to 2050: The Consequences of Inaction. Paris: OECD Publishing https://doi.org/10.1787/9789264122246-en

Office for National Statistics (2021). Population and household estimates, England, and Wales. Population and household estimates, England, and Wales: Census 2021, unrounded data. Retrieved from file:///C:/Users/tayoa/OneDrive/Desktop/Population%20and%20household%20estimates,%20England%20and%20Wales%20Census%202021,%20unrounded%20data.pdf

Ogunkunle, C. O., Varun, M., Jimoh, M. A., Olorunmaiye, K. S., & Fatoba, P. O. (2016). Evaluating the trace metal pollution of an urban paddy soil and bioaccumulation in rice (Oryza sativa L.) with the associated dietary risks to local population: a case study of Ilorin, north-central Nigeria. Environmental Earth Sciences, 75(20), 1-12.

Ogunkunle, C. O., Ziyath, A. M., Adewumi, F. E., & Fatoba, P. O. (2015). Bioaccumulation and associated dietary risks of Pb, Cd, and Zn in amaranth (Amaranthus cruentus) and jute mallow (Corchorus olitorius) grown on soil irrigated using polluted water from Asa River, Nigeria. Environmental monitoring and assessment, 187(5), 1-7.

Ogunniyi L., Fanifosi, G. E. and Komolafe O. D. (2017). The Contribution of Urban Agriculture to Household Food Insecurity in Ibadan Metropolis, Oyo State, Nigeria. Scientia Agriculture, 17(2): 42-47.

Okvat HA, Zautra AJ. Community gardening: a parsimonious path to individual, community, and environmental resilience. Am J Community Psychol. 2011 Jun;47(3-4):374-87. doi: 10.1007/s10464-010-9404-z. PMID: 21222153.

Olaoye, T., Ajilore, T., Akinluwade, K., Omole, F., & Adetunji, A. (2016). Energy crisis in Nigeria: Need for renewable energy mix. American journal of electrical and electronic engineering, 4(1), 1-8.

Olayiwola, O. O. (2012). RESOURCE UTILIZATION AND DETERMINANTS OF EFFICIENCY AMONG URBAN AGRICULTURE IN ABUJA, NIGERIA. Commerce and Management, 1(10), 21-35.

Olivier, D. W. (2018). A cropping system for resource-constrained urban agriculture: Lessons from Cape Town. Sustainability, 10(12), 4804.

Olivier, D. W., & Heinecken, L. (2017). The personal and social benefits of urban agriculture experienced by cultivators on the Cape Flats. Development Southern Africa, 34(2), 168-181.

Olofin, E.A. (2006). Highlights of the Field Production Survey, paper presented at the seminar on Horticultural Activities in Urban and Peri- Urban, Kano, Organized by NRI in Kano pp 7

Olomola, A. S. (1998). Choice and productivity effects of animal traction technology in the semi-arid zone of northern Nigeria.

Olumba, C. C., & Alimba, J. O. (2022). An assessment of discriminatory factors contributing to gender inequality among farmers participating in urban agriculture in Southeast Nigeria. SN Social Sciences, 2(4), 1-26.

Olumba, C. C., Alimba, J. O., & Tasie, O. (2019). Assessing the Factors influencing Access to land for Urban Agriculture in Southeast Nigeria (No. 1878-2020-494).

Olumba, C. C., Olumba, C. N., & Alimba, J. O. (2021). Constraints to urban agriculture in southeast Nigeria. Humanities and Social Sciences Communications, 8(1), 1-11.

Omondi, S. O., Oluoch-Kosura, W., & Jirström, M. (2017). The role of urban-based agriculture on food security: Kenyan case studies. Geographical research, 55(2), 231-241.

Omonona, B. T., & Babalola, D. A. (2007). Determinants of the production of fluted pumpkin (Telfaria occidentalis) among farmers in Nigeria: Evidence from Lagos State. Journal of agricultural & food information, 8(1), 95-105.

Onyebueke, V., Walker, J., Lipietz, B., Ujah, O., & Ibezim-Ohaeri, V. (2020). Urbanisation-induced displacements in peri-urban areas: Clashes between customary tenure and statutory practices in Ugbo-Okonkwo Community in Enugu, Nigeria. Land Use Policy, 99, 104884.

Opitz, I., Berges, R., Piorr, A., & Krikser, T. (2016). Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the Global North. Agriculture and Human Values, 33(2), 341-358.

Opperman, E., Braun, V., Clarke, V., & Rogers, C. (2014). “It feels so good it almost hurts”: Young adults' experiences of orgasm and sexual pleasure. The Journal of Sex Research, 51(5), 503-515.

Orsini, F., Gasperi, D., Marchetti, L., Piovene, C., Draghetti, S., Ramazzotti, S., ... & Gianquinto, G. (2014). Exploring the production capacity of rooftop gardens (RTGs) in urban agriculture: the potential impact on food and nutrition security, biodiversity, and other ecosystem services in the city of Bologna. Food Security, 6(6), 781-792.

Orsini, F., Kahane, R., Nono-Womdim, R., & Gianquinto, G. (2013). Urban agriculture in the developing world: A review. Agronomy for Sustainable Development, 33(4), 695–720. https://doi.org/10.1007/s13593-013-0143-z

Orsini, F., Pennisi, G., Michelon, N., Minelli, A., Bazzocchi, G., Sanyé-Mengual, E., & Gianquinto, G. (2020). Features and functions of multifunctional urban agriculture in the global north: a review. Frontiers in Sustainable Food Systems, 4, 562513.

Osabohien, R., Afolabi, A., & Godwin, A. (2018a). An econometric analysis of food security and agricultural credit facilities in Nigeria. The Open Agriculture Journal, 12(1).

Osabohien, R., Osabuohien, E., & Urhie, E. (2018b). Food security, institutional framework, and technology: Examining the nexus in Nigeria using ARDL approach. Current Nutrition & Food Science, 14(2), 154-163.

Oseni, G., Goldstein, M., & Utah, A. (2013). Gender dimensions in Nigerian agriculture.

Othman, N., Mohamad, M., Latip, R. A., & Ariffin, M. H. (2018, February). Urban farming activity towards sustainable wellbeing of urban dwellers. In IOP Conference Series: Earth and Environmental Science (Vol. 117, No. 1, p. 012007). IOP Publishing.

Otitoju, M. A., & Enete, A. A. (2016). Climate change adaptation: Uncovering constraints to the use of adaptation strategies among food crop farmers in South-west, Nigeria using principal component analysis (PCA). Cogent Food & Agriculture, 2(1), 1178692.

Otsuka, K., Quisumbing, A. R., Payongayong, E., & Aidoo, J. B. (2003). Land tenure and the management of land and trees: the case of customary land tenure areas of Ghana. Environment and Development Economics, 8(1), 77-104.

Ouédraogo, D. B., Belem, B., Kiba, D. I., Gnankambary, Z., Nacro, H. B., & Sedogo, P. M. (2019). Analyzing Constraints and Opportunities of Urban Agriculture in the Greenbelt of Ouagadougou, Burkina Faso. Agriculture, Forestry and Fisheries, 8(3), 73-80.

Owoo NS, Boakye-Yiadom L (2015) The gender dimension of the effects of land tenure security on agricultural productivity: some evidence from two districts in Kenya. J Int Dev 27(7):917–928Return to ref 2015 in article

Owuor, S., & Foeken, D. (2006). Surviving in the neighbourhoods of Nakuru town, Kenya. In Crisis and Creativity (pp. 22-45). Brill.

Oyekanmi, A. A., & Moliki, A. O. (2021). An Examination of Gender Inequality and Poverty Reduction. Journal of Sustainable Development in Africa, 23(1), 31-43.

Oyeleye, O. I., Toyobo, A. E., & Adetunji, M. A. (2013). Travel behaviour of rural people in developing countries. Civil and Environmental Research, 3(8), 25-31.

Padgham, J., Jabbour, J., & Dietrich, K. (2015). Managing change and building resilience: A multi-stressor analysis of urban and peri-urban agriculture in Africa and Asia. Urban Climate, 12, 183-204.

Page, S. E., Siegert, F., Rieley, J. O., Boehm, H. D. V., Jaya, A., & Limin, S. (2002). The amount of carbon released from peat and forest fires in Indonesia during 1997. Nature, 420(6911), 61-65.

Parfitt, J., Barthel, M., & Macnaughton, S. (2010). Food waste within food supply chains: quantification and potential for change to 2050. Philosophical transactions of the royal society B: biological sciences, 365(1554), 3065-3081.

Park, S. A., Shoemaker, C. A., & Haub, M. D. (2009). Physical and psychological health conditions of older adults classified as gardeners or nongardeners. HortScience, 44(1), 206-210.

Pasquini, M. W. (2006). The use of town refuse ash in urban agriculture around Jos, Nigeria: health and environmental risks. Science of the total environment, 354(1), 43-59.

Pasquini, M. W., & Alexander, M. J. (2004). Chemical properties of urban waste ash produced by open burning on the Jos Plateau: implications for agriculture. Science of the Total Environment, 319(1-3), 225-240.

Patel, H., Gouin, S., & Platt, R. W. (2003). Randomized, double-blind, placebo-controlled trial of oral albuterol in infants with mild-to-moderate acute viral bronchiolitis. The Journal of pediatrics, 142(5), 509-514.

Patton, M. Q. (2015). The sociological roots of utilization-focused evaluation. The American Sociologist, 46(4), 457-462.

Paül, V., & McKenzie, F. H. (2010). Agricultural areas under metropolitan threats: Lessons for Perth from Barcelona. In Demographic Change in Australia's Rural Landscapes (pp. 125-152). Springer, Dordrecht.

Payen, F. T., Evans, D. L., Falagán, N., Hardman, C. A., Kourmpetli, S., Liu, L., ... & Davies, J. A. (2022). How Much Food Can We Grow in Urban Areas? Food Production and Crop Yields of Urban Agriculture: A Meta-Analysis. Earth's future, 10(8), e2022EF002748.

Pedersen, I., Nordaunet, T., Martinsen, E. W., Berget, B., & Braastad, B. O. (2011). Farm animal-assisted intervention: Relationship between work and contact with farm animals and change in depression, anxiety, and self-efficacy among persons with clinical depression. Issues in mental health nursing, 32(8), 493-500.

Pelfrêne, A., Waterlot, C., & Douay, F. (2013). Influence of land use on human bioaccessibility of metals in smelter-impacted soils. Environmental Pollution, 178, 80-88.

Pengue, W. A. (2022). Local Food Systems: Making Visible the Invisible Through Urban Agroecology. Frontiers in Sustainable Cities, 83.

People and Planet (2005). People, food and agriculture, People and planet.net people and the planet pp. 2000-2009.

People Land Policy (2022). Land Rights Now. Accessed online October 2022 https://peopleslandpolicy.home.blog/2022/10/12/food-justice-needs-land-justice/

Péron, J.Y., and E. Geoffriau. 2007. Characteristics and sustainable development of peri-urban vegetable production in Europe. Acta Horticulturae 762: 159–170.

Perrin, A., Basset-Mens, C., & Gabrielle, B. (2014). Life cycle assessment of vegetable products: a review focusing on cropping systems diversity and the estimation of field emissions. The International Journal of Life Cycle Assessment, 19(6), 1247-1263.

Peterman A, Behrman JA, Quisumbing AR (2014) A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries. In: Quisumbing A, Meinzen-Dick R, Raney T, Croppenstedt A, Behrman J, Peterman A (eds) Gender in agriculture. Springer, Dordrecht

Phiri, M. (2009). Evaluation of the performance of joint forest management (JFM) programme: case of Dambwa Forest Reserve in Livingstone District, Zambia (Doctoral dissertation, Stellenbosch: University of Stellenbosch).

Pikner, T., Willman, K., & Jokinen, A. (2020). Urban commoning as a vehicle between government institutions and informality: collective gardening practices in Tampere and Narva. International Journal of Urban and Regional Research, 44(4), 711-729.

Pinderhughes, R. (2006). Green collar jobs. Race, Poverty & the Environment.

Pitt, H., & Jones, M. (2016). Scaling up and out as a pathway for food system transitions. Sustainability, 8(10), 1025.

Polit, D. F., & Beck, C. T. (2010). Generalization in quantitative and qualitative research: Myths and strategies. International journal of nursing studies, 47(11), 1451-1458. https://doi.org/10.1016/j.ijnurstu.2010.06.004

Pollard, G., Roetman, P., Ward, J., Chiera, B., & Mantzioris, E. (2018). Beyond productivity: Considering the health, social value and happiness of home and community food gardens. Urban Science, 2(4), 97.

Pölling, B., Prados Velasco, M. J., Torquati, B. M., Giacchè, G., Recasens, X., Paffarini, C., ... & Lorleberg, W. (2017). Business models in urban farming: A comparative analysis of case studies from Spain, Italy, and Germany. Moravian Geographical Reports, 25 (3), 166-180.

Poppendieck, J. (2014). Breadlines knee-deep in wheat: Food assistance in the Great Depression (Vol. 53). Univ of California Press.

Pothukuchi, K. (2011). The Detroit food system report 2009-2010.

Pothukuchi, K. (2018). Vacant land disposition for agriculture in Cleveland, Ohio: Is community development a mixed blessing? Journal of Urban Affairs, 40(5), 657-678.

Potts, D. (2009). The slowing of sub-Saharan Africa's urbanization: evidence and implications for urban livelihoods. Environmen and Urbanization, 21(1), 253-259. https://doi.org/10.1177/0956247809103026

Potutan, G. E., Schnitzler, W. H., Arnado, J. M., Janubas, L. G., & Holmer, R. J. (2000). Urban agriculture in Cagayan de Oro: a favourable response of city government and NGOs. Growing cities, growing food: urban agriculture on the policy agenda, 413-428.

Poudel, K., & Subedi, P. (2020). Impact of COVID-19 pandemic on socioeconomic and mental health aspects in Nepal. International Journal of Social Psychiatry, 66(8), 748-755.

Poulsen, M. N. (2017). Cultivating citizenship, equity, and social inclusion? Putting civic agriculture into practice through urban farming. Agriculture and Human Values, 34(1), 135-148.

Poulsen, M. N., Neff, R. A., & Winch, P. J. (2017). The multifunctionality of urban farming: perceived benefits for neighbourhood improvement. Local Environment, 22(11), 1411-1427.

Pouso, S., Borja, Á., Fleming, L. E., Gómez-Baggethun, E., White, M. P., and Uyarra, M. C. (2021). Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. Sci. Total Environ. 756:143984. doi: 10.1016/j.scitotenv.2020.143984

Prain, G., Karanja, N., & See-Smith, D. (2010). African urban harvest: agriculture in the cities of Cameroon, Kenya, and Uganda. IDRC, Ottawa, ON, CA.

Printezis, I., & Grebitus, C. (2018). Marketing channels for local food. Ecological Economics, 152, 161-171.

Prové, C., Kemper, D., Loudiyi, S., Mumenthaler, C., & Nikolaidou, S. (2015). Governance of urban agriculture initiatives: insights drawn from European case studies. Urban Agriculture Europe, 64-69.

Pu, M., & Zhong, Y. (2020). Rising concerns over agricultural production as COVID-19 spreads: Lessons from China. Global food security, 26, 100409.

Pudup, M. B. (2008). It takes a garden: Cultivating citizen-subjects in organized garden projects. Geoforum, 39(3), 1228-1240.

Puigdueta, I., Aguilera, E., Cruz, J. L., Iglesias, A., & Sanz-Cobena, A. (2021). Urban agriculture may change food consumption towards low carbon diets. Global Food Security, 28, 100507.

Pulighe, G., & Lupia, F. (2020). Food first: COVID-19 outbreak and cities lockdown a booster for a wider vision on urban agriculture. Sustainability, 12(12), 5012.

Pulliat, G. (2015). Food securitization and urban agriculture in Hanoi (Vietnam). Articulo-Journal of Urban Research, (Special issue 7).

Purcell, M., and Tyman, S.K., 2014. Cultivating food as a right to the city. Local Environment: The International Journal of Justice and Sustainability, 20 (10), 1132–1147. doi:10.1080/13549839.2014.903236

Putra, P. A., & Yuliando, H. (2015). Soilless culture system to support water use efficiency and product quality: a review. Agriculture and Agricultural Science Procedia, 3, 283-288.

Quastel, N. (2009). Political ecologies of gentrification. Urban Geography, 30(7), 694-725.

Rahmann, G., Reza Ardakani, M., Bàrberi, P., Boehm, H., Canali, S., Chander, M., ... & Zanoli, R. (2017). Organic Agriculture 3.0 is innovation with research. Organic Agriculture, 7(3), 169-197.

Rai, P. K., Lee, S. S., Zhang, M., Tsang, Y. F., & Kim, K. H. (2019). Heavy metals in food crops: Health risks, fate, mechanisms, and management. Environment international, 125, 365-385.

Raj, S., Raja, S., & Dukes, B. A. (2017). Beneficial but constrained: Role of urban agriculture programs in supporting healthy eating among youth. Journal of Hunger & Environmental Nutrition, 12(3), 406-428.

Rajput, V., Minkina, T., Mazarji, M., Shende, S., Sushkova, S., Mandzhieva, S., ... & Jatav, H. (2020). Accumulation of nanoparticles in the soil-plant systems and their effects on human health. Annals of Agricultural Sciences, 65(2), 137-143.

Ramaloo, P., Liong, C. Y., Siwar, C., & Isahak, A. (2018). Perception of community residents on supporting urban agriculture in Malaysian city: Case study at Bukit Mertajam. Jurnal Pengurusan, 53, 83-91.

Rathva, A. L., Gadhvi, D. N., & Patel, N. B. (2020). Feed and Fodder Availability and Utilization Pattern in UrbanPeri-Urban Dairy Farms in and Around Navsari City of South Gujarat. Indian Journal of Veterinary Sciences & Biotechnology, 15(3), 32-35.

Ravallion, M. (2002). On the urbanization of poverty. Journal of Development Economics, 68(2), 435-442.

Ravallion, M., Chen, S., and Sangraula, P. (2007). New Evidence on the Urbanization of Global Poverty. Population and Development Review, Vol. 33, No. 4, pp. 667-701. Retrieved from https://about.jstor.org/terms

Reeves, J., Cheng, Z., Kovach, J., Kleinhenz, M. D., & Grewal, P. S. (2014). Quantifying soil health and tomato crop productivity in urban community and market gardens. Urban ecosystems, 17(1), 221-238.

Revi, A., Satterthwaite, D., Aragón-Durand, F., Corfee-Morlot, J., Kiunsi, R. B., Pelling, M., ... & Sverdlik, A. (2014). Towards transformative adaptation in cities: the IPCC's Fifth Assessment. Environment and Urbanization, 26(1), 11-28.

Reynolds R (2008) On Guerrilla Gardening: A Handbook for Gardening without Boundaries. London: Bloomsbury.

Reynolds, K., & Cohen, N. (2016). Beyond the kale: Urban agriculture and social justice activism in New York City (Vol. 28). University of Georgia Press.

Reynolds, P. D. (2015). Primer in theory construction: An A&B classics edition. Routledge.

Ricketts, T. H., Regetz, J., Steffan-Dewenter, I., Cunningham, S. A., Kremen, C., Bogdanski, A., ... & Viana, B. F. (2008). Landscape effects on crop pollination services: are there general patterns? Ecology letters, 11(5), 499-515.

Rimal, B., Zhang, L., Stork, N., Sloan, S., & Rijal, S. (2018). Urban expansion occurred at the expense of agricultural lands in the Tarai region of Nepal from 1989 to 2016. Sustainability, 10(5), 1341.

Robson, C., & McCartan, K. (2016). Real world research. John Wiley & Sons.

Robson, J. P., & Berkes, F. (2011). Exploring some of the myths of land use change: Can be rural to urban migration drive declines in biodiversity? Global environmental change, 21(3), 844-854.

Rohit J, Dubey SK, Singh P, Singh BK, Kumbhare NV (2017) An assessment of constraints faced by the farmers in peri-urban vegetable cultivation. Int J Curr Microbiol Appl Sci 6(10):2245–2251. https://doi.org/10.20546/ijcmas.2017.610.265

Roman-Alcalá, A. (2015). Broadening the land question in food sovereignty to northern settings: A case study of occupy the farm. Globalizations, 12(4), 545-558.

RUAF (2010). International Conference on Urban Agriculture for Resilient Cities in Almere, The Netherlands. https://ruaf.org/assets/2019/11/Urban-Agriculture-Magazine-no.-25-RUAF-10-years.pdf

RUAF (2020). COVID-19: a wake-up call to rebuild our global food system. Retrieved from https://archive.ruaf.org/news/covid-19-a-wake-up-call-to-rebuild-our-global-food-system/

RUAF Foundation (2015). Urban agriculture, what and why? Available online at: http://www.ruaf.org/urbanagriculture-what-and-why

Rubin, D. B. (2005). Causal inference using potential outcomes: Design, modeling, decisions. Journal of the American Statistical Association, 100(469), 322-331.

Rubin, G. J., Potts, H. W., & Michie, S. (2011). Likely uptake of swine and seasonal flu vaccines among healthcare workers. A cross-sectional analysis of UK telephone survey data. Vaccine, 29(13), 2421-2428.

Ruel, M. T., Garrett, J. L., Hawkes, C., & Cohen, M. J. (2010). The food, fuel, and financial crises affect the urban and rural poor disproportionately: a review of the evidence. the Journal of Nutrition, 140(1), 170S-176S.

Ruggeri, G., Mazzocchi, C., & Corsi, S. (2016). Urban gardeners' motivations in a metropolitan city: The case of Milan. Sustainability, 8(11), 1099.

Rui, Y., & Ban, Y. (2014). Exploring the relationship between street centrality and land use in Stockholm. International Journal of Geographical Information Science, 28(7), 1425-1438.

Ruslin, R., Mashuri, S., Rasak, M. S. A., Alhabsyi, F., & Syam, H. (2022). Semi-structured Interview: A Methodological Reflection on the Development of a Qualitative Research Instrument in Educational Studies. IOSR Journal of Research & Method in Education (IOSR-JRME), 12(1), 22-29.

Russo, A., & Cirella, G. T. (2019). Edible urbanism 5.0. Palgrave communications, 5(1), 1-9.

Russo, A., & Cirella, G. T. (2020). Edible green infrastructure for urban regeneration and food security: case studies from the Campania Region. Agriculture, 10(8), 358.

Rutledge, M., Crawford, G., & Lee, C. (2022). Best Practices in Rural Neighborhood-Based Activism for Environmental Justice. Environmental Justice, 15(1), 65-68.

Sadler, R. C. (2016). Integrating expert knowledge in a GIS to optimize siting decisions for small-scale healthy food retail interventions. International journal of health geographics, 15(1), 1-13.

Safi, Z., & Buerkert, A. (2011). Heavy metal and microbial loads in sewage irrigated vegetables of Kabul, Afghanistan. Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS), 112(1), 29-36.

Saha, M., & Eckelman, M. J. (2017). Growing fresh fruits and vegetables in an urban landscape: A geospatial assessment of ground level and rooftop urban agriculture potential in Boston, USA. Landscape and Urban Planning, 165, 130-141.

Salau, E.S and Attah, A.J (2012). A socio-economic analysis of urban agriculture in Nasarawa state, Nigeria. PAT Journal 8 (1) 17-29. Retrieved from http://patnsukjournal.net/Vol8No1/p2.pdf

Sams, C. (2020). How Covid Changed Gardening Forever. Index Digital. Available online at: https://www.indexdigital.co.uk/home-gardens/how-covid-changed-gardening-forever (accessed November 27, 2020).

Samuelson, A. E., Gill, R. J., Brown, M. J., & Leadbeater, E. (2018). Lower bumblebee colony reproductive success in agricultural compared with urban environments. Proceedings of the Royal Society B, 285(1881), 20180807.

Sanginga PC, Adesina AA, Manyong VM, Otite O, Dashiell KE (2007) Social impact of soybean in Nigeria's southern Guinea savanna. International Institute of Tropical Agriculture, Ibadan

Sanyé-Mengual, E., Martinez-Blanco, J., Finkbeiner, M., Cerdà, M., Camargo, M., Ometto, A. R., ... & Ferreira, G. (2018). Urban horticulture in retail parks: Environmental assessment of the potential implementation of rooftop greenhouses in European and South American cities. Journal of cleaner production, 172,3081-3091.https://doi.org/10.1016/j.jclepro.2017.11.103

Sanyé-Mengual, E., Specht, K., Grapsa, E., Orsini, F., & Gianquinto, G. (2019). How can innovation in urban agriculture contribute to sustainability? A characterization and evaluation study from five Western European cities. Sustainability, 11(15), 4221.

Sanyé-Mengual, E., Specht, K., Krikser, T., Vanni, C., Pennisi, G., Orsini, F., & Gianquinto, G. P. (2018). Social acceptance and perceived ecosystem services of urban agriculture in Southern Europe: The case of Bologna, Italy. PLoS One, 13(9), e0200993.

Sarker, M. N. I., Wu, M., Alam, G. M., & Islam, M. S. (2019). Role of climate smart agriculture in promoting sustainable agriculture: a systematic literature review. International Journal of Agricultural Resources, Governance and Ecology, 15(4), 323-337.

Sato T, Yamamoto S, Qadir M, Endo T, Masunaga T, Ahmad Z (2014) Long-term effects of wastewater irrigation on soil heavy metal contamination in peri-urban areas of Aleppo, Syria. Int J Agric Biol 16:1153–1158

Satterthwaite, D., McGranahan, G., & Tacoli, C. (2010). Urbanization and its implications for food and farming. Philosophical transactions of the royal society B: biological sciences, 365(1554), 2809-2820.

Saunders, M. M. (2012). Perspectives from family caregivers receiving home nursing support: findings from a qualitative study of home care patients with heart failure. Home Healthcare Now, 30(2), 82-90.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Research methods for business students. Pearson education.

Scheelbeek, P. F., Dangour, A. D., Jarmul, S., Turner, G., Sietsma, A. J., Minx, J. C., ... & Berrang-Ford, L. (2021). The effects on public health of climate change adaptation responses: a systematic review of evidence from low-and middle-income countries. Environmental Research Letters, 16(7), 073001.

Schmutz, U., Kneafsey, M., Kay, C. S., Doernberg, A., & Zasada, I. (2018). Sustainability impact assessments of different urban short food supply chains: Examples from London, UK. Renewable Agriculture and Food Systems, 33(6), 518-529.

Schoen, V., Blythe, C., Caputo, S., Fox-Kämper, R., Specht, K., Fargue-Lelièvre, A., ... & Fedeńczak, K. (2021). "We have been part of the response": the effects of COVID-19 on community and allotment gardens in the global north. Frontiers in Sustainable Food Systems, 5, 732641.

Schoen, V., Caputo, S., & Blythe, C. (2020). Valuing physical and social output: A rapid assessment of a London community garden. Sustainability, 12(13), 5452.

Schreck, E., Foucault, Y., Sarret, G., Sobanska, S., Cécillon, L., Castrec-Rouelle, M., ... & Dumat, C. (2012). Metal and metalloid foliar uptake by various plant species exposed to atmospheric industrial fallout: mechanisms involved for lead. Science of the Total Environment, 427, 253-262.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. English language teaching, 5(9), 9-16.

Scott, D., & Becken, S. (2010). Adapting to climate change and climate policy: Progress, problems, and potentials. Journal of Sustainable tourism, 18(3), 283-295.

Seto, K. C., Güneralp, B., & Hutyra, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences, 109(40), 16083-16088.

Shackleton, C. M., Pasquini, M. W., & Drescher, A. W. (Eds.). (2009). African indigenous vegetables in urban agriculture. Routledge.

Shah, M. S., Eppinger, M., Ahmed, S., Shah, A. A., Hameed, A., & Hasan, F. (2015). Multidrug-resistant diarrheagenic E. coli pathotypes are associated with ready-to-eat salad and vegetables in Pakistan. Journal of the Korean Society for Applied Biological Chemistry, 58(2), 267-273.

Shahid, M., Nadeem, M., & Bakhat, H. F. (2020). Environmental toxicology and associated human health risks. Environmental Science and Pollution Research, 27(32), 39671-39675.

Shahid, M., Pinelli, E., & Dumat, C. (2012). Review of Pb availability and toxicity to plants in relation with metal speciation; role of synthetic and natural organic ligands. Journal of hazardous materials, 219, 1-12.

Shamsudin, M. N., Rezai, G., & Kit Teng, P. (2014). Public attitude toward urban agriculture in Malaysia: study on values and knowledge in Klang Valley. Journal of food products marketing, 20(sup1), 35-48.

Sharma HB, Vanapalli KR, Cheela VS et al (2020) Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic. Resour Conserv Recycl 162:105052. https://doi.org/10.1016/j.resconrec.2020.105052

Shifa M, Borel-Saladin J (2019) African urbanisation and poverty. In: Battersby J, Watson V (eds) Urban food systems governance and poverty in African Cities. Routledge, London

Shillington, L. J. (2013) 'Right to food, right to the city: Household urban agriculture, and socionatural metabolism in Managua, Nicaragua', Geoforum, 44, pp. 103–111.

Siborurema, E. (2019). The contribution of urban agriculture to sustainable development: potential role in improving food security and reducing poverty (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Siegner, M., Pinkse, J., & Panwar, R. (2018). Managing tensions in a social enterprise: The complex balancing act to deliver a multi-faceted but coherent social mission. Journal of cleaner production, 174, 1314-1324.

Silverman, D. (2010). Doing qualitative research. Thousand Oaks: Sage Publications

Simatele, D. M., & Binns, T. (2008, March). Motivation and marginalization in African urban agriculture: The case of Lusaka, Zambia. In Urban Forum (Vol. 19, No. 1, pp. 1-21). Springer Netherlands. https://doi.org/10.1007/s12132-008-9021-1

Simiyu, R. R. (2013, September). Gendered access to and utilization of land by food producers in urban Kenya. In Urban Forum (Vol. 24, No. 3, pp. 325-342). Springer Netherlands.

Simiyu, R. R., & Foeken, D. (2013). 'I'm only allowed to sell milk and eggs': Gender aspects of urban livestock keeping in Eldoret, Kenya. The Journal of Modern African Studies, 51(4), 577-603.

Simiyu, R., & Foeken, D. (2014). Gendered divisions of labour in urban crop cultivation in a Kenyan town: implications for livelihood outcomes. Gender, Place & Culture, 21(6), 768-784.

Simon, S. (2022). The 'Covid-Trigger': New Light on Urban Agriculture and Systemic Approach to Urbanism to Co-Create a Sustainable Lisbon. Systemic Practice and Action Research, 1-23.

Škamlová, L., Wilkaniec, A., Szczepańska, M., Bačík, V., & Hencelová, P. (2020). The development process and effects from the management of community gardens in two post-socialist cites: Bratislava and Poznań. Urban Forestry & Urban Greening, 48, 126572.

Slater, R. J. (2001). Urban agriculture, gender, and empowerment: an alternative view. Development Southern Africa, 18(5), 635-650.

Smart, J., Nel, E., & Binns, T. (2015). Economic crisis and food security in Africa: Exploring the significance of urban agriculture in Zambia's Copperbelt province. Geoforum, 65, 37-45.

Smit J, Ratta A, Nasr J (2001) Urban agriculture: food, jobs, and sustainable cities. Publication series for habitat II, vol 1. United Nations Development Program, New YorkReturn to ref 2001 in article

Smit, J., & Nasr, J. (1992). Urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources. Environment and urbanization, 4(2), 141-152. https://doi.org/10.1177/095624789200400214

Smit, J., Bailkey, M., & Van Veenhuizen, R. (2006). Urban agriculture and the building of communities. Van Veenhuizen, R. Cities farming for the future, urban agriculture for green and productive cities. Leusden: RUAF Foundation, 146-171.

Smit, W. (2018). Urban governance in Africa: an overview. African cities and the development conundrum, 55-77.

Smith, D. (2013). The Spade as mighty as the Sword; The story of World War Two's "Dig for Victory" Campaign. London: Aurum Press Ltd.

Smith, N. (2005). The new urban frontier: Gentrification and the revanchist city. routledge.

Social Farms & Gardens. COVID-19 Impact Survey. 2021a. Available online: https://www.farmgarden.org.uk/news/covid-19-impact-update-survey-launched (accessed on 6 September 2021).

Social Farms and Gardens (2021b). COVID-19: a growing opportunity for community gardening in London. Retrieved from https://ruaf.org/news/covid-19-a-growing-opportunity-for-community-gardening-in-london/?fbclid=IwAR3tGAYABECXrr2VbHbwm-1RWtYlWnZ9iPgAiE6h_OP0GedawMSSiq9SRw0

Sönmez, V. (2010). Auguste Comte (1798-1857) pozitivizm (olguculuk).

Soper, R. (2021). How health-conscious urban gardeners aim to increase vegetable consumption in their community while simultaneously supporting Black entrepreneurship. Journal of Agriculture, Food Systems, and Community Development, 10(2), 413-430.

Sowińska-Świerkosz, B., Michalik-Śnieżek, M., & Bieske-Matejak, A. (2021). Can Allotment Gardens (AGs) Be Considered an Example of Nature-Based Solutions (NBS) Based on the Use of Historical Green Infrastructure? Sustainability, 13(2), 835.

Speak, A. F., Mizgajski, A., & Borysiak, J. (2015). Allotment gardens and parks: Provision of ecosystem services with an emphasis on biodiversity. Urban Forestry & Urban Greening, 14(4), 772-781.

Specht, K., & Sanyé-Mengual, E. (2017). Risks in urban rooftop agriculture: Assessing stakeholders' perceptions to ensure efficient policymaking. Environmental Science & Policy, 69, 13-21.

Specht, K., Siebert, R., & Thomaier, S. (2016). Perception and acceptance of agricultural production in and on urban buildings (ZFarming): a qualitative study from Berlin, Germany. Agriculture and Human Values, 33(4), 753-769.

Specht, K., Siebert, R., Hartmann, I., Freisinger, U. B., Sawicka, M., Werner, A., ... & Dierich, A. (2014). Urban agriculture of the future: an overview of sustainability aspects of food production in and on buildings. Agriculture and human values, 31(1), 33-51. https://link.springer.com/article/10.1007/s10460-013-9448-4

Specht, K., Weith, T., Swoboda, K., & Siebert, R. (2016). Socially acceptable urban agriculture businesses. Agronomy for sustainable development, 36(1), 1-14.

Specht, K., Zoll, F., & Siebert, R. (2016). Application and evaluation of a participatory "open innovation" approach (ROIR): The case of introducing zero-acreage farming in Berlin. Landscape and Urban Planning, 151, 45-54.

Spilková, J., & Vágner, J. (2018). Food gardens as important elements of urban agriculture: Spatio-developmental trends and future prospects for urban gardening in Czechia. Norsk Geografisk Tidsskrift-Norwegian Journal of Geography, 72(1), 1-12.

Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., Bodirsky, B. L., Lassaletta, L., ... & Willett, W. (2018). Options for keeping the food system within environmental limits. Nature, 562(7728), 519-525.

Sridhar, A., Balakrishnan, A., Jacob, M. M., Sillanpää, M., & Dayanandan, N. (2022). Global impact of COVID-19 on agriculture: role of sustainable agriculture and digital farming. Environmental Science and Pollution Research, 1-17.

St Clair, R., Hardman, M., Armitage, R. P., & Sherriff, G. (2020). Urban agriculture in shared spaces: The difficulties with collaboration in an age of austerity. Urban Studies, 57(2), 350-365.

Staeheli, L. A., Mitchell, D., & Gibson, K. (2002). Conflicting rights to the city in New York's community gardens. GeoJournal, 58(2), 197-205.

Steel, C. (2008) Hungry City: How Food Shapes Our Lives, Random House Group Ltd.

Stein, E. W. (2021). The transformative environmental effects large-scale indoor farming may have on air, water, and soil. Air, Soil and Water Research, 14, 1178622121995819.

Stephen, A. M., Champ, M. M.-J., Cloran, S. J., Fleith, M., van Lieshout, L., Mejborn, H., & Burley, V. J. (2017). Dietary fibre in Europe: Current state of knowledge on definitions, sources, recommendations, intakes, and relationships to health. Nutrition Research Reviews, 30(2), 149–190. https://doi.org/10.1017/S095442241700004X

Steward, A. (2007). Nobody farms here anymore: livelihood diversification in the Amazonian community of Carvão, a historical perspective. Agriculture and Human Values, 24(1), 75-92.

Stewart, R., Korth, M., Langer, L., Rafferty, S., Da Silva, N. R., & van Rooyen, C. (2013). What are the impacts of urban agriculture programs on food security in low and middle-income countries? Environmental Evidence, 2(1), 1-13.

Stiglitz, J., & Hoff, K. (2001). Modern economic theory and development. Frontiers of development economics: The future in perspective, 389-459.

Strauss, A., & Corbin, J. (1998). Basics of qualitative research techniques.

Streiffeler, F. (1993). General principles and approaches for sustainable urban greenbelts with special reference to Africa. document interne, Humboldt Universitat zu Berlin.

Stubberfield, J., Troldborg, M., Ander, L., Crout, N., Young, S. D., & Hough, R. L. (2022). Exercise, Urban Food Production, Preparation and Consumption: Implications, Benefits and Risks to Grow-Your-Own (GYO) Gardeners. Agronomy, 12(1), 181.

Sturges, J. E., & Hanrahan, K. J. (2004). Comparing telephone and face-to-face qualitative interviewing: a research note. Qualitative research, 4(1), 107-118.

Su, S., Li, Z., Xu, M., Cai, Z., & Weng, M. (2017). A geo-big data approach to intra-urban food deserts: Transit-varying accessibility, social inequalities, and implications for urban planning. Habitat International, 64, 22-40.

Sunga, A. B., and Advincula, J. L. (2021). The "plantito/plantita" home gardening during the pandemic. Comm. Psych. Glob. Persp. 7, 88–105. doi:10.1285/i24212113v7i1p88

Surls, R., Feenstra, G., Golden, S., Galt, R., Hardesty, S., Napawan, C., & Wilen, C. (2015). Gearing up to support urban farming in California: Preliminary results of a needs assessment. Renewable Agriculture and Food Systems, 30(1), 33-42.

Suryantini, R., Atmodiwirjo, P., & Yatmo, Y. A. (2021). Toward a healthy home: Investigating food flow and the shift in domestic spatial practice during the COVID-19 pandemic. Housing and Society, 1-21.

Sustain (2020). Response, Resilience and Recovery: London's Food Response to Covid-19. Retrieved from https://www.sustainweb.org/publications/response-resilience-recovery-2020/

Swanepoel JW, Van Niekerk JA, D'Haese L (2017) The socio-economic profile of urban farming and non-farming households in the informal settlement area of the Cape Town metropole in South Africa. S Afr J Agric Ext 45(1):131–140

Swanwick, C., Dunnett, N., and Woolley, H. (2003). Nature, role, and value of green space in towns and cities: an overview. Built. Environ. (1978) 29, 94–106. doi:10.2148/benv.29.2.94.54467

Sy, M., O'Leary, N., Nagraj, S., El-Awaisi, A., O'Carroll, V., & Xyrichis, A. (2020). Doing interprofessional research in the COVID-19 era: a discussion paper. Journal of Interprofessional Care, 34(5), 600-606.

Taiwo, O. J. (2014) 'Determinants of peri-urban and urban agricultural locational choice behaviour in Lagos, Nigeria', Land Use Policy. Elsevier Ltd, 39, pp. 320–330.

Tambwe, N., Rudolph, M. and Greenstein, R. (2011) '"Instead of Begging, I Farm to Feed my Children": Urban Agriculture - An Alternative to Copper and Cobalt in Lubumbashi', Africa: Journal of the International African Institute. Cambridge University Press on behalf of the International African Institute, 81(3), pp. 391–412.

Tania, A. H., Gazi, M., & Mia, M. (2021). Evaluation of water quantity–quality, floodplain land use, and land surface temperature (LST) of Turag River in Bangladesh: an integrated approach of geospatial, field, and laboratory analyses. SN Applied Sciences, 3(1), 1-18.

Tapia, C., Randall, L., Wang, S., & Borges, L. A. (2021). Monitoring the contribution of urban agriculture to urban sustainability: an indicator-based framework. Sustainable Cities and Society, 74, 103130.

Taylor and Vaage (2015). Municipal Zoning for Local Foods in Iowa: A Guidebook for Reducing Local Regulatory Barriers to Local Foods. Retrieved from https://blogs.extension.iastate.edu/planningBLUZ/files/2012/01/ZONING-FOR-LOCAL-FOODS-GUIDEBOOK.pdf

Taylor, J. R. (2020). Modeling the potential productivity of urban agriculture and its impacts on soil quality through experimental research on scale-appropriate systems. Frontiers in Sustainable Food Systems, 4, 89.

Taylor, J. R., & Lovell, S. T. (2014). Urban home food gardens in the Global North: research traditions and future directions. Agriculture and human values, 31(2), 285-305.

Taylor, L., & Hochuli, D. F. (2017). Defining greenspace: Multiple uses across multiple disciplines. Landscape and urban planning, 158, 25-38.

Tchounwou, P. B. (2012). Eighth international symposium on recent advances in environmental health research. International Journal of Environmental Research and Public Health, 9(5), 1626-1629.

Teddlie, C., & Tashakkori, A. (2003). Major issues and controveries in the use of mixed methods in the social and behavioural sciences. Handbook of mixed methods in social & behavioural research, 3-50.

Teig, E., Amulya, J., Bardwell, L., Buchenau, M., Marshall, J. A., & Litt, J. S. (2009). Collective efficacy in Denver, Colorado: Strengthening neighborhoods and health through community gardens. Health & place, 15(4), 1115-1122.

Teng, P. (2020). Assuring food security in Singapore, a small island state facing COVID-19. Food Security, 12(4), 801-804.

Teti, M., Schatz, E., & Liebenberg, L. (2020). Methods in the time of COVID-19: the vital role of qualitative inquiries. International Journal of Qualitative Methods, 19, 1609406920920962.

ThassaŶaŶakajit, S., SuǁaŶŵaŶeepoŶg, S. aŶd MaŶkeď, P. ;ŦƟɷ6J. KŶoǁledge's Attitudes Relating to Urban Vegetable Productions of Growers in Bangkok, Thailand. International Journal of Agricultural Technology 12(7.2): 1773-1784.

The Will (2016) 'Opinion: Why civil servants aren't farmers', The Will 6 August, https://thewillnigeria.com/news/opinion-why-civil-servants-arent-farmers/ (accessed 21 March 2020).

The World Bank (2014). The World Bank Group and the Global Food Crisis. Retrieved from https://documents1.worldbank.org/curated/en/543311468323944900/pdf/The-World-Bank-Group-and-the-global-food-crisis-an-evaluation-of-the-World-Bank-Group-response.pdf

Thibert, J. (2012). Making local planning work for urban agriculture in the North American context: A view from the ground. Journal of Planning Education and Research, 32(3), 349-357.

Thomaier, S., Specht, K., Henckel, D., Dierich, A., Siebert, R., Freisinger, U. B., & Sawicka, M. (2015). Farming in and on urban buildings: Present practice and specific novelties of Zero-Acreage Farming (ZFarming). Renewable Agriculture and Food Systems, 30(1), 43-54.

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. BMC medical research methodology, 8(1), 45. https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-8-45

Thurmond, V. A. (2001). The point of triangulation. Journal of nursing scholarship, 33(3), 253-258.

Tibesigwa, B., & Visser, M. (2016). Assessing gender inequality in food security among small-holder farm households in urban and rural South Africa. World Development, 88, 33-49.

Tidball, K. G., & Krasny, M. E. (2007). From risk to resilience: What role for community greening and civic ecology in cities. Social learning towards a more sustainable world, 149-164.

Toerien, M., & Wilkinson, S. (2004). Exploring the depilation norm: a qualitative questionnaire study of women's body hair removal. Qualitative Research in Psychology, 1(1), 69-92.

Tompkins, J. G., Clune, R., Hermanson, D. R., & Ye, Z. (2014). The nominating committee process: A qualitative examination of board independence and formalization. Contemporary Accounting Research, 31(3), 748-786.

Tongo, M.D.C. 2007. Purposive sampling as a tool for informant selection. Ethnobot. Res. Appl. 5: 147 – 158.

Torero, M. (2020). Without food, there can be no exit from the pandemic.

Tornaghi, C. (2014). Critical geography of urban agriculture. Progress in Human Geography, 38(4), 551–567. https://doi.org/10.1177/0309132513512542

Tornaghi, C., & Certomà, C. (Eds.). (2019). Urban gardening as politics (pp. 1-220). London: Routledge.

Tranel, M., & Handlin Jr, L. B. (2006). Metromorphosis: documenting change. Journal of Urban Affairs, 28(2), 151-167.

Travaline, K., & Hunold, C. (2010). Urban agriculture and ecological citizenship in Philadelphia. Local Environment, 15(6), 581-590.

Trienekens, J. H., Hagen, J. M., Beulens, A. J., & Omta, S. W. F. (2003). Innovation through (international) food supply chain development: a research agenda. International Food and Agribusiness Management Review, 6(1030-2016-82618).

Trier-Bieniek, A. (2012). Framing the telephone interview as a participant-centred tool for qualitative research: a methodological discussion. Qualitative research, 12(6), 630-644.

Trochim W. M. K., Donnelly J. P. (2007). The research methods knowledge base (3rd ed.). Mason, OH: Thomson.

Turner, B., & Henryks, J. (2012). A Study of the Demand for Community Gardens and their Benefits for the ACT Community.

Pere Serra, David Saurí & Luca Salvati (2018) Peri-urban agriculture in Barcelona: outlining landscape dynamics vis à vis socio-environmental functions, Landscape Research, 43:5, 613-631, DOI: 10.1080/01426397.2017.1336758

Minotti, B., Cimini, A., D'Amico, G., Marino, D., Mazzocchi, G., & Tarra, S. (2022). Food Policy Processes in the City of Rome: A Perspective on Policy Integration and Governance Innovation. *Frontiers in Sustainable Food Systems*, 540.

Cavallo, A., Di Donato, B., & Marino, D. (2016). Mapping and assessing urban agriculture in Rome. *Agriculture and Agricultural Science Procedia*, *8*, 774-783.

Moragues-Faus, A., & Battersby, J. (2021). Urban food policies for a sustainable and just future: Concepts and tools for a renewed agenda. *Food Policy*, *103*, 102124.

Dansero, E., Marino, D., Mazzocchi, G., & Nicolarea, Y. (2019). Lo spazio delle politiche locali del cibo: temi, esperienze e prospettive. *Lo spazio delle politiche locali del cibo*, 1-322.

Mazzocchi, G., & Marino, D. (2020). Rome, a policy without politics: The participatory process for a metropolitan scale food policy. *International Journal of Environmental Research and Public Health*, *17*(2), 479.

European Commission, 'Science for Environment Policy' Rooftop gardens could grow three quarters of city's vegetables. DG Environment News Alert Service edited by SCU, The University of the West of England, Bristol. Issue 409, 26 March 2015

R. Roggema (ed.), Sustainable urban agriculture and food planning, Routledge, 2016, p 3

A. Jenkins, G. Keeffe and N. Hall, 'Planning urban food production into today's cities', Future of Food: Journal on Food, Agriculture and Society, 3 (1), 2015, pp

E. Rogge, E. Kerselaers and C. Prové, 'Envisioning opportunities for agriculture in peri-urban areas' Metropolitan Ruralities; published online: 26 July 2016, pp. 161-186.

McEldowney, J. (2017). *Urban Agriculture in Europe: Patterns, Challenges and Policies: In-depth Analysis*. European Parliament.

5 S. Daftary-Steel, H. Herrera and C. M. Porter, 'The unattainable trifecta of urban agriculture', Journal of Agriculture, Food Systems and Community Development, 6(1), 2015, pp. 19-32.

N. Curry, M. Reed, D. Keech, D. Maye and J. Kirwan, 'Urban agriculture and the policies of the European Union: the need for renewal', Spanish Journal of Rural Development, Vol. V (Special 1), 2014, pp. 91-106.

EFUA (2022). European Union's Horizon 2020 Research and Innovation Programme.

U.N., 1986. World Survey on the Role of women in Development Published by Department of International and Social Affairs, pp: 12.

U.S. Environmental Protection Agency (2011). Report on the 2011 U.S. Environmental Protection Agency (EPA) Decontamination Research and Development Conference. Retrieved from file:///C:/Users/tayoa/OneDrive/Desktop/2011%20DECON%20RESEARCH%20REPORT.PDF

Udoekanem, N. B., Adoga, D. O., & Onwumere, V. O. (2014). Land ownership in Nigeria: Historical development, current issues, and future expectations.

Ugolini, F., Massetti, L., Calaza-Martínez, P., Cariñanos, P., Dobbs, C., Ostoić, S. K., et al. (2020). Effects of the COVID-19 pandemic on the use and perceptions of urban green space: an international exploratory study. Urban For. Urban Green. 56:126888. doi: 10.1016/j.ufug.2020.126888

UK Data Archive (2014). Informed Consent. Retrieved from https://dam.ukdataservice.ac.uk/media/428433/ethicallegal_informedconsent_34apr2014_ukds.pdf

UK Data Service. (2015). Consent for data sharing. Retrieved 19/02/2015, 2015, from http://ukdataservice.ac.uk/manage-data/legal-ethical/consent-data-sharing/writtenoral.aspx

Ukeje, E. (2004). Modernizing small holder agriculture to ensure food security and gender empowerment: Issues and policy. Int Group Twenty-Four Res Pap, 23.

Uko, E. E. (2021). Policy and planning in urban and peri-urban agriculture: The cases of Uyo and Benin City, Southern Nigeria (Doctoral dissertation, University of Otago).

Uma, K. E., Eboh, F. E., Obidike, P. C., & Ogwuru, H. O. (2014). Stimulating food production in Nigeria for sustainable development: Lessons from China. American Journal of Scientific and Industrial Research, 5, 88-96.

UN (2013). Report on World Social Situation 2013: Inequality Matters. Retrieved from https://www.un.org/en/development/desa/publications/world-social-situation-2013.html

UN (2018). Promoting inclusion through social protection: Report on the World Social Situation 2018. Retrieved from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2018/07/1-1.pdf

UN Habitat (2006). Growing recognition for growing urbanization. 2006 Annual Report. Retrieved from http://mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2101

UN Water (2019). Water, Food and Energy. Retrieved from https://www.unwater.org/water-facts/water-food-and-energy/

UNDESA (2014). World Urbanization Prospects: The 2014 Revision, CD¬ROM Edition.

UNDESA (2019). World Population Prospects 2019 Highlights. https://www.un.org/development/desa/publications/world-population-prospects-2019-highlights.html

UNDP (1996). Urban Agriculture. Food, Jobs, and Sustainable Cities. United Nations Development Programme. Publication Series for Habitat II, vol. 1. UNDP, New York.

UNESCO, E. (2014). EFA Global Monitoring Report. Teaching and learning: Achieving quality for all.

UNFCCC. 2010. United Nations Framework Convention on Climate Change. http://unfccc.int.

UN-HABITAT (2008) State of the world's cities 2008/09. Earthscan, London. http://www.unhabitat.org.jo/en/inp/Upload/105056_Cover%20page.pdf

UN-Habitat (2021). The sustainable Development goals report 2021. Retrieved from https://unhabitat.org/sites/default/files/2021/07/the-sustainable-development-goals-report-2021.pdf

United Nations (2010). The right to adequate food. Geneva: United Nations. Office of the High Commissioner of Human Rights.

United Nations (2015) Transforming our world: the 2030 agenda for sustainable development. https://sustainabledevelopment.un.org/post2015/transformingourworld (Accessed 17 Nov 2020)

United Nations Development Programme. Technical Notes Human Development Report 2016. New York, NY (2016). https://sustainabledevelopment.un.org/content/documents/25212016_human_development_report.pdf

United Nations Population Fund (UNFPA). 2007. State of World Population 2007: Unleashing the Potential of Urban Growth, New York, NY: UNFPA.

United Nations, 2016. The World's Cities in 2016. United Nations, Geneva.

United Nations, Department of Economic and Social Affairs, Population Division (UN-DESA) (2018). World urbanization prospects: the 2018 revision, online edition. https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf Accessed 1 July 2021

United Nations. (2017). World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100. World Population Prospects: The 2017 Revision. United Nations Department of Economic and Social Affairs. Retrieved from https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html and https://population.un.org/wpp/

United Nations. 2004. World population to 2300. New York: Department of Economic and Social Affairs, United Nations.

UNODC (2019). United Nations Support to The Least Developed Countries. Retrieved from https://www.un.org/ohrlls/sites/www.un.org.ohrlls/files/united_nations_support_to_the_least_developed_countries.pdf

Uzoamaka, O., Chiemezie Chisom, N., & Nnamdi, U. (2021). Critique of Nigerian Land Use Act of 1978.

Van den Berg, A. E., van Winsum-Westra, M., De Vries, S., & Van Dillen, S. M. (2010). Allotment gardening and health: a comparative survey among allotment gardeners and their neighbors without an allotment. Environmental Health, 9(1), 1-12.

Van der Schans, J., & Wiskerke, J. (2012). Urban agriculture in developed economies. In Sustainable food planning, ed. I. Opitz et al. A. Viljoen, and J.S.C. Wiskerke, 245–258. Wageningen: Wageningen Academic Publishers.

Van Veenhuizen, R. (2006). Cities farming for the future. Cities farming for future, Urban Agriculture for green and productive cities, (p 2-17). RUAF Foundation, IDRC and IIRP, ETC-Urban agriculture, Leusden, The Netherlands.

Vannette, D. L., & Krosnick, J. A. (Eds.). (2017). The Palgrave handbook of survey research. Springer.

Veen, E. J., Bock, B. B., Van den Berg, W., Visser, A. J., & Wiskerke, J. S. (2016). Community gardening and social cohesion: different designs, different motivations. Local Environment, 21(10), 1271-1287.

Veenhuizen van, R. and Danso, G. (2007). Profitability and sustainability of urban and peri-urban agriculture. FAO Agricultural Management, Marketing and Finance Occasional Paper

Vejre, H., Eiter, S., Hernández-Jiménez, V., Lohrberg, F., Loupa-Ramos, I., Recasens, X., et al. (2016). "Can agriculture be urban," in Urban Agriculture Europe, eds F. Lohrberg, L. Lička, L. Scazzosi, and A. Timpe (Berlin: Jovis), 18–21.

Venter, Z. S., Barton, D. N., Gundersen, V., Figari, H., & Nowell, M. (2020). Urban nature in a time of crisis: Recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. Environmental research letters, 15(10), 104075.

Verdoliva, S. G., Gwyn-Jones, D., Detheridge, A., & Robson, P. (2021). Controlled comparisons between soil and hydroponic systems reveal increased water use efficiency and higher lycopene and β-carotene contents in hydroponically grown tomatoes. Scientia horticulturae, 279, 109896.

Vidal Merino, M., Gajjar, S. P., Subedi, A., Polgar, A., & Van Den Hoof, C. (2021). Resilient Governance Regimes that Support Urban Agriculture in Sub-Saharan Cities: Learning from Local Challenges. Frontiers in Sustainable Food Systems, 276.

Viljoen, A., & Bohn, K. (2015). Second Nature Urban Agriculture: Designing the Productive City. In The British Papers: Current Thinking on Sustainable City Design (pp. 45-46). RIBA Publishing.

Viljoen, A., Bohn, K., & Howe, J. (2005). More food with less space: why bother. Continuous productive urban landscapes, 19. Retrieved from https://books.google.co.uk/books?hl=en&lr=&id=SWuDgEfUqzIC&oi=fnd&pg=PA18&dq=viljoen+and+howe+2005&ots=AOXplImRMg&sig=EfmFlDaY-G8rJg4A5uP_rxwk7Qc&redir_esc=y#v=onepage&q=viljoen%20and%20howe%202005&f=false

Vitiello, D. (2008). Growing edible cities. Growing Greener Cities: Urban Sustainability in the Twenty-First Century, 259-280.

Vitiello, D., & Brinkley, C. (2014). The hidden history of food system planning. Journal of Planning History, 13(2), 91-112.

Vittori Antisari, L., Carbone, S., Gatti, A., Vianello, G., & Nannipieri, P. (2015). Uptake and translocation of metals and nutrients in tomato grown in soil polluted with metal oxide (CeO2, Fe3O4, SnO2, TiO2) or metallic (Ag, Co, Ni) engineered nanoparticles. Environmental Science and Pollution Research, 22(3), 1841-1853.

Vittuari, M., Bazzocchi, G., Blasioli, S., Cirone, F., Maggio, A., Orsini, F., et al. (2021). Envisioning the future of european food systems: approaches and research priorities after COVID-19. Front. Sustain. Food Syst. 5:58. doi: 10.3389/fsufs.2021.642787

Vogl, S. (2013). Telephone versus face-to-face interviews: Mode effect on semistructured interviews with children. Sociological Methodology, 43(1), 133-177.

Voicu, I., & Been, V. (2008). The effect of community gardens on neighboring property values. Real Estate Economics, 36(2), 241-283.

Wahab, B., & Abiodun, O. (2018). Strengthening food security through peri-urban agriculture in Ibadan, Nigeria. Ghana Journal of Geography, 10(2), 50-66.

Wakefield, S., Yeudall, F., Taron, C., Reynolds, J., & Skinner, A. (2007). Growing urban health: community gardening in South-East Toronto. Health promotion international, 22(2), 92-101.

Walsh, L. E., Mead, B. R., Hardman, C. A., Evans, D., Liu, L., Falagán, N., ... & Davies, J. (2022). Potential of urban green spaces for supporting horticultural production: a national scale analysis. Environmental Research Letters, 17(1), 014052.

Walters, S. A., & Stoelzle Midden, K. (2018). Sustainability of urban agriculture: Vegetable production on green roofs. Agriculture, 8(11), 168.

Wan, N. F., Cai, Y. M., Shen, Y. J., Ji, X. Y., Wu, X. W., Zheng, X. R., ... & Li, B. (2018). Increasing plant diversity with border crops reduces insecticide use and increases crop yield in urban agriculture. Elife, 7, e35103.

Wang, Y., Gao, Q., Cheng, Z., Zhang, J., and Wu, Y. (2020). Creating solace and hope during COVID-19: an innovative Internet-based social work intervention. Int. Soc. Work 64, 251–254. doi: 10.1177/0020872820959379

Wang, Y., Jodoin, P. M., Porikli, F., Konrad, J., Benezeth, Y., & Ishwar, P. (2014). CDnet 2014: An expanded change detection benchmark dataset. In Proceedings of the IEEE conference on computer vision and pattern recognition workshops (pp. 387-394).

Ward, C. D., & Shackleton, C. M. (2016). Natural resource use, incomes, and poverty along the rural–urban continuum of two medium-sized, South African towns. World Development, 78, 80-93.

Ward, J., Ward, P., Saint, C., & Mantzioris, E. (2014). The urban agriculture revolution. Water: Journal of the Australian Water Association, 41(1), 69-74.

Ward, K., Gott, M., & Hoare, K. (2015). Participants' views of telephone interviews within a grounded theory study. Journal of advanced nursing, 71(12), 2775-2785.

Warren, E., Hawkesworth, S., & Knai, C. (2015). Investigating the association between urban agriculture and food security, dietary diversity, and nutritional status: A systematic literature review. Food Policy, 53, 54-66.

Warshawsky, D. N. (2016). Civil society and the governance of urban food systems in sub-Saharan Africa. Geography Compass, 10(7), 293-306.

Webb, N. L. (2011). When is enough, enough? Advocacy, evidence, and criticism in the field of urban agriculture in South Africa. Development Southern Africa, 28(2), 195-208.

Weidner, T., & Yang, A. (2019). The potential of urban agriculture in combination with organic waste valorisation: Assessment of resource flows and emissions for two European cities. Journal of Cleaner Production, 118490.

Weidner, T., Yang, A., & Hamm, M. W. (2019). Consolidating the current knowledge on urban agriculture in productive urban food systems: Learnings, gaps, and outlook. Journal of Cleaner Production, 209, 1637-1655.

Weiss, T. G., & Wilkinson, R. (2021). Making sense of global governance futures. In Global Governance Futures (pp. 1-19). Routledge.

Weissman, E. (2015). Entrepreneurial endeavors:(re) producing neoliberalization through urban agriculture youth programming in Brooklyn, New York. Environmental Education Research, 21(3), 351-364.

Wekerle, G. R., & Classens, M. (2015). Food production in the city:(re) negotiating land, food, and property. Local Environment, 20(10), 1175-1193.

White R, Stirling A (2013) Sustaining trajectories towards sustainability: dynamics and diversity in UK communal growing activities. Glob Environ Change 23:838–846

White, J. T., & Bunn, C. (2017). Growing in Glasgow: Innovative practices and emerging policy pathways for urban agriculture. Land Use Policy, 68, 334-344. https://doi.org/10.1016/j.landusepol.2017.07.056

White, M. P., Alcock, I., Wheeler, B. W., and Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. Psychol. Sci. 24, 920–928. doi: 10.1177/0956797612464659

Whitley, H. (2020). Gender and urban agriculture. In Routledge Handbook of Gender and Agriculture (pp. 212-222). Routledge.

Whittinghill, L. J., & Rowe, D. B. (2012). The role of green roof technology in urban agriculture. Renewable Agriculture and Food Systems, 27(4), 314-322.

WHO (2003). Global Strategy on Diet, Physical Activity and Health. Retrieved from https://www.who.int/dietphysicalactivity/fruit/en/

WHO. (2020). Malnutrition. Fact Sheets. https://www.who.int/news-room/fact-sheets/detail/malnutrition

Wielemaker, R., Oenema, O., Zeeman, G., & Weijma, J. (2019). Fertile cities: Nutrient management practices in urban agriculture. Science of the total environment, 668, 1277-1288.

Wilhelm, J. A., & Smith, R. G. (2018). Ecosystem services and land sparing potential of urban and peri-urban agriculture: A review. Renewable Agriculture and Food Systems, 33(5), 481-494.

Wilkins, J. L., Farrell, T. J., & Rangarajan, A. (2015). Linking vegetable preferences, health, and local food systems through community-supported agriculture. Public health nutrition, 18(13), 2392-2401.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., ... & Murray, C. J. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393(10170), 447-492.

Winkler, I. S., Labandeira, C. C., Wappler, T., & Wilf, P. (2010). Distinguishing Agromyzidae (Diptera) leaf mines in the fossil record: new taxa from the Paleogene of North America and Germany and their evolutionary implications. Journal of Paleontology, 84(5), 935-954.and Sarah Taylor Lovell. "Environmental challenges threatening the growth of urban agriculture in the United States." Journal of environmental quality 42.5 (2013): 1283-1294.

Wiskerke, J. S. C., & Viljoen, A. (2012). Sustainable urban food provisioning: challenges for scientists, policymakers, planners, and designers. In A. Viljoen, & J. S. C. Wiskerke (Eds.). Sustainable food planning: Evolving theory and practice. Wageningen: Wageningen Academic Publishers.

Wodon, Q., & Zaman, H. (2010). Higher food prices in Sub-Saharan Africa: Poverty impact and policy responses. The World Bank Research Observer, 25(1), 157-176.

Wood, C. J., Pretty, J., & Griffin, M. (2016). A case–control study of the health and well-being benefits of allotment gardening. Journal of Public Health, 38(3), e336-e344.

World Bank (2018). Urban Population (Percentage of Total Population). Retrieved from https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS

World Bank (2020). Climate Smart Agriculture. Accessed June 2021 https://www.worldbank.org/en/topic/climate-smart-agriculture

World Bank and IFPRI (International Food Policy Research Institute) (2010) Gender and governance in rural services: insights from India, Ghana, and Ethiopia. Gender and Governance Author Team. International Bank for Reconstruction and Development/World Bank, Washington, DC

World Bank Group (2016). World Bank Annual Report 2016. Washington, DC: World Bank. doi: 10.1596/978-1-4648-0852-4.

World Bank Group (2022). Population growth. https://data.worldbank.org/indicator/SP.POP.GROW

World Health Organization (WHO) (2015) Global Health Observatory. http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/. Accessed 30 May 2021

Wortman, S. E., & Lovell, S. T. (2013). Environmental challenges threatening the growth of urban agriculture in the United States. Journal of Environmental Quality, 42(5), 1283-1294. doi:10.2134/jeq2013.01.0031

Wu, L., & Kim, S. K. (2021). Exploring the equality of accessing urban green spaces: A comparative study of 341 Chinese cities. Ecological Indicators, 121, 107080.

Yan, D., Liu, L., Liu, X., & Zhang, M. (2022). Global trends in urban agriculture research: A pathway toward urban resilience and sustainability. Land, 11(1), 117.

Yang, X., Liu, J., McGrouther, K., Huang, H., Lu, K., Guo, X., ... & Wang, H. (2016). Effect of biochar on the extractability of heavy metals (Cd, Cu, Pb, and Zn) and enzyme activity in soil. Environmental Science and Pollution Research, 23(2), 974-984.

Yaro, J. A., & Hesselberg, J. (2010). The contours of poverty in Northern Ghana: policy implications for combating food insecurity. Institute of African Studies Research Review, 26(1), 81-112.

Yin, J., Yin, Z., Zhong, H., Xu, S., Hu, X., Wang, J., & Wu, J. (2011). Monitoring urban expansion and land use/land cover changes of Shanghai metropolitan area during the transitional economy (1979–2009) in China. Environmental monitoring and assessment, 177(1), 609-621.

Yin, R. K. (2009). Case study research: Design and methods (Vol. 5). sage.

Yoshida, S., & Yagi, H. (2021). Long-term development of urban agriculture: resilience and sustainability of farmers facing the Covid-19 pandemic in Japan. Sustainability, 13(8), 4316.

Young, C., Hofmann, M., Frey, D., Moretti, M., & Bauer, N. (2020). Psychological restoration in urban gardens related to garden type, biodiversity, and garden-related stress. Landscape and Urban Planning, 198, 103777.

Yoveva, A., Gocheva, B., Voykova, G., Borissov, B., & Spassov, A. (2000). Sofia: urban agriculture in an economy in transition. Growing cities, growing food: urban agriculture on the policy agenda. A reader on urban agriculture, 501-518. Retrieved from https://www.ruaf.org/sites/default/files/Sofia_1.PDF

Yusuf, S. A., Balogun, O. L., & Falegbe, O. E. (2015). Effect of urban household farming on food security status in Ibadan metropolis, Oyo State, Nigeria. Journal of Agricultural Sciences (Belgrade), 60(1), 61-75.

Zainal, M., & Hamzah, S. R. A. (2018). Urban agriculture: The role of knowledge among farmer in Malaysia. International Journal of Academic Research in Business and Social Sciences, 7(14), 77-85.

Zanetti, O. (2007). Guerrilla Gardening – Geographers and Gardeners, Actors and Networks: Reconsidering Urban Public Space, unpublished MA dissertation, Queen Mary, University of London

Zanzi, A., Vaglia, V., Spigarolo, R., & Bocchi, S. (2021). Assessing Agri-Food Start-Ups Sustainability in Peri-Urban Agriculture Context. Land, 10(4), 384.

Zasada, I., C. Fertner, A. Piorr, and T.S. Nielsen. 2011. Peri-urbanisation and multifunctional adaptation of agriculture around Copenhagen. Geografisk Tidsskrift 111(1): 59–72.

Zasada, I., Weltin, M., Zoll, F., & Benninger, S. L. (2020). Home gardening practice in Pune (India), the role of communities, urban environment, and the contribution to urban sustainability. Urban Ecosystems, 23(2), 403-417.

Zechner, M., Näre, L., Karsio, O., Olakivi, A., Sointu, L., Hoppania, H. K., & Vaittinen, T. (2022). The politics of ailment: a new approach to care. Policy Press.

Zeunert, J. (2018). Dimensions of urban agriculture. In Routledge handbook of landscape and food (pp. 160-184). Routledge.

Zezza, A. and Tasciotti, L. (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. Food Policy 35 (2010) 265–273. http://dx.doi.org/10.1016/j.foodpol.2010.04.007

Zezza, A., Winters, P., Davis, B., Carletto, C., Covarrubias, K., Quiñones, E. J., ... & Bonomi, G. (2008). Rural household access to assets and agrarian institutions: A cross country comparison. Background Paper for the World Development Report.

Zhao, L. (2021). Exploring the spatial planning dimensions of urban informal food systems in Nanjing, China. Urban Agriculture & Regional Food Systems, 6(1), e20012.

Zheng, Y., He, Y., Zhou, Q., & Wang, H. (2022). Quantitative evaluation of urban expansion using NPP-VIIRS nighttime light and landsat spectral data. Sustainable Cities and Society, 76, 103338.

Zhou, Q., Guo, J. J., He, C. T., Shen, C., Huang, Y. Y., Chen, J. X., ... & Yang, Z. Y. (2016). Comparative transcriptome analysis between low-and high-cadmium-accumulating genotypes of pakchoi (Brassica chinensis L.) in response to cadmium stress. Environmental science & technology, 50(12), 6485-6494.

Ziem Bonye, S., Yenglier Yiridomoh, G., & Derbile, E. K. (2021). Urban expansion and agricultural land use change in Ghana: Implications for peri-urban farmer household food security in Wa Municipality. International Journal of Urban Sustainable Development, 13(2), 383-399.

Zimmerer, K. S., Bell, M. G., Chirisa, I., Duvall, C. S., Egerer, M., Hung, P. Y., ... & Yacamán Ochoa, C. (2021). Grand challenges in urban agriculture: ecological and social approaches to transformative sustainability. Frontiers in Sustainable Food Systems, 5, 101.

Zohrabi, M. (2013). Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings. Theory & practice in language studies, 3(2). doi:10.4304/tpls.3.2.254-26