

An Assessment of the Opportunities and Constraints of Urban Agriculture in Cheptais  
Town, Bungoma County, Kenya

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## DECLARATION

This research project is my original work and has not been presented for a degree at any other University

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This proposal has been submitted for examination with our approval as University supervisors.

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## **DEDICATION**

I would like to dedicate this research project to my family, more so my parents Jane and Henry Chemoss for their encouragement and overwhelming support.

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My appreciation also goes out to the Department of Geography and Environmental Studies teaching staff who shared their knowledge and enthusiasm during the proposal defence - thank you all for your invaluable time and inestimable service. I would also like to thank my University supervisors Dr. Mikalitsa S. Mukhovi and Dr. Boniface Wambua for their technical input, patience, and guidance through this process. I wish to thank the urban farmers of Cheptais town for taking the time to share information and their experiences - thank you for your dedication and continued efforts, and your contributions to the ever-growing agricultural systems in Cheptais. To the University of Nairobi, thank you for providing an enabling environment and support system which has allowed me to further my academic skills and expand my professional network.

## ABSTRACT

This research study was undertaken in order to assess the opportunities and constraints of sustainable urban agriculture in Cheptais town, Bungoma County. The objectives included; (1) to examine the type and purpose of urban agriculture; (2) to assess the opportunities for urban agriculture; and (3) to establish the constraints facing urban agriculture. The data for the research was collected using a survey questionnaire and direct field observations. Descriptive statistics were used to analyse data and the study results were based on data generated from a sample of 152 urban farmers in Cheptais town. The sample design used to identify the 152 urban farmers was simple random sampling design. The study revealed that urban agriculture is being practiced widely but carried out on a small scale due to the limited space available. Out of the 152 urban farmers surveyed, 83 practiced crop cultivation only, 55 indulged in mixed farming, while 14 took on animal husbandry only. This has encouraged urban farmers to diversify the crops they grow, moving away from the once-popular maize and coffee options. Those with livestock and poultry have also adapted to keeping manageable numbers and avoid overcrowding. About 82% of urban farmer's households surveyed confirmed that they were dependent on urban agriculture for their food source while about 71% indicated that it was a major contributor to their household income. This indicated that the urban farmers were keen on ensuring that the portions of land dedicated to the practice are used sustainably in order to allow for the successful continuation of yield production. There was also a large preference for produce from urban agriculture, as stated by over 90% of the urban farmers surveyed. This was because it was considered fresh, readily available, and affordable for both farmers and non-farmer consumers. The study concluded that urban agriculture does form an important part of the economic, social and environmental web of Cheptais town. Many of the inhabitants depend on it for economic sustenance, it provides a space to make social connections through trade and more urban farmers are working to ensure their activities do not cause a negative ecological impact. This study recommends additional capacity and support for female and youth farmers allowing them to make contributions towards the growth and development of Chaptais town. It also recommends the creation of opportunities and spaces that promote knowledge sharing on urban agriculture as well as making available information on crop and animal diversity to help promote healthy living and environmental health.

## **ABBREVIATIONS AND ACRONYMS**

BIC	Bahá'í International Community
FAO	Food and Agriculture Organization
IPM	Integrated Pest Management
NAFIS	National Farmers Information Service
NGO	Non-Governmental Organization
SDG	Sustainable Development Goals
UA	Urban Agriculture
UN	United Nations
UNFPA	United Nations Population Fund

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## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the study

The age of socio-economic development and industrialization has changed the landscape of the world, pushing a population whose source of livelihood was once centered on agrarian activities towards societies now characterized by industrial ideals, and that is highly dependent on technology (Knowd et al., 2006). This switch has led to major urban growth and it is expected that more than half of the world's population will be living in urban areas by the year 2030 (UNFPA, 2016). According to the United Nations Population Fund (UNFPA, 2016), Africa and Asia are expected to lead in numbers when it comes to urbanization and the process is expected to unfold together with social, economic, and environmental changes.

Even though urbanization aims to pave the way for economic growth, resource use efficiency, and improved wellbeing for the population, it has also led to an increase of worrying trends which include the rise in poverty levels, low unemployment, and the depletion of resources. According to Moser & Satterthwaite, (2010), one additional major concern brought about by the rise in the worldwide population and, more so, increased urbanization, is the food security crisis. The crisis described by Moser & Satterthwaite has, in part, resulted from the majority of the abled workforce moving away from the rural areas - essentially the bedrock of where food production takes place - to seek better economic opportunities, therefore reducing the rural capacity to keep up with the consumer demands arising from urban areas.

There is an assumption that the move from rural to urban settings automatically leads to increased independence, increased employment opportunities, and improved standards of living. However, this is not the case. Urban poverty is on the rise in many middle and low-income nations making it clear that urbanization does not instantaneously afford those who have moved into cities and towns equitable distribution of wealth and well-being (Tacoli,

2012). The introduction of urban agriculture stands out as one of the major options that can help address the various growing vulnerabilities that are facing contemporary urban societies.

Urban agriculture has been described as the production, processing, and distribution of both food and non-food items using resources that can be found in and around an urban center (Korth et al., 2014). It is expected that urban agriculture could be geared towards either subsistence or commercial consumption. However, its main purpose is to ensure that those living within and around urban centers benefit from the final products and services in these areas, therefore, ensuring a positive contribution towards food security (Drescher, 2001).

According to Battersby & Watson, (2018), education that focuses on increasing knowledge of food production in urban areas as well as policies that support such educational initiatives has not been prioritized and has largely been absent from the community system. Consequently, the discussion surrounding the contribution of urban settlements towards food security and policies has also been ignored. Necessity calls for a shift in the way food production is perceived, a move that requires shifting from over-dependence on the rural environment for food. Baha'i International Community (BIC, 2016) shares that the perceptions of roles with regards to rural and urban settings will need to be completely reimagined thus bringing together knowledge from the past - rooted in rural structures - together with the present scientific advances and a strong vision of the future. This will begin laying the foundation for societies that are food secure and a new pattern of community life will begin to emerge.

## **1.2 Statement of the problem**

Urban agriculture provides urban dwellers with innovative ways to provide food for themselves and also provides an opportunity for sustained food production and income generation. Krishnan et al., (2016), share that sustainable urban agriculture is ultimately connected to the three elements of sustainability: social, economic, and the environment.

A majority of studies related to urban agriculture in Kenya have focused on major cities and towns which, to large extent, face similar opportunities and constraints when it comes to implementing the practice in relation to the three elements of sustainability. Therefore, it is imperative that we also understand the opportunities and constraints that smaller towns and urban centers, such as Cheptais town, undergo in order to understand the impact that urban agriculture has on their economic, social and environmental development.

### **1.3 Research questions**

1. What is the type and purpose of urban agriculture in Cheptais town?
2. What are the opportunities available for urban agriculture in Cheptais town?
3. What are the constraints facing urban agriculture in Cheptais town?

### **1.4 Research objectives**

The general objective of the research study is to assess the opportunities and constraints facing the practice of urban agriculture in Cheptais town, Bungoma County.

The specific objectives are to:

1. To examine the type and purpose of urban agriculture in Cheptais town
2. To assess the opportunities available for urban agriculture in Cheptais town
3. To establish the constraints facing urban agriculture in Cheptais town

### **1.5 Study Hypothesis**

1. There is no significant difference between the number of urban farmers that adopt urban agriculture for either commercial or subsistence purposes

## **1.6 Justification of the study**

It is estimated that around 68% of the world's total population will be living in urban areas by the year 2050 (UN, 2018). This means that food production in urban areas is increasingly important as it offers potential strategies to cater to the food needs of urban households. Urban agriculture also offers critical coping strategies for poor households which can help to contribute to their food security as well as provide a livelihood source. According to Drechsel & Karg, (2018), a large number of the urban population do not grow their own food. The dependence on external food sources has left urban dwellers vulnerable to high prices, forcing a majority of them to spend a large portion of their household incomes on food.

Cheptais town lies at the heart of Kenya's agricultural produce center, Bungoma county. The selection of Cheptais town for this study will help offer insights as to what potential urban agriculture has when afforded adequate resources such as land for both crop cultivation and animal rearing. Also, given that a majority of studies on urban agriculture focus on major cities and towns, Cheptais offers an opportunity to assess the contributions of smaller towns to the urban food system.

Results from the study will assist policymakers and stakeholders in ensuring urban farmers receive adequate support through investments, funding, and knowledge sharing. This will help prop up household food security, contribute to job creation, create environmental awareness, and promote better environmental management.

## **1.7 Scope of the study**

This study took place within Cheptais town with the primary focus being placed on urban farming. Venturing on the outskirts and beyond Cheptais town would include peri-urban and rural areas which were not the focus of the study. The unit of analysis was urban farming households. Through observation of the household compounds, it was easy to spot crops or animals which were an indicator that the household was engaging in urban agriculture.

Apartment building residents were not included as it would have been tedious and time-consuming to identify whether any of the residents were practicing urban agriculture.

The purpose of this study was to assess the opportunities available that make the practice of urban agriculture viable. Further analysis of the opportunities gave a better picture as to whether the practice of urban agriculture was making contributions to household food security and household livelihood. The study also helped to identify some of the major barriers preventing the successful practice of urban agriculture within Cheptais town. This included access to and sufficient use of farming space, crop variations, labour, and finances. An assessment of both opportunities and constraints helped to indicate how viable sustainable urban agriculture is for farming households in Cheptais town.



## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

Urban agriculture is simply defined as the growing of plants and the rearing of animals within and around cities. Taguchi & Santini, (2019), add that when defining urban agriculture in terms of characteristics, it operates on a small-scale level that is mainly for household consumption. This makes the practice applicable and viable for an urban setting, given that the space required is not extensive. According to De Zeeuw, (2004), a uniquely distinguishing fact about urban agriculture is that it is a practice that has been embedded into the social, environmental, and economic urban system. Mougeot, (2000), adds that with supportive institutional systems and policies, the interactive nature between urban agriculture and the economic and environmental systems can be moulded in ways that assist in generating employment, overcoming negative economic impacts, adapting to climate change, establishing new social relationships and can contribute to the effective management of natural resources.

### **2.2. Agriculture and food security**

Given the myriad of issues arising from food insecurity, there also exists a number of possible solutions to remedy the problems, all of which include a strong interdependent approach that focuses on linking food security and the various elements of sustainable development thus, legitimizing the concept that the achievement of zero hunger, among other indicators, is indeed one of the prerequisites of achieving the current set of Sustainable Development Goals (FAO, 2020).

The right to food is a fundamental human right that is protected by both international humanitarian law and international human rights. This right requires consistent, unfailing and unrestricted, direct or indirect, access to food that corresponds adequately to the cultural traditions of the consumer while also ensuring that the mental and physical well-being of both the individual and collective community are catered to adequately (Ziegler et al., 2011). The

right to food is, therefore, a principal requirement that needs to be fulfilled by both government and non-state actors and not be overlooked or merely viewed as an act of charity to the population (FAO, 2020). The 2030 Agenda for Sustainable Development highly prioritizes the importance of the right to adequate food and views it as a key contributor on the path towards development. This is further emphasized under the second Sustainable Development Goal (SDG) which is working to, “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” (UN, 2015).

### **2.3 An overview of the importance of urban agriculture**

The role of urban agriculture has become increasingly important around the globe due to the anticipated population rise, and the impact that these increased numbers will have on global food security. The integration of agriculture into the urban system is therefore becoming more crucial given that a majority of the population is steadily shifting towards urban centers. These rural-urban shifts create pressure on the already diminishing natural resources that are available in cities and towns. Since this shift cannot be stopped, it has become necessary to advocate for urban agriculture that is ecologically sustainable (Sumner, 2011).

According to Bricas & Conaré, (2019), globalization played a major role in distancing cities from their food sources and this created the dependency on rural areas for food production. This has gradually weakened the food production abilities of cities. However, Bricas and Conaré add that the events of the 21st century have made it necessary to reintegrate food production into the public policymaking agendas within different cities. They add that agriculture is closely linked to the national economy of many countries and it is, therefore, important to revitalize the connection between cities and agriculture.

In addition to enhancing the opportunity for the rise in green cities and environmental stewardship, urban agriculture gives farmers the opportunity to grow and market their produce. This leads to both community revitalization as well as economic development (Krishnan et al.,

2016). As urban farmers continue to contribute to food systems, it is expected that the social welfare of the urban dweller will be impacted positively. This will be evident through improved health and nutrition as well as the increased sense of empowerment permeating through urban centers and their environs.

A major constraint we currently face is that global population is expected to reach 9.7 billion in the year 2050 and the ability to secure accessible and sustainable food supplies is proving to be a daunting task (Kennard & Bamford, 2019). This is especially so while trying to limit the occurrence of negative climate change impacts and natural resource exploitation and degradation which are amongst the most pressing issues in the world today (UN, 2019). With the expected increase in population, an estimated 68% of the total global population will be living in urban centers by 2050. This movement is expected to strain agricultural land further in order to meet the nutritional needs of the urban population (Wilhelm & Smith, 2018).

On a more positive note, in order to relieve the strain, urban agriculture has emerged, creating spaces for people to grow and sell their food within and around their cities. This gives way to the emergence of local food economies that consequently shorten food supply chains and allow urban farmers to bypass the corporate-controlled food systems - which happen to support mass industrial agricultural practices that are unsustainable (Kennard & Bamford, 2019). Additionally, the shift to local food systems initiated through urban agriculture can help in reducing greenhouse gas emissions currently associated with mass food supply chains. This also allows consumers to have access to fresher and more nutritious foods that are readily accessible (Wilhelm & Smith, 2018).

### **2.3.1 Glimpse of urban agriculture at a global scale**

Even though urban agriculture has the ability to provide fresh and healthy food for families, communities, and urban markets, it has become difficult to quantify the contribution that urban agriculture makes to the global food supply. In 2007, FAO estimated that between 15 to 20%

of the world's food production came from urban agriculture however, more recent findings that take into consideration population growth estimates, together with rural-urban shifts, show that urban agriculture has the potential to produce only 5% of the world's agricultural produce (Clinton et al., 2018). However, a number of cities continue to report high levels of food sufficiency across the world, bringing to view the extent to which regions are able to cater to their population's food requirements (Clapp, 2017). Examples of this include Shanghai, China which is able to meet 50% of vegetable demand from production that is taking place within its city borders (Lang & Miao, 2013). Cities like Sydney, Australia, have also been able to produce what amounts to 24% of total vegetables, while also producing 99% of Asian vegetables (Mok et al., 2014). In 2014, Cuba managed to produce 50% of all fresh produce which subsequently helped to generate over 300,000 jobs, catapulting the country's global urban agriculture status (Altieri & Nicholls, 2018).

It is important to note, however, that for countries such as Cuba, its access to extensive urban land was borne out of the economic crisis caused by the fall of the Soviet Union in 1989. This fallout caused a shift from industrial agriculture. Industrial farms were then distributed to cooperatives and smallholder farmers which ultimately created an opportunity for urban agriculture to take root given the magnitude of space that had become available (Fernandez et al., 2018). This however is not the same for cities such as New York, where there is not enough urban space to satisfy the consumption needs of the urban dwellers. According to Martellozzo et al., (2014), such cities with limited space are learning how to make use of indoor growing techniques, rooftop gardens, and vertical farming styles which have helped to by-pass the access to "traditional" farming spaces commonly used for food production.

Though increasing food production through the utilization of various spaces tips the positive side of the food security scales, access to healthy and nutritious food still remains a key issue on the food security spectrum (Mack et al., 2017). Globally, the agri-food systems are still quite

laden with access inequalities. In developed countries, we see close to a quarter of children and adolescents that are overweight or obese (Ng et al., 2014), while in developing countries, close to 1 billion people continue to suffer from under-nutrition (McGuire, 2015). This brings into focus the phenomenon of “food deserts” where fresh and nutritious foods such as vegetables and fruits are not available. In the case of developed countries, though fresh and healthy food may be available, it may be inaccessible due to the fact that they are pricier as compared to “fast foods”.

According to Opitz et al., (2016), the issue of inaccessibility of fresh foods may be eliminated if urban centers begin to produce their own food. Locally produced food may begin to gain traction and popularity among urbanites as they may be perceived to be of higher quality by consumers. This popularity may be due to the idea that food quality perception is closely linked to aspects such as freshness, flavour, and origin. Certainly, the ability to visit such urban farms and gardens, as well as meet the farmers themselves, allows for a high level of transparency about the food production process – an important aspect for those that may be suspicious of produce from supermarkets or other unknown vendors (Block et al., 2012).

### **2.3.2 Urban food systems in Africa**

The population in Africa is expected to go up by 50% by the year 2030 from the numbers observed in 2010 (Smit, 2016). The majority of these numbers are expected to increase in the intermediate and smaller cities which contain less than 500,000 inhabitants. According to Beardsley & Werthmann, (2008), 46% of urban dwellers in Africa live in informal settlements such as slums where adequate housing and services are already lacking, including space required for the practice of urban agriculture. Unfortunately, these informal settlements happen to be the spaces in which new urban population growth is taking place therefore further constricting the resources available.

In order to be able to understand the food context in such informal urban settlements, we need to first have an understanding of the urban food system. This involves an assessment of the activities that take place from the production stage to processing, packaging, distribution, retailing, and finally, consumption (Ericksen, 2008). A study of two cities in Africa, Accra in Ghana, and Kitwe in Zambia uncovered that households were greatly dependent on purchasing food (Zeeuw & Prain, 2011). This meant that at least half, or more, of household expenditures, went towards the purchase of food, leaving the poorer households more vulnerable to cases of food insecurity. Additionally, households had no hand in contributing to the production process or any other stage leading up to the consumption stage.

Given the dependency on purchased food by African households, being able to afford food becomes an important factor to consider when assessing the household food security situation. Therefore, even though food may be available, the greater issue at hand becomes the household income levels, and whether they are able to afford it. In Nairobi, Kenya, even though food is readily available, 47% of its population are still subjected to food insecurity because the majority - medium-income households - constantly spend about 75% of their income on food (Zeeuw & Prain, 2011). Additionally, little consideration is placed on diets that are nutritionally adequate due to their costly nature forcing households to settle for food that is affordable with little focus on diet suitability. The studies conducted in Accra and Kitwe added that due to the lack of proper diets, 20 to 30% of children in low-income households presented with symptoms of both chronic and acute malnutrition (Zeeuw & Prain, 2011). This is especially evident in slums where food insecurity is high and dietary diversity is unaffordable.

### **2.3.2.1 Constraints arising in urban agriculture in Africa**

There are concerns when it comes to safety issues surrounding urban-produced foods, raising a red flag as to whether the produce is safe for consumption given the lack of adequate resources that are needed for agriculture. Unlike developed countries where transparency of the urban

food production system is appreciated, the case may be different in developing countries in which transparency may negatively impact the perception of food quality (Mok et al., 2014). This is especially unfortunate in developing countries, where authorities view urban agriculture as an activity that is linked to increased cases of diarrhoea and malaria (Hamilton et al., 2014). Hamilton et.al. add that use of contaminated water for irrigation and the use of faecal sludge as a source of nutrients is likely to cause detrimental health impacts to consumers. In Ghana, research revealed that agricultural practices such as open irrigation increased mosquito prevalence, while the overuse of insecticides increased resistance. The Ghana research also revealed that a majority of the sampled vegetables contained both faecal contamination as well as pesticide residue which were above the maximum recommended limit suitable for consumption (Amoah et al., 2006).

According to Hamilton et al., (2014), there has been a predominant view amongst governments in developing countries that urban agriculture is an archaic practice that needs to be ignored and even repressed given the negative issues arising from its practice. However, even with the challenges, urban agriculture continues to be practiced widely in global South countries and has had a positive impact on food security (Hamilton et al., 2014; Zezza & Tasciotti, 2010). Therefore, instead of suppressing the practice of urban agriculture, it is becoming increasingly important to understand the nutritional quality of food produced in the urban setting as well as improve safety guidelines that govern food production processes (Kennard & Bamford, 2019).

As many developing countries continue to engage in urban agriculture for the purpose of establishing food security and income generation, and it is becoming increasingly important to take into consideration food diversity. Food produced should to be of a variety that caters to the nutritional needs that complement and contribute to a healthy lifestyle. This study will therefore look at whether there is diversity in the crops grown and animals reared in Cheptais town, indicating whether there are any constraints preventing the urban farmers from doing so.

### **2.3.2.2 Opportunities arising in urban agriculture in Africa**

Though land for farming is limited, households in the African urban settings have come up with creative ways to still practice agriculture. The use of open spaces and small home gardens to keep livestock and grow their own food has allowed these urban households to reduce their food expenditures. Producing their own food not only prevents them from dipping into their variable income to buy food, but also gives them a stable food source that they can access at any time (Wesselow et al., 2020).

Urban agriculture also has the ability to green cities which in turn helps in maintaining buffer and reserve zones that positively impact city microclimates. This has led to transform the thinking of how urban agriculture can positively contribute to the urban setting. With that in mind, a new urban agenda has been adopted in Africa that places cities as the main drivers for achieving development in the continent (Güneralp et al., 2017). Envisioned in this African Urban Agenda is the opportunity for cities to facilitate sustainable urbanization practices, such as urban agriculture, incorporating conservation and ecological governance in urban planning (Satterthwaite, 2016).

The economic contributions that urban agriculture makes towards households cannot be ignored. Though for many African household's urban agriculture is used to produce food for personal consumption, there are a number of urban households that engage in urban agriculture in order to generate income by selling produce. In Dar es Salaam, Tanzania, studies show that urban agriculture is of great importance to the communities, with many engaging in some form of food production mainly for income which in turn generate profits that increase household income (UNEP, 2017).

Looking at the aspect of availability of land for urban agriculture, smaller towns and urban centers may not face similar constraints as major cities and towns where limited space and population density may hinder the practice of urban agriculture. This study will therefore assess



the opportunities arising when urban farmers have adequate land, unhindered by massive populations, to practice urban agriculture.

### **2.3.3 Urban agriculture in Kenya**

Foeken & Owuor, (2006), share that despite being a basic fundamental right recognized internationally, they note that up until the 1970s many African countries considered urban agriculture illegal and most farmers practicing it, in and around urban centers, faced constant harassment by local authorities. Their studies uncovered that policies regarding the use of land were restrictive and it was only after the 1980s that a shift was witnessed with regards to the policies allowing for the practice of urban agriculture. Even with the shift, it is noted that the practice is only tolerated to a certain extent provided that it does not become a nuisance.

Like the majority of Sub-Saharan African countries, urban centers in Kenya are continuously experiencing increased population growth. This has unfortunately surpassed the rate at which food is produced creating an inability to adequately feed the ever-growing population (Omondi et al., 2017). Additionally, urban farmers have to contend with issues of extended periods of drought, unpredictable rainfall, pests and diseases, and floods among other incidences (Foeken & Owuor, 2006).

According to Omondi, (2018), urban agriculture in Kenya is practiced by different income groups, all of which mostly grow crops and rear livestock within their own plots of land. Those without personal land, lease land for agricultural practices while others make use of riverbeds, roadsides, and along railway lines. Produce from these agricultural ventures is usually consumed by the households themselves while surplus produce is sold for income generation (Omondi et.al. 2017).

### **2.3.3.1 Constraints arising from urban agriculture in Kenya**

Though urban agriculture has not been overtly condemned, there still lies opposition from the urban public health sector, urban planning, and various environmental circles deeming urban agriculture to be unsuitable for urban spaces (Kennard & Bamford, 2019). This poses a challenge because adequate resources, such as a constant supply of fresh water, may be challenging to acquire forcing the urban farmers to use contaminated wastewater.

In Kenya, the government is yet to share a comprehensive national policy that regulates and promotes the practice of urban agriculture in a sustainable manner that can help to improve the welfare of urbanites (Omondi et al., 2017). Without sufficient regulations in place, it becomes difficult to guarantee whether urban agriculture adheres to the proper land management practices that uphold environmental and human health especially in small urban centers such as Cheptais town.

### **2.3.3.2 Opportunities arising from urban agriculture in Kenya**

While other Counties continue to explore setting up agricultural policies, Nairobi City County successfully passed a Bill that aims at promoting and regulating urban agriculture within its County borders (GOK, 2014). Other non-governmental entities such as Solidarités as well as the Mazingira Institute have also been actively promoting urban agriculture in Kenya through conducting research and facilitating forums where urban farmers, private and public institutions come together to share knowledge and experiences of urban agriculture (Omondi et.al. 2017).

Given the land limitations in major cities such as Nairobi, innovative alternatives such as sack gardening have been proven to be very effective when it comes to food production. According to Gallaher et al. (2013), the key advantage of this particular method is that it uses little space allowing a larger number of urban farmers in Nairobi to take advantage of it alleviating the pressure of securing land for farming.

## **2.4 Community socio-economic dynamics and urban agriculture**

Streiffeler, (1987), gives a social perspective on urban agriculture stating that in addition to its apparent contributions to food security and income. Streiffeler adds that it has been known to cater to an informal economy that allows urban dwellers to be proactive in their pursuit for survival as they form their own production and consumption systems amidst formal systems that may have failed to cater to their needs. Bricas & Conaré, (2019) add that introducing urban agriculture in the urban setting helps to rebuild social ties - a symbolic gesture that is of great importance. They also add that social cohesion has given the urban communities the ability to engage in capacity and knowledge-building opportunities and has allowed urban dwellers to make use of the various resources at their disposal.

Urban agriculture also offers an opportunity for urban dwellers to socialize and cooperate with family and other members of the community giving them space to share insights on environmental awareness (Lovell, 2010). Knowledge gained from these interactive processes is then put into practice, nurtured, and shared with the collective community, and passed down to the younger upcoming generation of urbanites (Yap, 2018). In Western countries such as the United States, rooftop farms simply provide a space for friends and family to come together to share meals prepared from the organic gardens which in many cases, sparks curiosity and interest towards urban agriculture. This, therefore, offers a space to educate friends and neighbours and share skills and knowledge about urban farming (Ackerman et al., 2014).

The ability to be self-reliant plays a major role in ensuring economic stability for a country. Cities like Hong-Kong and Singapore, which are among the most densely populated urban cities in Asia and the world, have managed to establish a thriving fresh food production system that is between 30-50% self-reliant and this is due to the fact that households with available land allow for the provision of multiple uses which now includes food production for subsistence and commercial use (Sommers & Smit, 1994).

According to Raja et al., (2017), urban agriculture plays a key role in providing formal and informal employment for men and women in urban areas. Not only does this contribute to food security and healthy nutrition, but it also contributes to economic growth. It also helps to build morale in individuals as they feel they are making an economic contribution through their agricultural practices. Additionally, that urban agriculture has assisted low-income households in redirecting their budgets towards household or family needs. A study carried out by (Enete & Achike, 2008), in Ohafia, Nigeria, indicated that a majority of urban farmers with higher education and full-time salaried jobs, still engaged in agriculture in order to adequately cater to the family's needs.

In contrast, though urban agriculture has been hailed for its potential and ability to promote food security and improved livelihoods, marginalized communities as well as poor households, rarely benefit from urban agriculture due to limited or a complete lack of access to resources (Raja et al., 2017). This means that for the most part, the benefits of urban agriculture may be directly linked to the number of resources one has access to as well as farming-related skills and knowledge.

Individually, low-class income earners are unable to access adequate resources to begin or sustain any agricultural practice. However, small groups of individuals banding together to access resources seem to be taking off well. In the slums of Kibera, Kenya, networks of cultivators taking part in different agricultural practices have come together, sharing knowledge and skills which has, in turn, allowed them access to various goods and services as a collective (Gallaher et al., 2013). This has become a platform to empower economically marginalized groups of people in the society, allowing spaces for skills sharing and training to be available, creating social networks, and subsidizing necessary farming inputs which helps to boost the impact of urban agriculture.

## **2.5 Environmental wellbeing and urban agriculture**

In recent decades, rural to urban migration has been on the rise causing major strains on physical spaces and natural resources (Fang et al., 2019). According to Sarker et al., (2019), the unprecedented population growth in urban centers has required, where possible, expansion and improvement of certain infrastructural systems such as piped water, drainage systems, power lines, and road networks. Unfortunately, this infrastructural growth has not always had a positive impact on the environment. Bricas and Conaré (2019) share that in addition to contributing to land degradation agriculture, in general, contributes to greenhouse-gas emissions - a major contributor to the climate crisis. Given the importance of agricultural activities, Bricas and Conaré add that by the end of 2018 there had been efforts to share strategies to help minimize the negative climate impacts, connecting close to 1000 cities that are now able to collaborate, share knowledge and best-practices strategies when it comes to urban agriculture.

It has also become increasingly necessary to include urban food production in the urban expansion process in order to supplement any produce coming in from rural agriculture (Fang et al., 2019). Brown & Carter, (2003) add that urban dwellers are looking for more innovative ways to become self-sufficient when acquiring food items by using portions of available land for subsistence which largely contributes to their survival strategy during periods of economic crises which often leads to food scarcity.

A study by Benis & Ferrão, (2017), encourages the concept of urban agriculture and describes it as effective, practical, healthy, and sustainable given the fact that households produce the variety of food they wish to consume at any time without the hustle of utilizing extra energy to acquire the food from distant locations. Additionally, this minimizes waste generated from packaging and energy in transportation by those producing the food and, given the communal

nature of urban agriculture, neighbours may simply buy products from each other while local stores and shops may source their farm produce from urban farms in the area.

Dima & Odero, (1997), add that urban agriculture aims at increasing agricultural produce from locally available resources in a manner that does not degrade the environment while still ensuring that it caters to the ever-growing needs of the population. With the proper technical and institutional support, urban farming has the ability to rally the urban communities and engage them in the planning and implementation processes geared towards recycling of organic waste and reuse of wastewater which will allow them to make positive contributions towards safeguarding the environment as well as maintain healthy living conditions (Hovorka et al., 2009).

In a bid to reduce negative impacts, the movement towards implementing urban agriculture in Cuba has seen the establishment of close to 8000 urban gardens throughout the country (Bricas & Conaré, 2019). These urban gardens have all been set up with the aim of upholding agroeconomic principles that focus on cutting off the use of harmful fertilizers as well as chemicals. This has been set up to encourage the use and recycling of natural resources as well as the diversification of farming techniques.

Overexploitation of natural resources is a major issue that faces communities living in poverty who, because of the lack of alternatives, are forced to overuse the few resources that are available around them. Some natural resources like water usually need time to be replenished and can easily be depleted especially if a single source works to cater to a number of different chores and activities in a community. (Faruqui & Al-Jayyousi, 2002) share findings from a study that included research on a pilot project based in Tufileh, Jordan, that had been set up with the aim of reusing untreated household greywater for agriculture. Tufileh is a city that generally experiences water scarcity for a large portion of the year, therefore, prompting the community to seek out alternative water sources. The use of greywater has thus allowed

households to spend less money on the purchase of water for irrigation from the municipality and has boosted the popularity of urban agriculture.

## **2.6 Uncovering the potential and increasing the support for urban agriculture**

When assessing the potential for urban agriculture today, it is essential to not just look at the natural resources available. It is also important to assess the other numerous and considerable resources that are available which include knowledge resources such as educational institutions and research centers (Bricas & Conaré, 2019). Such resources allow researchers and intellectuals to re-assess the considerable assets that may have been neglected and use them to roll out new innovative food strategies and therefore, new policies.

According to Pauleit et al., (2019), local urban agriculture is a crucial practice that provides urban dwellers with food. It is therefore important to ensure that policies are in place to economically support agricultural efforts within the urban scene. They add that the integration of urban agriculture into urban spaces allows those most vulnerable to natural and economic disasters to have contingency plans in place to help support the household.

The city of Johannesburg, South Africa, has put in place policies allowing for the establishment of agricultural resource centers that offer information, education, and training. There is also information about access to land for agriculture, food gardening, and general assistance aimed at promoting agricultural development strategies as well as social and nutritional protection (Malan, 2015). This offers support to urban dwellers hoping to practice agriculture at household, communal or large commercial scales.

According to Mboganie-Mwangi & Foeken, (1996), urban agriculture is not a new phenomenon in cities such as Nairobi, Kenya. This practice was made necessary as a result of the rising food prices in the late 1980s. Urban agriculture has since then spread to other urban centers in Kenya and has even seen farmers lease land for the cultivation of crops that can be

used for subsistence purposes. Additionally, Taguchi & Santini, (2019) add that urban agriculture has allowed households to provide a healthy and nutritious diet for the family, ultimately turning urban agriculture into a necessity for everyday survival.

## **2.7 Literature gap**

From the studies assessed, a majority of them indicate that urban agriculture is a plausible solution to achieving food security and contributing to household livelihoods. Though urban agriculture has considerable potential to contribute to food security, more details need to be made available regarding access to safe and adequate resources used. Not only is access important, but the quality of resources such as clean water for urban agriculture needs to be analysed to ensure food produced is safe for consumption and the environment. Policies aiding in the management of urban agriculture in the urban setting are also limited in many developing countries. In Kenya, for example, very few counties have Bills in place that regulate and promote urban agriculture. This is particularly important when assessing the allocation of resources in the urban setting which requires proper environmental planning and management steps to be taken and implemented in order to ensure urban agriculture is sustainable.

## **2.8 Theoretical framework**

This study applied the sustainable urban livelihoods approach that stems from the original “sustainable livelihoods approach” developed by Chambers and Conway in 1992. According to Chambers and Conway, a livelihood is defined by the capabilities, material and social resources, together with the activities required for a means of living. Furthermore, a livelihood can only be described as sustainable when it is able to cope and recover from shocks and stresses, enhancing its capabilities both in the present and future without compromising the natural resources that are utilized.

Under the urban setting, the livelihoods of urban households are to a large extent defined by the opportunities and constraints under which they are functioning. Therefore, understanding

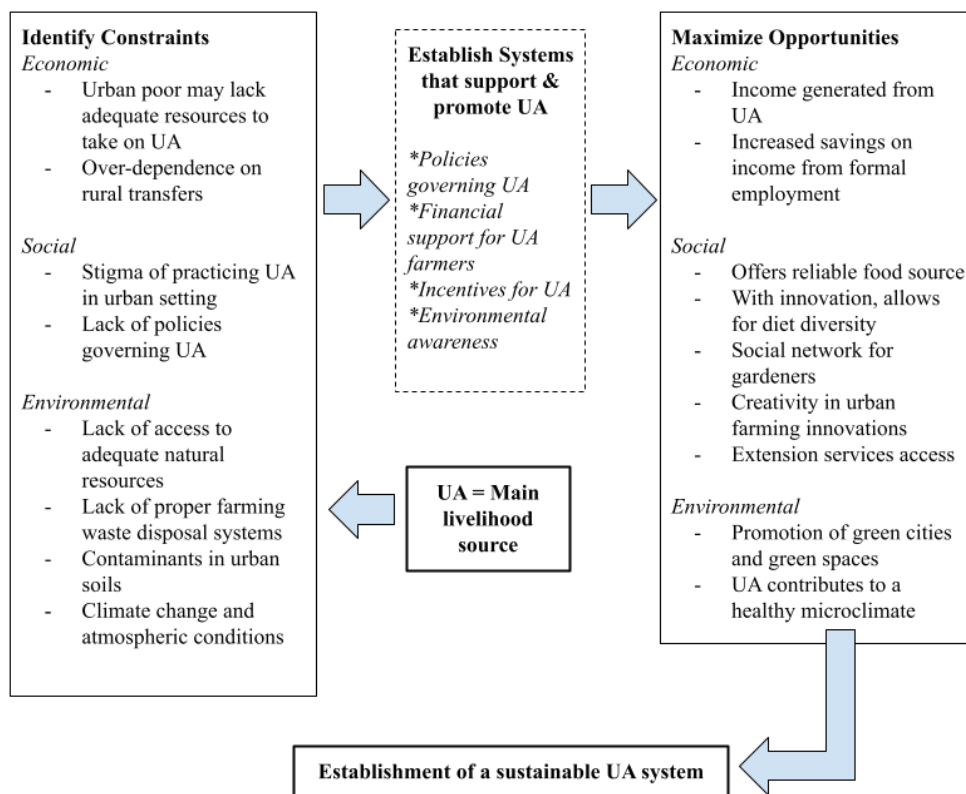


the urban context is essential in order to understand the nature of sustainable urban livelihoods. This study examined sustainable urban livelihoods approach to urban agriculture with the view that over 80% of households in Cheptais are engaged in urban agriculture. This therefore indicated that given its wide and extensive practice, there is a high dependence on urban agriculture to support and sustain household incomes as well as food sources.

Given the importance of urban agriculture in Cheptais town, it is important to identify opportunities available that allow urban farmers to practice it in a manner that supports and maintains economic, social and environmental stability. At the same time, there is a need to identify constraints, perceived or actual, that arise that prevent urban agriculture from being practiced adequately. In order to ensure that there is continuity with the practice, it is vital to continuously assess any arising constraints to ensure livelihood sources, in this case urban agriculture, are sustained both at present and for future urban farmers.

## 2.9 Conceptual framework

Figure 2. 1: Conceptual Framework



Source: Adapted from (FAO, 2014)

In order for urban agriculture to be sustainable, the ecosystem services that it depends on, need to be adequate and protected. This means that there is an added challenge for those that practice urban agriculture to ensure that resources such as clean water, fertile soil, and nutrient cycling are maintained to ensure that the food produced is adequate and safe for consumption. This requires support from and coordination with entities that can help to legitimize the practice of urban agriculture.

The support and coordination of activities related to urban agriculture are largely determined by the policies governing urban agriculture in any given area. Adequate support elicits opportunities that range within various economic, social, and environmental parameters which include increased income as well as saving, reliable and diverse food sources as a result of the use of innovative farming techniques, social networks that share knowledge on available

extension services available and the establishment of a healthy microclimate promoted through green cities and spaces.

The lack of adequate support, on the other hand, elicits a number of constraints which include limited or a complete lack of access to adequate resources especially needed to take up urban agriculture, especially by poor households, which at the same time forces them to be dependent on external sources of food such as those from rural transfers. Additionally, the lack of support of activities related to urban agriculture creates the perception that it is unsuitable for the urban setting. This lack of support also means that suitable resources may not be directed towards urban agriculture, forcing those that practice it to use unsuitable resources such as contaminated water that end up contaminating the soil further and is likely to produce crops that are unsuitable for consumption.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

The focus of this chapter will be to outline how data will be obtained from the field, in order to help fulfil the research objectives that have been set up in Chapter 1. It will look at the study area, the research design that will be used, sources of data, target population, sampling procedure, methods of data collection, and finally data analysis.

### **3.2 Study Area**

#### **3.2.1 Location of the study area**

Cheptais town is located within Mt. Elgon sub-county which is one of the nine sub-counties in Bungoma County, Kenya. Cheptais town is geographically placed in the western part of Kenya at approximately  $0.8079^{\circ}N, 34.4673^{\circ}E$ , and occupies an area of about  $9.8km^2$ .

#### **3.2.2 Socio-economic characteristics of the study area**

##### **3.2.2.1 Population**

According to the 2019 Kenya Population and Housing Census, Cheptais sub-county has a total population of 136,035 inhabitants all of whom make up 26,326 households. Amongst these 26,326 households a total of 22,457 (approximately 85%) are farming households engaged in crop production, livestock production, aquaculture and fishing.

Cheptais town has a total of 8251 people consisting of 4056 males and 4195 females. The total population is divided into approximately 1686 households with a population density of about 844 per  $km^2$  (KNBS, 2019). Given that the exact number of households practicing urban agriculture in Cheptais town are unknown, an 85% approximation indicated in the sub-county level, may be used to determine an approximate number of households that practice urban agriculture. This would indicate that the majority of inhabitants in Cheptais town (1433 out of

1686) are farmers whose agricultural practices range from crop cultivation, livestock production, aquaculture and fishing.

#### **3.2.2.2 Infrastructure**

Highway A104, spanning from Mombasa, Nairobi, Eldoret, Webuye, and Malaba traverses Bungoma County with Cheptais town located about 25 kilometres from it. Though Cheptais town is in proximity to this major highway that cuts across the Country, road networks leading to the town are still underdeveloped consisting of a series of untarmacked dirt roads. Over the last decade road networks have been undergoing improvement making the transportation of goods and services more efficient within Bungoma County and through smaller towns in it. It is therefore expected that in the coming years infrastructural improvements will be made in and around Cheptais town.

#### **3.2.2.3 Sources of income**

The population of Cheptais town holds a number of professions which includes teachers, retailers and the service industry providers. However, a majority of the inhabitants are engaged in urban agriculture (on-farm activities) and are able to get income from it from selling farm produce at the local market place or to neighbours. Crops such as maize and beans are popular while a number of farmers also venture into farming Irish and sweet potatoes, bananas and an assortment of vegetables. Those partially or not engaged in urban agriculture i.e. engaged in off-farm / non-farm activities, are in the business of managing informal roadside stalls such as kiosks or small shops within the town center that provide different goods and services to the inhabitants of Cheptais town.

#### **3.2.2.4 Land use**

Bungoma County largely sits on arable land that is used for both food and cash crop purposes. With favourable arable lands and weather, this makes the county prime for agricultural activity that towns such as Cheptais can put to productive agricultural use. Such conditions also present

a good opportunity for job creation which would help contribute to the economic status of Bungoma County (Chemiat & Makone, 2015). A typical household in Cheptais town sits on land ranging between a quarter to one full acre of land with a majority of the urban farmers planting maize and beans while other farmers also indulge in growing a selection of vegetables. Households that practice animal husbandry rare two to three cows at a time while those with poultry can rare at least five up to 50 chicken depending on whether they are being reared for subsistence of commercial purposes. Access to adequate land also largely dictates how many animals or poultry urban households can keep.

### **3.2.3 Physical characteristics of the study area**

#### **3.2.3.1 Topography**

Located within Bungoma County, Cheptais town sits on the base of Mt. Elgon is surrounded by hills and has within its vicinity a number of rivers, waterfalls as well as caves. Within its proximity towards the north is the Mt. Elgon forest reserve that spans  $618.2km^2$  as well as the Mt. Elgon National park that spans  $50.683km^2$ .

#### **3.2.3.2 Geology**

Cheptais is largely influenced by the geology of the Mt. Elgon region due to proximity. Cheptais town therefore makes up part of the Western Highlands consisting of a peneplain that rises on the east from 1200 to approximately 1700 meters. Towards the south-east there are plateau highlands about 2200 meters above sea level constituting the Kisii Series of sediments and lavas. These highlands are composed of basement system rocks and granite, and separate the lower part of Nyanza from the Uasin Gishu Plateau. Some areas isolated within the western belt are mountainous with centers of tertiary volcanic activity.

#### **3.2.3.3 Rainfall**

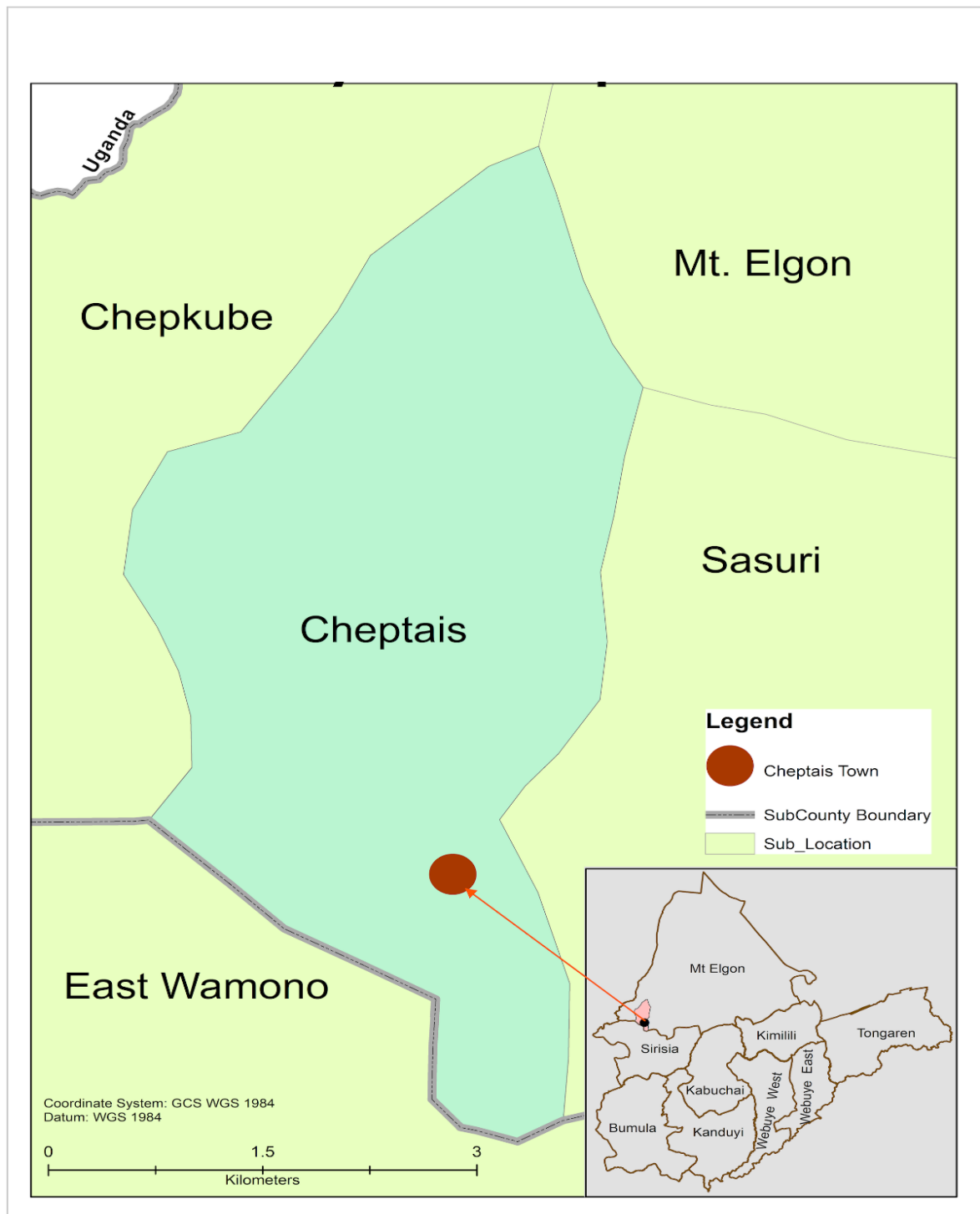
The area has a moist to moderately dry climate and generally receives annual rainfall that is abundant and well distributed in the region with long rains spanning from March to July, and

short rains from August to October ranging from 1250mm to 1800mm every year (Chemiat & Makone, 2015).

#### **3.2.3.4 Temperature**

Temperatures in Cheptais range from 15.9°C during wet and cold months to 30.5°C during the hot and dry months. However, due to changes in the general climatic conditions, there has been increased variability in temperature and rainfall patterns that have caused some changes with regards to agricultural seasons.

Figure 3. 1: Map of Cheptais town as placed within Bungoma County



Source: Esri Inc. (2020)



### **3.3 Research Design**

The study utilised descriptive statistics to help demonstrate how urban agriculture in Cheptais town is a major contributor to the livelihood of farmers in the area, allowing them to also articulate the opportunities and constraints that they have experienced. With the use of a survey, data regarding the demographics together with other background information of the farmers such as their level of education, employment status, number of years that they have been farming

### **3.4 Target Population**

The target population was urban farmers involved in agricultural production in Cheptais town who are among the 1686 households in the area with the number of estimated urban farming households at 1433. The unit of analysis was urban farmer households. These households were expected to have some observable characteristics such as backyard, front yard, crops, or animals present in the yard. The restriction to “urban space” was necessary in order to give a clear indication of the internal production taking place and its ability to sustain the needs of the people living in Cheptais town.

### **3.5 Sample size and Sampling Procedure**

#### **3.5.1 Sample size**

The sample size was derived using a modification of Cochran’s formula (which gave a total of 385 households), in order to get a smaller sample size due to the small population size in the study area. Cochran’s formula to obtain the 385 households is indicated below:

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(1.96^2)(0.5)(0.5)}{0.05^2} = 385$$

Where:  $n_0$  = the sample size required,

$Z$  = the confidence level of 95%, (1.96),

p = the Standard deviation expressed as a decimal (0.5),

q = 1-p which is 0.5 and e = the margin of error of 0.5

The modification gave a more finite sample size of 152 urban farming households and was calculated below as:

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}} = \frac{385}{1 + \frac{(385 - 1)}{250}} = 152$$

Where: n = sample size required

$n_o$  = Cochran's sample size (385)

N = Number of households in the target population (250)

The study applied a 95% confidence level, a standard deviation of 0.5, and a margin of error (confidence interval) of +/- 5%.

### 3.5.2 Sampling procedure

This study applied simple random sampling techniques to sample urban farmer households in Cheptais town. Out of the estimated 1433 urban farming households, a sample of 152 households were selected with use of Cochran's formula that aided in the sample size calculation process. The Cochran's formula which automatically generated a sample size of 385, was further modified to give a finite sample size. Thus, from the 1433 estimated urban farming households, a final sample size of 152 was calculated. The 152 households provided a suitable number that ensured the focus of the study remained within Cheptais town without venturing to the outskirts given the limited number of households located within Cheptais town.

The use of simple random sampling ensured that urban farmer households present in Cheptais town were selected randomly. This was established by assigning the 1433 households'

consecutive numbers from 1 to 1433 after which 152 were randomly selected to participate in the study out of the 1433.

### **3.6 Sources of Data**

#### **3.6.1 Primary sources**

This study utilized both primary and secondary information during data collection. The primary data was acquired through the use of a closed and open-ended questionnaire which was prepared and used to collect information directly from the urban farmer's households. Direct field observation was also applied to identify compounds that had physically identifiable crops and livestock.

#### **3.6.2 Secondary sources**

Secondary data was used to supplement the study with information reviewed from similar studies that have covered similar research problems connected to urban agriculture. The secondary data was acquired through journal articles, academic research papers, and reports on agricultural practices in Bungoma County. These documents helped show the agricultural history, contributions that agriculture has made with regards to economic and social development and, documented impacts of the practice of urban agriculture.

### **3.7 Methods of Data Collection**

#### **3.7.1 Questionnaires**

The questionnaire included closed-ended and open-ended questions. Closed-ended questions were the main instrument for information gathering during the study and were set up in a manner that allowed for quick responses especially where pre-coded answers were available. This also allowed for uniformity allowing the respondents to focus significant areas of interest i.e., the opportunities and constraints they faced in urban agriculture. Additionally, they present a high level of validity with repetition bringing out a trend that helped to address the research

objectives. Open-ended questions were used to probe respondents for additional information on specific questions. Questions asked were used to inventory the existing urban agriculture activities as well as identifying opportunities and constraints that the urban farmers are facing.

### **3.7.2 Observation**

Observation was also used to identify the type of agriculture practiced by the farmers, the crop and animal diversity, whether there were physically identifiable innovative practices being implemented and the general sources of water that were used for both crops and animals. Observation was a useful element as it made it simpler to identify whether a household was a farming household simply through the presence of crops or animals in the compound.

### **3.8 Methods of Data Analysis**

This study used both qualitative and quantitative data. Qualitative data was used to pick out major themes the respondents brought out relating to opportunities that are available for sustainable urban agriculture.

It first assessed the characteristics of urban farmers which helped to understand their motivation for urban agriculture, nature and extent. A chi-square test was used to determine whether urban agriculture was practiced for subsistence or commercial purposes. The independent variable for this test was the male and female urban farmers of Cheptais town while the dependent variables were where the outputs of urban agriculture were directed which in this case was either between commercial or subsistence.

The second objective sought to access the opportunities presented that could be maximized on with the practice of urban agriculture. The independent variables here were the urban farmers while the dependent variables were the range of opportunities arising from the practice of urban agriculture which included its contribution to household income, increased food security as well as access to healthier and diversified meals among other variables. Here, a chi-square test

was also used to specifically determine whether urban agriculture was a contributor to household income, therefore providing an opportunity to boost household finances.

The third objective focused on establishing the major constraints that urban farmers in Cheptais faced when practicing urban agriculture. The independent variables here were the urban farmers in Cheptais town while the dependent variables were the factors listed by the urban farmers as constraints which arose as they practiced urban agriculture. This included access to land for agriculture, funding to help improve or purchase inputs for agriculture, labour availability to assist with farming and access to knowledge on urban agriculture. A chi-square test was also used here to determine which constraint impacted a higher number of farmers therefore determining the greatest constraint that urban farmer households faced in Cheptais town.

### **3.9 Ethical issues**

The researcher introduced the purpose of the study together with objectives to each respondent and explained how the activities will be carried out. Before proceeding with data collection, the researcher ensured that verbal consent is sought from every respondent before the questionnaire was administered. Research assistants were given adequate training as well as familiarization with the purpose and objectives of the research in order to stay within the authorized parameters. Data collected was handled with confidentiality throughout the process and was only handled by the researcher and research assistants.

## **CHAPTER FOUR: RESULTS AND DISCUSSION**

### **4.1 Background data on urban household farmers in Cheptais town**

#### **4.1.1 Urban farmers by gender**

Total male urban farmers were 101 which was approximately 66.4% while 51, approximately 33.5%, were females giving a ratio of males to females as 2:1. The same ratio was observed in other aspects where data was collected which included; crops grown and animals reared. This indicated that more males engaged in urban agriculture as compared to females from the sample analysed. One contributing factor to this ratio is that culturally, men are given priority when inheriting land when they become of age (18 years). This has given more men an upper hand when it comes to access to land for agricultural activities. But, even with the 2:1 ratio, both males and females participated in similar activities and showed no gender preference for a particular agricultural activity.

#### **4.1.2 Urban farmers by age**

A majority of the urban farmers (87%) were between 17 and 36 years, the remaining 13% were over 37 years while the oldest respondent was 59 years. This indicated that the larger number of urban farmers in Cheptais town were youth, giving them the chance to participate in urban agriculture either for subsistence or commercial purposes. This also indicated that youth were keen on engaging in urban agriculture to provide them with income or supplement what they already had which would help with additional expenses such as payment of fees for those still undertaking their studies. This also helps in instilling a sense of responsibility in the youth who can begin to learn the value of agriculture not just as a source of food but also as a livelihood source.

#### **4.1.3 Urban farmers by level of education**

There was a high level of literacy recorded. This was confirmed by the total 60% of urban farmers who indicated that they had either attended college or university. Only 1% recorded

no formal education had been received. The urban farmers indicated that educational skills gained had assisted them in improving their agricultural productivity. Formal education opened them up to knowledge on agriculture and commercial activities while informal education gave them hands-on training and improved their farming methods while also keeping them abreast of the newer and changing ideas and innovations related to urban farming. The attainment of formal education was also considered important as it would give the urban farmers a better chance of securing employment, where income gained would assist them in improving their agricultural activities.

#### 4.1.4 Urban farmers by sources of income

About 70% of the farmers confirmed that urban agriculture was their main source of income while approximately 28% had other sources of income which included working as teachers, working at retail shops, while others confirmed being employed at the county government offices. Regarding the number of years that the respondents had been practicing urban agriculture, over half (56%) confirmed practicing for over 5 years. Those that had taken part in urban agriculture for less than 5 years totalled about 43.9%.

Table 4. 1: Characteristics of urban farmers in Cheptais town

	Characteristics	Frequency	Percentage
Gender of the urban farmers	Female	51	33.5%
	Male	101	66.4%
Age of the urban farmers	17-26	95	62.5%
	27-36	38	25%
	37-46	13	8.5%
	47-57	4	2.6%
	58 and Over	2	1.3%
Level of education	Primary	8	5.2%
	Secondary	49	32.2%
	College	41	26.9%
	University bachelors	50	32.8%
	University Masters	2	1.3%
	No formal schooling	2	1.3%

Income sources	Fully dependent on UA	108	71%
	Not fully dependent on UA	44	28.9%
Number of years practicing UA	Less than 1 year	9	5.9%
	1-2 years	24	15.7%
	Over 2 and up to 5 years	34	22.3%
	Over 5 years	85	55.9%
Earnings from UA (Ksh. per month)	Less than 1000	2	1.8%
	1001-5000	52	49%
	5001-10000	31	29.2%
	10001-15000	11	10.3%
	15001-20000	3	2.8%
	20001 and over	7	6.6%

Source: Field survey (2020)

## 4.2 Type and purpose of urban agriculture in Cheptais town

### 4.2.1 Types of agriculture practiced in Cheptais town

Respondents showed a high preference for crop cultivation only (55%) sighting the favourable weather patterns as part of their motivation to grow crops. Less than 10% practiced animal rearing only while 36% of the total number of respondents confirmed that they practiced mixed farming on their urban farms (Figure 4.1).

Other reasons cited as to why farmers preferred crop cultivation was that unlike animals and poultry, crops did not require constant monitoring due to their stationary nature, which therefore did not require hiring of additional help to ensure they were fed or prevent them from trespassing onto neighbours' property. In cases of poultry rearing, this meant that the farmers would always need to ensure that the adequate feeds for the different growth stages were available, which was expensive to acquire especially for those that kept broiler or layer chicken rather than free-range.



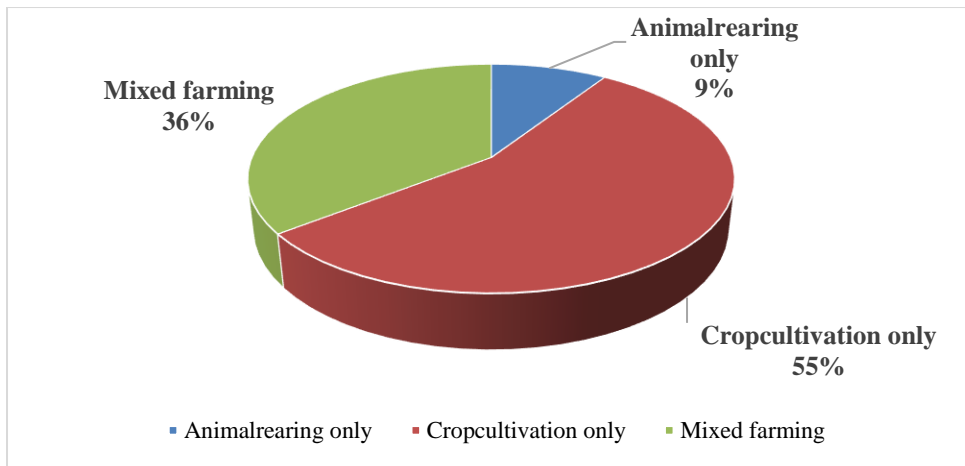


Figure 4. 1: Types of urban agriculture practiced in Cheptais town

Source: Field Survey (2020)

#### 4.2.1.1 Crops grown

Figure 4.2 gives a breakdown of the diverse crops that are grown by farmers in Cheptais town. The most popular crops grown were confirmed to be maize and beans each with well over 60% of the sampled respondents growing them either exclusively or together with other crops. The other variety of crops included tomatoes, onions, potatoes (both Irish and sweet potatoes), vegetables (kale, spinach, cabbage, managu, kunde), fruits (avocado, passion fruit, banana). About a third of the sampled respondents also engaged in coffee-growing all of whom had at least an acre of land to grow the desired amount.

Maize is still a staple food in the area hence its popularity among the urban farmers. Beans were also a popular crop among the urban farmers and could be grown at the same time with maize or on its own. Both maize and beans are popular because they are widely consumed and there was always a market for them and had long-term storage qualities, unlike fresh vegetables. Seeds from harvests could also be stored to be used for upcoming planting seasons which meant that farmers did not need to buy a lot of additional seeds or any at all if what they had stored for planting was sufficient.

Other fresh produce that was becoming popular among the urban farmers was green vegetables. About 20% of the urban farmers grew green vegetables for subsistence while those with larger plots of land grew more that could be sold to neighbours or in the main open market. Other fresh produce such as tomatoes (17%), onions (15%), and potatoes (7%), were also largely grown for commercial purposes and sold in the open-air market.

Fruits have also become an available crop choice in Cheptais town with 11% of those surveyed growing them. The most popular fruit was bananas which grew freely and did not require much maintenance. Other fruit included avocados which were for subsistence but those that grew them mentioned that just one tree produced large quantities of fruit that could be sold to neighbours and the open-air market. Coffee was also grown by a total of 11% urban farmers surveyed. Those that grew it air-dried the harvest which was then sold to specific buyers or sold at the open-air market.

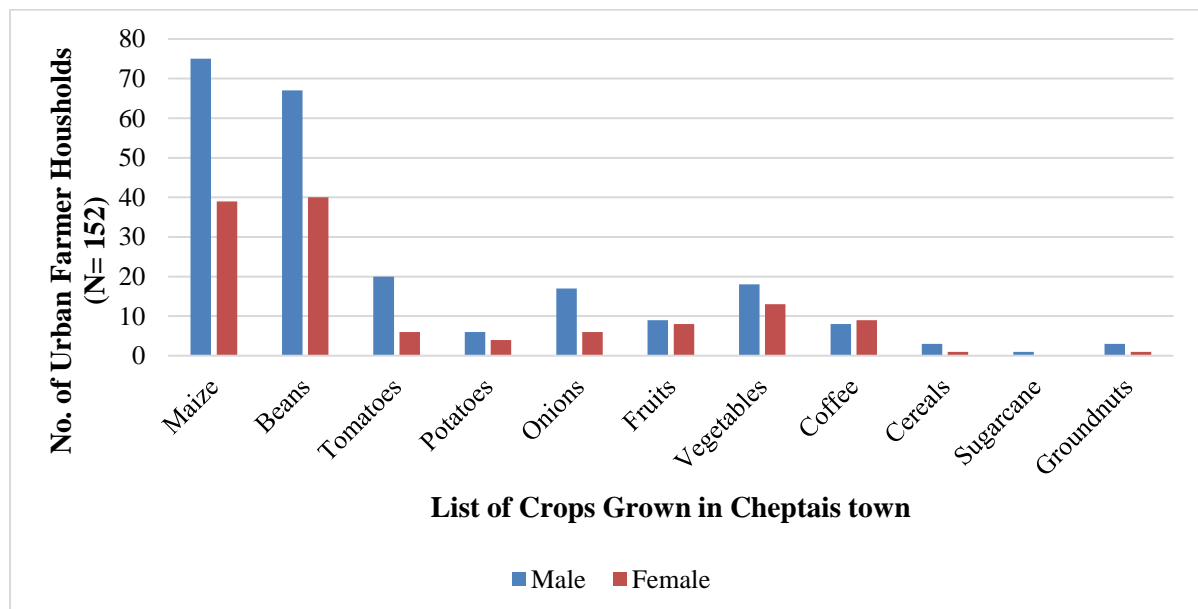


Figure 4. 2: List of crops grown in Cheptais town

Source: Field Survey (2020)

Plate 4. 1: Bean crop (left) and maize crop (right)



Source: Field Survey (2020)

#### **4.2.2.2 Animals reared**

Urban farmers that indulged in animal husbandry (Figure 4.3) engaged in poultry farming. This was the most popular 59% of the total that kept animals. The poultry farmers raised broilers for meat, layers for eggs, or free-range chicken (kienyeji) which could be used to produce free-range eggs or for meat. 55% of those that kept animals also kept cows for milk production which was utilized for subsistence purposes and sold when more was produced than what the household needed. Other animals included goats, sheep, and pigs (Figure 4.3).

Urban farmers that kept animals had them in limited numbers. Those that kept cattle did not go beyond two cows in their compound. Any male calves that were born would usually be sold off after a few months to farmers in the rural areas who had larger plots of land. This was because bulls were not as useful in small pieces of land such as those available in and around Cheptais town. Cows were considered more useful as they produced milk that could be consumed by the household or sold. Most of the farmers also preferred keeping free-range chicken rather than broilers or layers because the free-range chicken had a higher value and sold for a higher price as compared to the others. The free-range chicken did not require special feeds, unlike broilers and layers, which made them affordable to keep.

A few farmers kept goats and sheep which were raised mostly for meat. There was no high preference for the two as many cited that they could be a nuisance and could easily cause damage to crops if they broke free from their containment or restraints. However, both sold at a good price especially when ready for slaughter around holidays such as Easter and Christmas. Those that kept pigs reared them exclusively for meat for commercial purposes and had specific buyers to which they sold them off to. Pig rearing, however, was not a common practice as it required a lot of maintenance, especially in large quantities.

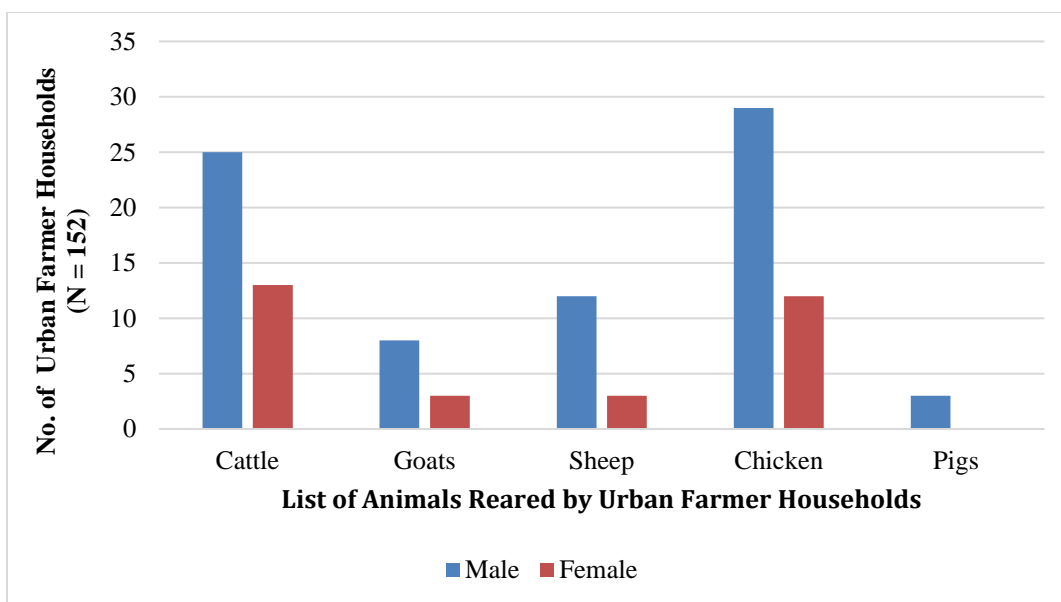


Figure 4. 3: List of animals reared in Cheptais town

Source: Field Survey (2020)

Plate 4. 2: Free-range chick (left) and chicken (right)



Source: Field Survey (2020)

Plate 4. 3: Cow for milk (left) and broiler chicken (right)



Source: Field Survey (2020)

From the field survey, urban agriculture was held in high regard for its ability to provide food and a livelihood source for the community in and around Cheptais town. Most of the urban farmers still largely grew staple crops such as maize and beans, and rear common household animals such as cows and chicken whose maintenance is straightforward and not costly.

Though there was some diversity noted with regards to the crops grown, each variety, aside from maize and beans, had less than 20 farmers that planted them. This limited or completely prevented the urban farmers in the area from using innovative farming methods such as table-top gardens, mobile gardens, multi-story gardens, and hanging gardens – techniques which if properly applied could increase the quantity of green leafy vegetables grown together with other crop varieties such as carrots, cabbages, indigenous vegetable tubers in addition to the potatoes, tomatoes and onions currently grown.

With regards to animals rearing adequate pasture especially during the drier months was a concern that limited a number of farmers from keeping animals such as cattle. However, animals may subsist entirely on forage if need be. In this case, grass cut and forage crops grown together with crop residues could be set aside for cattle and ensiled in order to fill nutritional gap needs during seasons where pasture is not available.

There is also little in the way of value addition on products that are produced through urban farming practices in Cheptais town. All products are sold as they are to those within and around the town. Opportunities for value addition would allow for knowledge sharing spaces and increased incentives to produce products from practices such as bee-keeping which do not require large plots of land to practice, and whose products could be sold within and outside of Cheptais town.

#### **4.2.2 Hypothesis testing**

The null hypothesis ( $H_0$ ) stated that there is no significant difference between the number of urban farmers that adopt urban agriculture for either commercial or subsistence purposes. The Alternative Hypothesis ( $H_1$ ) therefore stated that there is a significant difference between the number of urban farmers that practice urban agriculture for either commercial purposes or for subsistence. The variables cross tabulated for chi-square were (1) farmer gender, measured in two categories that is either male and female, and (2) and adoption purpose, measured by either subsistence or commercial options.

Given that:  $\chi^2 = (\text{degrees of freedom, } N = \text{sample size}) = \text{chi-square statistic value, } p = \text{p-value}$ , therefore:  $\chi^2 (2, N=152) = 5.433, p=.020$  (Table 4.2). A chi-square test of independence was performed which found that the p-value was .020 which was less than alpha at .05, therefore the chi-square test of independence showed there was significant difference between the number of urban farmers that practice urban agriculture for either commercial purposes or for subsistence. The null hypothesis was rejected, and the alternative adopted which stated that there was significant difference between the number of urban farmers that practice urban farming either for commercial purposes or subsistence purposes.

Further assessment of the results pointed out that urban farmers had a higher preference for directing outputs from urban agriculture towards commercial purposes irrespective of the



farmer’s gender. This allowed farming households to additional income sources which could was redirected towards household savings or used to cater to household expenses.

Table 4. 2: Chi-Square Test

<b>Chi-Square Tests</b>					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.433 <sup>a</sup>	1	.020		
Continuity Correction <sup>b</sup>	4.645	1	.031		
Likelihood Ratio	5.580	1	.018		
Fisher's Exact Test				.023	.015
N of Valid Cases	152				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.63.					
b. Computed only for a 2x2 table					

Source: Field Survey (2020)

### 4.3 Opportunities for urban agriculture

#### 4.3.1 Knowledge on sustainable urban agriculture

One of the other key issues raised was the practice of sustainable urban agriculture. Questions asked included where the urban farmers sourced knowledge on sustainable agriculture (Figure 4.7).

Over half (61%) of the respondents confirmed checking online sources for information on sustainable agricultural practices. This allowed them to make an assessment of what crops could be grown at the same time, how much input such as water would be required for specific crops and timelines that crops needed in order to be ready for harvesting. Others checked for suitable structure designs that would allow them to raise poultry in suitable conditions which would prevent overcrowding, and would also purchase, or construct suitable feeding and water structures. Online sources also provided information on how to suitably dispose of or recycle waste generated from agricultural activities.

Given that a majority of the urban farmers surveyed were youth, it also made sense that a large portion of them would be getting information on sustainable urban agriculture from online sources. A majority of the population, through observation, have been noted to possess mobile devices, smartphones, and gadgets which allow them to easily access internet sources and therefore, knowledge on different subject matter and in this case, content on sustainable urban agriculture.

About 16% of the respondents confirmed receiving knowledge on sustainable agriculture from fellow family members and this included knowledge passed down from generation to generation that was still applicable. This included techniques for storing seeds for upcoming planting seasons, intercropping preferences and organic composting among other traditional agricultural techniques. Another 10% confirmed receiving sustainable agricultural information from extension services such as the National Farmers Information Service (NAFIS) office. Here they were able to get information about natural resource management, post-harvest treatment of crops as well as marketing of agricultural products. The remaining 13% received their information from either educational institutions or visiting NGO field officers.

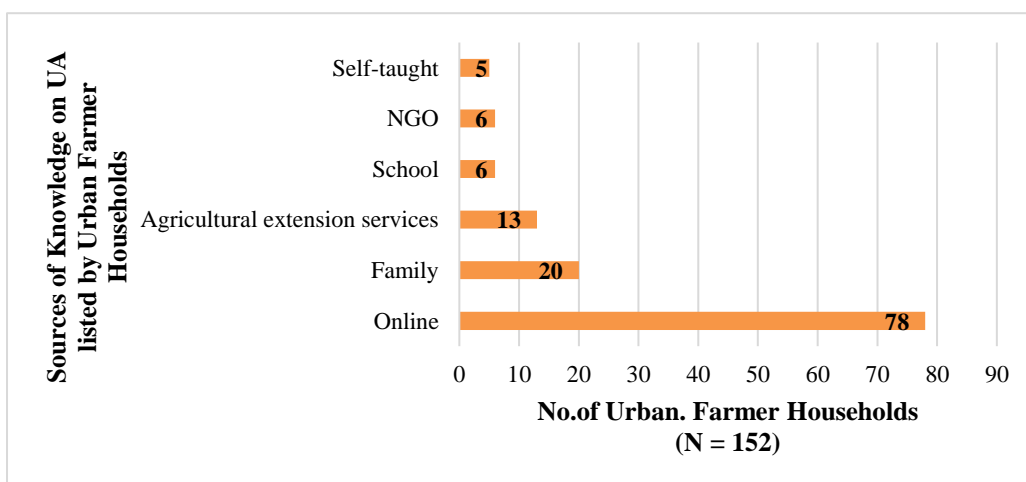


Figure 4. 4: Listed sources of knowledge on sustainable urban agriculture

Source: Field Survey (2020)



### 4.3.2 Benefits received from practicing sustainable urban agriculture

Taking part in agricultural activities has had numerous benefits. For the urban farmers in Cheptais one of the most popular reasons was that products from urban farms are healthier than what they would normally purchase from the supermarket. One of the urban farmers interviewed Christabel Yego, expressed that the maize that she harvested from her garden and had ground at the local milling station, had no additives or preservatives. All she had to do was store flour in a well-sealed container to prevent any moisture or pests from spoiling the processed harvest. A large number (72.8%) of the farmers “agreed”, while 25% “strongly agreed” that the produce from their farms was healthier (Table 4.2).

Table 4. 3: Importance of UA and impact on health and nutrition

	Produce from own farm is healthier than purchased	Practicing UA allows me to diversify my diet	UA provides me with a reliable food source
Strongly agree	25%	59%	26%
Agree	72.8%	35%	64%
Neither agree nor disagree	1.2%	5%	7%
Disagree	0%	1%	2%
Strongly disagree	0%	0%	0%

Source: Field Survey (2020)

Another popular reason for practicing urban agriculture was that it helped diversify their diets. 59% of respondents “strongly agreed”, while 35% “agreed” with the diet diversification aspect. Those respondents who did not personally produce certain products were still able to purchase whatever they needed either from neighbours or from the open-air market where other farmers in the town came to sell their produce.

Reliability is an aspect that was also of great importance to the respondents. A total of 64% of them “agreed” while 26% “strongly agreed” that by practicing urban agriculture they were assured of a reliable food source. Mr. Nixon Juma, a farmer who practices crop cultivation only shared that even though he does not keep any poultry himself, he has neighbours that he can purchase fresh milk on a daily basis. Other practices adopted by the urban farmers included

proper storage of products such as maize and beans after harvesting. Mr. Juma added that a bag (90kgs) of maize could be consumed by his family of five over a period of six to eight months. This stored produce acts as a food buffer until the harvesting season arrives.

Plate 4. 4: Plot of land with variety of crops



Source: Field Survey (2020)

#### **4.3.3 Linking urban agriculture to environmental sustainability**

Of the total 152 respondents, 108 confirmed that they were fully dependent on urban agriculture as their main livelihood source. With that in mind, there was a keen sense amongst the farmers to ensure that they were able to keep up with production and where possible, increase production. This also allowed them to practice environmental planning (Table 4.4). About 80%

“agreed” while 13% “strongly agreed” that they were able to manage their portions of land adequately. In order to ensure soil fertility was maintained 83% of those that practiced crop cultivation grew legumes (beans). Another 23% practiced crop rotation to allow different sections of their garden to recover from the crop production process. Those with poultry ensured that spaces were not overcrowded by either selling to neighbours or at the open-air market.

On the issue of environmental impacts, 78% “agreed” while 11% “strongly agreed” that their practice of urban agriculture had little negative environmental impact. This was evident as over 85% of the farmers used organic/natural means of weeding such as mulching and hand weeding rather than using chemical herbicides. Those that practiced mixed farming also utilized manure from cattle and poultry as fertilizer

Table 4. 4: Perceptions on environmental sustainability

	Helps me reduce negative environmental impacts	Helps me plan and practice proper environmental management
Strongly agree	11%	13%
Agree	78%	80%
Neither agree nor disagree	8%	5%
Disagree	1%	1%
Strongly disagree	0%	0%

Source: Field Survey (2020)

Plate 4. 5: Mulching used to tomato crop section



Source: Field Survey (2020)

Mulching was a popular activity among a number of farmers. Mr. Marvin Kiboi, one of the farmers that grew potatoes shared that he used mulching for his tomato crops because it helped maintain soil fertility and added nutrients to the soil, therefore, minimizing the need for chemical fertilizers. Other advantages are that it helped maintain soil moisture, reducing the need to manually irrigate the crops.

#### 4.3.4 Contributions of urban agriculture towards economic sustainability

It was evident that urban agriculture had an important economic role for the farmers in Cheptais town mostly due to the fact that 71% were dependent on it as a livelihood source. Table 4.1 also indicated that over half (56%) of the respondents indicated that they had been practicing urban agriculture for over 5 years. Table 4.5 below gives an indication of the economic impact that urban agriculture has had on farmers. About 83% “agreed” while an additional 10% “strongly agreed” that urban agriculture helped them so save money. This was evident through the agricultural diversification they practiced together with produce storage techniques which allowed them to depend largely on what they had. This meant that less money was spent on food which allowed household income to be directed towards other needs.

Table 4.1 also indicated that 70% of the urban farmers sampled had either part or full-time employment. This then meant that urban agriculture offered an additional source of income for the household. According to Table 4.4, 82% “agreed” while another 11% “strongly agreed” that urban agriculture helped to diversify their household income.

Table 4. 5: Economic sustainability

		Frequency	Percentage
UA helps me save money	Strongly agree	15	10%
	Agree	126	83%
	Neither agree nor disagree	9	5%
	Disagree	2	1%
UA helps me diversify household income	Strongly agree	16	11%
	Agree	126	82%

	Neither agree nor disagree	7	5%
	Disagree	3	1%

Source: Field Survey (2020)

#### 4.4 Constraints facing urban agriculture

The urban farmers of Cheptais town were also able to share a number of challenges that inhibited their farming potential (Figure 4.4). A majority of the farmers (36%) complained that access to land for farming was a major issue. About 27% indicated that access to capital posed a challenge for them when practicing agriculture while a cumulative 18% complained that access to knowledge, adequate labour, and time were some of the challenges arising in their practice of urban agriculture.

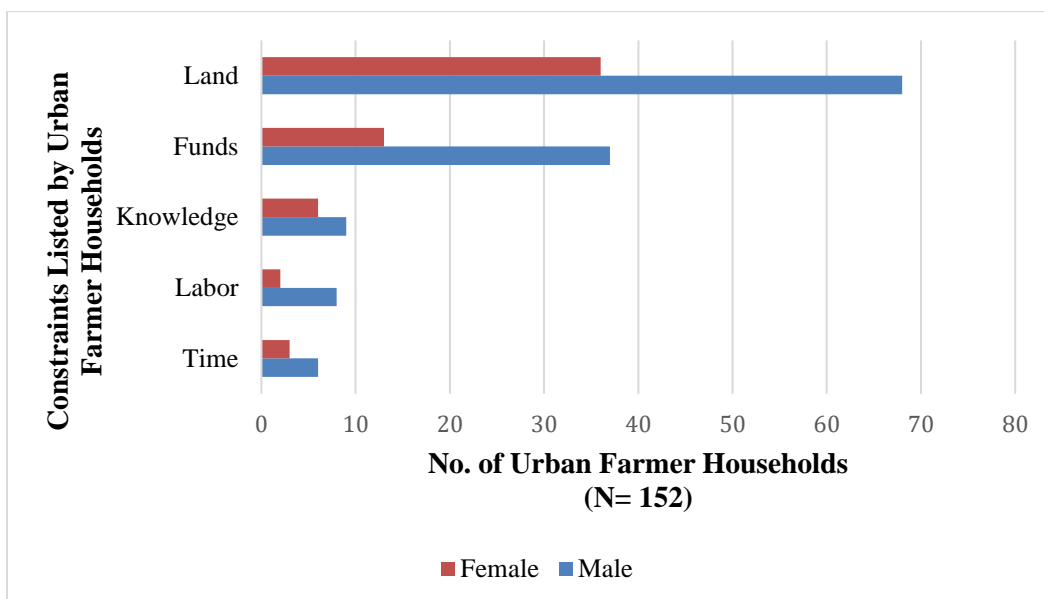


Figure 4. 5: Constraints listed by urban farmers in Cheptais town

Source: Field Survey (2020)

##### 4.4.1 Access to land

Historically, matters concerning space and access to land have been a contentious issue because the inhabitants in the area still have strong attachments to cultural practices especially with matters of inheritance. Though Kenyan law of succession outlines that both men and women, boys and girls have an equal right to inherit land, culturally in this area, only male children can inherit land. Women are “not entitled” to land and therefore are placed in a difficult position



when it comes to claiming land because male relatives (brothers and sons) would be prioritized and in many cases, they would subdivide land amongst themselves leaving out the women. However, women were allowed to till and get produce from parents' or spouse's land but, cannot claim to "own" the land.

Even though men had more access to land, there were more complaints from them regarding the lack of adequate land. Many attested this to the fact that they had to subdivide the lands they owned amongst their sons who had come of age (18 years). This was done so as to allow them to begin farming and have as a livelihood source. There were fewer complaints from women regarding access to land as they would either farm on their parent's land (if unmarried) or their spouse's land. However, some women did express interest in acquiring more land in order to expand their farming activities.

From the 152 respondents sampled, only 144 consented to openly share the land they had access to for farming. Out of those that consented the majority of them (45%) had an acre or less for agricultural activities, 29% had more than an acre but less than three acres while the remaining 26% had over three acres of land (Figure 4.5).

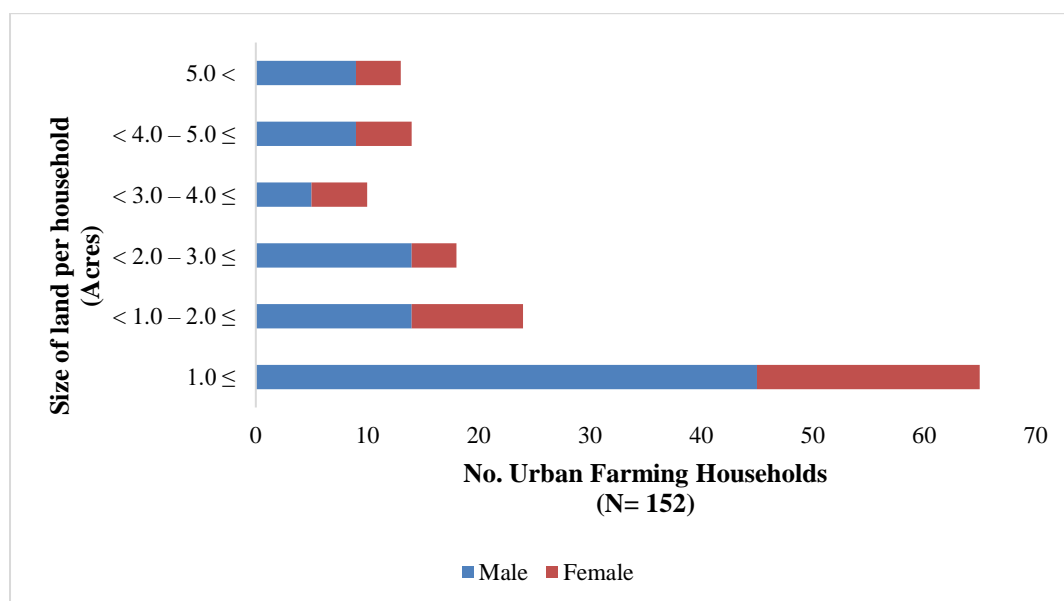


Figure 4. 6: Size of land per urban farming household

Source: Field Survey (2020)

#### **4.4.2 Access to capital**

Approximately 33% of the urban farmers indicated that access to capital was a constraint that they faced when practicing urban agriculture. The need for additional capital would assist to adequately expand or implement strategies that would allow them to maximize the available land that they had for agriculture.

A total of 106 urban farmers out of the 152 sampled consented to share details on income received from urban agriculture practices (Figure 4.6). The majority, (49%), confirmed earning between Ksh.1001 to Ksh.5000 which was then prioritized towards household needs which were mainly food (not produced in their own farm), medical needs, school fees, and support of either immediate or extended family members. This meant that little was left to put back into improving or increasing agricultural activities. About 29% confirmed earnings between Ksh.5001 and Ksh.10000, while 13% earned over Ksh.10000.

Though agriculture has been a normal activity and way of life in this particular area, the traditional methods of how it is practiced have also been adopted by urban farmers. Many of them apply little to no innovation when it comes to farming and therefore, only manage to break-even and not necessarily make a huge amount of profit from farming products. This trickles down from their perceived challenge of adequate land where many are of the mindset that you can only make profits from farming when you have access to large portions of land. From observation, there is still a lot of potential when it comes to how land for urban farming is utilized in Cheptais town. Once innovative techniques are applied, there is a high possibility of not only breaking-even but also receiving good profits that can not only be used to improve farm inputs but also contribute to other livelihood needs.

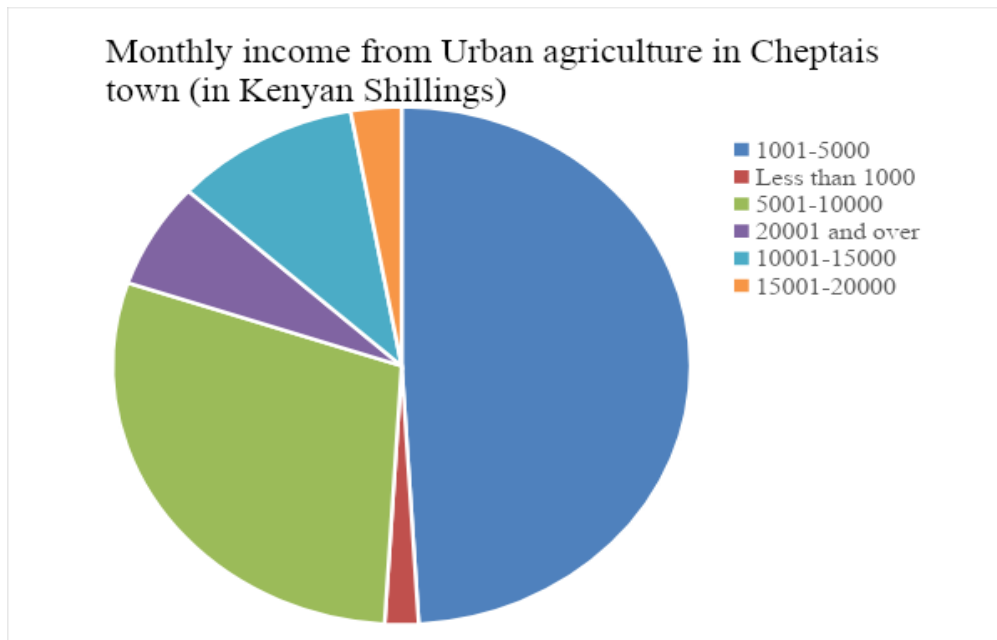


Figure 4. 7: Urban farmer's monthly income from produce

Source: Field Survey (2020)

#### 4.4.3 Access to knowledge

Nearly 10% of the urban farmers surveyed pointed out that access to adequate knowledge prevented them from fully taking advantage of the opportunities that urban agriculture had to offer. Part of this included access to information on crop cultivation especially for those who wanted to diversify from maize and beans cultivation. Many indicated that without the proper knowledge, it was difficult to become motivated to try out anything new and it was, therefore, safer to stick to what they had been used to.

For those farmers that are wary of damage from pests, access to adequate knowledge would also allow them to see how best to implement practices such as Integrated Pest Management (IPM) where they can apply a combination of farming techniques such as planting resistant varieties, biological control and even modification of cultural agricultural practices in order to prevent damage and improve yields.



#### **4.4.4 Access to labour**

Close to 7% complained about the lack of sufficient labour to carry out agricultural activities. Many of the urban farmers still practice tilling in order to manage weeds. Since their plots of land are small, this has to be carried out by hand or by use of tools such as a garden hoe. This can be time-consuming and tiresome when carried out alone. This is especially so for those who are not full-time farmers who are already employed on a full-time basis. This, therefore, requires additional labour to assist with farm upkeep. Those urban farmers that kept animals such as cattle also required additional help from a herder in the event that cattle needed to be moved to a different location in order to graze. In the case of those that kept broiler and layer chicken, there had to be someone in the vicinity to help ensure that the poultry was adequately fed throughout the day and the eggs (in the case of layers) were collected and not damaged by the chicken.

#### **4.4.5 Access to adequate time**

About 6% expressed that the lack of sufficient time was among the challenges that they faced when practicing urban agriculture. This was especially so for those that had full-time employment and could only focus on agricultural activities when they arrived home early in the evening or on weekends when they were in their homesteads. This also meant that they largely practiced urban agriculture for subsistence purposes as there was no time to substantially focus on growing a particular crop or rearing a specific animal for commercial purposes.

## **CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter shares a summary from the analysis and data collected from sampled respondents from Cheptais town, Bungoma County. It also shares the conclusions and recommendations made. Responses received were based on the study objectives which sought to determine the nature and extent of urban agriculture, identify the major constraints facing urban agriculture and to assess the opportunities for sustainable urban agriculture.

### **5.2 Summary of Findings**

This research shows that even though there may be a number of challenges that urban farmers face, urban farming remains a popular activity in Cheptais town where a majority of inhabitants earn a livelihood from it.

#### **5.2.1 Nature and extent of urban agriculture**

There is a large farming population in Cheptais town, with many of the farmers either practicing crop cultivation only, animal husbandry only or mixed farming. A greater majority preferred crop cultivation only since that did not require any additional physical structures to be set up, unlike animal husbandry where containment structures were necessary mainly for security purposes and to prevent damage of crops by animals. Given the large farming population, over half of those sampled indicated that they had been farming for over five years meanwhile, well over half were fully dependent on urban agriculture for their household income.

#### **5.2.2. Major constraints facing urban agriculture**

Among the major constraints that urban farmers in Cheptais face, is a lack of sufficient capital and land. Given that a majority earn between Ksh.1000 and Ksh.5000 every month from urban farming, capital to be able to purchase additional land so as to expand farming practices is limited. Additional land would allow farmers to grow more crops therefore increasing yields.

Additionally, more land would also allow for more diversity of crops grown while for those with an interest in animal husbandry, this would allow for additional land for structures such as chicken coops or cow pens. However, it should be noted that there is still great potential for innovative agriculture that has not yet been fully explored. Innovations such as hanging gardens, multi-story gardens, and more could be used in order to maximize on the land currently available.

Other issues arising include access to knowledge, where farmers show keen interest on how to implement new farming practices as a means to adapt to weather patterns. Other farmers showed interest in diversifying the crops they grew but lacked the knowledge of how to adequately prepare land or seedbeds. Manpower and time and time were also raised as a concern by a number of farmers especially by those with larger than an acre of land who also happened to not have hired help to assist them.

### **5.2.3 Opportunities available for the adoption of sustainable urban agriculture**

A majority of the sampled respondents agreed that urban agriculture was their main livelihood source as well as food source. This indicated that they were keen on ensuring their current practices did not jeopardize the ability to continue producing from their current plots of land.

In order to maintain soil fertility, farmers practice intercropping. A majority of farmers had a preference for beans for its benefits in applying natural biological nitrogen fixation. Other sustainable practices included mulching which largely assisted in maintaining soil moisture and reducing the need for irrigation or manual watering of crops.

Those with livestock ensure that adequate numbers are maintained and avoid overpopulation. Poultry, in particular, were either sold or consumed. Zero grazing was also practiced to ensure that livestock were limited to specific sections for grazing. This allowed for pasture recovery as livestock moved from one section to another and helped prevent overgrazing.

### **5.3 Conclusion**

It is clear that urban agriculture has been and continues to be a popular activity in Cheptais town and its environs. The farming practice, in itself, is one that has been passed on from generation to generation adding to its popularity and the fact a majority of people depend on it as a food and livelihood source. Urban agriculture has also gained popularity for its ability to provide affordable as well as fresh produce that can be accessed by both farmers and non-farmers in the area. Even with different challenges listed, the farmers surveyed are still keen on their urban agricultural practices as it has been and continues to be a key component in the economic, social and ecological of their lives in Cheptais town.

### **5.4 Recommendations**

#### **Policy recommendations**

1. Enhance the capacity of female urban farmers allowing them to make equal contribution towards urban agriculture in Cheptais town.
2. Increased opportunities and spaces for knowledge sharing to improve on crop diversification. Though farmers in Cheptais are slowly diversifying the crops grown, many farmers are still highly dependent on maize and beans which can be limited or restricted to specific weather patterns.
3. Encourage agricultural extension services to make information on local crops and animal breeds, and urban agriculture best practices available online. This will help share pertinent information on urban agriculture with urban farmers from Cheptais town who largely access information on urban agriculture from online sources.
4. Provide incentives for youth engaging in urban agriculture in Cheptais town. This will allow them to increase their contribution towards the growth and development of urban agriculture in the area with income gained directed towards increasing agriculture inputs and ultimately agricultural yields.

5. Promotion of innovative techniques to utilize urban farming land in Cheptais town which can in turn promote crop diversification.

### **Recommendations for Future Research**

1. Agriculture in general has been linked to negative climate and environmental impacts which is also among the reasons why no policies are available that legitimize urban agriculture. There is a need to understand how urban agriculture has managed to mitigate the negative impacts therefore allowing the practice to be legitimized.
2. There is a need to further explore how impactful online information sources are in urban agriculture and how extension services can make use of them to reach more urban farmers across the country.

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## APPENDICES

### Appendix I

#### HOUSEHOLD QUESTIONNAIRE

##### Urban Agriculture in Cheptais Town, Bungoma County: An Assessment of the Opportunities and Constraints

###### Demographics

1. Respondents name:
2. Age:
3. Gender:
  - [1] Male
  - [2] Female
4. Highest level of education:
  - [1] None
  - [2] Primary school
  - [3] Secondary
  - [4] Tertiary/college
  - [5] University - Bachelors
  - [6] University - Masters

###### Nature and extent to which urban agriculture is practiced

5. Where is your urban garden/farm located?
  - [1] In homestead
  - [2] Off-homestead (within or around town)
  - [3] Both
6. What is the approximate size of your urban garden/farm?
7. How long have you been practicing urban agriculture?
  - [1] More than 5 years
  - [2] 2 to 5 years
  - [3] 1 to 2 years
  - [4] Less than 1 year
8. What type of agriculture do you practice on your urban farm/garden?
  - [1] Crop cultivation only
  - [2] Animal rearing only
  - [3] Mixed farming

###### Social and Economic contributions and challenges

9. In the last 12 months, what was the main use of the products from your urban crop and/or livestock activities?

- [1] Subsistence
- [2] Sale for money (commercial)

10. Is urban agriculture your main source of household income?

- [1] Yes (Go to question 12)
- [2] No (list other livelihood sources i.e., formal and/or informal)

11. Where/to whom do you sell your urban agriculture produce?

- [1] Neighbours
- [2] Sold at open air markets
- [3] Sold to supermarkets

12. How much money do you make from practicing urban agriculture (from sales of produce) per week or month?

13. How much money do you spend on practicing urban agriculture i.e., from buying tools, seeds, fertilizers, feeds etc. per week or month?

14. Is urban agriculture your main source of food for the household?

- [1] Yes
- [2] No (If no, list other food sources i.e., where they acquire food from)

15. Do you practice urban agriculture by yourself or do you have someone to assist you?

- [1] Practices alone (no assistance)
- [2] Is assisted by family
- [3] Has hired help

16. What are some of the challenges you face when undertaking urban agriculture?

- [1] Lack of sufficient land
- [2] Insufficient capital
- [3] Insufficient labour (no help tending to crops or animals)
- [4] No time to tend to crops and/or animals
- [5] Limited knowledge and experience with urban agriculture

17. Are you part of a cooperative or group that collectively engages in urban agriculture activities?

- [1] Yes (Go to question 18)
- [2] No

18. How has this engagement been of benefit to you?

- [1] Access to financial resources
- [2] Access to farming equipment
- [3] Provided space for knowledge and skills sharing

- [4] Emotional support/encouragement
- [5] No benefit

## Assessing the application of sustainable urban agriculture

### Crop cultivation and animal husbandry techniques

19. What types of crops do you grow on your urban farm? List them

20. How do you preserve soil fertility?

- [1] Fertilization (Chemicals, animal manure, green manure etc.) Go to question 21
- [2] Crop rotation (Cultivation of a series of dissimilar types of crops in the same area in sequential seasons)
- [3] Intercropping (Cultivation of two or more dissimilar types of crops in the same area in the same season)
- [4] Tillage

21. What type of fertilizer do you use?

- [1] Chemical fertilizers
- [2] Organic fertilizers (non-chemicals like animal manure, green manure, compost, etc.)

22. How do you control pests and diseases?

- [1] Chemical pesticides (treatment), specify
- [2] Biological & organic control methods (non-chemical control methods), specify what you use/do
- [3] Integrated pest management (IPM) methods  
(Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.)

23. How do you control weeds?

- [1] By burning plant residues after harvesting
- [2] By grazing through animals
- [3] By mechanical weeding (tillage, mowing, and/or manual)
- [4] By crop rotation and/or intercropping
- [5] By chemical herbicides, specify what do you use?

24. What types of animals do you keep on your urban farm/garden? How many? List them

25. Where do you source for feeds for your animals?

- [1] Free grazing/feeding within homestead
- [2] Free grazing/feeding outside homestead

[2] Purchased feeds

26. How do you prevent animal overpopulation?

- [1] Sell excess animals
- [2] Slaughter for self-consumption
- [3] Give away for free

27. How do you dispose of animal waste?

- [1] Composting
- [2] Stock piling (storing the waste until you're ready to use it)
- [3] Removal (by manure hauler)

28. Where do you get water for urban agriculture?

- a) Tapped water from the house [1] Yes [2] No
- b) Collected rain water [1] Yes [2] No
- c) Purchased water [1] Yes [2] No

29. Do you apply any irrigation techniques?

- [1] Yes (move to question 30)
- [2] No (move to question 31)

30. What type of irrigation technique do you use?

- [1] Manual irrigation (use of watering cans/container)
- [2] Sprinkler irrigation
- [2] Drip irrigation
- [4] Other (no need to specify)

#### Perception and knowledge of sustainable urban agriculture

31. Which of the below statements best describes sustainable urban agriculture in your opinion?

- [1] Sustainable agriculture enhances environmental quality, human health, and animal welfare
- [2] Sustainable agriculture provides a mutually beneficial relationship between the farmers and their surrounding community
- [3] With sustainable agriculture, farms/gardens are able to sustain the economic viability of their households
- [4] All the above

32. Do you practice sustainable urban agriculture?

- [1] Yes (Got to question 33)
- [2] No (Got to question 34)

33. Where did you learn about sustainable urban agriculture from?

- [1] Information from friends and family
- [2] Online sites



- [3] Information from local official agricultural offices/agencies
- [4] Information from NGOs supporting agricultural practices
- [5] Self-taught

34. What are the challenges you face when practicing sustainable urban agriculture?

- [1] Not enough knowledge on it
- [2] Difficulty in maintaining soil fertility
- [3] Access to water
- [4] Financial limitations
- [5] No access to crop varieties

35. What are your reasons for practicing urban agriculture? Indicate the extent to which you agree or disagree using the scale of:

- [1] Strongly disagree [2] Disagree [3] Neither agree nor disagree [4] Agree [5] Strongly agree

	[1]	[2]	[3]	[4]	[5]
a. Helps me save money					
b. Helps me diversify my household income					
c. Allows me to have a reliable source of food					
d. Produce from my farm is healthier					
e. Helps to diversify my diet					
f. It helps me reduce negative environmental impacts					
g. Helps me plan and practice proper environmental management					
h. Gives me the opportunity to learn new skills					
i. Gives me the opportunity to socialize with other people					
j. Other reasons, specify:					