ASSESSING URBAN AGRICULTURAL ENTERPRISES AND THEIR EFFECT ON FOOD SECURITY IN CITIES. A CASE STUDY OF MBARARA CITY SOUTH, WESTERN UGANDA

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A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DEGREE OF MASTER OF ARTS IN GEOGRAPHY OF KYAMBOGO UNIVERSITY.

NOVEMBER, 2024

DECLARATION

I declare that the information in this dissertation is my own work and has not been previously submitted to any higher education institution leading for any degree award and that all the information sources consulted have been acknowledged by means of references.

Signature…… Date……

APPROVAL

This is to certify that this dissertation entitled *"Assessing Urban Agricultural Enterprises and their effect on food security in cities. A Case Study of Mbarara City South, Western Uganda"*. has been carried out under our supervision and is submitted for examination with our approval.

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DEDICATION

I dedicate this dissertation to my dear husband Mr. Nabimanya Evat for his tremendous contribution to my career growth.

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LIST OF ACRONYMS

HFIAS	: Household Food Insecurity Access Scale
USAID	: United States Agency for International Development.
UA	: Urban Agriculture.
KCCA	: Kampala Capital City Authority.
FAO	: Food Agricultural Organizations.
FANTA	: Food and Nutrition Technical Assistance.
HFSSM	: Household Food Security Survey Module.
MAAIF	: Ministry of Agriculture, Animal Industry and Fisheries
U.S.A	: United States of America
NDDB	: National Dairy Development Board.
DAFF	: Department of Agriculture, Forestry, and Fisheries.
UBOS	: Uganda Bureau of Statistics

ABSTRACT

Urban agriculture in new cities is key and should be part and parcel of any sustainable urban physical plan but, most urban physical plans in Uganda never include urban agriculture in their urban physical plans. This is because there is limited or no information about how much contribution different urban agricultural enterprises make towards the food security of urban dwellers. This study was about urban agriculture and food security among urban household farmers in Mbarara City south division. The specific objectives included; to examine the effect of urban animal farming on food security among urban households, assess the effect of urban poultry farming on food security among urban households, analyze the effect of urban arable farming on food security among urban households and assess the effect of multiple urban agricultural enterprises on food security among urban household farmers in Mbarara City south division. A cross-sectional design using both quantitative and qualitative methods was used for data collection and analysis. Data was corrected from 307 respondents sampled using proportionate and stratified strategies using questionnaires, direct observation and interviews. Data analysis was done using SPSS version 16 to generate both descriptive and inferential statistics. The collected data was analyzed using descriptive statistics, binomial statistical test and Pearson chi-square basing on a scientific scale called Household Food Access Scale. If the P-value was less than 0.05 to food security indicator , it meant that there was significant difference but when the P.value was above 0.05 to food security indicator, it meant that there was no significant difference. Results showed that majority of urban household farmers who practiced urban animal farming ,urban poultry farming and multiple urban agricultural enterprises were mildly food insecure while, majority of urban household farmers who practiced urban arable farming were food secure. Therefore, urban arable farming was the most efficient practice while urban poultry farming was the least efficient practice. The study concludes that urban arable farming should be encouraged among urban household farmers since it promoted food security to the division compared to other enterprises in Mbarara city south. Therefore, programmes to encourage urban arable farming should be emphasized by urban physical planners of the city by showing that it can be practiced in sacks, rooftops, small plots, containers and verandas.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Urban agriculture is a sector of the economy that operates within towns, cities, or metropolises, or on their periphery (peri-urban). In doing so, it recycles the human and material resources, goods, and services that are present in and around that urban area and, in turn, supplies human and material resources, goods, and services primarily to that urban area globally (FAO, Food security, issue 2, l-4, F AO (Food and Agriculture Organization), 2006) It grows, raises, processes, and distributes a variety of food and non-food products.

Urban Agriculture can be categorized most effectively based on how each is produced such as arable farming, poultry farming and animal rearing. Its products can be utilized for trading and commercial purposes, excess sales, or consumption. These are aimed at ensuring food security among urban dwellers. Urban agriculture utilizes spaces such as rooftops, vacant lots, and community gardens, reducing pressure on agricultural land located outside the urban area (Santo, 2016)

Urban agriculture has been successful in addressing food security and environmental issues. China, for example, has supported urban agriculture in Cities like Shanghai that have put rules in place to support vertical and rooftop farming, which helps the local food industry (Jiayu, 2023). In order to increase food security and give low-income communities more influence, community gardens have been built in Brazilian cities like Sao Paulo and Rio de Janeiro. These gardens give residents access to fresh vegetables while also fostering the community (Nagib, 2019).

When everyone has physical, social, and economic access to enough safe, nourishing food that satisfies their dietary needs and food choices for an active and healthy life, this is referred to as food security. It encompasses the availability, access, utilization, and stability of food. Food security is often calculated at the national or household level and is influenced by factors such as agricultural productivity, food production and distribution systems, income and employment, trade policies, social safety nets, and nutrition education (USAID, 1992; FAO, 2006; (Coates, 2013).

According to (Sergio, 2020) Food security has a crucial part in ensuring the wellbeing and nutrition of urban populations. In cities with adequate food security, residents have access to a diverse range of nutritious foods, leading to improved overall health and reduced risks of illnesses linked to diet, including obesity, diabetes, as well as cardiovascular diseases. Achieving food security in cities involves promoting sustainable food production and distribution systems.

Globally, urban agriculture provides access to fresh, nutritious vegetables in cities and support food security (Beach, 2013). It offers a way to generate revenue and reduce poverty, especially for low-income households (Ogot, 1996). By bringing people together and establishing communal spaces, urban agriculture can help foster social cohesion and community growth.

Urban agricultural programs have been put in place in cities like Berlin in Germany, Melbourne in Australia, and New York City due to their recognition of the value of local food production. By facilitating access to fresh produce, encouraging sustainable lifestyles,

and building community resilience in the face of food emergencies, urban farming and community gardens can improve food security (Gregerson, 1995).

Cuba experienced acute food shortages in the 1990s as a result of its economic problems and the loss of Soviet aid. The nation's urban agricultural movement, which focuses on small-scale, decentralized farming in cities, was born in response. This approach reduced reliance on imported food and improved food access for city dwellers (Ploeg, 2009).

Urban household farmers around the world face difficulties despite the many benefits of urban agriculture for food security. Huang (1995) claims that urban farmers in Portland, Oregon, have difficulty getting access to resources including seeds, fertilizer, tools, and equipment, all of which are necessary for successful agriculture. Their ability to successfully cultivate food may be hampered by limited access to these resources.

Urban farming is widely recognized as a crucial tool for eradicating poverty and food insecurity in Africa, enhancing nutrition, and fostering sustainable urban growth. In Accra, Ghana, urban agriculture has been practiced for decades, with various enterprises engaged in promoting and supporting urban farming. The significance of urban agriculture in guaranteeing food access as well as availability for low-income households, as well as helping them manage variable food prices, was highlighted in research by Lynch and (Binns, 1998). Urban agriculture has been a key tactic in increasing food supply in Dakar, Senegal. According to (Tefft, 2017), urban agriculture produced a large assortment of foods, including fruits, vegetables, and chicken, which helped to improve dietary diversity and overall food security.

According to (Iaquinta, 2002), there are various obstacles facing urban agriculture in Africa in terms of food security. The lack of sufficient land for production in urban areas is one of the main issues facing urban agriculture with regard to food security. Due to the fast urbanization, informal settlements, and competing land uses in many African cities, urban farmers find it challenging to get plots for agricultural activity especially animal rearing. For instance, the unpredictability of land tenure and informal land markets has posed serious obstacles for urban agriculture in areas like Lagos, Nigeria.

In East Africa for instance Dar es Salaam, Tanzania, Urban agriculture has been crucial in tackling issues with food security. Many city dwellers carry out small-scale gardening in open areas and plots. These initiatives have helped make fresh food more accessible and raised household incomes in metropolitan areas. Urban agriculture is crucial for improving food security and livelihoods (Alemayehu, 2022).

Urban agriculture has been embraced by Rwanda, particularly the capital city of Kigali, as part of its initiatives to increase food security and encourage sustainable urban growth. The construction of community gardens, school gardens, and personal gardens is part of the city's "Kigali Up" campaign, which encourages locals to participate in urban farming. These initiatives aid in lowering food insecurity and expanding access to nutrient-dense foods (WorldBank, 2016).

Due to fast urbanization and population increases, land is scarce in many East African towns. Furthermore, it might be challenging for urban farmers to access and invest in land for long-term agricultural activity because land tenure arrangements can be hazy and

unstable. For instance, Obange (2019) shows the issues with land tenure that urban farmers in Nairobi, Kenya, must deal with.

Urban farming was developed in Uganda as a result of the political and economic crises of the 1970s, and it is now widely used on the outskirts of large cities (Stewart et al, 2013). Along with the development of staple crops in urban environments, vegetable production makes up the majority of urban agriculture systems (Nakyagaba *et al*., 2023).

Uganda's capital city, Kampala, has witnessed an increase in urban agricultural programs. These programs have included community gardens, rooftop farming, and backyard farming. The United Nations Food and Agriculture Organization (FAO, 2011) indicates that these methods boosted urban residents' access to fresh vegetables. For that reason, efforts should be made to encourage such methods on individual confined lots. To encourage inhabitants to cultivate their own vegetables in confined locations, the Kampala Capital City Authority (KCCA) launched a backyard farming program. The program aims to ease the burden on rural food supply chains and provide access to nourishing food (Kironde, 2002). In Kampala, Makerere University conducted a study regarding the effects of urban agriculture on food security. Urban gardening provided a variety of fruits and vegetables that helped households feel more secure about their access to food. (Tomicevic-Dubljevic J, Slavica Cepic, 2017)

Due to Uganda's growing urbanization and conflicting land uses, (Mukwaya, 2012) stated that there is frequently little land available for agricultural activities in urban areas. Agricultural land is being developed for housing and industrial uses as cities expand. This might prevent urban agriculture from growing. For example, agricultural land has been

continuously encroached upon for urban growth in Kampala, the Ugandan capital, diminishing the amount of space available for agriculture. Additionally, people may be hesitant to devote time and money to urban agriculture if their ownership and tenure rights are uncertain. The long-term viability of urban farming programs might be hampered by the absence of defined property rights and legal frameworks (Binns, *et al*., 2012).

With about a million residents, Mbarara City ranks as Uganda's second-largest city (Lumu *et al*., 2013). It has shown signs of bringing about economic, political, and social change. As a result, many locals from various parts of the region are drawn to reside in Mbarara (MAAIF, 2010). More than 85% of households buy food from traditional market places, and less than 24% buy it from supermarkets. Some of the local population has come with the intensions of carrying out urban agriculture although the need to buy food from markets still exists due to expanding population. Given that the majority of the populations rely on the market for their food needs and that there is such a fast-expanding population estimating to 190,719, access to food for urban inhabitants has continued to be a serious problem.

1.2 Statement of the problem

Urban agriculture aims at safeguarding populations from food scarcity, enhance the nutrition value and increase on stability of food supply (Jiayu 2023; Gustavo 2019; Gómez 2020). In New York, Accra and Dakar urban agriculture has ensured food availability and accessibility for low income households and also assisted them in adjusting to volatile food prices (Alemayehu 2022; Binns & Lynch 1998; (James Tefft 2017). However, in other cities like Nairobi, Kampala and Lagos, urban agriculture has underscored its importance because people have continued buying food from rural areas, importing food in

supermarkets (Nakyagaba *et al*., 2023; Pay Drechsel 2015). Mbarara City is one of the newly elevated cities in Uganda where some households practice urban agriculture in different forms of enterprises (arable, poultry and animal rearing in backyards) with the aim of improving food security at household level. Despite the fact that enormous studies indicate that urban agriculture brings both positive and negative effects, all these studies have been carried out in major capital and older cities moreover using descriptive measurements rather than quantification by standard scales. Consequently, little or no information has been looked at from the upcoming cities and described how urban agricultural enterprises are being practiced. Understanding contribution of different urban agricultural enterprises in new cities would enable policy makers, city planners to make sustainable plans in early stages of a city so that only those enterprises that contribute significantly are emphasized among the households. Therefore, this study seeks to investigate the effect of urban agricultural enterprises on food security among urban households by examining the effect of animal farming, poultry farming and arable farming on food security in south division Mbarara City western Uganda.

1.3 General Objective

The study aimed at examining the effect of different urban agricultural enterprises on food security levels among urban household farmers in Mbarara City south division western Uganda.

1.3.1Specific Objectives of the study

(i) To examine the effect of urban animal rearing on food security among urban household farmers in Mbarara City South division.

(ii) To assess the effect of urban poultry farming on food security among urban household farmers in Mbarara City South division.

(iii) To analyze the effect of urban crop farming on food security among urban household farmers in Mbarara City South division.

(iv) To assess the effect of multiple urban agricultural enterprises on food security among urban household farmers in Mbarara City South division.

1.4 Research hypothesis

Four null hypothesis were tested in this study, thus

i. There is no significant difference between urban animal farming and food security among urban household farmers.

ii. There is no significant difference between urban poultry farming and food security among urban household farmers.

iii. There is no significant difference between urban arable farming and food security among urban household farmers.

iv. There is no significant difference between urban farming and food security having more than one urban agricultural enterprise.

1.5 Justification of the study

Little attention has been paid to urban agriculture byurban farmers, agricultural officials, researchers and policy makers in including urban agriculture in the urban physical planning of Mbarara City. This is attributed to limited knowledge about the importance of this activity in securing urban population against possible food scarcity. The current study was therefore meant to enlighten the urban farmers, agricultural officials, researchers on the extent to which urban farming affected food security among urban household farmers,

therefore giving them a basis to step up on urban agriculture. Although many studies have been done (FOA, 2016; Ratta and Smit 2001), they were conducted in other areas not Mbarara City South division. Therefore, recommendations from this study are also expected to form the basis for policy initiatives, especially in providing evidence for rethinking the policy concerning urban agriculture and food security among urban households in the city.

1.6 Significance of the study

Findings from the study will benefit the following different categories of people as discussed. Policymakers and administrators will learn from the study about the potential contribution of urban agriculture to the advancement of food security, the reduction of poverty, as well as resilient urban development. Policymakers and administrators can build policies and programs that encourage the advancement of urban farming while addressing the concerns of farmers and other stakeholders by understanding the potential associated with it.

The research will broaden the understanding of sustainable agriculture, especially in cities. Finding methods to produce food in cities that are ecological, socially just, and economically feasible is becoming more and more important as the world becomes more urbanized. The study can advance this crucial field of study and practice by examining how urban agriculture affects food security in urban households.

The study will assist urban household farmers in illuminating the potential advantages and difficulties of urban agriculture as a strategy for guaranteeing food security. Urban agriculture an offer farmers chances to increase their income and quality of life through the production and sale of fresh food in neighborhood markets. But it can also come with

difficulties, such as restricted ability to obtain water, land, and other resources, as well as possible health hazards from urban pollution.

The study will help urban planners and stakeholders to promote sustainable agricultural practices that are both economically viable and environmentally friendly because urban agriculture has a significant impact on the environment, and understanding its impact on household farmers can help to identify ways to reduce negative impacts such as soil degradation, water pollution and deforestation. The study will help globally in the implementation of sustainable development goals (2030) of 1 and 2 that is no poverty and no hunger.

1.7 Scope of the study

1.7.1 Geographical scope

The research was carried out in south division of Mbarara City western Uganda. The division constitutes of 7 wards and 64 cells. This location was chosen because the researcher intended to establish the effect of urban agriculture on food security among farmers in Mbarara city south division Southwestern Uganda.

1.7.2 Content scope

The study specifically focused on, examining the effect of urban animal rearing among urban households, assessing the effect of urban poultry farming among urban households, analyzing the effects of urban arable farming among urban households and assessing the effect of multiple urban agricultural enterprises on food security among urban household farmers in Mbarara City south division Southwestern Uganda.

1.7.3Time scope

The study lasted a period of two years (2022-2024). This time frame was chosen to allow the researcher to get responses from the respondents that are representative of their opinions based on observations made during this period, enabling the researcher to compile cohesive information from the respondents.

1.8 Conceptual Framework

This conceptual framework explains the key variables of the study Figure 1.1. Urban agriculture was the independent variable measured in terms of arable farming, animal rearing and poultry farming while urban household's food security was the dependent variable measured in terms of availability, accessibility, utilization and stability.

The illustration also consists of intervening variables such as conductive laws, ready markets for products, availability of inputs, availability of land, access to technology, access to information, value addition and access to financial services. These determined the state of food security through intervening variables.

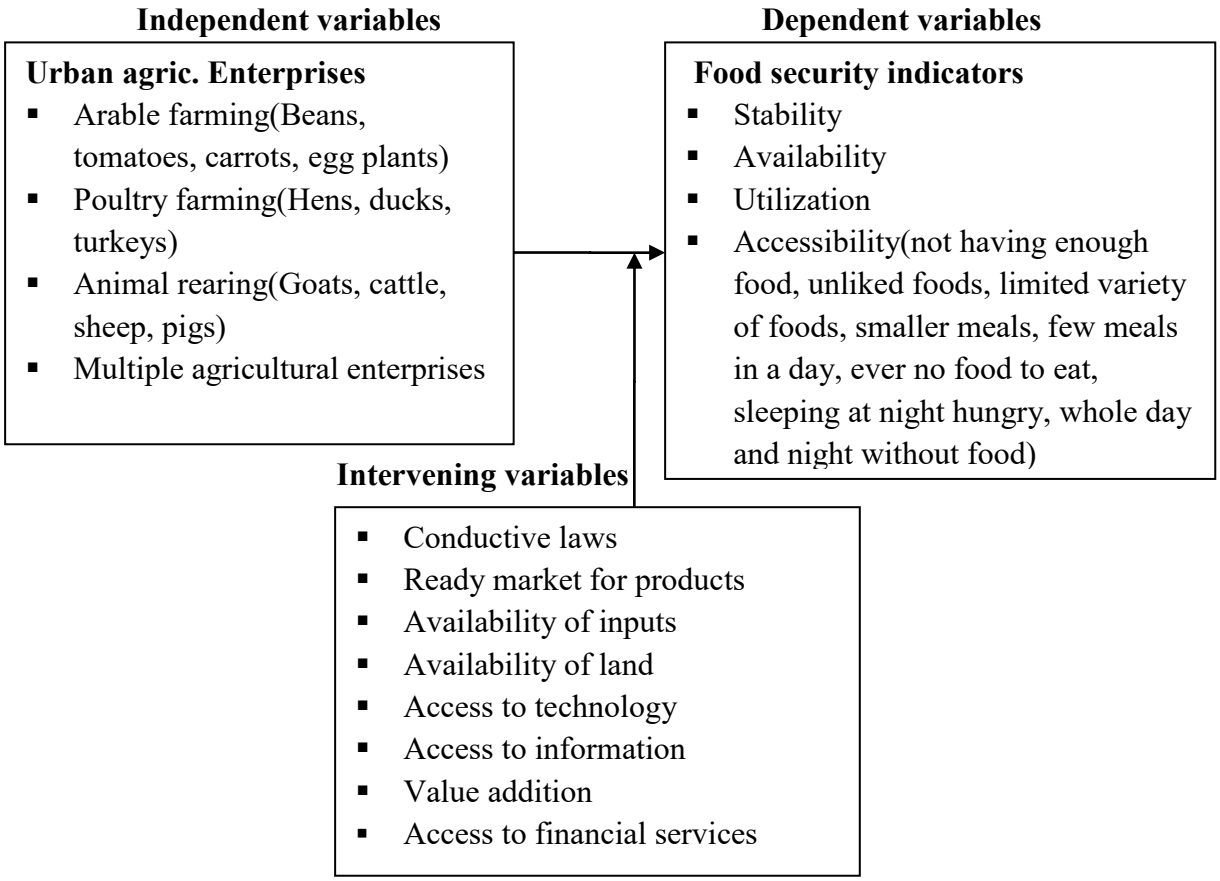

Figure 1.1:Conceptual Framework

Source: Ludwig Von Bertalnffy (2022). Modified by the researcher

From the above frame work, it was perceived that urban agriculture which involves; arable farming, animal raring and poultry farming, benefited urban household farmers through food availability, utilization, accessibility and stability. But for the above to be achieved their must be conductive laws, ready market for products, access to technology and access to information.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

This chapter presents the review of targeted journal articles, text books and grey literature (theses and technical reports). It aims at comparing studies by different scholars while identifying the gaps that were in there which the current study sought to close up.

2.2 Urban agriculture

Urban agriculture constitutes a sector that is situated inside (intraurban) or in the outskirts (peri-urban) pertaining to a city, town, or metropolitan. It develops, nurtures, prepares, and distributes a variety of both food and non-food items, reusing primarily the resources, both material and human goods, as well as amenities that are present in and around the metropolitan area, and providing material and human resources in return of goods, and services primarily to that city globally (FAO, Food security, issue 2, l-4, F AO (Food and Agriculture Organization), 2006).

Urban agriculture uses sites like rooftops, empty lots, and community gardens to relieve strain on rural agricultural land. Farmers can preserve agricultural land on the fringes of cities while maintaining local agricultural production by making effective use of the urban spaces that are now accessible. By preventing urbanization in high populated cities, this preservation of agricultural land helps to ensure sustained food security (Santo, 2016).

2.3 Food security

'Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs

and food preferences for an active and healthy life (FAO, The State of Food Insecurity in the World. Fourth Edition, 2002). Food security can be achieved when the quality, quantity, safety, type, nutritional value and social value of food are considered and the food can easily be afforded by the people who prefer it. (Rainer, Schoeneberger, Pfeifer, Hans-Joachim and Preuss (2000). This brings out the four dimensions of food security which include; food availability, food access food systems stability and food utilization. This four dimensions of food security are further discussed as follows;-

2.3.1 Food Accessibility.

The Household Food Insecurity Access Scale (HFIAS), a modification of the technique used to determine the prevalence of food insecurity in the United States (U.S.), was developed by the Food and Nutrition Technical Assistance (FANTA) project of USAID on an annual basis. The approach is predicated regarding the notion that the feeling of not having enough food (access) results into consistent behaviors and reactions that might be recorded, quantified, and summed up on a scale through a survey. The following are the ways that households lack access to food were revealed through qualitative study with American low-income households (Radimer *et al*., 1990; Radimer *et al*., 1992; Wehler *et al*., 1992; Hamilton, 1997). Emotions of unease around food (circumstances, assets, or supply); beliefs that there is not enough food (for both youngsters and adults); Food quality views (including features nutritional value, and diversity of diet sufficiency, and preference); declared decrease in consumption of food (among both adults and children); reported negative effects of lower consumption of food (among both adults and children); and felt disgrace for using unethical methods to get food.

Respondents are asked to identify actions and attitudes related to these distinct components, often known as "domains," of how food insecurity is felt in the 18-question U.S. Household Food Security Survey Module (US HFSSM) (Hamilton *et al*., 1997). For instance, a query on opinions of inadequate quantity inquires as to if any individuals were forced to consume less food than they believed they should. One of the questions pertaining to uncertainty asked the respondent if they were worried about food shortages for their family. A continuous indication of the degree of food insecurity in a family is provided by the summation of responses to the US HFSSM on a scale. Cut-off values on the measurement allow for the categorical determination of whether or not a household is food secure.

2.3.2 Food availability.

Food availability is "the physical presence of food in the area of concern through all forms of domestic production, commercial imports and food aid". Food availability can be assessed at different levels such as at community, district, national or regional levels. There are mainly three elements of food availability namely financial, socio-cultural and physical elements (WFP, 2009).

2.3.3 Food Utilization

According to (USAID,1992) food utilization is when, "Food is properly used; proper food processing and storage techniques are employed; adequate knowledge of nutrition and child care techniques exists and is applied; and adequate health and sanitation services exist.

2.3.4 Food Stability

Food stability combines food availability and food access dimensions of food security, it is concerned with availability and accessibility of food at all times (Maxwell S Frankenberg T., 1992). Food stability exists when the prices of foodstuffs are stable and when food supply is constant throughout a given period of time (Webb P., Rogers B, 2003).

In 2023, around 2.33 billion (35%) people globally faced moderate or severe food insecurity. A number that has not been changed significantly since the sharp turn up in 2020, amid the COVID-19 pendermic. Among those, over 864 million people experienced severe food insecurity, going without food for the entire day or more at times (WFP, 2024). In august 2022, 48% of the population in Uganda experienced moderate food insecure, and 11% experienced severe food insecurity (Daily Monitor 20th December, 2023)

2.4 Urban crop farming

Crop farming is the practice of cultivating plants on agricultural land primarily for food, fiber, or other essential resources. It involves preparing soil, planting seeds, and managing crop growth through practices like irrigation, fertilization, and pest control until harvest. Commonly cultivated crops include grains, fruits, vegetables, and fiber plants like cotton. Crop farming plays a critical role in food security and economic development, supporting both subsistence and commercial agriculture (Parker & Lusk, 2019).

Urban crop farming is becoming more popular as a way to give small-scale farmers an income source and provide city dwellers with access to healthy vegetables. Depending on the temperature, soil type, and resources available, urban farming systems employ a range of agricultural production strategies (M.Sekhar, 2024). There are some common

techniques, though, like crop rotation, water conservation, and the application of organic fertilizers. Since there is frequently a shortage of available space, farmers in urban contexts can cultivate crops intensively on small pieces of land. This calls for high-density planting, intercropping, and rotating crops in order to maximize the use of the available space as well as increase productivity. This study focused only on food availability, neglecting variables like utilization and stability, even though they would round out the analysis and characterize urban agriculture. The predominant arable farming during the characterization was not organized in this study.

The most often grown crops in Accra, Ghana's urban farming systems include exotic and indigenous leafy vegetables like amaranthus, lettuce, and spinach ((Joycelyn K. Quans, L. Escalante, Angela P-H. Kunadu, Firibu K Saalia, 2020). Urban farmers in Accra use a variety of practices to improve soil fertility, including crop rotation, intercropping, the use of organic fertilizers, and composting. To save water and minimize crop stress, farmers especially use water-saving techniques, including mulching and drip irrigation (Peter A. Y. Ampim, Samuel G. K. Adiku, John J. Sloan, 2015). According to (Opoku, 2021), urban farmers regularly adopt intensive gardening as a technique for crop production in Ghana. Although this study examined urban arable farming, it only looked at older, capital cities, excluding the more recent cities, and the magnitude varied from place to place.

Farmers in Dar es Salaam, Tanzania, rotate crops like maize, beans, and vegetables to preserve soil health and reduce the risk of pests and diseases (Shetto *et al*., 2007). Another method is container gardening, which involves growing food in things like buckets, bags, or pots. In Tanzania, Othman *et al*. (2020) found out that container gardening was a popular way for urban farmers to produce their crops. This comprises growing crops on

building rooftops using soil beds or containers. This study characterized urban arable farming but concentrated on the larger cities while ignoring the rapidly emerging cities which may be different in setting.

Farmers in Kampala's urban areas mostly grow vegetables such as amaranthus, spider plant, and nakati that are sold in neighboring markets (Akoth, 2021). Urban farmers in Kampala are progressively implementing various soil fertility management strategies, such as the addition of organic matter, crop rotation, and intercropping, in order to maintain soil fertility and boost crop yields (Akoth, 2021).

According to Kinyanjui *et al*. (2020), vertical farming is gaining popularity in Kenya's urban areas due to its capacity to cultivate crops in confined spaces. Compost, manure, and vermicompost are just a few of the organic fertilizers that farmers in urban farming systems, particularly in Nairobi, Kenya, use to raise agricultural yields and enhance soil fertility (Kamau, 2019). In addition, urban farmers usually grow green vegetables like kale and spinach as well as root crops like sweet potatoes and cassava (Charlie M. Shackleton, Margaret W. Pasquini and Axel W. Drescher, 2009) While classifying them, this study did not organize the majority of arable farming which would help policy maker to plan accordingly.

2.5 Urban poultry farming

The terms urban poultry, backyard poultry, and city chickens, all refer to flocks kept on residential lots. Keeping chickens in urban areas is becoming increasingly popular in the United States and other parts of the world. Many families keep small numbers of chickens as a source of eggs, as part of the local-food movement.(Jacob, 2024)

In poultry farming, several production methods are employed, including the production of broilers (Steven C. Ricke, 2024). In this instance, birds are reared specifically to provide meat. Because they are reared in controlled environments and are ready for slaughter quickly, broilers are a very efficient way to produce meat. The fundamental goal of layer poultry farming is egg production. Specialized breeds of hens are bred to improve egg production, and these animals are kept in laying coops with nest boxes and feeding equipment (Growel, 2023). This study concentrated on food availability while omitting other aspects, such as food utilization and stability, even though including all of these aspects would characterize urban poultry farming and make the study comprehensive. This study was incomplete since it did not characterize the prevalent poultry farming practices that would help urban household farmers to plot well.

In contrast to intensive production techniques, where birds are raised in tightly controlled environments to maximize growth and productivity, (Starmer, 2019) asserts that some poultry farmers opt for free-range or pasture-raised systems, where birds have access to outdoor spaces, allowing them to exhibit more natural behaviors. Using this strategy frequently requires close attention to diet, lighting, ventilation, humidity, and temperature. Despite characterizing urban poultry farming, this study did not arrange the fowl, which would have made the study effective.

However, according to (Kathleen L. MacMahon, 2008), raising chickens results in a lot of waste, including manure. If it is not adequately managed, this rubbish can lead to environmental issues, including soil erosion and water pollution farms. The primary sources of greenhouse gas emissions from the chicken sector are the management of manure and the manufacture of feed. As chicken production has intensified, biosecurity has

become a significant problem. The economy and public health can be seriously impacted by disease outbreaks like the avian flu. Strict biosecurity precautions are regularly implemented to prevent disease transmission between farms.

2.6 Urban Animal Farming

Urban livestock production refers to the rearing and processing of animals within municipalities (towns and cities). The increasing demand for livestock products in developing countries is mainly driven by urbanization. Urban livestock production system encompasses all types of livestock keeping in and around densely populated areas. In many cities, especially those with a long history of livestock keeping, like Lagos and Nairobi, urban residents raise goats for meat and milk. For this approach to be successful, zoning and administration are crucial. The study excluded the newly emerging cities in favour of older ones however, while characterizing urban animal farming, the scale varies from place to place (Kebede, 2023).

One of the key motivations for urban animal farming is food production. People raise animals for their farm meat and milk, which help to protect the environment by reducing the need to transport food across great distances (Kyembabazi, Ssemakula, 2020). Municipal laws, which frequently have a significant impact on how animals are raised in cities, make it challenging to raise animals there. Zoning rules, health legislation, and noise limitations may all forbid or authorize the activity, leading to a patchwork of laws in different urban areas. In urban animal rearing, appropriate cleanliness and animal health are crucial in order to minimize potential health concerns for both animals and humans (Maantay, 2002).

2.7 Multiple Urban Agricultural Enterprises

This refers to various types of agricultural activities that operate within urban areas such as urban animal rearing, urban poultry farming, urban crop farming. These enterprises can encompass a wide range of practices, including community gardens, rooftop farms, vertical farming, backyard farming, zero grazing and deep litter system. The term highlights the diversity and multiplicity of agricultural initiatives that aim to produce food, enhance local food systems, and utilize urban spaces for agricultural purposes.

Urban agriculture is recognized for its potential benefits, such as improving food security, fostering community engagement, reducing food miles, and promoting sustainability. Multiple urban agricultural enterprises often work in collaboration with local governments, organizations, and communities to address urban challenges like food deserts and environmental degradation (UN, 2019).

For example, according to a study by the United Nations (2019), urban agriculture can play a crucial role in enhancing food security and nutrition while contributing to urban greening and biodiversity:

2.8 Effect of urban animal farming on food security among urban households

Urban animal farming in Brasilia, Brazil, greatly helps ensure the food security of city dwellers. Brazilian beef export is large, but domestic consumption is still very high. Urban dwellers mostly rely on animal products like cattle and pigs to meet their protein demands. Urban animal farming is becoming more in demand in Brazil as a result of the growth of urban areas in order to fulfill the dietary needs of the population (Madaleno, 2000). Although this study looked at the impact of urban animal rearing on food security, it only

focused on older, larger cities, excluding more recently developed ones, despite the fact that the activities that can be done in each type of city vary depending on its size. One factor of food security was examined in the study. The study only examined one component of food security, namely food availability, neglecting other dimensions like food utilization and stability, even though the study would be complete if all of these factors were taken into account.

The benefits of recycling animal waste have been noticed by urban homes in Shanghai, China. Pig farming is a form of urban agriculture that makes it possible for households to recycle food wastes for use as animal feed, alleviating environmental restrictions and improving circular economy concepts (Juntao Wang, Wenhua Li, 2021). The influence of animal husbandry on the safety of food in terms of waste utilization and recycling was not quantified in this broad study. The study focused on older, larger cities, excluding newly emerging ones; however, the degree of influence varies from city to city.

Animal waste products can be used as fertilizer in urban agriculture, promoting environmentally friendly and sustainable practices. The integration of urban livestock farming into waste management systems in some European cities, including Berlin and Amsterdam (FAO, Transforming the livestock sector through the Sustainable Development Goals 2030, 2018), serves as an example of this. The demand on waste management systems is reduced by using organic waste from houses and food processing industries to make animal feed. This study shows how animal rearing affects food security, although it mostly concentrated on older cities, excluding more recent ones, even though something fresh may be done in such new cities. The study narrowed its focus on one element of food

utilization, neglecting other variables like food accessibility and availability; however, the analysis would be thorough if all variables were taken into account.

Animal agriculture results in the production of high-quality protein, primarily in the form of meat, milk, and eggs. Livestock is a good source of micronutrients and crucial amino acids, particularly in underdeveloped countries where diets may be low in specific elements ((Iannotti, 2021). This study demonstrates how raising animals affects the availability of food. However, it largely ignored other elements of food security, such as utilization and accessibility, and instead concentrated on food availability. Urban animal farming has an impact on food security in terms of the nutrients obtained, even though no quantitative analysis was done.

India's New Delhi is among the global top milk producers, as well as dairy farming in particular is crucial to ensuring urban residents' food security. According to a report from the National Dairy Development Board (NDDB**)** published in 2021, dairy farming helps millions of rural people survive while also meeting the growing demand for milk and dairy products in urban areas. Despite the fact that this study investigated how urban animal farming boosts food security, it focused solely on one sector, which is dairy farming, and ignored others, such as beef farming, that can also help cities' economies become more diversified. This study focused on older, larger cities while excluding emerging, newer cities, as cities' sizes vary from location to location.

China's animal husbandry sector is essential for supplying the country's rapidly expanding urban population with food. China is the world's largest producer of pork and the country with the highest meat consumption. The Food and Agriculture Organization (FAO, 2020**)**

claimed that China produced more than 50% of the world's pork in 2020, demonstrating the significance of animal husbandry in ensuring the availability of food for urban households. Despite the fact that this study looked at how animal rearing affects food security, it focused only on the effects of pig production, which is pork, ignoring other animal-based products that would also be important, such as beef and chevon. The study relied on food availability while ignoring other variables like food utilization and stability, but it would be comprehensive if all aspects affecting food security were taken into account. Even if there are distinct activities in such new cities, this study concentrated on older, larger cities while disregarding newly emerging cities.

2.9 Effect of urban poultry farming on food security among urban households

Poultry farming requires less area than other cattle-raising techniques do. Urban households can therefore raise small flocks of hens even in cramped spaces like backyards, rooftops, or shared gardens (Jacob, 2024). Due to the effective use of land for chicken farming, urban inhabitants may produce food locally, lessening their dependency on long-distance food supply chains. The magnitude of the influence varies by city, and while this study examines how poultry farming affects food security, it should be highlighted that it was undertaken in small metropolitan areas.

Urban farming can employ manure, an organic waste product of chicken farms, as fertilizer. In addition to reducing the demand for synthetic fertilizers, this waste recycling strategy increases urban garden production and soil fertility, increasing the amount of food produced and its accessibility n (FAO, Transforming the livestock sector through the Sustainable Development Goals 2030, 2018). To build a sustainable closed-loop system that enhances crop yields and soil quality for instance Berlin. Even though this study

focused on how chicken farming affects food security, it only addressed accessibility and availability, ignoring other factors like utilization and stability. However, if all factors were taken into account, the study would be comprehensive. The study focused on older, larger cities, excluding newly emerging cities, even though something new could emerge in such towns.

Urban poultry farming boosts food resilience and self-sufficiency by reducing reliance on outside food sources. By doing so, it lessens the dangers brought on by disruptions in the food supply chain, like those that happen during natural disasters or financial crises. Urban households are able to have some degree of control over their food supply because of it. For instance As a result of developing poultry farming techniques during the COVID-19 pandemic, some urban households in countriy like Bangladesh was better able to ensure a steady supply of eggs and chicken meat, which aided in their food security during lockdowns and travel restrictions (FAO, Food security for households most affected by the COVID-19 crisis in at-risk low income urban areas, 2023). Despite the fact that this study examined how chicken farming affects food security, it only looked at two aspects of food availability and utilization while ignoring other food-related factors like stability and accessibility. However, the study cannot be considered complete without considering all of these elements. Considering the fact that this study looked at how urban poultry farming affects food security, it centered on older, larger cities while disregarding younger, less developed ones, where something new might emerge.

As a convenient and affordable source of animal-based protein, poultry products help people diversify their diets. For instance, chicken farming was a key source of affordable animal protein in Brasilia, Brazil, which has experienced extensive urbanization (Gani,

2019). Chicken farming can fill the void in urban areas where access to conventional livestock may be constrained and improve nutrient intake. Urban populations have benefited from increased consumption of poultry by diversifying their diets and reducing their reliance on more expensive sources of protein (Kayonde, 2019). Poultry farming can help urban populations by increasing access to nutrient-dense food options and enhancing nutritional security (Bruin, 2020). Despite describing how urban poultry rearing affects food security, this study mainly concentrated on food availability while ignoring other elements including stability, accessibility, and utilization. If the study concentrated on every area, it would be complete. This study focused on larger cities while excluding newly emerging cities, although the impact of the city varies depending on where it is.

Particularly broiler chickens have a rather quick production cycle when compared to other animals. As a result, meat production has accelerated, expanding the food supply. According to Dafwang *et al*. (2017), broilers can reach market weight in 6-7 weeks, enabling more frequent harvests and a speedier transition from production to consumption. This study only considered the availability of food in explaining how chicken farming improves food security, neglecting other variables like utilization, accessibility, and stability. The study would be conclusive if all variables were taken into account. In general, it can be claimed that chicken farming affects food safety in relation to the nutrients obtained, irrespective of the lack of quantification. The study focused on just one poultry product, chicken broiler, ignoring other poultry-based products like layers, which would diversify the economy if all were taken into account.

A large portion of the urban population of Lagos, Nigeria, depends on urban chicken farming to meet their needs for nutritive protein. The chicken industry in the country has

been steadily growing, and it currently has a significant impact on the supply chain for meals consumed in cities (Adesehinwa, 2020). Local chicken production, especially in backyard systems, has increased the availability of cheap sources of protein, which is essential in urban environments where having access to a range of foods at reasonable rates may be constrained. This study mostly ignored newly developing cities in favor of older, larger ones. The amount of influence varies by city, and while this study examines how poultry farming affects food security, it should be highlighted that it was carried out in older, larger cities.

2.10 Effect of urban crop farming on food security among urban households

In Nigeria, crop farming has a sizable impact on urban residents' access to food. As per a research article published in the journal "Sustainable Development," small-scale urban farmers grow fruits, vegetables, and other crops in cities like Lagos and Abuja to help augment the food supply for the city's growing population. (Sophie de Bruin, Just Dengerink, 2020) demonstrates that local food production enhances urban residents' food security by lowering their reliance on expensive imported food goods. This study shows how arable farming impacts food security, although it primarily focuses on older cities while disregarding newer ones and the magnitude of the city varies depending on where you are.

It is obvious how crucial crop farming is to increasing urban residents' access to food in Kenya (Onyango Omondi Samuel, 2020). By cultivating crops like maize, kale, and beans within municipal boundaries, urban farmers have been able to provide city people, particularly those in low-income regions, having access to reasonably priced, healthful meals options. This strategy enhances dietary diversity and food accessibility for urban

households **(**FAO, 2017). The effect of arable farming regarding food security in terms of the crops grown can be expressed generally, despite the lack of quantification. This investigation looked at the impact of poultry farming on food security, but it only addressed availability of food, excluding other elements like utilization and accessibility. If these elements were taken into account, the study would be comprehensive.

Agribusiness is crucial to addressing difficulties with food security in South Africa's urban areas. (Duduzile G MbajiorguI; Kola O Odeku, 2022) supports urban agricultural efforts to promote sustainable food production for instance, Cape Town residents can now grow their own vegetables and herbs thanks to the construction of rooftop farms and community gardens. These initiatives promote local employment opportunities while also enhancing food security by delivering fresh produce directly to urban homes (DAFF, 2018). While this study explains how arable farming affects food security, it mostly focuses on the availability of food, neglecting other aspects like food utilization, even though the study would be complete if those aspects were addressed. The study also focused on larger cities while disregarding those that were just developing, yet the impact of size varies from city to city.

Rwanda has developed urban agriculture to a great extent to increase food security. There are more rooftop farming initiatives and community gardens in Kigali, the capital of Rwanda. These initiatives provide healthy meals and opportunities for employment to urban households, particularly those run by women and young people (Kabagambe, 2022). This study shows how arable farming affects food security, despite the fact that it centered primarily on older, larger cities and excluded rapidly developing ones, even though the size

of cities varies depending on the location. In terms of financial gain, there was no quantification done.

Urban agriculture reduces the distance that food must travel from rural to urban regions, lowering transportation-related emissions and energy use. To lessen the effects of climate change, regional food production is crucial. (Michal Kulak,A.R. Graves, 2013) urban farming reduced greenhouse gas emissions associated with food delivery. This study examines the impact of arable farming on food security, although it only considers one aspect of food accessibility, ignoring other aspects like utilization.

2.11 Conclusion

40% of the literature of the study reviewed did not consider the newly developing cities, all aspects of food security, quantification of the study and the dominant urban agricultural enterprises whereas 60% of the literature reviewed tried to consider all of them.

2.12 Operational definitions/terms and concepts

Urban agriculture refers to the practice of growing, processing, and distributing food and other agricultural products within urban and peri-urban areas, typically in or near densely populated cities.

Food security is defined as a state in which all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life

Crop farming refers to the cultivation of crops on land that is suitable for agricultural production.

Animal farming, also known as animal rearing or livestock farming refers to the practice of raising animals for the purpose of obtaining food, fiber, and other products.

Poultry farming refers to the practice of raising domesticated birds, such as chickens, ducks, turkeys, and geese, for the purpose of producing meat, eggs, or both.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter explains the study area, research design, target audience, sample size and sampling procedures, data collection methodologies, data handling procedures, data analysis, study variables, and measurements.

3.2 Study Area

The study was conducted in Mbarara City south division, south Western Uganda. Mbarara city is strategically located as a major economic hub along the highway to Rwanda and Democratic Republic of Congo. It is the major city in south western Uganda. Mbarara City, is located 266 kilometers from Kampala on the Kampala-Kabale road. Geographically, it is found at longitude $30^0$37I East and latitude $0^0$36I South and is bordered by Rwampara and Isingiro districts to the south. The city serves as the primary economic hub and is home to the Mbarara District's political and administrative centers. The entire land area within the city limits is approximately 449.09 km2 (44,909 hectares), and it is divided into two divisions: Mbarara City South (191.49 km2) and Mbarara City North (257.6 km2). There are 187 villages and 23 wards in Mbarara City (Kakyebezi, 2021).

The study area was selected because it is an upcoming city and people are attracted from different regions to come and settle there, therefore is a need to know the magnitude of their food security in terms of household levels.

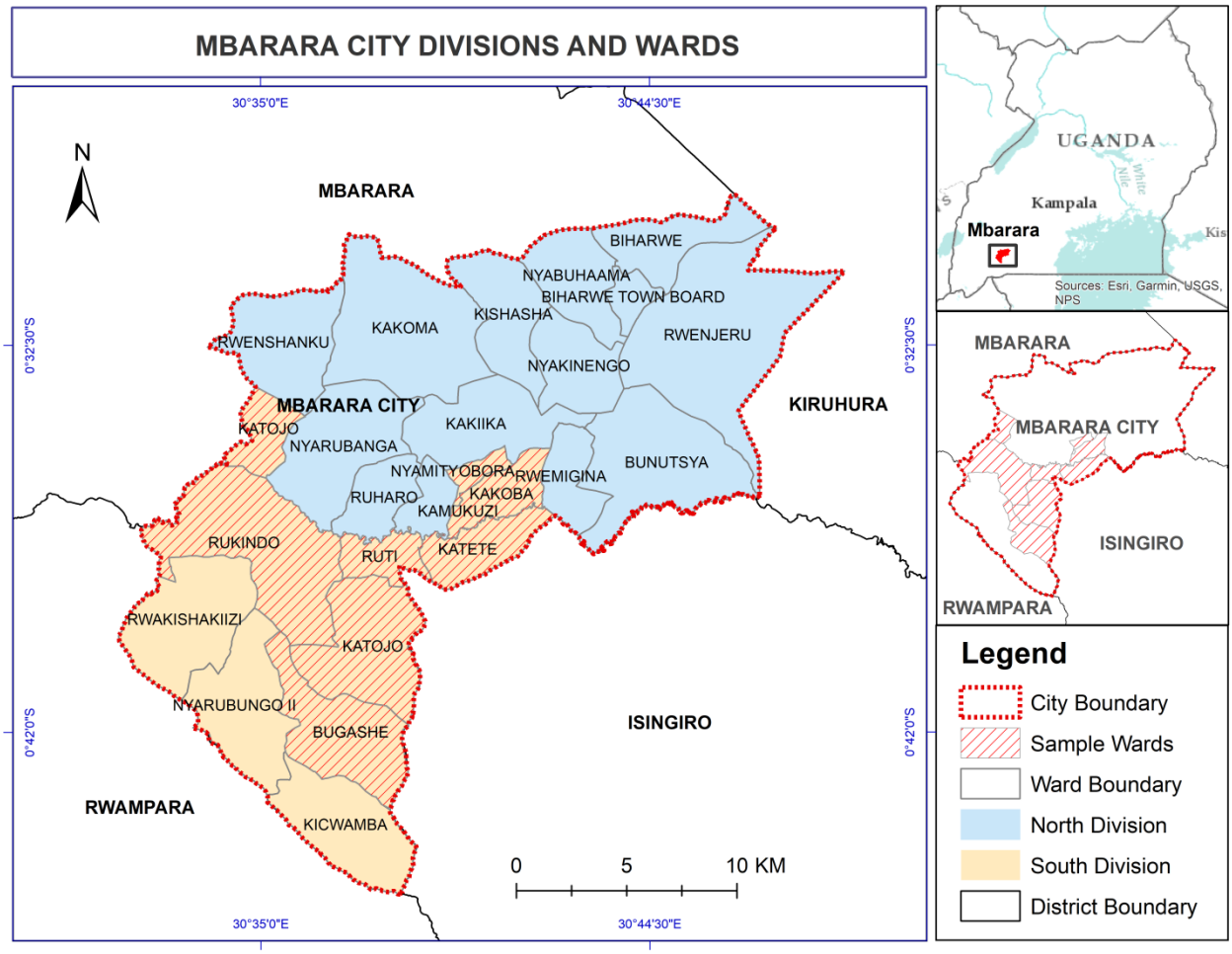

Figure 3.1: Map of Mbarara city showing south division wards

3.2.1 Demographic characteristics of Mbarara city

There are 23 wards in Mbarara City's two divisions, Mbarara City North and Mbarara City South. The city's total population in 2014 was 195.013. This population was at its highest at night and was predicted to be 250,000 during the day. There are currently 300,000 people living in the city throughout the day, according to estimates. A 5% annual growth rate for the population is predicted. Mbarara City North had a population of 77,928 in 2014, made up of 37,900 men and 40,028 women. Mbarara City South had 117,085 people living there, made up of 57,434 men and 59,651 women. It is anticipated that by 2024,

there would be 317,656 people living in Mbarara City North, 126,937 in Mbarara City South, and 190,719 overall (Kakyebezi, 2021)

3.2.2 Ethnicity

Mbarara city is ethnically diverse, but the predominant ethnic group in the region is the Banyankore. The Ankole people, known for their cattle-keeping traditions, are part of the larger Bantu ethnic grouping, which is spread across much of sub-Saharan Africa. The culture and social life of Mbarara and the broader Ankole region are heavily influenced by the historical and economic importance of cattle. Apart from the Banyankore, Mbarara city, being an urban center, has attracted a variety of other ethnic groups from different parts of Uganda and neighboring countries. This mix includes the Baganda, Basoga, Banyankole, Bakiga, Batooro, Banyarwanda, and others, each contributing to the cultural diversity of the city. The city's role as a commercial and educational hub has further enhanced its multicultural and ethnically diverse character, making it a melting pot of traditions and languages (Kembabazi 2020). This expanding population has put pressure on food security

3.2.3 Geomorphology

Mbarara City is characterized by diverse geomorphologic features. The region's landscape includes hills, valleys, and plains. The city is typically located at a height of 1,432 meters above sea level. It sits on the Ankole Plateau, known for its undulating terrain that is favorable for arable farming enterprises. The surrounding landscape has been shaped by various geological processes, including weathering and erosion that has led to growth of pasture favorable for livestock keeping that was seen to be a big contributor of food security of the city. Hills in Mbarara area often exhibit rounded or gently sloping profiles,

indicative of prolonged weathering and erosion. Valleys, formed by the action of rivers and streams, contribute to the overall topographic variability. The city's geomorphology is influenced by the presence of water bodies, such as river Rwizi and Lake Mburo to the east, contributing to the shaping of the land over time (Kakyebezi, 2021). This geomorphology has attracted some household heads to carry out urban agriculture in order to be food secure.

3.2.4 Climate

Mbarara City experiences a tropical savanna climate. This climate type is characterized by two main seasons: a wet season and a dry season. The wet season sees significant rainfall, typically occurring from March to May and then again from September to November. These periods are when the city receives the most rainfall, contributing to its lush green landscapes. The dry season spans from December to February and from June to August, during which rainfall is much less frequent. Temperatures in Mbarara are relatively stable throughout the year, with average daytime temperatures ranging from about 25°C (77°F) to 30°C (86°F). Nights are cooler, with temperatures dropping to between 15°C (59°F) and 20°C (68°F). the climate is favourable for urban agriculture which can curb the challenges of food insecurity due to expanding population.

3.2.5 Geology and Soil

The geological framework of Mbarara city consists of Precambrian rocks overlain by younger sedimentary and volcanic deposits in some areas. The Precambrian basement rocks, which form the foundation of the region, are part of the ancient cratons that make up much of Africa's core. These rocks include gneisses, schists, and quartzites, which are

metamorphic in nature, reflecting the high pressures and temperatures they have been subjected to over geological time.

In addition to the Precambrian basement, the area has experienced volcanic activities associated with the rifting process. These activities have deposited volcanic rocks in various locations, contributing to the region's diverse geological makeup that have formed fertile soils for arable farming. The valleys and associated faults have also led to the formation of sedimentary basins where newer sediments have accumulated over time.(Kakyebezi, 2021)

The soils in Mbarara City vary but are generally derived from the weathering of these underlying rocks. The soil types can be broadly categorized into a few main types such as Ferralsols which are deeply weathered tropical soils, rich in iron and aluminum oxides, common in parts of the city. They are well-drained but can be nutrient-poor due to intense weathering, Acrisols and Nitisols soils are also prevalent in the city, characterized by a higher nutrient content compared to Ferralsols, making them more suitable for agriculture. They are often found in areas with moderate to high rainfall. These soils are suitable for urban agriculture especially urban arable farming. This can contribute to food security levels among urban household farmers.

3.2.6 Vegetation

Mbarara city has a mix of vegetation types largely influenced by its climate, topography and human activities. The most dominant vegetation type in the region is Savannah grassland characterized by vast grasslands with scattered trees and shrubs. The Savannah

supports a range of grass species which are well adapted to both wet and dry seasons important for animal farming.

3.2.7 Land use activities in Mbarara city

Mbarara City is a major urban hub with the physical, social, and economic qualities needed to spur industrial growth. The city has a significant potential for the growth and promotion of industries, as evidenced by the present rate (approximately 8%) of industrial development and the numerous criteria for industry sites. On a very modest scale, agriculture is carried out in areas where development has not yet begun and on open terrain like compounds and road reserves. Crop cultivation and animal farming (including poultry, rabbits, and livestock raised on zero- and free-range grazing) are included in this agriculture. It serves both commercial (income-generating) and dietary needs. This is done on a personal level. Another significant activity taking place in the city is construction. About 98 percent of this work is done by individuals for their own facilities, primarily commercial, residential, and industrial buildings. The city officials only occasionally engage in construction work, and this work is done through contracts or open competition (Kakyebezi, 2021).

3.3 Research Design

The research adopted a study design that was cross-sectional. The research gathered data collected from a sample population in a specific, predetermined time period. It involved a short interaction with several people regarding how urban agriculture affects food security among different urban household farmers in the division at a given time period.

3.4 Sampling size and sampling strategy

This information is summarized in Table 3.1.

Table 3.1: Sampling size and sampling strategy

The population sampled was from the total population which was from different wards, cells which includes household heads, LC1 chairpersons and key informants using different sampling strategies as summarized in Table 3.1

Category	Total population	Sampled population	Strategy
Wards	10	7	Purposive sampling
Cells	64	31	Proportionate
Household heads (respondents)	1374	309	Simple random
LC 1 chairpersons	64	31	Purposive sampling
Key informants (Extension workers, policy makers, city planners, production officers)	4	2	Purposive sampling

There are 10 wards that comprise Mbarara City's south division and out of these wards 7 were purposively sampled which included Kakoba, Ruti, Nyamityobora, Katete, Bugashi, Rukindo, and Katojo. There are 64 cells in total and using proportionate sampling, 31 cells were considered (table 3.2). Using Simple random sampling 309 household farmers were sampled using the Slovenian technique of computation (Prevolnik, 2020) out of the 1,374 household farmers in the south division of Mbarara City. Out of 64 local council 1s, 31 were purposively sampled in order to get registers about household farmers. Two key informants (city planners, production officers) were purposively sampled from 4 in order to get more information on urban agriculture.

The sampled cells were got from the sampled wards as summarized in Table 3.2

Table 3.2:Sample frame

WARD	CELL
Kakoba	Rwentondo,Nyakaiz, Kyapotanyi, Rwemigina, Mwengura, Koranorya
Katete	Karugangama, Kabele I, Kaale II, Omukihogo
Nyamityobora	Kijungu, Kisenyi, Makenke, Agip, Kiswahili
Katojo	Kachwama, Karuyenje, Kakyerere I, Kakyerere II, Kishasha
Ruti	Tankhill, Rwizi, Katera I, Katera II, Nyakayojo
Bugashe	Kata, Kasheshe, Kitojo
Rukindo	Kanombe, Kanyinya, Nyakaina

Kakoba ward had 12 cells but 6 were sampled. Out of 6 cells in Katete ward, 4 cells were sampled. Nyamityobora had 10 wards, 5 were sampled. In Katojo 5 cells were sampled out of 10. Out of 10 cells in Ruti ward, 5 were sampled. 3 cells were sampled from Bugashe ward out of 6 while in Rukindo ward 3 cells were sampled out of 6.

3.5 Methods and instruments for Data Collection

Primary data was mainly sourced from the field and different methods were used to collect the data. Each objective was achieved by collecting data using various methods. These methods included interview guide, observation check list and questionnaire scale.

3.5.1 Interview Method

The interview method was applied to gather data about the effect of multiple urban agricultural enterprises on food security among urban household farmers using an interview guide (appendix 1). The guide was used because it is clear, accurate, and saves time. The interviewees were the key informants that is, city planners and production officers. The method was used because it is clear, accurate, and saves time.

3.5.2 Questionnaire method

Questionnaire method was used to obtain data about the effect of urban crop farming, urban animal farming and urban poultry farming and multiple urban agricultural enterprise on food security (appendices 2, 3, 4 and 5). The researcher chose this method because it was useful for understanding opinions and attitudes of urban household farmers. The urban household farmers were asked about effect of different urban agricultural enterprise and their food access status was assessed using the Household Food Insecurity Access Scale (HFIAS). The indicators of food access include worrying about the ability to get food, eating food that one does not prefer due to limited resources, eating a limited variety of food due to lack of resources, eating food that one does not want due to Jack of resources to obtain other types of food, eating a smaller meal because there was not enough food, eating fewer meals in a day because there was not enough food, having no kind of food because of lack of resources to get food, going to sleep at night without food because of lack of resources to get food and going a whole day and night without food because there was not enough food (Coates, 2007) . Each participant was asked about the occurrence of events as indicated in table 3.3.

3.6 HFIAS occurrence questions

Each of the questions in the following table is asked with a recall period of four weeks (30 days). The respondent is first asked an occurrence question that is, whether the condition in the question happened at all in the past four weeks (Yes & No). If the respondent answers "Yes" to an occurrence question, a frequency of occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

Table 3.3: Presents the occurrence Questions that were used to find out the food access status of households. For this study, the HFIAS score was adopted.

No.	Occurrence Questions
1	In the past four weeks, did you worry that your household would not have enough food?
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
6	In the past four weeks, did you or any household member have to eat 'fewer meals in a day because there was not enough food?
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

3.7. HFIAS score

The first is the HFIAS score which considers if any of the events in table 3.3 occurred once (1), sometimes (2) or often (3) or never (0) occurred at all. The sum of the scores add up to an upper limit of 27 if the respondent answers often to all the nine questions with a code of 3 and minimum of zero if the answers are never to all the nine questions (De Cock,2012).

HFIAS score= Y 1 +Y2+Y3+Y4+Y5+Y6+Y7+Y8+Y9 ……(ii)

Where Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8 and Y9 are occurrence of events stated in questions shown in table 3.2. If the score is closer to 27, then the household will experience

food inaccessibility. However, if the score is closer to 0, then the household will experience food access (Coates et al., 2007).

The modification of this model would imply that if the household is closer to 0-6, it is food secure, 7-13 it is mildly food insecure, 14-20 the household is moderately food insecure and 21-27 it is severely food insecure.

NOTE: Although there are various options of food security aspects, this study concentrated on food accessibility since food accessibility measures connects well with the research topic.

3.8 Data Analysis

Given the nature of data obtained about food security, analysis was done in SPSS (16.0) basing on two steps including Bi-normial statistical analysis which analysed the first step of only two occurrences (yes or no) of the score card indicators of food security. In this case, the researcher applied the bi-normial test proportion (assumption of 60%) which grouped the yes and no responses. In this case for one to say that the majority were yes or no, should be above average. In this test, we expect that the observed is above 60%. If it is true, it would give us a P-value of $P<0.05$ and vice-versa.

This was followed by the second step that involved three occurrences (rarely, often and sometimes). This second step combined Bi-normial statistical analysis and a chi-square to test (Pearson's chi-square) to test whether these (the rarely, often and sometimes) were different or similar across the wards and to what extent these were similar or different, or to test whether any of the three was associated with the ward(s). This tested variation in food security by individual enterprise across wards. For each of the three (often, sometimes

and rarely), the system created a dummy variable, where within rarely you have two alternatives where if one has not said rarely then they are assumed to be in another class. So here the comparison was between those who said rarely and those who belonged to another class.

3.9 Ethical Considerations and Approvals

Ethics consideration refers to a well recognized set of moral guidelines that are recommended by a person or organization and provide guidelines and behavioral standards for both researchers and research participants. Ethical clearance was sought from Kyambogo University in the graduate School, to conduct research. During the pre-test data collection process, the researcher ensured that all authorities were informed of the study's goals and methods in an effort to win their support and assistance.

3.9.1 Informed Consent

The researcher ensured that the study was in accordance with the guidelines and protocols specified in the research design. Each participant in the study filled out an informed consent form that details the study's objectives. To protect the research's confidentiality and encourage participation, participants were occasionally asked for verbal consent. Additionally, the respondents and participants were made aware of their ability to withdraw from the study at any time and that participation was voluntary. The researcher ensured that the research was carried out with the research supervisor's regular advice and direction.

3.9.2 Participants' Confidentiality

The researcher ensured that data presented ensured that the interview questions and questionnaire items do not in any way divulge the respondents' identities and was not requested regarding to the response names. To ensure participant privacy, a unique identification number was assigned to each participant's record. Prior to participation, participants were required to provide written consent, and during the entire process, confidentiality and anonymity was stressed. Only the participants in the study accessed data that personally identified them. The survey remained anonymous (there wasn't any way of identify a participant on the survey questionnaire) and participants were fully informed about the methods used to collect the data. Subject names and other identifying information were only collected for quality control purposes; no study report ever identified a specific person.

When a research study is conducted, ethical considerations refer to the standards of conduct that will be followed. It is frequently advisable to conduct research investigations in accordance with higher moral standards. Because of this, the identities of the people whose information will be gathered will be kept totally confidential throughout the analysis.

No person was a subject of the study unless he or she voluntarily agreed to participate in it. As a result, this analysis was conducted with the utmost honesty, using the information or data that was collected from respondents. The gathered information did not negatively affect the group as a whole.

While conducting the study, the researcher made sure that the respondents were never disclosed; the questionnaires were coded to preserve anonymity. Both appropriate documents and informed consent were sought.

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND ANALYSIS

4.1 Introduction

This chapter contains the presentation of data collected from the field, interpretation and analysis of the results.

4.2 Demographic characteristics of urban household farmers of Mbarara City South Division

The researcher felt it was crucial to first comprehend the demographic dynamics of the people she was working with, as the research material dealt with the spatial and social component of food security. These were summarized in form of a table as in indicated in table 4.1 which showed demographic traits of the population that was engaged with, as gathered from the field.

Table 4.1: Demographic characteristics of the population in Mbarara City South division.

S/N	Demographic characteristics	Number	Percent
1	**Gender**		
	Female	167	55%
	Male	140	45%
2	**Age group**		
	18-30 years	42	14%
	31-43 years	120	39%
	44-56 years	82	27%
	Above 57 years	63	21%
3	**Marital status**		
	Single	94	31%
	Married	135	44%
	Divorced	50	16%
	Widowed	28	9%
	Others specify	00	00%
4	**Level of education**		
	No formal education	101	33%
	Primary education	140	46%
	Secondary education	42	14%
	Tertiary education	24	7%
	Others specify	00	00%
5	**Religion**		
	Catholic	94	31%
	Anglican	99	32%
	Islam	42	13%
	Seventh day Adventist	20	7%
	Pentecostal	52	17%

Table 4.1, indicates that majority of the respondents were people in the age bracket of 31 - 43 (39%) while the age bracket 18-30 was not only the youngest age group considered but also contained the least number of respondents (14%). Majority of those engaged in urban agriculture were married people (44%) while the widowed were the minority (9%). Majority of the urban farmers were those that had acquired primary school education (46%). The most highly educated people at tertiary level were not so much into urban

agriculture (7%). These were engaged in other enterprises other than agriculture. Anglicans dominated the urban farming activities (32%) as compared to the seventh-day Adventists who registered the least number of respondents (7%).

4.3 Effect of urban animal rearing and food security among urban household farmers in Mbarara City South division

On a small scale, the majority of male urban household farmers raised cattle, goats, rabbits, and pigs. The most often used techniques were backyard farming, zero grazing for cattle (Plate 4.1) and the free-range system for goats. Because of the prevalence of Islam in the area, the majority of the farmers kept goats in their backyards, while a few kept pigs. About piggery, a respondent noted that,

> *"I am a moslem, I cannot keep pigs because it is against my religion, I only keep goats and cattle and its where I generate income to buy food for my family."*

Another respondent highlighted the economic benefits, stating,

> *"By selling the surplus milk from our cattle, we generate additional income that we use to buy other essential items. This extra income ensures that we can afford a balanced diet, even when the prices at the market fluctuate."*

This sentiment was echoed by several participants indicating the benefit of having surplus milk from the reared cattle.

Plate 4.1:Photograph showing urban animal farming on zero grazing in Rwentondo cell, Kakoba ward Mbarara city south division.

A scientifically approved scale known as the household food insecurity access scale was used to collect data on how urban animal farming enterprises affected the food security of various households in various wards of Mbarara city south. This was done in accordance with the study's first objective, which aimed at, the effect of urban animal farming and food security among urban householdfarmers in Mbarara city south. A household that engaged in this kind of venture could be classified as food secure, mildly food insecure, moderately food insecure, or severely food insecure, depending on the magnitude. As a result, the number of homes from various wards that fit into one of the categories above was counted, and the outcomes are shown in Table 4.2.

Table 4.2: Effect of urban animal farming and food security among urban household farmers found in different wards of Mbarara City South division.

Ward	Food security levels among households that practice urban animal farming in different wards				
	Food secure	**Mildly food insecure**	**Moderately food insecure**	**Severely food insecure**	**Total**
Kakoba	7	8	3	0	**18**
Katete	6	6	0	0	**12**
Nyamityobora	6	8	1	0	**15**
Katojo	4	10	1	0	**15**
Ruti	3	4	5	0	**12**
Bugashe	2	6	1	0	**9**
Rukindo	4	5	0	0	**9**
Total	**32**	**47**	**11**	**0**	**90**

The highest food security was found in Kakoba ward where only seven households were food secure, while the least food security was found in Bugashe ward where only two households were found to be food secure (table 4.2). Katojo was the lead of the category with 10 households in this group to be mildly food insecure while Ruti was the least with only 4 households in this category (table 4.2). Kakoba and Ruti wards had the highest number of households that were moderately food insecure (table 4.2). The study revealed that none of the urban animal farmers was critically or severely food insecure as indicate by zero number of households were recorded with food insecurity. It is therefore indicative that urban animal raring gives some degree of food security ranging from food security to mild insecurity and moderate security.

The results in Table 4.2 were represented for better visual analysis and impression. This was in form of a pie chart as shown in Figure 4.1.

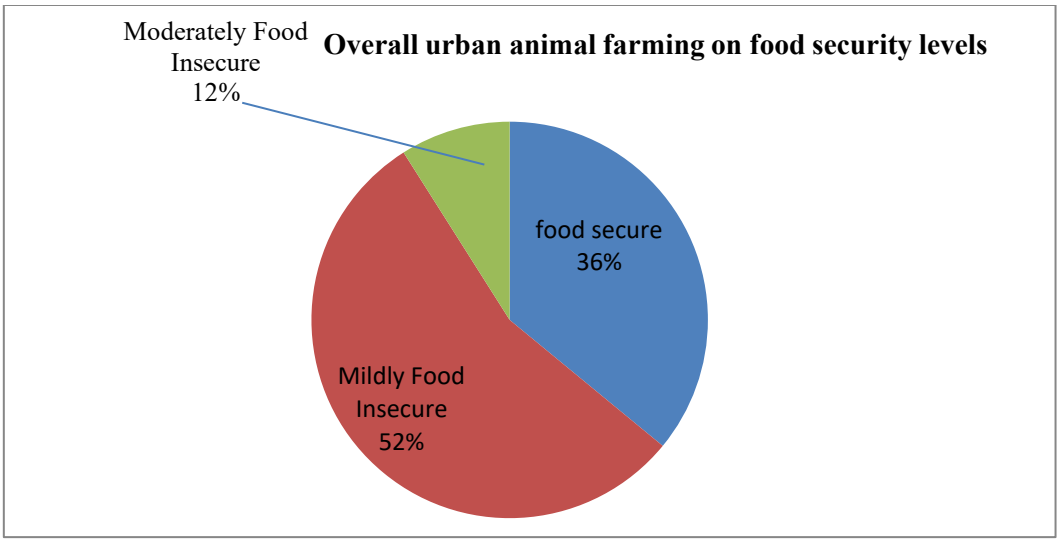

Figure 4.1: Overall food security levels among urban animal household farmers in Mbarara City South division

Based on the total number of farmers that practiced urban animal farming in the different wards, the highest number of urban animal farmers was registered in Kakoba, while Rukindo and Bagashe registered similar but least number of urban animal farmers. Based on the different levels of food security in different wards, urban animal raring brought about 35.6% food secure in the division shown in figure 4.1. On the other hand, the majority of urban animal farmers accounting for 52.2% only felt mildly food insecure as indicated in figure 4.1.

Table 4.3: Results of data analysis about food security among urban animal farmers in Mbarara City South division

Food security indicator	Group	N	Observed Prop.	Test Prop.	P-Value
Did you worry about not having enough food?	Yes	51	.5	.6	.151[a]
	No	43	.5		
Household member not able to eat preferred food?	Yes	72	.8	.6	.001
	No	22	.2		
Did household eat limited variety?	Yes	73	.8	.6	.000
	No	21	.2		
Did household member eat unliked food?	Yes	62	.7	.6	.141
	No	32	.3		
Did household member eat a smaller amount?	No	61	.6	.6	.195
	Yes	33	.4		
Did household member have to eat fewer meals?	Yes	23	.2	.6	.000[a]
	No	71	.8		
Was there ever no any food to eat?	No	91	1.0	.6	.000
	Yes	3	.0		
Did a household member go to sleep at night hungry?	No	91	1.0	.6	.000
	Yes	3	.0		
Did a member go a whole day and night without eating?	No	91	1.0	.6	.000
	Yes	3	.0		
** Significant at 0.05 level					

Alternative hypothesis states that the proportion of cases in the first group < .6.

In comparison with the binomial proportion test of 0.6, there was no significant difference in the yes and no responses to 3 food insecurity indicators across the wards at P>0.05. These responses included; worry of not having enough food for a household, household eating unliked foods and house hold members eating smaller amounts of food (Table 4.3). The remaining six food security indicators differed from ward to ward significantly at P<0.05 irrespective of the yes or no responses (Table 4.3)

The yes and no response was not enough to tell the level of food security. This ushered in food insecurity analysis that explained three other occurrence levels (rarely, often and sometimes). Bi-normial statistical analysis and chi-square test (Pearson's chi-square) were

combined to test whether these (the rarely, often and sometimes) were different or similar across the wards and to what extent these were similar or different so that we say food insecurity was the same across the wards or differed across the wards. For each of the three (often, sometimes and rarely , the system/software created a dummy variable/code, where within rarely you have two alternatives where if one has not said rarely then they are assumed to be in another class. So here the comparison is between those who said rarely and those who belonged to often or sometimes. Results of data analysis were presented in table 4.4

Table 4.4: Analysis of food insecurity occurrences among urban animal farmers and Chi-square test across wards

Food insecurity occurrence indicators	**Food insecurity occurrence from different wards**						
	Rarely	**Sometimes**	**Often**	**Total**	**Person's Chi-Square**	**Df**	**P-value**
Did you worry about not having enough food?	39	11	1	51	16.071[a]	12	.188
Household member not able to eat preferred food?	57	15		72	8.877[a]	6	.181
Did household eat limited variety?	53	9		62	13.053[a]	6	.042
Did household member eat unliked food?	28	5		33	8.067[a]	6	.233
Did household member eat a smaller amount?	23			23	4.553[a]	4	.336

Table 4.4 indicates that the effect of urban animal rearing on food security of house hold remained the same throughout the wards at $P>0.05$ except for one aspect of eating limited amount which differed from ward to ward significantly at $P<0.05$. This means that amount of food eaten by households differed from ward to ward significantly at $P<0.05$.

The Pearson Chi-square has significance value of 0.188 which is above the significance level of 0.05 and this showed that there was no significant difference between urban animal rearing households and food insecurity across all wards on the item of the households worrying about not having enough food. This showed that urban animal rearing and food insecurity is the same across all wards. The null hypothesis which states that there is no significant difference between urban animal household rearing and food insecurity across all wards is accepted.

There was no significant difference between urban animal rearing households and food insecurity across all wards on the item of household members not being able to eat preferred food, according to the Pearson Chi-square, which has a significance value of 0.181, which is above the significance level of 0.05. This demonstrated that urban animal poverty and food insecurity are prevalent in all wards. Accepted is the null hypothesis, which claims that there is no discernible difference between food insecurity and urban animal household rearing in any ward.

The Pearson Chi-square has significance value of 0.042 which is below the significance level of 0.05 and this showed that there was a significant difference between urban animal rearing households and food insecurity across all wards on the item of the household members eating a limited variety of food. This showed that urban animal rearing and food insecurity differ across all wards. The null hypothesis which states that there is no significant difference between urban animal household raring and food insecurity across all wards is rejected.

All wards showed no significant difference in food insecurity and urban animal rearing households when it came to the item of household members eating food they did not like, according to the Pearson Chi-square, which has a significance value of 0.233, which is above the significance level of 0.05. This demonstrated that disparities in food insecurity and urban animal rearing occur in every ward. All wards' food insecurity and urban animal household rearing do not significantly differ from one another, according to the null hypothesis, which is accepted.

The Pearson Chi-square has significance value of 0.336 which is above the significance level of 0.05 and this showed that there was no significant difference between urban animal rearing households and food insecurity across all wards on the item of the household members eating a smaller meal than they felt needed because there was enough food. This showed that urban animal rearing and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between urban animal household rearing and food insecurity across all wards is accepted.

4.4 Effect of urban Poultry farming on food security among urban household farmers in Mbarara city south

Most married female urban household farmers raised chickens on a medium-scale, specializing in layers. The two methods practiced in backyards were the deep litter system (Plate 4.2) and the free-range system. After completing primary school, a minority of urban farmers were involved in raising Kroiler chickens.

As one respondent said,

"Raising chickens in my backyard has ensured that we have a constant supply of eggs and sometimes meat. This has reduced our dependence on market purchase and has guaranteed that we always have something to eat even when money is tight."

Another participant noted,

"We have a challenge of diseases that affect our birds due to lack of awareness on how to vaccinate resulting in to death of some of our birds."

Plate 4.2:Photograph showing urban poultry farming in deep Litter system in Kijungu cell, Nyamityobora ward Mbarara city south division.

Regarding the study's second objective, which was to determine how urban poultry farming affected food security among urban households in Mbarara City South, data regarding the impact of urban poultry farming enterprises on food security in various Mbarara City South wards was gathered using the household food insecurity access scale, a scale that has been approved by science. A household that engaged in this kind of operation was classified as either severely food insecure, moderately food insecure, slightly food insecure, or secure based on the scale. Table 4.2 provides a summary of the number of homes from various wards that fit into any of the aforementioned categories.

Table 4.5: Effect of urban poultry farming and food security among urban household farmers found in different wards of Mbarara City South Division.

Ward	**Food security Levels among households that practice urban poultry farming in different wards**				
	Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure	**Total**
Kakoba	5	11	2	0	18
Katete	1	9	2	0	12
Nyamityobora	4	9	2	0	15
Katojo	4	10	1	0	15
Ruti	5	6	1	0	12
Bugashe	5	1	3	0	9
Rukindo	2	7	3	0	12
Total	**26**	**53**	**14**	**0**	**93**

The highest food security was found in Kakoba, Ruti and Bugashe wards each of which had five households that met the category of food security; the ward with the lowest food security was Katete with one household. (table 4.5). Katojo was the lead in the category of mildly food insecure with 10 households in this group while Bugashe was the least with only 1 household in this category (table 4.5). Bugashe and Rukindo wards had the highest number of households that were moderately food insecure(table 4.5). The study revealed that none of the urban animal farmers was severely food insecure as indicate by zero

number of households recorded with food insecurity. It is therefore indicative that urban poultry farming gives some degree of food security ranging from food secure to mild food insecurity and moderate food insecurity.

The results in Table 4.5 were graphically represented for better visual analysis and impression. This was in the form of a pie chart as shown in Figure 4.2.

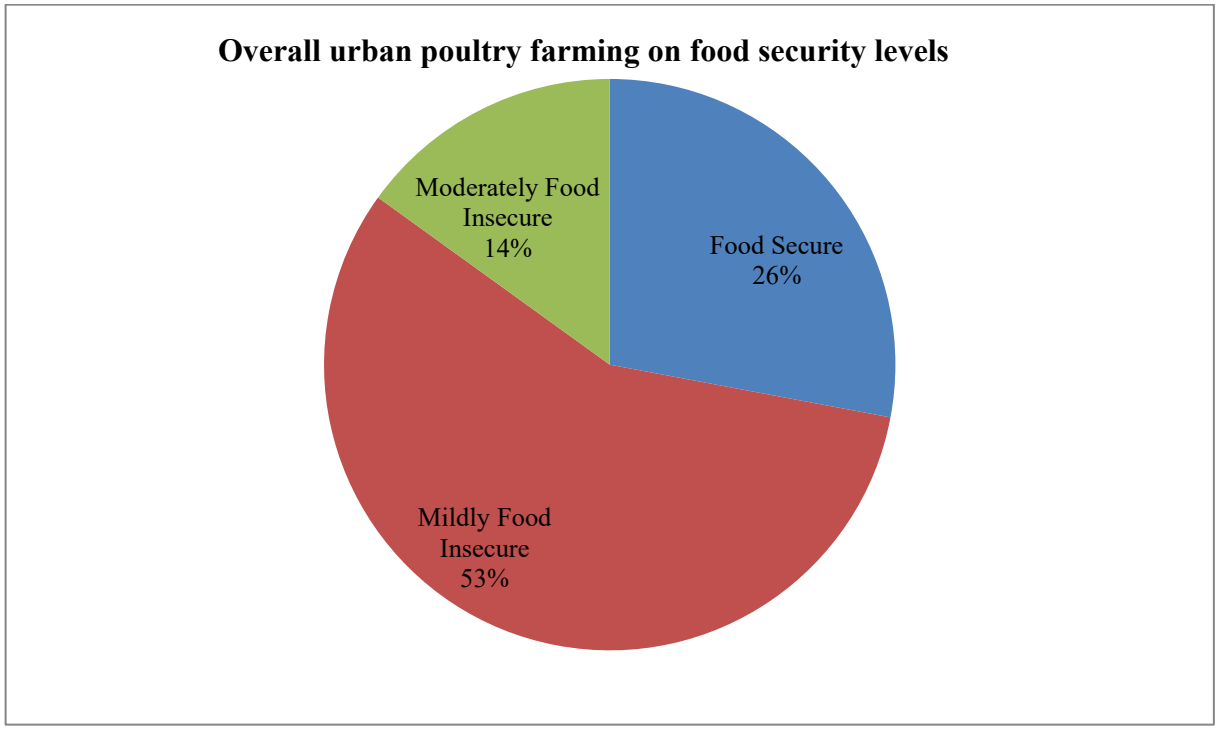

Figure 4.2: Overall food security levels among urban poultry household farmers in Mbarara city south division

Based on the total number of farmers that practiced urban poultry farming in the different wards, the highest number of urban poultry farmers was registered in Kakoba, while Bagashe registered least number of urban poultry farmers. Based on the different levels of food security in different wards, urban poultry farming brought about 26% food secure in the division shown in figure 4.3. On the other hand, the majority of urban poultry farmers accounting for 53% were mildly food insecure as indicated in figure 4.3. The least number

of urban poultry farmers accounting to 14% were moderately food insecure as indicated in figure 4.3.

Table 4.6: Results of data analysis about Food security among urban poultry farmers in Mbarara City South Division

Food security indicator	Group	N	Observed Prop.	Test Prop.	P-Value
Did you worry about not having enough food?	Yes	59	.6	.6	.286
	No	34	.4		
Household member not able to eat preferred food?	Yes	76	.8	.6	.000
	No	17	.2		
Did household eat limited variety?	Yes	77	.8	.6	.000
	No	16	.2		
Did household member eat unliked food?	Yes	69	.7	.6	.003
	No	24	.3		
Did household member eat a smaller amount?	Yes	61	.7	.6	.160
	No	32	.3		
Did household member have to eat fewer meals?	Yes	15	.2	.6	.000[a]
	No	78	.8		
Was there ever no any food to eat?	No	93	1.0	.6	.000
Did a household member go to sleep at night hungry?	No	93	1.0	.6	.000
Did a member go a whole day and night without eating?	No	93	1.0	.6	.000
** Significant at 0.05 level					

There was no significant difference in the yes and no responses to two indicators of food security across the wards with $P>0.05$ when compared to the binomial proportion test of 0.6. These indicators included worry about a household's not having enough food and household members eating a smaller amount (Table 4.6). Whether a ward received a yes or no response, the remaining seven food security indicators differed from one ward to another significantly at $P<0.05$ (Table 4.6).

The yes and no response was not enough to tell the level of food security. This ushered in food insecurity analysis that explained three other occurrence levels (rarely, often and sometimes). Bi-normial statistical analysis and chi-square test (Pearson's chi-square) were combined to test whether these (the rarely, often and sometimes) were different or similar across the wards and to what extent these were similar or different so that we say food insecurity was the same across the wards or differed across the wards. For each of the three (often, sometimes and rarely , the system/software created a dummy variable/code, where within rarely you have two alternatives where if one has not said rarely then they are assumed to be in another class. So here the comparison is between those who said rarely and those who belonged to often or sometimes. Results of data analysis were presented in table 4.7.

Table 4.7: Analysis of food insecurity occurrences among urban poultry farmers and Chi-square test across wards

Food insecurity occurrence indicators	Food insecurity occurrence from different wards						
	Rarely	Sometimes	Often	Total	Person's Chi-Square	Df	P-value
Did you worry about not having enough food?	46	30		76	9.305[d]	6	.157
Household member not able to eat preferred food?	44	33		77	5.411[d]	6	.492
Did household eat limited variety?	56	13		69	4.038[d]	6	.672
Did household member eat unliked food?	56	5		61	3.782[c]	6	.706
Did household member eat a smaller amount?	14	1		15	4.286[c]	4	.369

Table 4.7 reveals that the study found no significant difference in food security levels among urban poultry farmers in Mbarara city wards. This was at P>0.05

The study found no significant difference in food insecurity between urban poultry farming households and food insecurity across all wards when it came to the worry of households not having enough food, as indicated by the Pearson Chi-square significance value of 0.157, which is above the significance level of 0.05. This demonstrated the similarity between urban chicken farming and food insecurity in every ward. The null hypothesis, according to which there is no discernible difference between food insecurity in all wards and urban poultry household farming is accepted.

The Pearson Chi-square has significance value of 0.492 which is above the significance level of 0.05 and this showed that there was no significant difference between urban

poultry farming households and food insecurity across all wards on the item of the household members not eating preferred food. This showed that urban poultry farming and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between urban poultry household farming and food insecurity across all wards is accepted.

Regarding the item of household members eating a limited variety of food, there was no significant difference between urban poultry farming households and food insecurity across all wards, according to the Pearson Chi-square, which has a significance value of 0.672, which is above the significance level of 0.05. This demonstrated that food insecurity and urban chicken farming are prevalent in all wards. Accepted is the null hypothesis, which claims that there is no discernible relationship between food insecurity in any ward and urban poultry home farming.

The Pearson Chi-square has significance value of 0.706 which is above the significance level of 0.05 and this showed that there was no significant difference between urban poultry farming households and food insecurity across all wards on the item of the household members eating food that they did not like. This indicated that urban poultry farming and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between urban poultry household farming and food insecurity across all wards is accepted.

In all wards, there was no significant difference between urban poultry farming households and food insecurity on the item of household members eating less food, according to the Pearson Chi-square, which has a significance value of 0.369, which is above the

significance level of 0.05. This demonstrated that food insecurity and urban poultry farming are prevalent in all wards. Accepted is the null hypothesis, which claims there is no discernible relationship between food insecurity in any ward and urban poultry household farming.

4.5 Effect of urban crop farming and food security among urban household farmers in Mbarara City South Division

The majority of female urban farmers, who are between the ages of 36 and 45, cultivated crops on small areas of land mostly Onions, in sucks, cabbages and spinach in containers as shown in plate 4.3 and tomatoes on verandahs, backyards and rooftops. A few Anglican women would bring some of the crops to churches as offerings or for thanks giving. Male youths between the ages of 18 and 30 made up the minority of urban farmers. One respondent noted,

> *"Since I started my small vegetable garden, I no longer worry about the high prices of vegetables in the market. I can harvest fresh produce from my backyard whenever I need it."*

Another Participate said that,

> *"I grow different types of crops using various methods for example in sacks, containers, on verandas and on small plots of land. These crops are for home consumption and surplus for sell to generate income."*

Plate 4.3 Photograph showing urban crop farming in container gardening Tankhill cell, Katete ward Mbarara city south

Using a scientifically approved scale known as the household food insecurity access scale, information about how urban crop farming enterprises affected food security of various households in different wards in Mbarara city was gathered in accordance with the third objective of the study, which stated, effect of urban crop farming on food security among urban households in Mbarara city south. The scale indicated whether a household engaging in this kind of enterprise was food secure, somewhat food insecure, highly food insecure, or severely food insecure. Table 4.8 provides a summary of the results, which involved counting the number of families from various wards that fit into any of the aforementioned categories.

Table 4.8: Effect of urban crop farming on food security among urban household farmers found in different wards of Mbarara City South Division.

Ward	**Food security levels among households that practice urban crop farming in different wards**				
	Food secure	Mildly food secure	Moderately food secure	Severely food secure	**Total**
Kakoba	11	7	0	0	18
Katete	2	10	0	0	12
Nyamityobora	7	8	0	0	15
Katojo	10	5	0	0	15
Ruti	6	6	0	0	12
Bugashe	4	3	2	0	9
Rukindo	7	5	0	0	12
Total	**47**	**44**	**2**	**0**	**93**

The highest food security was found in Kakoba ward where eleven households were food secure, while the least food security was found in Katete ward where only two households were found to be food secure (table 4.8). Katete was the lead with mildly food insecure with 10 households in this group while Bugashe was the least with only 3 households in this category (table 4.8). Only Bugashe ward was found to be moderately food insecure with two households (table 4.8). The study revealed that none of the urban crop farmers was severely food insecure as indicate by zero number of households were recorded with food insecurity. It is therefore indicative that urban crop farming gives some degree of food security ranging from total security to mild insecurity and moderate security.

The results in table 4.8 were graphically represented for better visual analysis and impression. This was in form of a pie chart as shown in figure 4.5.

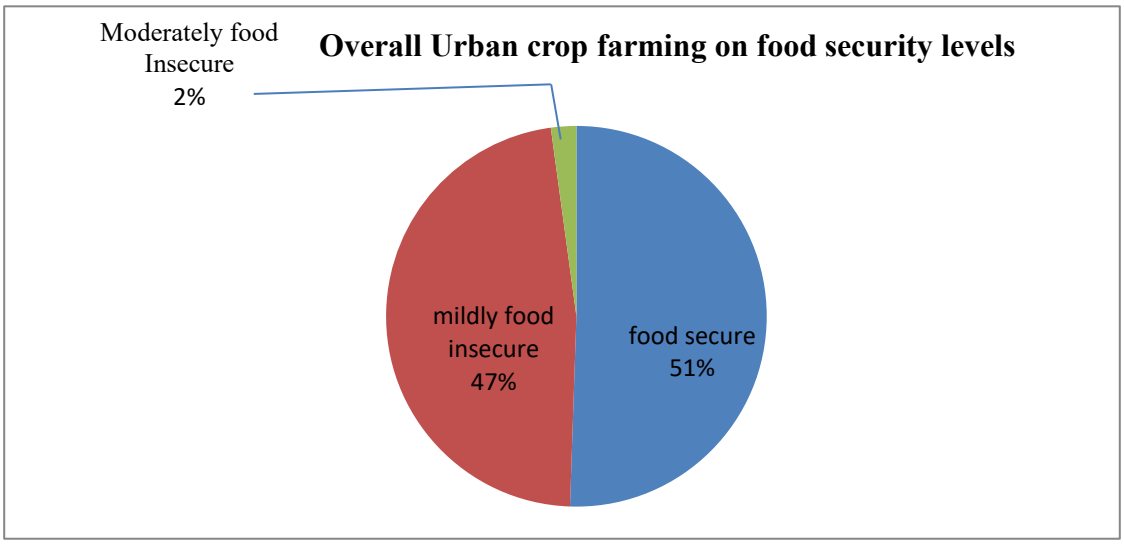

Figure 4.3: Overall food security levels among urban crop household farmers in Mbarara city south division

Based on the total number of farmers that practiced urban crop farming in the different wards, the highest number of urban crop farmers was registered in Kakoba, while Bagashe registered least number of urban crop farmers. Based on the different levels of food security in different wards, majority of urban crop farmers brought about 51% food secure in the division shown in figure 4.5. On the other hand, urban crop farmers accounting for 47% were mildly food insecure as indicated in figure 4.5.

Table 4.9: Results of data analysis about Food security among urban crop farmers in Mbarara City South division

Food security indicator	Group	N	Observed Prop.	Test Prop.	P-Value
Did you worry about not having enough food?	No	37	.4	.6	.001[a]
	Yes	51	.6		
Household member not able to eat preferred food?	No	22	.3	.6	.000[a]
	Yes	66	.8		
Did household eat limited variety?	No	24	.3	.6	.000[a]
	Yes	64	.7		
Did household member eat unliked food?	Yes	46	.5	.6	.086[a]
	No	42	.5		
Did household member eat a smaller amount?	No	75	.9	.6	.000
	Yes	13	.1		
Did household member have to eat fewer meals?	No	83	1.0	.6	.000
	Yes	4	.0		
Was there ever no any food to eat?	No	88	1.0	.6	.000
Did a household member go to sleep at night hungry?	No	88	1.0	.6	.000
Did a member go a whole day and night without eating?	No	87	1.0	.6	.000
** Significant at 0.05 level					

Table 4.9 depicts that apart from one indicator which was household eating unliked food, other indicators of food security differed across wards significantly to a tune of $P<0.05$ This means that food security varied significantly from ward to ward at $P<0.05$. Household in the wards that never ate what they liked and this was similar throughout the wards at $P>0.05$

Table 4.9 shows that there was no significant difference in the yes and no responses to one food insecurity indicator across the wards with $P > 0.05$ when compared to the binomial proportion test of 0.6. This indicator was household eating disliked foods. Regardless of

the yes or no answers, the remaining eight food security variables/indicators differed significantly from ward to ward at P<0.05 (Table 4.9).

The yes and no response was not enough to tell the level of food security. This ushered in food insecurity analysis that explained three other occurrence levels (rarely, often and sometimes). Bi-normial statistical analysis and chi-square test (Pearson's chi-square) were combined to test whether these (the rarely, often and sometimes) were different or similar across the wards and to what extent these were similar or different so that we say food insecurity was the same across the wards or differed across the wards. For each of the three (often, sometimes and rarely , the system/software created a dummy variable/code, where within rarely you have two alternatives where if one has not said rarely then they are assumed to be in another class. So here the comparison is between those who said rarely and those who belonged to often or sometimes. Results of data analysis were presented in table 4.10.

Table 4.10: Analysis of food insecurity occurrences among urban crop farmers and Chi-square test across wards

Food insecurity occurrence indicators	**Food insecurity occurrence from different wards**						
	Rarely	**Some-times**	**Often**	**Total**	**Person's Chi-Square**	**Df**	**P-value**
Did you worry about not having enough food?	46	5		51	5.839[b]	6	.442
Household member not able to eat preferred food?	48	18		66	15.775[b]	6	.015
Did household eat limited variety?	43	3		46	11.770[b]	6	.067
Did household member eat unliked food?	13			13	13.194[b]	6	.040
Did household member eat a smaller amount?	4			4.0			

The effect of urban crop farming on food security of household was the same that is household worrying about food not being enough and household eating limited variety of food across wards at P>0.05 while other aspects like household member eating limited amount of food and eating unliked food differed from ward to ward significantly at P<0.05. This means that amount of food eaten by households engaged in crop farming differed from ward to ward significantly at P<0.05.

The Pearson Chi-square has significance value of 0.442 which is above the significance level of 0.05 and this showed that there was no significant difference between urban crop farming households and food insecurity across all wards on the item of the households worrying about not having enough food. This showed that urban crop farming and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between urban crop farming households and food insecurity across all wards is accepted.

The Pearson Chi-square has significance value of 0.015 which is below the significance level of 0.05 which indicated that there was a significant difference between urban crop farming households and food insecurity across all wards on the item of any household member not able to eat the kinds of foods preferred because of a lack of resources. This showed that urban crop farming and food insecurity are different across all wards. The null hypothesis which states that there is no significant difference between urban crop farming households and food insecurity across all wards is rejected.

The Pearson Chi-square has significance value of 0.067 which is above the significance level of 0.05 and this showed that there was no significant difference between urban crop

farming households and food insecurity across all wards on the item of household members eating a limited variety of foods due to a lack of resources. This showed that urban crop farming and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between urban crop farming households and food insecurity across all wards is accepted.

The Pearson Chi-square has significance value of 0.040 which is below the significance level of 0.05 which indicated that there was a significant difference between urban crop farming households and food insecurity across all wards on the item of any household members eating foods that they really did not want to eat because of a lack of resources to obtain other types of food. This showed that urban crop farming and food insecurity are different across all wards. The null hypothesis which states that there is no significant difference between urban crop farming households and food insecurity across all wards is rejected.

4.6 Effect of multiple urban agricultural enterprises on food security in Mbarara city south division

Most of the male urban household farmers practiced multiple urban agricultural enterprises especially urban arable farming like legume plants that is beans, peas and vegetables like cabbages, dodo and egg plants. They also kept animals like cattle goats and pigs. These male farmers were aged 36-50 years. The minority of the farmers used zero grazing in their backyards but the commonest method of keeping animals was free range and they were mostly grazing alongside roads as showed in plate 4.4

This argument was echoed by numerous participants, highlighting that diversified sources of food and income reduce vulnerability to diverse conditions affecting any single enterprise.

Another participant noted,

> *"I am grazing alongside the road because I have little space at home to feed all my animals."*

Plate 4.4: Photograph showing urban animal raring alongside road in Kyapotanyi cell, Kakoba ward Mbarara city south.

Regarding the study's fourth objective, which was to determine how urban farmers with multiple urban agricultural enterprises in Mbarara City South division affected food security, data regarding the impact of multiple urban agricultural enterprises on food security in various households across Mbarara City wards was gathered using the household food insecurity access scale, a scale that has been approved scientifically. A household that engaged in this kind of operation was classified as either severely food insecure, moderately food insecure, mildly food insecure, or secure based on the scale. As

a consequence, the number of ward-specific households that fit into one of the aforementioned categories was counted, and the outcomes are shown in Table 4.11.

Table 4.11: Effect of multiple urban agricultural enterprises on food security found in different wards of Mbarara city south division.

Ward	**Food security levels among households that practice multiple urban agricultural enterprises in different wards**				
	Food secure	Mildly food secure	Moderately food secure	Severely food secure	**Total**
Kakoba	3	3	0	0	6
Katete	1	2	0	0	3
Katojo	3	3	0	0	6
Bugashe	4	4	0	0	8
Rukindo	4	4	0	0	8
Total	**15**	**16**	**0**	**0**	**31**

The highest food security was found in Rukindo and Bugashe wards each of which had four households that met the category of food security; the ward with the lowest food security was Katete with one household (Table 4.11). Rukindo and Bugashe were mildly food insecure being the lead each with category of 4 households in this group while Ruti was the least with only 4 households in this category (table 4.11)

Zero households were found to be experiencing food insecurity, indicating that none of the urban multiple farmers were moderately or severely food needy. Thus, it is suggestive that urban multiple farming provides a range of food security, from food secure to mildly food insecure. As stated by respondent,

"When the crops fail due to drought, we can still rely on the milk and eggs from our livestock."

The results in Table 4.11 were graphically represented for better visual analysis and impression. This was in the form of a pie chart as shown in Figure 4.4.

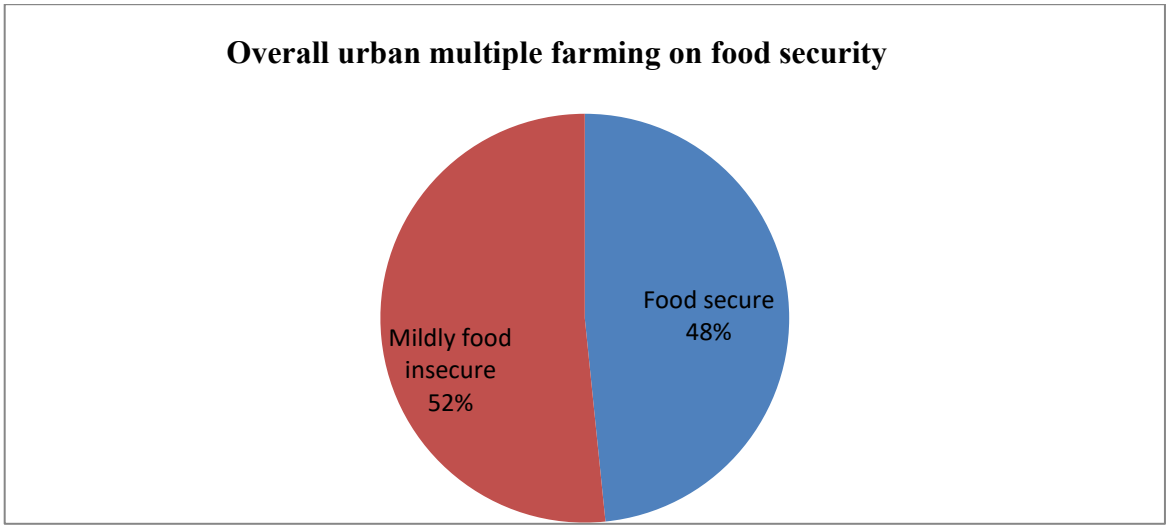

Figure 4.4: Overall food security levels among urban households that practice multiple urban agricultural enterprises across wards in Mbarara City south division

Based on the total number of farmers that practiced multiple urban agricultural enterprises in the different wards, the highest number of urban farmers who practiced multiple urban agricultural enterprises was registered in Rukindo and Bagashe while Katete registered the least number of urban farmers who practiced multiple urban agricultural enterprises. Based on the different levels of food security in different wards, urban farmers who practiced multiple urban agricultural enterprises brought about 48% food secure in the division shown in figure 4.4.

On the other hand, the majority of urban farmers who practiced multiple urban agricultural enterprises accounting for 52.2% were mildly food insecure as indicated in figure 4.4,

Table 4.12: Results of data analysis about Food security of multiple urban agricultural enterprises on food security in Mbarara city south division

Food security indicator	Group	N	Observed Prop.	Test Prop.	P-Value
Did you worry about not having enough food?	Yes	23	.7	.6	.116
	No	9	.3		
Household member not able to eat preferred food?	Yes	25	.8	.6	.025
	No	7	.2		
Did household eat limited variety?	Yes	25	.8	.6	.025
	No	7	.2		
Did household member eat unliked food?	Yes	20	.6	.6	.462
	No	12	.4		
Did household member eat a smaller amount?	Yes	3	.1	.6	.000[a]
	No	29	.9		
Did household member have to eat fewer meals?	Yes	1	.0	.6	.000[a]
	No	31	1.0		
Was there ever no any food to eat?	No	32	1.0	.6	.000
Did a household member go to sleep at night hungry?	No	32	1.0	.6	.000
Did a member go a whole day and night without eating?	No	32	1.0	.6	.000

Table 4.12 reveals that the two food insecurity indicators, worrying about not having enough food for the household and eating unliked foods, did not significantly differ in the yes and no responses across the wards with $P>0.05$ when compared to the binomial proportion test of 0.6. Whether the answers were yes or no, the remaining seven food security variables/indicators varied significantly at $P<0.05$ between wards.

The yes and no response was not enough to tell the level of food security. This ushered in food insecurity analysis that explained three other occurrence levels (rarely, often and sometimes). Bi-normial statistical analysis and chi-square test (Pearson's chi-square) were combined to test whether these (the rarely, often and sometimes) were different or similar across the wards and to what extent these were similar or different so that we say food

insecurity was the same across the wards or differed across the wards. For each of the three (often, sometimes and rarely , the system/software created a dummy variable/code, where within rarely you have two alternatives where if one has not said rarely then they are assumed to be in another class. So here the comparison is between those who said rarely and those who belonged to often or sometimes. Results of data analysis were presented in table 4.13.

Table 4.13: Analysis of food insecurity occurrences among urban farmers who practiced multiple urban agricultural enterprises and Chi-square test across wards

Food insecurity occurrence indicators	**Food insecurity occurrence from different wards**						
	Rarely	**Sometimes**	**Often**	**Total**	**Person's Chi-Square**	**Df**	**P-value**
Did you worry about not having enough food?	20	3		23	6.469[c]	4	.167
Household member not able to eat preferred food?	22	3		25	7.244[c]	4	.124
Did household eat limited variety?	20			20	2.214[c]	4	.697
Did household member eat unliked food?	3			3			
Did household member eat a smaller amount?	1			1			

The effect of urban farmers practicing multiple urban agricultural enterprises on food security of household was the same across wards at P>0.05. This means there is no significant difference between multiple urban agricultural enterprises and food insecurity across all wards.

The Pearson Chi-square has significance value of 0.167 which is above the significance level of 0.05 and this showed that there was no significant difference between multiple urban agricultural enterprises and food insecurity across all wards on the item of the

households worrying about not having enough food. This showed that multiple urban agricultural enterprises and food insecurity are the same across all wards. The null hypothesis which states that there is no significant difference between multiple urban agricultural enterprises and food insecurity across all wards is accepted.

Regarding the item of household members not eating favorite food, there was no significant difference between multiple urban agricultural enterprises and food insecurity across all wards, according to the Pearson Chi-square, which has a significance value of 0.124, which is above the significance level of 0.05. This demonstrated that food insecurity and multiple urban agricultural enterprises are the same in every ward. Accepted is the null hypothesis, which claims that there is no significant difference in food insecurity between multiple urban agricultural enterprises and all wards.

When it came to the item of household members eating a limited variety of food, there was no significant difference between multiple urban agricultural enterprises and food insecurity across all wards, according to the Pearson Chi-square, which has a significance value of 0.697, which is above the significance level of 0.05. This demonstrated that food insecurity and multiple urban agricultural enterprises are the same in every ward. Accepted is the null hypothesis, which claims that there is no significant difference in food insecurity between multiple urban agricultural enterprises and all wards.

On the last step, the researcher determined the overall food security levels across enterprises as shown in Table 4.14.

Table 4.14: Showing overall food security levels by enterprises

Enterprises	Food secure	Mildly food insecure	Moderately food insecure
Urban animal farming	32	47	11
Urban poultry farming	26	52	14
Urban arable farming	47	44	2
Multiple farming	15	16	0
Total	**120**	**160**	**27**

The highest Food security was registered in urban arable farming while the least was registered in urban poultry farming. On the other hand, mildly food insecurity was registered highly in urban poultry farming while urban arable farming registered the least food insecurity. Moderately food insecurity was registered highly in urban poultry farming while urban arable farming registered the least food insecurity.

Urban Farmers who practiced more than one enterprise were few in number compared to other enterprises. (Table 4.14)

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter contains the discussions, conclusions from the findings, and recommendations for action as well as recommendations for further research.

5.2 Discussions

5.2.1 Effect of Urban animal rearing on food security among urban households in Mbarara city south division

Majority of urban farmers who practiced urban animal farming were food secure because most households would eat variety and preferred foods. This degree of food security differed across the wards. In some wards farmers had variety of milk and meat got from animals to get proteins, In other wards farmers utilized urban space for zero grazing, farming alongside roads thus food secure. Urban animal farming allows for the production of fresh meat and dairy which are essential sources of high-quality protein. More so the farmers had different types of animals like pigs, goats, sheep and rabbits which were a source of meat. This is in agreement with (Mario Herrero,Daniel Mason-D'Croz,Philip K Thornton, 2021) who said that urban animal farming results into production of high-quality protein in form of milk and meat and over all food security.

The study found out that some urban farmers who practiced urban animal farming were mildly food insecure because they would sometimes worry about running out of food. This degree of food insecurity differed across the wards. In some wards, it was attributed to limited spaces in urban areas that restricted farmers from keeping many animals. In other wards, farmers experienced low production and animal deaths as a result of unfavorable

climate conditions which in turn resulted in low income production. This is in line with (Tuffour, 2023) who said that urban farmers face challenges such as land scarcity, which restricts the number of animals they can be raised for food. This limitation reduces the availability of fresh meat and dairy products, impacting the nutritional diversity of their diets and potentially leading to mild food insecurity.

The study found out that urban households who practiced urban animal farming were moderately food insecure because they would eat monotonous and unliked foods. This insecurity level differed across the wards. In some wards, it was due to price fluctuations of animal products while in other wards, urban farmers were dictated on to maintain particular number of animals hence food insecurity. This is in agreement with (Mahbubur Meenar,Alfonso Morales,Leonard Bonarek, 2017), who noted that stricter regulations on zoning and land use have limited the expansion of urban animal farms which has brought a negative impact on food security.

5.2.2 Effect of urban poultry farming on food security among urban households in Mbarara city south division

Majority of the urban farmers who practiced urban poultry farming were mildly food insecure because they would often worry about not having enough food. This degree of food security differed across the wards. In some wards, farmers had little space which reduced the number of birds they could keep. This affected their income generation hence food insecurity. In other wards food insecurity was due to ignorance of disease prevention which resulted into death of some birds. This is in agreement with (Kyembabazi, Ssemakula, 2020) who said that urban areas often lack the open land necessary for constructing adequate housing and providing ranging areas for poultry. This not only

affects the well-being and productivity of the birds but also limits the scale of food security for urban dwellers who engage in poultry farming.

The study found out that some urban household farmers who practiced urban poultry farming were food secure because they would eat variety and preferred foods. This degree of food security differed across wards. In some wards farmers had market for their poultry products such as eggs and chicken. Therefore they would generate income to buy other variety of foods hence food secure. In other wards, farmers would eat eggs and get proteins then sell the surplus to buy more preferred foods. This is in relation with (FAO, Poultry Genetic Resources and Small Poultry Production Systems in Uganda, 2009) noted that urban households often rely on poultry products as a significant source of protein, essential nutrients, and income generation. By selling eggs and meat from poultry, urban farmers can access nutritious food for their families while also generating income to purchase other essential food items.

The study found out that some urban household farmers who practiced urban poultry farming were moderately food insecure because they would often eat monotonous foods and unliked foods. This food insecurity differed across wards. In some wards farmers kept a smaller number of birds which did not generate enough income to support the household while in other wards it was attributed to lack of shelter and better chicken houses as well as death of birds from diseases. This is in disagreement with (Galukande E, Alinaitwe J, Mudondo H., 2016) who said that birds can be raised in cramped spaces like backyards, rooftops or shared gardens in order to generate income after selling the products to buy food, thus food security.

5.2.3 Effect of Urban crop farming on food security among urban households in Mbarara City south

Majority of Urban household farmers who practiced urban crop farming were food secure because they would eat variety and other preferred foods. This degree of food security differed across the wards. In some wards, it was largely due to fertile soils which encouraged high crop yields. The fertile soils in urban areas provided essential nutrients necessary for plant growth which enabled successful cultivation even in constrained environments like rooftops vacant lots or community gardens hence experiencing no food insecurity. This agrees with (Carlos Tapia, 2021) who stated that the presence of fertile soils in urban areas allows for sustainable agricultural practices that promote soil health and ecosystem resilience.

The results revealed that some urban household farmers who practiced urban crop farming were food secure. In other wards, Farmers had enough space like container gardening, sacks, backyard gardening, rooftops and small plots to plant their crops. This enabled them not to worry about having enough food and this is in connection with (Kyembabazi, Ssemakula, 2020) who noted that crop farming within cities can help alleviate food insecurity by utilizing available urban land for cultivation.

The study found out that some farmers who practiced urban crop farming were mildly food insecure because they would sometimes worry about not having enough food and unable to eat preferred foods. This degree of food insecurity differed across the wards. This was brought about by unfavorable climate for example drought that made their crops not to yield well hence poor harvests that resulted into food insecurity. In other wards, farmers had a challenge of limited spaces that restricted them to grow a variety of crops. This made

them to be food insecure. This is in agreement with (Ronald Twongirwe, 2019) who stated that urban crop farmers in drought-prone areas experience decreased crop production, increased irrigation costs, and even crop failure, exacerbating food insecurity and poverty in urban areas

The study found out that some farmers who practiced urban crop farming were moderately food insecure because they would frequently eat monotonous food and often eat un desirable foods. This food insecurity differed across the wards. This was due to inadequate water supply for crop upkeep and irrigation that has an impact on crop production. In other wards, urban farmers had infertile soils which led to low yields hence food insecurity. In other wards, some farmers had a challenge of timely seasons which led to low productions resulting to food insecurity. This is in agreement with (Fred Magdoff, Harold van Es, 2021), who said that urban farmers often face challenges such as limited land availability and soil quality, which restrict their ability to produce sufficient quantities of nutritious food. This can result in households relying heavily on a few staple crops, leading to a lack of dietary diversity and potential nutrient deficiencies. Additionally, space limitations may prevent farmers from implementing efficient farming techniques or investing in infrastructure, further exacerbating food insecurity issues.

5.2.4 Effect of multiple urban agricultural enterprises on food security among urban household farmers in Mbarara City South Division.

Majority of urban household farmers who practiced more than one enterprise were mildly food insecure because they would eat variety and preferred foods. This degree of food security differed from ward to ward. This was because these farmers engaged in a variety of enterprises such s poultry, urban arable farming and urban animals farming like cattle,

goats, sheep and pigs. These products are sold and income is generated to buy the preferred foods hence food security. This is in agreement with (Mario Herrero,Daniel Mason-D'Croz,Philip K Thornton, 2021) who narrated that different enterprises produce a large assortment of foods including milk, vegetables and chicken which helped to improve dietary diversity and over all food security.

The results showed that some urban household farmers who practiced more than one enterprise were mildly food insure because they would sometimes eat monotonous foods and limited foods. This degree of food insecurity differed across the wards. This was because in some wards, farmers had limited spaces to practice multiple agricultural enterprises.

5.3 Mitigation to barriers of urban farming

Barriers to urban farming were mitigated by farmers in Mbarara city the following ways.

Limited space was managed by the urban farmers through using rooftops, container gardens, sacks, backyard farming and verandah gardening.

Inadequate water access was managed by farmers harvesting rain water to give to their animals, using drip irrigation systems to irrigate their gardens and others were using soil moisture management such as mulching, organic matter to retain water

Market constraints. Most farmers decided to use collective bargaining, pooling resources and others developed unique branding and obtained certifications to make products more attractive.

5.4 Conclusions

The study found out that urban household farmers who practiced urban animal raring were mildly food insecure because they had a variety of animals like cattle, goats, sheep, and rabbits. Some of these animals would be sold to buy other foods although they would sometimes worry about not having enough food.

The results show that urban household farmers who practiced urban poultry farming were mildly food insecure. This resulted from the fact that some birds were kept on deep litter system and they had to be fed leading to expenses on poultry feeds, some farmers had little space which reduced the number of poultry kept, some birds were not vaccinated which led to poor output.

The results show that urban household farmers who practiced urban arable farming had enough crops planted and enough supplies to purchase a variety of food they desired making them food secure. These supplies had sufficient markets and well developed road networks that eased them to transport their produces.

The study found out that farmers who practiced more than one enterprise were mildly food insecure. This was attributed to the fact that there was diversification of the economy but still farmers did not practice in large quantities.

5.5 Recommendations

Urban farmers who are practicing urban animal farming are encouraged to keep different animals like cattle, goats, sheep and pigs in order to move from mildly food insecurity to food secure. They would utilize urban spaces like grazing alongside roads or use zero

grazing methods and sell the extra milk and meat to generate income to buy other preferred foods.

The practice of poultry farming among urban household farmers was mildly food insecure in Mbarara city south division. This was attributed to lack of information of vaccines and treatment that led to poor output. Therefore policy makers, political leaders and agricultural officers should sensitize the farmers on how they can get information and access to vaccination and treatment such that all farmers can be promoted to food secure.

Urban household farmers are recommended to practice urban crop farming by utilizing the urban limited spaces like verandahs ,backyards , container ,small gardens to plant variety of crops in order to be food secure and to generate income from the surplus after selling them. This strategy was to enable them to be food secure.

Urban farmers are encouraged to practice different enterprises like crop farming and poultry farming such that in case birds are not laying eggs, they are harvesting crops. These strategies will enable the urban household farmers to be food secure.

5.6 Recommendation for further research

The research study focused on the effect of urban agriculture on food security but it only concentrated on food accessibility using house hold food access scale that is internationally recognized. It would also be necessary for a study to be carried out on other aspects of food security like food availability or food utilization or food stability

5.7 Contribution to the new knowledge

The study will contribute to the country on how to sustain the first goal of millennium development goals of 2015 that is to eradicate extreme poverty and hunger.

The study will contribute worldwide on how to achieve some of the 17 sustainable development goals by 2030 like no hunger, no poverty, health and wellbeing and sustainable cities and communities.

The study will contribute to different cities on how to select the best urban agricultural enterprise to be recommended to urban household farmers, city planners and production officers.

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APPENDICES

Appendix 1: Interview Guide for Key Informants.

Hello, I'm Arinaitwe Justine, a student of Kyambogo University pursuing a master's degree in Art in Geography. I am currently conducting research on effect of urban agriculture on food security among urban household farmers in Mbarara city western Uganda. Your participation is voluntary and you may only answer questions that you are comfortable with. I humbly request that you answer each question as honestly as possible.

Participants' characteristics

No.	Participants demography	Code	Answer
1	Gender	0 = Female 1 = Male	
2	Age group	1 = 18-35 years 2 = 36-45 years 3 = 46-55 years 4 =Above 55 years	
3	Marital status	1 = Single 2 = Married 3 = Divorced 4 = Widowed 5 = Cohabitation 6 = Others specify	
4	Level of education	1 = No formal education 2 = primary education 3=Secondary education 4=Tertiary education 5=Others specify	
5	Religion	1=Catholic 2=Anglican 3=Islam 4=Seventhday Adventist 5=Pentecost	
6	Family size	Number	

7 What is the most practiced urban agricultural enterprise in urban households? Please tick your answer with

(a) Poultry farming	1
(b) Animal raring	2
(c) Arable farming	3
(d) Others specify	4

8 Indicate the most consumed agricultural products in urban households. Please tick your answer with

(a) Eggs	
(b) Chicken	
(c) Meat	
(d) Chivon	
(e) Pork	
(f) Milk	
(g) Ghee	
(h) Tomatoes	
(i) Cabbages	
(j) Carrots	
(k) Egg plants	

9 Which type of enterprise is mostly favoured by urban space? Please tick your answer.

(e) Poultry farming	1
(f) Animal raring	2
(g) Arable farming	3
(h) Others specify	4

10 Which type of enterprise is mostly favoured by climate? Please tick your answer with ()

(i) Poultry farming	1
(j) Animal raring	2

(k) Arable farming	3
(l) Others specify	4

11 Which type of enterprise is relatively cheap to practice? Please tick your answer with ()

(m)Poultry farming	1
(n) Animal raring	2
(o) Arable farming	3
(p) Others specify	4

12 Which level of technology do you use in your farm?

…….....

……..

Appendix 2: Questionnaire for Urban Animal Household Farmers.

Bio data

Sex (tick the appropriate)

Female ☐ Male ☐

Level of education (tick the appropriate)

Primary ☐ Secondary ☐ Tertiary ☐ Non formal education ☐

Effect of animal raring on food security among urban household farmers.

No.	Question	Response Options	CODE
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
1a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
2a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1=Yes	….|___|
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in	….|___|

		the past four weeks) 3 = Often (more than ten times in the past four weeks)	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food	0 = No (skip to Q5) 1=Yes	….|___|
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1=Yes	….|___|
5a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1=Yes	….|___|
6a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1=Yes	….|___|
7a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in	….|___|

		the past four weeks) 3 = Often (more than ten times in the past four weeks)	
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1=Yes	….|___|
8a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1=Yes	….|___|
9a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|

Appendix 3:Questionnaire for Urban Poultry Household Farmers.

Bio Data

Sex (tick the appropriate)

Female ☐ Male ☐

Level of education (tick the appropriate)

Primary ☐ Secondary ☐ Tertiary ☐ Non-formal education ☐

Effect of poultry farming on food security among urban household farmers

No.	Question	Response Options	CODE
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
1a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
2a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1=Yes	….|___|
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks)	….|___|

		3 = Often (more than ten times in the past four weeks)	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food	0 = No (skip to Q5) 1=Yes	….|___|
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.	In the past four weeks, did you or any qhousehold member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1=Yes	….|___|
5a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1=Yes	….|___|
6a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1=Yes	….|___|

7a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1=Yes	….|___|
8a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1=Yes	….|___|
9a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|

Appendix 4. Questionnaire for Urban Arable Household Farmers.

Bio data

Sex (tick the appropriate)

Female ☐ Male ☐

Level of education (tick the appropriate)

Primary ☐ Secondary ☐ Tertiary ☐ Non-formal education ☐

Effect of arable farming on food security among urban household farmer

No.	Question	Response Options	CODE
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
1a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
2a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1=Yes	….|___|
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times	….|___|

		in the past four weeks)	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food	0 = No (skip to Q5) 1=Yes	….|___|
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1=Yes	….|___|
5a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1=Yes	….|___|
6a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1=Yes	….|___|
7a		1 = Rarely (once or twice in the past four weeks)	

	How often did this happen?	2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1=Yes	….|___|
8a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1=Yes	….|___|
9a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|

Appendix 5. Questionnaire for Urban Multiple Household Farmers.

Bio data

Sex (tick the appropriate)

Female ☐ Male ☐

Level of education (tick the appropriate)

Primary ☐ Secondary ☐ Tertiary ☐ Non formal education ☐

Effect of urban multiple agricultural enterprises on food security among urban household farmer

No.	Question	Response Options	CODE
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
1a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
2a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1=Yes	….|___|
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
4	In the past four weeks, did you or any household member have to eat	0 = No (skip to Q5) 1=Yes	

	some foods that you really did not want to eat because of lack of resources to obtain other types of food		….|___|
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1=Yes	….|___|
5a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1=Yes	….|___|
6a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1=Yes	….|___|
7a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1=Yes	….|___|
8a		1 = Rarely (once or twice in the	

	How often did this happen?	past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1=Yes	….|___|
9a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|