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COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR FOOD SECURITY STUDIES

THE ROLE OF PERI-URBAN AGRICULTURE FOR HOUSEHOLD FOOD SECURITY IN AKAKI KALITY SUB-CITY, ADDIS ABABA CITY ADMINISTRATION, ETHIOPA

BY
TIZITA GIRMA AYELE

DECEMBER,
2024

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A THESIS SUBMITTED TO CENTER FOR FOOD SECURITY STUDIES, COLLEGE OF DEVELOPMENT STUDIES, ADDIS ABABA UNIVERSITY, FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN FOOD SECURITY AND DEVELOPMENT STUDY

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Declaration

This thesis is my original work and has not been presented for MA/MSc degree in any other University and that all the sources and materials used for the thesis have been properly acknowledged.
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As advisor of the thesis, I certify that I have read and evaluated the thesis prepared by Tizita Girma Ayele under my guidance, entitled “The role of peri urban and peri-urban agriculture for household food security in Akaki Kality sub-city, Addis Ababa, Ethiopia” and I recommend that for open defense as fulfilling the requirements for the degree of Master of Science in Food Security and Development.

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Dedication
I dedicated this thesis to my beloved family

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Abstract

This research examines the role of peri-urban agriculture (UPA) in enhancing household food security in Akaki Kality Sub-city, Addis Ababa, Ethiopia. The objective of this research is to explore the role of peri urban agriculture in household food security and identify key factors influencing participation in peri-urban agriculture (UPA) in Akaki Kality Sub-city, Addis Ababa, Ethiopia. a total of 420 sample households were selected randomly using a multistage sampling technique, grouped into two strata: urban and peri-urban agriculture participants and non-participants. Descriptive and inferential statistical analyses were utilized to explore the the difference between participants and non participant households on peri urban agriculture on socioeconomic,demographic factors and institutional factors. Food security was assessed using the Household Dietary Diversity Score (HDDS), and Household Food Insecurity Access Scale (HFIAS). Logistic regression was used to identify factors that affect participation in peri urban agriculture while negative binomial regression and ordered logistic regression models were used to identify factors influencing food security outcomes. The findings revealed that peri-urban agriculture participants exhibited significantly higher food security levels compared to non-participants. Socio-economic factors, such as access to microfinance, education level, agricultural experience, and peri urban agriculture practices, were positively associated with food security. Conversely, limited access to inputs and microfinance services were identified as constraints to broader participation in urban agriculture. Furthermore, peri-urban agriculture participation was found to enhance dietary diversity, contributing to improved food security within households. This study highlights the positive impact of peri urban agriculture on food security and nutrition, particularly in urban settings. Therefore, it is recommended to strengthen access to financial services, improve agricultural training programs, and address land tenure challenges to support the growth of urban agriculture. Additionally, policy interventions should focus on enhancing urban food systems to promote sustainable food security.

Key words: Peri-urban agriculture food security participation

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Abbreviations

AAU	Addis Ababa University
AACA	Addis Ababa City Administration
CSS	Central Statistical Services
DDS	Dietary Diversity Score
EIAR	Ethiopian Institute of Agricultural Research
FCS	Food Consumption Score
FAO	Food and Agriculture Organization
FGD	Focus Group Discussions
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HFS	Household Food Security
HH	Household
MFI	Microfinance
MoANR	Ministry of Agriculture and Natural Resources
OLS	Ordinary Least Squares
SSA	Sub-Saharan Africa
TFS	Total Family Size
UA	Urban Agriculture
UPA	Urban and Peri-Urban Agriculture
UN-Habitat	United Nations Human Settlements Programme
USAID	United States Agency for International Development
WFP	World Food Programme

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Ensuring food security in the ever-emerging epoch of urbanization, particularly the poor, has become a critical issue. Nearly 50% of the world's population now resides in cities, and the figure is growing rapidly in low-income countries (Rikolto, 2022). Although the share of urbanization in low-income countries is lower than developed nations, they are experiencing the fastest rates of urbanization, and the rate is quite high in Sub-Saharan Africa (SSA) (Rikolto, 2022). The urban poor in SSA are vulnerable to food insecurity. These populations are primarily dependent on purchasing food from local markets, and while food may be available, it often comes at a high cost. As a result, food expenses can take up a large percentage of household income, leaving these populations exposed to price fluctuations (Zezza et al., 2019). Unlike the rural poor, most urban residents do not have access to traditional food security mechanisms such as agriculture, which further complicates their ability to secure adequate food. The high rental costs of housing couple with transport, and medication cost exacerbates the problem of food insecurotu in urban areas (Rikolto, 2022).

Global estimates show that, although hunger rates have been declining, approximately more than million people worldwide were chronically undernourished from 2012 to 2014, with 791 million of these individuals living in low-income countries. Food access remains a significant challenge, particularly in the poorest regions, including sub-Saharan Africa and parts of Southern Asia (FAO et al., 2020). While progress has been made in reducing the number of undernourished individuals, challenges linked to population growth, and climate change coupled with deplation of resource continue to threaten food security, especially in low income urban areas (Godfray et al., 2010).

In Ethiopia, rapid urbanization has been caused by multituidinal factors including population growth, policies that promoted industrial development and migration (UN-Habitat, 2013). As people migrate to urban areas in search of better economic opportunities, education, and healthcare, urban centers have experienced rapid expansion (Temesgen, 2020). The Ethiopian government has actively promoted urbanization and industrial growth through initiatives like the Growth and Transformation Plan (GTP), resulting in the establishment of industrial zones and the attraction of both domestic and foreign investments (Wily, 2017).
However, the high rate of urbanization in Ethiopia has caused the prevalence of high food prices, which has placed additional strain on the food security of urban households (Yalew, 2020). In particular, Akaki Kality Sub-City, a districts in Addis Ababa, is experiencing the pressures of rapid population growth, urban expansion, and escalating food costs. The city's urbanization has led to the loss of agricultural land, a reduction in vegetation cover, and environmental degradation, including the pollution of rivers (Terfa et al., 2019; Teferi & Abraha, 2017). For instance, Akaki Kality Sub-City, which is the focus of this study, is particularly affected by these issues. The land-use changes have led to a reduction in agricultural areas, from 64.27% in 1985 to 56.28% in 2015 (Worako, 2016), which diminishes the availability of land for food production. With a growing urban population, there is increasing pressure on available land, which further exacerbates the challenges related to food security.

Urban agriculture (UA) has emerged as a strategy to improve food security in urbanizing areas such as Addis Ababa. UA is linked to engaging either in crop cultivation or livestock production within urban environments—such as on vacant lots, in gardens, or even on balconies—urban agriculture provides urban households with direct access to fresh, nutritious food, reducing their reliance on expensive market purchases (FAO, 2020). Additionally, it can contribute to household income through the sale of surplus produce, helping to improve the financial resilience of low-income families (Maxwell, 2001). Beyond economic benefits, urban agriculture also promotes environmental sustainability by recycling organic waste, reducing urban

heat island effects, and improving local biodiversity (Aubry et al., 2012). Furthermore, urban agriculture can foster stronger community ties and enhance the social and cultural well-being of urban residents, creating more sustainable and resilient urban spaces (Mougeot, 2006).

In Ethiopia, urban agriculture offers significant potential to diversify livelihoods, improve food security, and ensure sustainable urban development. UA allows urban residents to grow high-value vegetables and other crops, which are crucial for poverty alleviation (Ashebir et al., 2007; Yalew, 2020). Furthermore, it supports the recycling and reuse of urban waste, promoting environmental sustainability. However, despite these benefits, the sector lacks adequate institutional and policy support, and urban farmers face numerous challenges, such as land tenure insecurity, limited access to resources, and environmental contamination (Yalew, 2020).
National policies, such as the Ethiopian National Urban Green Infrastructure Standard (MUDHo, 2015) and the Addis Ababa City Structure Plan (AACA, 2020), recognize the role of urban agriculture in improving food security, providing job opportunities, and promoting environmental sustainability. These policies highlight the importance of preserving agricultural sites in urban and peri-urban areas and identifying new spaces for food production (Senait et al., 2021). However, urban planning often overlooks urban agriculture in favor of industrial and commercial development, which further marginalizes this sector.

Akaki Sub-City, located in the eastern part of Addis Ababa, Ethiopia, has increasingly embraced urban agriculture as a strategy to enhance food security, livelihoods, and environmental sustainability. Urban farming in Akaki has enabled residents to grow vegetables, fruits, and staple crops, reducing reliance on market purchases and improving dietary diversity (EIAR, 2020). Urban agriculture in the sub city is primarily small-scale and subsistence oriented. The most common practices include vegetable farming (e.g., lettuce, cabbage, and tomatoes) and small-scale livestock rearing (poultry, dairy cattle). A significant portion of farming relies on irrigation from the Akaki River and shallow wells, though water pollution from

industrial discharge poses serious health and environmental risks (Mekuria et al., 2020).
The sub-city's proximity to the Akaki River helps irrigation-based farming get promoted, though pollution from industrial runoff remains a challenge. Additionally, the Addis Ababa Urban Agriculture Office reports that over 15% of households in Akaki engage in some form of urban agriculture, contributing to income generation and poverty reduction (AAUAO, 2019).

While the benefits of UA are well-acknowledged globally, there is limited empirical research on its role in improving food security in Ethiopia, particularly in urban areas like Akaki Kality Sub-City. Existing studies have not sufficiently explored the extent of urban agriculture practices, the challenges faced by urban farmers, or the contributions of urban agriculture to food security in these regions (Yalew, 2020; Ashebir et al., 2007). This gap is particularly noticeable in the context of Ethiopia's broader food security strategies, where urban agriculture is often excluded from discussions on addressing food insecurity, as indicated in the SDG2, which aims at combating hunger and ameliorating nutrition (Crush, 2016).

This study seeks to fill this gap by exploring the role of urban agriculture on household food security in Akaki Kality Sub-City. The research will examine factors influencing participation in urban agriculture, the challenges and opportunities faced by urban farmers, and the contributions of urban agriculture to food security. This study aims to provide valuable insights that can inform urban food security strategies and contribute to the development of policies that support urban agriculture in Ethiopia's rapidly urbanizing areas.

1.2. Statement of the Problem

Urban food insecurity is one of the most pressing problems in developing countries such as Ethiopia where the lion's share of urban households are net buyers of food. One of the way out to ensure food security in urban areas is expanding urban agriculture. Recent trends witnessed that urban agriculture has increasingly been intensified and has been reckoned as a highly promising pillar of food supply systems (Paganini et al., 2018). Albiet, there is no as such conclusive evidence that

showcase the contribution to urban agriculture on food security. For instance, Stewart et al. (2013) come up with results that supported the contribution of urban agriculture to urban food security. In the contrary, a study by Schmidt and Vorster (1995) could not find a link between food gardens and nutritional security and no significant difference could be found between farming and non-farming households concerning nutritional status. Van Averbeke (2007) reported that urban agriculture has contributed to household income and food security in the informal settlements in South Africa.

According to FAOSTAT(2023) nearly 57 percent of the population of Ethiopia is undernourished. Urban poverty has been on the rise, with about 27.3% of urban residents living below the poverty line as of 2015(PDC,2018). A significant portion of this population faces food insecurity, which is linked to unemployment, low wages, and high food prices. The cost of food has been rising sharply in Ethiopia's cities, especially in Addis Ababa. As of 2022, the inflation rate for food was around 30%, which has made staple foods, such as teff (a major grain), vegetables, and meat, increasingly unaffordable for low-income urban households. This price increase exacerbates food insecurity among vulnerable groups.

In order to tackle the aforementioned problems of urban food insecurity, urban agriculture has been suggested since long. Urban agriculture has been pronounced since the last decade and urban households have practiced urban agriculture. Studies have also illuminated various results on the role of UA for household food security in Ethiopia. For instance, Ashebir et al. (2007) highlighted the modest contribution of UA to food security. In the same way, the Senait et al. (2021) showed a positive relationship between the period of engagement in urban agriculture and household food security status. The result clearly depicted that households which have practiced urban agriculture relatively for a longer period of time had lower levels of food insecurity. However, Yalew (2020) claimed that urban agriculture is quite debatable in terms of ensuring urban food security.

There have been various studies that tried to examine the role of urban agriculture in Addis Ababa (Fekadu, 2018, Alemayehu, 2019 and Tegbaru et al., 2021). These studies collectively show that urban agriculture plays a crucial role in improving food security, providing economic opportunities, and promoting sustainable livelihoods in urban areas in Ethiopia. However, there are some interesting issues that requires rigorous assessment. This includes the following research question: Does urban agriculture increase dietary diversity or help households to escape sever food insecurity? This research gaps have been a bridge by taking Akaki Kality Sub-City, which is one of the sub cities in Addis Ababa where significant households have been involved in UA, as a study area. The existing body of literature, therefore, provides little information to generalize the role of UPA in other urban areas, such as in Akaki Kality Sub-City. This study aims to fill this gap in literature by identifying factors

influencing participation in UA, assessing the role of UA on household food security, and identifying the challenges and opportunities of UA in Akaki Kality Sub-City.

1.3. Objectives of the study

1.3.1 General objective

The general objective of the study is to investigate the role of urban and peri-urban agriculture for household food security in Akaki Kality Sub-City, Addis Ababa, Ethiopia.

1.3.2. Specific objectives

The specific objectives of the study are to:

- √ Assess the role of peri urban agriculture on household food security
- √ Identify factors influencing participation in peri urban agriculture.

1.4. Research question

The study will answer the following three research questions:

1. How do various factors influence participation in UA in the study area?
2. Why is UA important for household food security in in the study area?

1.5. Significance of the Study

This study provides critical insights into the role of urban and peri-urban agriculture (UA) in enhancing household food security, a pressing issue in the context of rapid urbanization. As food systems are increasingly challenged by population growth and economic constraints, UA offers a viable approach to improving urban food availability and affordability (Zezza & Tasciotti, 2010; Orsini et al., 2013).

Through an in-depth examination of factors influencing participation in UA, this research would contribute to the existing body of knowledge by identifying socioeconomic, environmental, and policy-related factors that shape urban residents' engagement in UA. These findings can inform policymakers and urban planners, particularly in Akaki Kality Sub-City, on how to encourage inclusive participation in UA, especially among food-insecure households, thereby strengthening urban resilience (Frayne et al., 2014; Redwood, 2009).

Additionally, this study provides evidence of UA's positive impact on household food security, demonstrating its role in enhancing food access, diversity, and affordability. Households participating in UA not only benefit from increased food availability but

also experience greater dietary diversity and reduced reliance on market-purchased foods (Poulsen et al., 2015). For Akaki Kality residents, the study offers valuable insights into how UA can improve local food security and self-sufficiency. Furthermore, the findings will provide a strong foundation for future development initiatives aimed at alleviating urban food insecurity through sustainable, localized food production.

Finally, by exploring the challenges and opportunities associated with UA, this research identifies critical barriers such as land scarcity and resource limitations, alongside potential growth areas such as community collaboration and resource efficiency (Mougeot, 2005; Cofie et al., 2006). Addressing these challenges and capitalizing on the identified opportunities can improve an enabling environment for UA, which can further strengthen urban food systems. Moreover, the research will be beneficial for policymakers in Akaki Kality Sub-City, helping to inform local policy development. It will also serve as a valuable resource for future researchers interested in studying the role of UA in urban contexts.

1.6. Scope of the Study

Geographically, the study is focused on Akaki Kality Sub-City, a rapidly urbanizing area in Ethiopia. The research examines households that participate in urban and peri-urban agriculture (UA) within this specific sub-city, which is facing unique challenges such as rising food prices, food insecurity, and urban expansion.

Thematically, the study will focus on urban and peri-urban agriculture (UA) and its role in household food security. The research will aim to assess the role of UA in improving food security, identify factors influencing participation in UA, and explore the challenges and opportunities associated with urban and peri-urban agriculture in Akaki Kality Sub-City.

1.7. Limitations of the Study

This study is limited to Akaki Kality Sub-City, focusing on the role of urban and peri-urban agriculture (UA) in enhancing household food security within this specific area. As the findings are context-specific, they may not be directly applicable to other urban areas without further research. Additionally, the study used cross-sectional data, which provides a snapshot of the situation at one point in time, limiting the ability to examine long-term trends such as the effect of climate change and seasonal change on food security. Finally, food security was assessed using only two indicators: household dietary diversity and food consumption, which may not capture the full

spectrum of factors influencing food security in urban areas.

1.8. Operational Definitions of Key Terms

Urban Agriculture (UA): Refers to the practice of cultivating, processing, and distributing food within urban and peri-urban areas. For this study, it specifically includes agricultural activities taking place in the urban and peri-urban regions surrounding Addis Ababa, aimed at improving food security and livelihood.

Peri-Urban Agriculture (PUA): Agricultural practices occurring in areas adjacent to the urban fringe, which are influenced by urbanization but not yet fully urbanized. This study focuses on peri-urban areas surrounding Addis Ababa, where farming practices contribute to both food production and the socio-economic fabric of urban communities.

Household Food Security: A condition where all members of a household have access to sufficient, nutritious food that meets their dietary needs for an active and healthy life. This study measures food security through two indicators: household dietary diversity and household food consumption levels.

Food Security Indicators: The two main indicators of food security used in this study are:

1. Household Dietary Diversity: The variety of food groups consumed by the household over a given period.
2. Household Food Consumption: The quantity and frequency of food consumption by household members, reflecting their access to sufficient food.

Socioeconomic Factors: Variables that influence individuals' or households' participation in urban agriculture, including income levels, education, occupation, and access to resources such as land, water, and financial support.

1.9. Organization of the study

This study has five chapters. Chapter one presents the background of the study, statement of the problem, objectives of the study, research questions, significance , limitation of the study and operational definition of key terms. Chapter two deals with theoretical, empirical and conceptual literature reviews related urban and peri-urban agriculture and food security as well as conceptual frame work for the study. Chapter three describes the study area, research design, sampling method, method of data collection and analysis. Chapter four presents the results of the study and

discusses the main findings. Finally, chapter five presents the conclusions and recommendations.

CHAPTER TWO

RELATED LITERATURE REVIEW

In this chapter, conceptual and theoretical review of literature related to urban and peri-urban agriculture and food security was presented. Lastly, the conceptual frame work for this study, which is studied from the theoretical perspective, is described at the last section of this chapter.

2.1. Theoretical foundation and concept of UPA agriculture participation

2.1.1. Concept of UPA agriculture participation

According to Kapucu, (2011) the theory of participation recognizes that the engagement and participation of individuals are key factors in enhancing the success and sustainability of urban agriculture. In the context of this study, participation refers to the active involvement of urban residents in urban agricultural activities. By focusing on participation, this study aims to understand the factors that influence urban residents' engagement in urban agriculture and how their

involvement can be effectively facilitated.

The theory of participation is a suitable theoretical framework for investigating the practices of urban and peri-urban agriculture due to its relevance in understanding the dynamics of individuals' involvement in such activities. Participation is considered crucial for the strategic success of initiatives and programs, as it brings about legitimacy, mobilization, commitment, skill acquisition, effectiveness, and individual value (Pandeya, 2015).

The Theory of Participation, especially the work by Arnstein (1969) on the ladder of participation, explores how different levels of involvement from non-participation to full participation can shape the effectiveness and sustainability of urban agriculture which will addresses the factors that influence participation in urban and peri-urban agriculture (UA). In addition, it can help explain why certain communities may engage in urban agriculture more actively than others, based on factors like socioeconomic status, knowledge of agriculture, and access to resources.

Participation in urban agriculture is not just about food production; it also involves social and economic empowerment. The Theory of Participation highlights how active participation can enhance individuals' control over their own lives and food sources which would help to assess how participating in urban agriculture contributes to the food security of households by providing economic opportunities, fostering community cohesion, and improving access to fresh food. Active involvement of local stakeholders in decision-making can enhance the resilience of urban agriculture systems, ensuring that they remain viable and beneficial for households in the long term. This would be particularly relevant in to explore the role of UA in household food security.

The literature reveals that the lack of participation has been identified as a significant reason for the failure of various agricultural development programs, particularly in developing countries (Mansuri & Rao, 2013). Therefore, understanding the factors that hinder or facilitate participation in urban agriculture is crucial for designing effective interventions and policies.

Several factors can limit urban residents' participation in urban agriculture, including limited access to land, lack of knowledge about agriculture and farming practices, time constraints, and a general disinterest in agriculture (Cole, 2006). Additionally, financial constraints, such as a lack of capital, can hinder urban individuals' ability to participate in urban agriculture (Scheyvens, 2003). Institutional barriers, such as land allocation, credit provision, and input supply, can also impede urban residents' participation in urban agriculture (Aref et al., 2010). Although the majority of urban dwellers have a desire to participate in urban agriculture the above discussed factors could hinder their participation (Luyet et al., 2012). These factors highlight the importance of investigating the barriers and facilitators of participation in urban agriculture.

The theory of participation is a suitable theoretical foundation for investigating the role of urban and peri-urban agriculture in achieving household food security. By examining the factors that influence households' participation in urban agriculture

and understanding how this participation contributes to food security dimensions of availability, accessibility, and utilization, the study aims to provide insights and recommendations to promote sustainable and inclusive urban and peri-urban agricultural practices for improved household food security.

2.1.2 The concept of food security

The concept of food security has become a global issue and evolved through a sequence of definition and paradigms for more than half a century. Accordingly, after the first conference of FAO held in 1943, the concept of food security passes over many accepted definitions and evolutionary phases and promoted by concerned international bodies (George et al., 2009). The food security centered concern has evolved five main chronological approaches. These includes (1) the food surplus disposal in between1940-50 (2) the means to promote food for development in1960 (3) the idea of food assurance in 1970‟ (4) broaden food security issues in 1980 and (5) the shift to freedom from hunger and malnutrition since 1990.These chronological approaches have been acknowledged by international bilateral donor organization to help in improving the food insecurity situation prevailing poor countries including Ethiopia (Getinet, 2011).

For the purpose of this study, the most common and accepted definition given by World Food Summit held in 1996 is adopted as working definition. According to the WFS:

“food security exists when all people, at all time, have physical and economic access to sufficient, safe and nutritious food meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996).

In addition, the 1996 WFS and WFS 2002 anchored on the four pillars of food insecurity namely food availability, food access, food utilization and stability, which are together, equally important dimension of measuring food security.

Food availability: is the first pillar of food security. It is described as food's actual physical existence. Domestic food production, commercial food imports and exports, food aid, and domestic food stocks all contribute to food availability at the national level. At the household level, food may be purchased from nearby markets or produced on-site. According to Pieters et al. (2013) food availability is linked to the extent to which food is within the boundary of households either through production or market (Pieters et al., 2013).

Food access: refers to the social, economic, and physical availability of food. It can also be described as the household's capacity to produce, buy, give, and otherwise obtain enough food. When all homes possess the necessary resources to purchase food in adequate quantity, quality, and variety for a wholesome diet, access is guaranteed. The primary determinants of this are household resources and prices (USAID, 1995). Access to enough food that is ensured to be both sufficient in quality and quantity to meet the nutritional needs of every household member is known as household food access. According to Jrad et al. (2010), people should have the financial flexibility or purchasing ability to purchase enough wholesome food, and

the food should be available when it's needed.

Food utilization: refers to safe food that satisfies nutritional requirements. To achieve a condition of nutritional wellbeing, food security includes sufficient diet, clean water, medical care and sanitation (WFP, 2009). Access and availability of food alone are insufficient; people also need to be provided safe and nourishing nourishment. It also describes how well a household's members utilize the food that is available to them. Especially to the diversity of deities consumed and the capacity of the individual to absorb nutrients from the food consumed (WFP, 2012).
Food stability: suggests that food must be available in terms of availability, access and utilization for food security to exist "at all times". It alludes to the necessity of the short- and long-term evaluation of food (Hartwig et al., 2011; Babatunde et al., 2008). The approach to household food security that emerged in the late 1980s placed a strong emphasis on food availability and reliable access. As a result, household food security is thought to depend on both steady and sustained access to food at the local level as well as local and regional food availability (World Bank, 2003).

Food security is quite challenging to measure since it deals with food production, distribution and consumption. It is quite evident that production and distribution plays paramount importance to ensure food security of an individual or a society at large (Debebe, 1995). The FAO definition of food insecurity is: "A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life" (FAO, 2011).
Food insecurity could be stressed that food security and poverty and famine are not the consequence of the non-availability of food, improper utilization and instability over a certain time period other words the results of food insecurity. Food insecurity occurs when enough and safe foods are not available or the ability to acquire such foods is reduced. Household food insecurity implies that food is not available, accessed with certainty in socially acceptable, or is not physiologically utilized completely (Frongillo and Nama, 2012).

Farmers' reactions to food insecurity were divided into two categories by Maxwell (1996), as cited in Meskerem (2011): coping and adaptive strategies. Adaptive strategies refer to long-term adjustment and entail a permanent shift in the mix of ways that food is required, regardless of the year in question. Coping strategies are responses made by households to address the worsening status of households' food security. According to Maxwell et al. (2002), a coping strategy is a person's reaction to circumstances in which they are undernourished.
While the most popular adaptive strategies include risk minimization, food and income diversification mechanisms, planting damage-resistant crops, cultivating marginal soils, etc., the most popular coping strategies during abnormal seasons include short-term dietary changes, altering intra-household food distribution (e.g., skipping adults to feed children), limiting the size and frequency of food, borrowing

and exchanging gifts from friends and family, selling livestock and firewood, cash for work and relief assistance, etc. (Meskerem, 2011; Degefa, 2005).

2.1.3 The concept of Urban and peri-urban agriculture (UPA)

Peri-urban agriculture (UPA) refers to the practice of growing food and raising animals within or on the outskirts of urban areas. Urban agriculture occurs within city limits, typically through community gardens, rooftop farms, and small-scale horticultural activities. Peri-urban agriculture, in contrast, takes place in the areas on the fringes of cities, often involving larger-scale farming operations such as vegetable and fruit farming, livestock raising, and poultry production (Mougeot, 2000; Smit et al., 2001). Both urban and peri-urban agriculture are vital for ensuring local food security, providing fresh and affordable produce within urban areas that might otherwise rely heavily on external food supply chains (Brook et al., 2006).

These agricultural practices not only contribute to food security but also provide significant economic and livelihood benefits. Urban and peri-urban farming offer opportunities for income generation, as farmers can sell their products in local markets, creating employment opportunities in farming, food processing, and distribution (Zezza & Tasciotti, 2010). Furthermore, urban agriculture often promotes community engagement, with local residents working together to cultivate food, thereby strengthening social ties and empowering communities (Aubry et al., 2012).

Environmental sustainability is another key benefit of UPA. Practices such as waste recycling, composting, and utilizing urban wastewater for irrigation help mitigate the environmental impact of waste disposal and reduce the carbon footprint associated with transporting food over long distances (Liu et al., 2014). UPA also helps combat urban heat islands by introducing green spaces, which regulate temperatures and improve the overall livability of cities (McDonald et al., 2018).

However, peri-urban agriculture face several challenges, particularly related to land availability and competition for space. As cities expand, there are increasing conflicts between urban sprawl, industrial development, and agricultural activities (Drescher et al., 2016). Urban areas, in particular, experience land tenure issues, with farmers often struggling to secure long-term rights to land for farming. Moreover, pollution from industrial waste, traffic emissions,

and chemicals can contaminate soil and water, posing a risk to food safety (Liu et al., 2014). Access to irrigation resources is another challenge, as urban water supply systems may be inadequate or costly for farmers (Larsen et al., 2016). Additionally,

the lack of comprehensive policies and regulatory frameworks can limit the potential for urban and peri-urban farming, with zoning laws often restricting agricultural activities in urban spaces (Mougeot, 2000).

Despite these challenges, urban and peri-urban agriculture provides a range of benefits that enhance the resilience and sustainability of urban communities. It strengthens local food systems, reduces dependence on external food sources, and improves economic self-sufficiency for urban households (Smit et al., 2001). Moreover, UPA plays a crucial role in improving urban residents' well-being, offering a source of fresh produce, promoting social interaction, and fostering environmental stewardship (Aubry et al., 2012). As cities continue to grow, urban and peri-urban agriculture will be essential in meeting the food security needs of urban populations and contributing to the overall sustainability of urban environments (McDonald et al., 2018).

2.1.4 Theories on peri urban agriculture and food security

2.1.4.1 Sustainable Livelihoods Approach (SLA)

The Sustainable Livelihoods Approach (SLA) is a holistic framework used to understand how people, especially those living in poverty, build and maintain their livelihoods. It considers livelihoods as sustainable when they can cope with and recover from shocks, maintain or enhance assets and capabilities, and contribute to the well-being of future generations without undermining natural resources (DFID, 1999). SLA identifies five core asset categories human, social, natural, financial, and physical capital—that individuals combine to pursue livelihood strategies. These strategies are shaped by policies, institutions, and vulnerability contexts such as drought, market shocks, or conflict (Scoones, 1998). It recognizes that poor households often engage in multiple activities—like farming, trading, or migration—to manage risks and sustain income.

2.1.4.2 Food Sovereignty Theory

Food Sovereignty Theory is a political and social framework that emphasizes the right of peoples and communities to define their own food systems, prioritizing local food production, culturally appropriate diets, and ecological sustainability. Introduced by the international peasant movement La Vía Campesina in 1996, it emerged as a critique of global food systems dominated by large agribusiness and international trade institutions (La Vía Campesina, 1996). Unlike food security, which focuses primarily on ensuring access to food, food sovereignty stresses control over how food is produced, distributed, and consumed emphasizing justice, land rights, and environmental stewardship (Patel, 2009). It supports smallholder farmers, agroecology, and local markets, while opposing trade liberalization policies that often displace local producers. In practice, food sovereignty promotes strategies such as urban and peri-urban agriculture, community-supported agriculture (CSA), and land

reform to strengthen local food economies. This is especially relevant in countries like Ethiopia, where food systems are heavily reliant on small-scale farming, yet face threats from land grabs, market shocks, and climate change. By focusing on democratic governance of food systems, food sovereignty links food production with broader goals of social equity, environmental resilience, and community empowerment (Nyéléni Declaration, 2007).

2.1.4.3 Ecological Urbanism and Resilience Theory

Ecological Urbanism is an interdisciplinary framework that integrates ecological principles into urban planning and design, aiming to create cities that are sustainable, livable, and in harmony with natural systems. It emphasizes the interconnectedness of urban environments with natural ecosystems, advocating for green infrastructure such as parks, urban agriculture, green roofs, and sustainable drainage systems. According to Mostafavi and Doherty (2010), ecological urbanism encourages cities to move beyond conventional sustainability metrics by embedding ecological logic into urban form and lifestyle. This approach seeks not just to minimize harm but to regenerate urban ecosystems, improve biodiversity, and enhance quality of life.

Resilience Theory, closely aligned with ecological urbanism, focuses on a system's ability to absorb disturbances, adapt to change, and continue functioning during and after shocks such as climate events, economic crises, or food supply disruptions (Ahern, 2011). In urban food systems, resilience is strengthened through decentralized food production, especially urban and peri-urban agriculture, which reduces dependence on long supply chains and improves local food access. UN-Habitat (2016) notes that resilience thinking helps cities anticipate vulnerabilities and develop safe-to-fail strategies, making them more robust in the face of uncertainty. Together, these frameworks offer a powerful lens for reimagining urban development in the Global South, where cities face mounting pressure from climate change, population growth, and infrastructure stress.

2.1.4.4 Systems Theory in Urban Food Systems

Systems Theory provides a framework for understanding the interconnected components of complex systems, such as cities and their food networks. In the context of urban agriculture and food security, systems theory emphasizes that food production, distribution, consumption, waste management, and governance are not isolated activities but interdependent subsystems within a broader urban ecosystem (Forrester, 1961). It highlights how feedback loops, delays, and non-linear relationships affect outcomes. For instance, a policy promoting urban farming may reduce food insecurity, which in turn improves health, productivity, and ultimately strengthens the economy—creating positive feedback within the system. Conversely, disruptions such as climate shocks or market failures can ripple across sectors, affecting food access, employment, and health.

Applying systems theory helps policymakers and urban planners identify leverage points—areas where small interventions can produce large effects. For example,

integrating waste recycling systems with urban farming (composting organic waste) creates synergies between sanitation, food production, and environmental health (Meadows, 2008). This approach is particularly useful in urban areas of the Global South, where informal food systems, weak infrastructure, and rapid urbanization interact dynamically. By using systems thinking, cities can design holistic, adaptive strategies that consider social, ecological, and economic dimensions of food security (Senge, 1990). This theory encourages long-term planning that responds to complexity rather than oversimplifying urban challenges.

2.1.5 Overview of urban and peri-urban agriculture in Ethiopia

In the Ethiopian context, UPA has gained increasing significance due to rapid urbanization, rising food insecurity, and growing demand for fresh and affordable food among urban populations. Cities like Addis Ababa, including Akaki Kality Sub-City, have witnessed an expansion of UPA practices as a strategy to address economic challenges and improve urban food supply (Tegegne et al., 2014).
UPA in Ethiopia encompasses a range of activities, including small-scale farming, backyard gardening, and livestock production. These practices are often integrated with the urban economy, providing income and employment opportunities for urban households, particularly the poor. Crops commonly grown include vegetables, fruits, and cereals, while livestock production includes poultry, dairy farming, and small ruminants. The accessibility of markets and urban centers facilitates the sale of surplus produce, contributing to household income (Gebremariam & Gebremedhin, 2020).

Despite its benefits, UPA in Ethiopia faces several challenges, including limited access to land, water scarcity, and competition with other urban development priorities. Additionally, inadequate policy support and weak institutional frameworks hinder the integration of UPA into
urban planning. Nonetheless, UPA remains a critical livelihood strategy for many urban and peri-urban residents, providing a direct contribution to household food security through improved access to fresh produce and dietary diversity (Fenta et al., 2019).
The concept of UPA in Ethiopia is closely tied to poverty alleviation and sustainable urban development. It aligns with efforts to enhance urban resilience and promote sustainable resource use in rapidly growing cities. With proper policy support, investment in infrastructure, and stakeholder collaboration, UPA has the potential to play a transformative role in Ethiopia's urban food systems and contribute significantly to household food security and urban sustainability.

In Ethiopia’s UPA plays a vital role for urban food systems by providing fresh, affordable, and accessible food to urban populations, particularly for low-income households. In cities like Addis Ababa, where food insecurity and unemployment are prevalent, UPA serves as a source of both sustenance and supplementary income. It

contributes to dietary diversity by enabling urban residents to grow vegetables, fruits, and other crops close to home. Peri-urban areas, with more available land, often support larger-scale agricultural production, including cereal farming and livestock rearing. In addition to enhancing food security, UPA offers environmental and social benefits. It utilizes urban organic waste for composting, helps reduce food miles, and promotes greening in urban areas, contributing to better air quality and climate resilience. Moreover, UPA fosters community engagement through shared farming initiatives, which can strengthen social cohesion among urban residents (Tegegne et al., 2014).

Despite its importance, UPA in Ethiopia faces numerous challenges. Land access remains a significant barrier, as urban expansion and infrastructure development often take precedence over agricultural activities. Urban farmers struggle to secure tenure, limiting their ability to invest in long-term agricultural improvements. Water scarcity and pollution also hinder UPA. The limited availability of clean water for irrigation in urban areas, compounded by untreated wastewater and industrial pollution, affects the productivity and safety of urban agriculture. Additionally, urban farmers often lack access to financial resources, agricultural inputs, and extension services, which constrains the adoption of improved practices and technologies (Fenta et al., 2019). Institutional challenges further complicate the development of UPA. In Ethiopia, there is limited integration of UPA into urban planning and policy frameworks, leaving urban farmers without clear guidelines or support. The absence of organized markets for urban agricultural products also reduces the economic potential of UPA.

Despite these challenges, UPA presents significant opportunities for Ethiopia. With proper policy support and investments, UPA can play a transformative role in achieving sustainable urban development. For instance, the use of treated wastewater for irrigation and the promotion of vertical farming could address land and water constraints. Incorporating UPA into urban planning, such as designating spaces for community gardens and urban farms, could enhance its sustainability and accessibility. Ethiopia’s government and non-governmental organizations have recognized the potential of UPA to contribute to urban food systems and environmental sustainability. Recent initiatives focus on providing training to urban farmers, promoting climate-smart agricultural practices, and facilitating access to markets for urban agricultural products (Gebre-Egziabher, 2010).

2.1.6 Measurement of food security

Food security is suggested to be measured using multiple indicators (Maxwell et al., 2013). Usage of single indicator could lead to underestimating the number of households experiencing food insecurity (Coates, 2013). Practitioners and policymakers have long recognized the need for diverse assessment techniques due

to the multifaceted nature of food security (FAO, 2013). Food security encompasses quantity, quality, vulnerability, risks, and consumption trends, but it often overlooks other aspects like dietary diversity, micronutrient sufficiency, and fluctuations over time (Maxwell et al., 2013). Caloric intake is rarely used as a food security metric in research due to its time-consuming and costly nature. And food security is not the sole factor that affects nutritional status (Young and Jaspars, 2009).

The HDDS and FCS are widely recognized as key indices for assessing household food security. Food consumption score and caloric consumption are used to measure food security, but their association varies across contexts, leading to underestimation of food insecurity incidence (Wiesmann et al., 2008). However, Maxwell et al. (2008) argue that FCS is a quick, precise, and cross-contextual indicator of food security. HDDS and FCS track food frequency and variety, possibly weighing these groups, but this data may not always accurately reflect actual intake (Coates et al., 2007). FAO (2010) promotes HDDS, a 24-hour recall system similar to FCS, but without frequency information or weighted category cut-offs. Dietary variety is simpler and cheaper to implement than conventional food security measures, which often require complex quantitative data and multi-county analysis (Ruel, 2003).

Swindale and Bilinsky (2006) define household dietary diversity (HDDS) as the ability to obtain enough and safe food to meet nutritional needs for a healthy and productive life. HDDS measures a household's economic ability to buy different foods over a specified time frame, typically 24 hours, 7 days, or 30 days. However, it is not commonly used to monitor an individual's nutritional quality or potential hazards; instead, it is used to measure current conditions (Leroy et al., 2015). If evaluating the population's nutritional adequacy is the main goal of the study, dietary diversity data should be gathered using individuals, not households.

The household-level indicator is a more suitable metric for assessing economic access to food or estimating food categories families consume (Ngema et al., 2021). The HDDS can be combined with other food security status indicators like the household food security access scale (HFSAS) to assess a family's access to specific food counts (Cafiero et al., 2014). When assessing household dietary variety,

the HDDS and HFSAS are equally reliable and significantly related (Daniel et al., 2021). The HDDS indicator can also be used to investigate dietary patterns. FAO (2013) categorizes families into low, medium, or high HDDS based on their consumption of three or fewer food categories, four to six food groups, or seven or more food groups in the last seven days. Swindale and Ohri-Vachaspati (2005) identified 12 food groups for HDDS calculation: cereals, legumes, eggs, milk, meat, fish, oil, fat, sugar, honey, fruits, vegetables, etc.

Food consumption score, a weighted score, is one of the indicators of food access and one of the pillars of food security. FCS measures food consumption frequency and nutritional content by multiplying the frequency of each food category by its weight. According to Daniel et al. (2013), the HDDS and FCS have a strong relationship and may be used in combination to evaluate dietary variety at the household level and serve as a reliable stand-in for energy efficiency in various settings. The HDDS and FCS provide similar information, but their selection often depends on various factors and is not a valid indicator of micronutrient adequacy. Smith and Subandoro (2007) used various food groups to measure FCS, including cereals, legumes, dairy goods, fish, meat, eggs, lipids, oils, fruits, and vegetables. This study will use HDDS and FCS over seven days to assess food security, with a Spearman correlation analysis conducted for both.

2.2. Review of empirical studies

2.2.1 influencing household's participation in UA

A study conducted by Nansamba (2021) indicated that factors influencing participation in UPA include gender, age, education, proximity to markets, experience, and policy determinant factors. Taiwo (2014) examines the determinants of UPA location choice behavior in Lagos, Nigeria. This study found that characteristics that farmers considered important when choosing an urban agricultural site were closeness to water, proximity to their place of living, access to land, proximity to a market, good fertile soils, low input costs, and the availability of low-cost labor.

A research conducted by Kurgat et al. (2020) examined the factors influencing the use of five technologies that might assist urban residents to participate UPA. A multivariate probit model was used with data from 120 households. This study found that farm location, household resources, and female management of agricultural resources were important variables that determined adoption. This also revealed that

agro-forestry, irrigation, crop diversity, and the use of chemical fertilizers are just a few of the technologies that work well together. It was discovered that irrigation and livestock diversification have trade-offs.
In SSA various studies have linked a variety of factors to the participation and non-participation in UPA (Wainaina et al., 2016; Kurgat et al., 2018). Results show that access to information, belief systems, institutional factors (such as input-output marketplaces, extension services, and social groups), and farm factors, as well as household and farm characteristics, have an impact on participation in UPA.
According to Zhang (2016) investigated reclaiming localization for revitalizing peri-urban agriculture change. Urban and peri-urban farm development is primarily influenced by adjustment techniques such as specialization, niche production, multi functionality in decision-making, food chain management, food quality, and food embeddedness, according to this study. According to Anuga et al. (2019) and Kurgat et al. (2020), the adoption of CSA strategies by smallholder farmers is influenced by a multitude of factors, including social capital, farm-specific factors, institutional knowledge of technology and information, institutional access to basic infrastructure services, and climate-related factors.

2.2.2 The roles of UPA for food security

According to Abdoellah et al. (2023) examined self-reported food-related behaviors and experiences, both before and after UA activities, to evaluate urban agriculture using the food insecurity experience scale. The nutritional adequacy of urban farmer households was evaluated using a 24-hour meal recall technique; the data were analyzed using chi-square and reported in a descriptive way. The results showed that challenges with commercialization, food insecurity, and nutrition might be addressed by urban agriculture.
Khumalo and Sibanda (2019) examine the level of food security in peri-urban settings for households that do any form of agricultural work. The household dietary diversity score (HDDS) and household food insecurity access score (HFIAS) measurements were used to determine the food security status of a family. Using probit regression analysis, the variables associated with households' involvement in UPA activities were determined. To determine if there were any statistically significant differences between the two groups, the non-parametric independent sample test Mann-Whitney U was employed. Based on the results of the HDDS tool, more treatment groups (54%) than their counterparts (40%) in the same food category were included in more than six food categories, which are regarded as food secure. However, according to the findings of the Mann-Whitney U test, there was no statistically significant difference between the two groups' dietary diversity (HDDS). By the HFIAS measure, more people in the treatment group (about 72%) than in the control group (about 61%) were thought to have adequate access to food. The HFIAS of the two groups differed significantly, based on Mann-Whitney U test findings ($U = 4118.5$, $p < 0.001$).
A study by Bannor et al. (2021) assessed the food security status of urban

agriculture households in Ghana and India. The household's food security level was analyzed using the HFIAS, and the factors determining the levels of UA and its impact on food security were examined using the seemingly unrelated regression model and linear regression. According to the study, households had mild food insecurity on average, whereas Indian households experienced moderate food insecurity. The findings also showed that diverse demographic, economic, institutional, health, and nutrition determinants had distinct effects on urban agriculture and food security. Additionally, the level of engagement in UA had positive effects on food security. The studies mentioned above had their own limitations with regard to model formulation, data analysis, operational definitions, and selection bias, even if they demonstrated their objectively related findings.

2.2.3 Literature Gaps

Regarding to the above theoretical and empirical literature reviews, it can be understood that there is limited research on the factors influencing household participation in UA in Akaki Kality Sub City: While there are existing studies that have identified general factors influencing urban agriculture (UA) participation, there is a dearth of research specifically focusing on Akaki Kality Sub City. It is crucial to explore the unique contextual factors that influence household participation in UA in this specific area. Factors such as local socio-economic conditions, land availability, infrastructure, and policy frameworks may have distinct influences on UA participation in Akaki Kality Sub City compared to other locations. Conducting research in this specific area will provide valuable insights into the factors that drive or hinder household engagement in UA.

Scarcity of studies on the impact of UA on food security in Akaki Kality Sub City: While the role of UA in enhancing food security has been recognized in general, there is a lack of research specifically examining the impact of UA on food security within the context of Akaki Kality Sub City. Investigating the specific contributions of UA in addressing food insecurity, including aspects such as dietary diversity and nutritional adequacy, is crucial for understanding the effectiveness of UA initiatives in this particular area. By conducting research on the impact of UA on food security in Akaki Kality Sub City, valuable insights can be gained to inform local policymakers and stakeholders about the potential benefits and challenges associated with UA practices in enhancing food security.

Lack of comprehensive understanding of UA practices and challenges in Akaki Kality Sub City: Despite the existing literature on UA practices and challenges, there is a need for more specific knowledge regarding the practices and challenges faced by urban farmers in Akaki Kality Sub City. This includes studying the types of crops grown, farming methods employed, access to resources (such as land, water, and inputs), marketing channels, and barriers encountered by urban farmers in the sub-city. By gaining a comprehensive understanding of UA practices and challenges in Akaki Kality Sub City, policymakers and practitioners can develop targeted interventions and support systems to address the specific needs and constraints

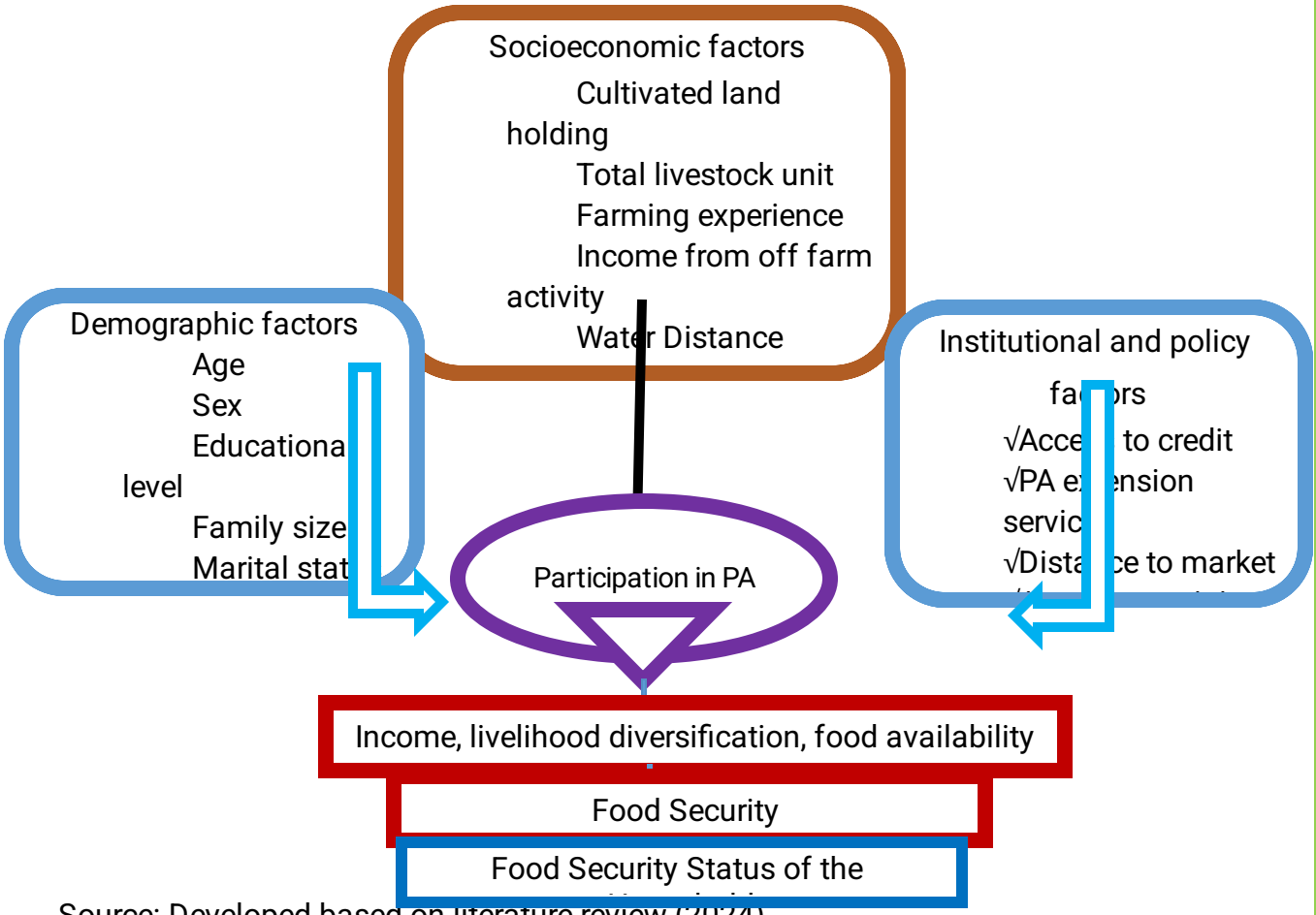
faced by urban farmers in the area, thereby promoting the sustainability and productivity of UA initiatives.

2. 2.3 Conceptual framework

The conceptual framework presented in Figure 2.1 shows the linkage between study variables assumed as affecting participation in PA and household food security in the study area. The conceptual framework was constructed based on researcher experience and from reading various literature related PA and food security and adopting framework from Gamhewage et al. (2015). The decision to participate in urban agriculture is affected by three categories of factors. These factors include socio-economic factors, resource factors and institutional factors (Figure 1). The socio-economic factors are influenced by demographic characteristics which include sex, age, education and family size (Swanepoel et al., 2017). The resource factors include access to land and farm experience, these factors act as barriers for households to enter into urban agriculture (Jongwe, 2014; Adebisi and Monisola, 2012). Participation is also influenced by institutional factors such as input supply and extension service, which stimulate households' participation in UA (Gamhewage et al., 2015).

The framework contains different factors that mainly determine the PA participation of households. Based on theoretical and empirical studies, there are many factors that influence the role of participation PA and determine food security status by peri-urban households.

These factors which affect household's participation in PA activities are categorized in to demographic, socio-economic, institutional factors either negatively or positively related to participation in PA practice among urban and per-urban households and food security. According to Abebaw (2003), farm household who participate in urban and per-urban agriculture would able to increase crop production through increased complementary inputs which can enable them to produce more food for household consumption. Likewise, PA can enable to adopt more diversified crop.



Source: Developed based on literature review (2024)

In addition, access to PA can enable households to improve new technologies and intensify cultivation, leading to increase productivity, overall high production, and greater returns from farming (Nugusse cited FAO, 2011). Hence, PA improves the food availability, access, utilization and stability in the household. It enhances food availability and stability through solving the food production related problems. Urban small scale irrigation agriculture improves food access through generating employment opportunity and income sources to some members of the family especially to women and children. Moreover, the family can consume balanced and nutritious food from their crop, fruit and vegetable produced through PA.

CHAPTER THREE

RESEARCH METHODS AND MATERIALS

3.1. Description of the study area

3.1.1. Location

This study was undertaken in Akaki Kality Sub-City, which is located in south of Addis Ababa City, central Ethiopia. It is located at longitude from 38^0 75' 32" to 38^0 87'

94” and latitude from 8^0 83’ 35” to 8^0 95’ 94”.
Figure 2:Map of the study area

Source: (CSA, 2007, Ethio-GIS 2015)

3.1.2 Demographic Characteristics

The sub city encompasses a range of socioeconomic statuses, with individuals from different income levels. Educational opportunities are available, with schools and potentially higher education institutions present. The population of Akaki Kality Sub-City was estimated to be 181,270 in 2007 and projected to reach 255,348 in 2022. (CSA) Like any other parts of Ethiopia, the population growth of this sub city is in alarming rates with annual population change of 2.3 %.

3.1.2 Physiographic Characteristics

Akaki Kality Sub-City has a total area of 12,581.65ha and characterized by an elevation of approximately 2,300 meters (7,546 feet) above sea level, offering a cool and temperate climate. The landscape mostly flat or gently rolling. This topography provides opportunities for agriculture, including urban and peri-urban farming. Akaki Kality Sub-City experiences a highland or temperate climate due to its elevation. The climate is characterized by mild to cool temperatures and distinct wet and dry seasons. Here is a breakdown of the climate patterns. The average annual temperature ranges from around 12 to 20 degrees Celsius and annual rainfall of 600-1200 mm having a bimodal rainfall pattern. The highland climate and moderate temperatures of Akaki Kality Sub-City are generally favorable for agricultural activities. The sub city's elevation and rainfall patterns make it suitable for the cultivation of various crops, including cereals like maize, teff, barley, as well as vegetables and horticultural crops.

3.1.3 Economic activity

Akaki Kality Sub-City has a range of economic activities, including agriculture. Despite being an urban area, there are small-scale farms and agricultural cooperatives that cultivate crops like maize, teff, barley, tomatoes, onions, and peppers. Livestock farming, particularly dairy farming, is also prevalent, with cattle, sheep, goats, and poultry being raised for various products. Additionally, there are agro-processing industries that package and process agricultural goods, as well as wholesale and retail markets for trading agricultural products. The sub-city is home to food processing and manufacturing companies that transform raw agricultural materials into packaged food items. Alongside agriculture, the service sector, including restaurants, hotels, and financial institutions, supports the local population. Economic activities may change over time in response to local and national economic trends.

3.2 Research Design

This research designed for this particular study was a cross-sectional research design that encompasses PA and non- PA, and applied mixed research approaches. Both qualitative and quantitative research approach were used in order to address the objective of the study.

3.2.2 Data types and sources

Both qualitative and quantitative primary data were gathered directly from PA and non-PA users. Pre-tested structured survey questionnaires were used to collect quantitative data. The demographic, socioeconomic, institutional, and food security status of both groups of homes were evaluated using a household survey. To gather information about attitudes and perceptions regarding the impact of PA on

household food security, a qualitative approach was employed. Interviews with important informants were used for this. Additionally, secondary data from a variety of published and unpublished documents were examined and arranged.

3.2.3 Sampling technique and procedure

The study applied multi-stage sampling technique procedure to select the study households. In the first stage, the study area Akaki Kality Sub-city was purposely selected based on PA potential. In the second stage, two sample woredas were randomly selected from where PA has been practiced. In the third stage, households living in the selected sample woreda were stratified in to two groups, namely PA users (210) and non-PA (210) and then 420 study households were randomly selected.

3.2.4 Sample determination

To get a representative sample size, the study employed the sample size determination formula given by Yamane's (1967). In the determination of sample size where there is large population, but we do not know the variability in the proportion about PA user and non-PA users. Finally, to determine the representative sample household from the study area, Yamane's formula is a widely used approach for determining the sample size in a population when the exact size is known and we want to calculate a sample with a specific margin of error. The sample size for the study was calculated using Yamane's formula, which yielded a recommended sample size of 399 households. However, given the potential for non-responses or incomplete data, the slightly larger sample size of 420 households was selected. This approach serves as a buffer to ensure the robustness of the final sample, maintaining the integrity and representativeness of the data, and ultimately enhancing the accuracy and reliability of the study's findings .Therefore, for purpose of this study, 420 households (210 PA users and 210 non PA users were employed as a sample of the study.

Likewise, to determine household samples from the selected woreda for each stratum, sampling proportion to population was use. The sample of the respondent household was selected representative way of selection with e=0.05 or 5% margin of error is allowing for a 5% margin error to the sample.

399

n=399

Where,

n = required sample size

N = total population size

e = margin of error (0.05 for 5% margin of error)

Finally, representative samples for each was selected by using simple random sampling.

3.2.5 Tools and techniques of data collection

The researcher employed household surveys, FGD, KIIs and field observations to collect the primary data. These are explained as follows;

Household surveys

A structured questionnaire was used to conduct household surveys with the 420 households that were chosen in order to produce both qualitative and quantitative data at the household level. Socioeconomic, institutional, and household demographic data were all included in the questionnaire. Household surveys were also used to gather data on the food security condition of the households. Scientific principles and criteria were used throughout the questionnaire design, data collection, data filling, encoding, data entry, and processing to preserve the quality of the data gathered

Key Informant Interviews (KII)

Key informant interviews are used to obtain information directly from those who have experienced in UPA. It was conducted with local administration and specialists at the Woreda and kebele levels. To gather pertinent information, six professionals were interviewed, including kebele leaders, development agents, and agricultural office experts. The goal of setting up informant interviews with the chosen experts was to supplement the information gathered from household surveys. The researcher encouraged experts to openly discuss about the topic.

Focus group discussions (FGD)

Focus Group Discussions (FGD) are a useful tool for gathering data about social norms, habits, and the range of viewpoints within a given group. Two focus group discussions (FGDs) were conducted with a variety of participants, including elders, female household heads, experts, young people, and households with PA participation. There have been six people in each group. The group discussion was led by the researcher. The topic of PA and food security have been thoroughly discussed during the conversations.

Field observations

A field visit was executed by the researcher to substantiate and augment the information obtained through other primarily and secondary data collection tools. The socioeconomic conditions of the area types and practice of PA were explored through field observation.

Secondary data

Secondary source information was also utilized to gather data for this study. Both published and unpublished research, including theses, dissertations, journals, articles, and reports, were reviewed and incorporated. Additionally, government documents accessed from official websites such as the Ministry of Agriculture and Natural Resources (MoANR), Ethiopian Institute of Agricultural Research (EIAR), Central Statistics Agency (CSA), and National Meteorological Agency (NMA) were thoroughly examined and employed in the study.

3.3 Method of data analysis

This study employed both quantitative and qualitative methods for data collection and analysis. Quantitative data, gathered through household surveys and secondary sources, was analyzed using descriptive statistics and econometric techniques. The food security status of the study households was assessed using established food security measurement methods. The quantitative data was processed and managed using “STATA Version 15” software. Similarly, qualitative data obtained from key informant interviews, focus group discussions, and field observations was analyzed using narrative and framework analysis approaches.

3.3.1 Descriptive statistics

Descriptive statistics, including means, percentages, frequencies, and standard deviations, were used to summarize the demographic, socio-economic and peri-urban agriculture (PA) characteristics, and institutional attributes of the study households. Additionally, descriptive statistics were employed to analyze input usage, production costs, and outputs among the households.

3.3.2 Analysis of food security

There are many metrics that we use to measure food security. The metrics differ in terms of timeliness and scope. In this study the Household Dietary Diversity Score (HDDS) and Household Food Insecurity Access Scale (HFIAS) .The first indicators helps us to examine the effective of urban agriculture on dietary diversity. This is because urban agriculture tends to diversify the food consumption basket of households. In addition to this, HIFIAS has been used to gauge the effect of urban agriculture on different degree of food insecurity.

Household Dietary Diversity Score (HDDS)

HDDS helps to capture food access and availability through counting the type of food the household consumption. HDDS is measured by several food group consumed over a given reference period. The reference period is mostly the previous day (FAO & WFP 2009). The HDDS was calculated using 12 different food types, including cereals, root and tubers, vegetables, fruit, meat, poultry and offal, eggs, fish and seafood, pulses/legume/nuts, milk and milk products, oil/fat/, sugar/honey/, and miscellaneous. The HDDS variable was first calculated for each household, and its value ranged from 0 to 12. The HDDS value was then calculated for 12 food groups (0-12).

Total number of food groups consumed by members of the household, will be “0” or

“1”

Second, the average HDDS indicator is calculated for the sample population.

Household food insecurity access scale
Household food insecure access scale (HFIAS) is an adaptation of the approach used to estimate the prevalence of food insecurity in the United States (US). It is based on the idea that the experience of food insecurity (access) causes predictable reaction and responses that can be captured and quantified through a survey and summarized in a scale (Wehleret al., 1992, Hamilton, 1997).
Household food insecurity access scale has two types of questions. The first question type is should be occurrence questions. There are nine occurrence questions that ask whether a specific condition associated with the experience of food insecurity ever occurred during the previous four weeks (30 days). Each severity question is followed by a frequency of occurrence question, which asks how often a report condition occurred during the previous weeks. In addition, each occurrence question consists of the stem (time frame for recall), the study of question (refers to specific behavior or attitude), and two respondent option (0=no, 1=yes). There is also a „skip code‟ next to each „‟no‟‟ respondent option. Therefore, anytime the respondent answers "no" to an occurrence question, this code tells the enumerator to skip the associated frequency-of-occurrence followed up question (Bilinsky, 2007). The respondent is also asked how frequently the condition mentioned in the prior occurrence questions occurred during the preceding four weeks in each HFIAS frequency of occurrence question. Additionally, the three response options (1 = rarely, 2 = occasionally, and 3 = often) show a range of frequency. Therefore, by adding up the codes for each frequency of occurrence, the first HFIAS score variable is determined for every household. For every instance in which the response to the relevant occurrence question is "no," the data analysis should code the frequency of occurrence as 0 before adding up the frequency of occurrence (i.e., if Q1=0 then Q1a=0, if Q2=0 then Q2a=0, etc.). As a result, the household can receive a maximum score of 27 (if the household answers "often" to all nine frequency of occurrence questions, which is coded as response code 3); the lowest possible score is 0 (if the household answers "no" to all frequency of occurrence questions, the interviewer skips the frequency of occurrence question, which is then coded as 0 by the data analysis). A household's level of food insecurity (access) increased with a higher score, whereas a household's level of food insecurity (access) decreased with a lower score (USAID, 2007).

3.3.3 Econometric analysis

The study conducted by Cameron and Trivedi (1998) in their seminal work Regression Analysis of Count Data. The employed Negative Binomial Regression Model to analyze the relationship between urban and peri-urban agriculture and household food security, measured using the Household Dietary Diversity Score

(HDDS). This model is appropriate due to the nature of the dependent variable which is count data, over dispersion in data. This model was chosen after alternative econometric models were considered, including; Ordinary Least Squares (OLS) Regression testes baseline relationships, Poisson Regression Model initially considered for count data but found inappropriate due to over dispersion in the dataset as confirmed by a likelihood ratio test, Ordered Logistic Regression assessed for ordinal categorical outcomes but not applied due to the structure of the dependent variable.

The Household Dietary Diversity Score (HDDS)

Following Rashid et al., (2011) the use of zero-truncated Poisson regression model to estimate HDDS as the random variable following a Poisson distribution with probability density defined as:

Where DDS is the realized value of a random variable with mean and variance and respectively. is assumed to be strictly positive (y > 0). Where, the parameter λ is specified as:

E {, }= = exp () = exp()

Maximizing the likelihood (or log likelihood) has no closed-form solution, so a technique like iteratively reweighted least squares or Poisson regression is used to find an estimate of the regression coefficients.

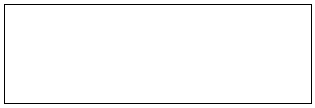
The negative binomial regression model is used to estimate the relationship between a dependent variable (dietary diversity score) and independent variables in cases where the dependent variable represents count data and exhibits over dispersion. The general form of the negative binomial regression model can be expressed as:

Where: yi is the household food security indicator (HDDS)
xi represents explanatory variables including household socioeconomic and demographic characteristics
β denotes coefficients to be estimated.
The model assumes that the variance of yi is greater than its mean (over dispersion), making it more flexible than the Poisson regression model. This flexibility is achieved by incorporating a gamma distributed random effect into the mean parameter. This approach follows the standard framework as discussed in Cameron and Trivedi (1998) in their seminal work Regression Analysis of Count Data.

In the ordered logit model, there is a continuous, unmeasured latent variable Y*

whose values determine what the observed ordinal variable Y equals. The continuous latent variable Y* has various threshold points. The values on the observed variable Y depend on whether or not the values have crossed a particular threshold or not. In this case, the thresholds could be presented as follows.

Yi = 1 if Y* is ≤ , Yi = 2 if Y* ≤ Y*i ≤ ,Yi = 3 if Y*if ≤ Y*i ≤ , Yi = 4 if Y* >
Based on this hierarchical cut points, the Ordered Logit Model will be estimated in the following way:



The estimated cut off terms to estimate the probability that Y will take on a particular value could be computed as follows.

Since both the Household Food Insecurity Access Scale (HFIAS) categorize households into different food insecurity statuses, an ordered logit regression model was applied to establish a link between urban agriculture and the food insecurity status of households. A generalized ordered logit model is an improvement upon the ordered logit model, as it accounts for the parallel assumption, thereby avoiding bias in the estimation. The generalized ordered logit model is specified as follows, following Richard Williams and Quiroz (2019).

Where M is the number of categories of the ordinal dependent variable. From the above, it can be determined that the probabilities that Y will take on each of the values 1,…,M are equal to

Where denotes all relevant socio-economic and institutional variables affecting food insecurity.

3.3.4 Qualitative data analysis

The qualitative data, which includes non-numeric information such as interview transcripts, notes, videos, audio recordings, images, and test documents (collected through key informant interviews, focus group discussions, and field observations), was analyzed using narrative and framework analysis. This approach aimed to interpret and explain the informants' perceptions, providing deeper insights into the issues under investigation.

3.3.5 Definition of variables and hypothesis

Based on the conceptual and empirical literature review, explanatory variables which have been logical and justify able rational in influencing household food security status are identified.

3. Dependent variables

Participation decision in PA: It was the first dependent variable taking the value 1 if the household participate in PA and 0 if not participated in PA. The main intention here is to identify the factors determining the participation of the household in PA. Food security status: It was the other dependent variable in this study taking the value 1 if the sample household is food secured and 0 otherwise.

4. Outcomes

Regarding food security is that it refers to the ability of individual to obtain sufficient food on a day to day basis. Likewise, international food security is defined as the ability of people to secure adequate food. Therefore, HDDS is a method used to assess the diversity of foods consumed by a household over a specific reference period. The score is calculated based on the number of food groups consumed by household members, reflecting the household's access to a variety of foods and their dietary quality. Through if there were participation in UPA; there is a food security in the household.

5. Independent variables

The following potential explanatory variables, also called independent variables hypothesized to determine the household's decision to participate in PA and food security status are included contribution for various factors. These factors related to the household demographic, socioeconomic and institutional factors and these are explained as follows. Additionally, the summary of the potential explanatory variables is presented in Table 3.1.

Sex of the Household Head (SEX): This is a dummy variable and a value of 1 is assigned for male and 0, otherwise. Female household heads often face constraints in managing farming activities efficiently and on time due to their involvement in numerous domestic responsibilities (Essa, 2011; Kifle et al., 2017). Additionally, male household heads are more likely to participate in kebele meetings and engage with

the community, which improves their access to information, external services, and knowledge about farming techniques. Empirical studies reported a significant and positive influence of sex on participation in PA (Zakari et al., 2014). It is implied that households headed by men are more likely to engage in PA than female headed households. Thus, it is hypothesized that PA participation in this study is positively impacted by the sex of the house head.

Age of the household head (AGE): Age is a continuous variable and measured in years. Through age households could develop experience in farming, and hence interest in PA. With regard to its direction of influence, Ashwini (2021) found a positive influence of age on participation in PA. Thus, the age of the family head is thought to positively affect PA involvement in this study.

Education level of the household head (EDU): It is a continuous variable that is assessed by the household head's formal years of education. Higher educated households were thought to be better able to apply scientific information, manage their farming operations and lifestyle in a positive way, and increase domestic production to meet household consumption needs (Getachew et al., 2018). This might involve the capacity of households to swiftly decide after weighing the benefits and drawbacks of PA. The household head's educational attainment significantly and favorably influences PA membership, according to empirical research (Sultana and Kiani, 2011). This study therefore hypothesizes that household involvement in UPA and food security status are positively impacted by the educational attainment of the household head.

Prior experience in agriculture (EXPAGR): It is linked to the household head’s prior experience in agriculture and a value of 1 is attached to the head of the household who have prio years of experience in urban agriculture and 0 otherwise. Individuals with prior experience in agriculture are more likely to involve in PA than their counterparts. Empirical study reported a significant and positive influence of prior experience in agriculture on participation in PA (Abafita and Kim, 2014). Hence, in this study, prior experience in agriculture is expected to have a positive influence on participation in PA.

Household size (HHSIZ): is associated with the total number of people residing in the household. The demand for food may increase with the number of household members, leading to an increase in PA. Misgana (2014) found that household size had a significant and favorable impact on PA involvement. Thus, the study's hypothesis is that household size will positively impact PA involvement.

Farm land size (LANDSIZ): It refers to the entire area, expressed in hectares, of the household's garden or farm land. There may be more opportunities to participate in PA if there is more farm land. However, empirical research indicate varied results regarding its direction of influence. In contrast to Tilksew and Fekadu (2014), who reported considerable and negative influence, Fekadu and Mequanent (2010) reported significant and favorable influence. However, the size of the garden or farm area is thought to positively affect households' involvement in PA in this study.

Availability of input supply (INPUT): It refers to household’s access to inputs and it is

a dummy variable, 1 if yes and otherwise 0. Availability of input supply such as seeds and fertilizer will encourage households' participation in PA. Wali and Janekarnkij (2013) found a significant and positive influence of availability of input supply and participation in PA. Therefore, in this study, availability of input supply is hypothesized to have a positive influence on households' participation in PA.
Extension contact (EXTSION): It refers to household's access to extension services and it is a dummy variable, 1 if yes and otherwise 0. Access to extension services may increase households' awareness about the advantages of PA, and hence their participation. Wali and Janekarnkij (2013) found a significant and positive influence of extension contact on participation in PA. Therefore, in this study, extension contact is hypothesized to have a positive influence on households' participation in PA.

Table 1:Summary of description of variables and its value of measurement

Variable definition	Type of variable	Unit of Measurement	Expected sign
Participation in peri-urban	Dummy	Yes/No	
Sex of the household head	Dummy	1 for male and 0 for female	+ve
Age of the household head	Continuous	Number	+ve
Educational levels of HH	Continuous	Year	+ve
Family size/labor availability	Continuous	Number	+/-
Farm size/land holding	Continuous	Hectare	+ve
Market distance	Continuous	Kilometer	-ve
Input supply	Dummy	1 for yes & 0 otherwise	+ve
Extension contact	Dummy	1 for yes & 0 otherwise	+ve

Source: Own definition based on literature review (2024)

3.4 Ethical consideration

Permission to conduct the research was granted by Akaki Kality Sub-City, while ethical clearance was obtained from Addis Ababa University (AAU). Questionnaires were administered to respondents after securing their informed written consent. Before obtaining consent, the researcher and research assistants explained the purpose of the study and assured respondents that their information would remain confidential. To protect privacy, names and other identifying details were excluded

during data collection. The researcher ensured that all information gathered would be kept strictly confidential and used exclusively for the study's purposes.

CHAPTER FOUR

4.1 RESULT AND DISCUSSION

This chapter presents the major findings of the research and deliberates it in contrast with the result of other studies. Both descriptive and econometric methods were used to analyze general demographic, socioeconomic and institutional characteristics of PA in the study area. The descriptive analysis focus on summarizing the most salient various aspects of the responds such as socioeconomic conditions of urban farmers, and demographic households in Akaki sub city in Addis Ababa. The econometric analysis was also used to identify factors affecting PA in the study areas and to link the role of Peri- urban agriculture on food security.

4.2 Descriptive Analysis

4.2.1 Demographic characteristics of household

One of the most important factors that may affect the participation of households in urban agriculture is age of the head of the households. In this regard, the result shows that the average of the head of the household which practices urban agriculture (42.53 years) is higher than the head of the household which doesn't practice urban agriculture (40.94 years), The result is statistically significant at 5 percent (P= 0.044). This could be partly linked to the fact older individuals may also have a better ability to access credit, implement sustainable agricultural practices, and manage food resources (Yamano & Jayne, 2004). Likewise, the average level of education of the head of the household which practices urban agriculture is 7.35, which is higher compared to those who don't practice urban agriculture (6.07) and the result is significant at 5 percent with a p-value of 0.002. This suggests that higher education levels are more prevalent among urban agriculture practitioners, which is consistent with research indicating that educated households are more likely to adopt new agricultural techniques and access market information (Shimelis, 2009). Education can enhance decision-making and provide better opportunities for improving food security through more effective agricultural practices (Sumberg et al., 2013).

The results of the analysis have also revealed that there is not any significant difference on average family size between those households which practiced urban agriculture and those which don't. In a netshell, the average family size of households is 3.81 for urban agriculture practitioners and non practitioners.

Table 2: Demographic characteristics of households

Name of Variables	Peri_Urban Agriculture (N=210)	Non-Urban Agriculture (N=210)	Total Households (N=420)	P-Value
Age (Years)	42.53 (11.39)	40.94 (13.98)	41.74 (12.79)	0.044**
Level of Education	7.35 (3.49)	6.07 (3.02)	6.71 (3.36)	0.002***
Total Family Size	3.73 (1.81)	3.99 (1.72)	3.86 (1.81)	0.185
Gender (Male = 1, Female = 0)	58%	54%	56%	0.185
Marital Status (Married = 1, Single = 0)	68%	63%	66%	0.049**

Note: *** show significance at p<0.01, ** significance at p<0.05
Source: Analyzed from own data (2024)

There is no statistically significant difference in gender composition between households which practice urban agriculture and those which don't. Both household categories have a similar percentage of males (58% vs. 54%), with a p-value of 0.185, entailing that both groups have the same gender composition. This suggests that gender is not a significant factor in differentiating urban agriculture participation. The equal gender distribution across both groups might reflect gender-neutral access or opportunities for urban agriculture participation. However, it is important to consider that other factors (household responsibilities, access to resources) could influence the gender dynamics in urban agriculture practices.

The result showed that urban households which practiced urban agriculture have more married members (68%) compared to households which don't practice urban agriculture (63%), with a p-value of 0.049, which is statistically significant ($p < 0.05$). This finding suggests that marital status, particularly being married, may be associated with greater participation in urban agriculture. Married individuals may have more family support and shared responsibilities, making it easier to engage in urban farming activities. Additionally, married individuals might have more stable living arrangements, increasing the likelihood of land access and agricultural

involvement. This aligns with studies indicating that household stability can influence the decision to participate in agriculture (Cohen & Lichtenstein, 2015). Therefore, marital status is significant factors influencing participation in urban agriculture, suggesting that household stability play key roles in enabling participation.

4.2.2 Economic and institutional characteristics of households

Institutional and economic factors are crucial in promoting households to participate in urban agriculture. In this regard the result illuminates that households which participate in urban agriculture have significantly larger average land holdings (1.22 hectares) than households which don't taker part in urban agriculture (0.36 hectares), with a difference in land size being statistically significant. Larger land size provides more opportunities for agricultural diversification, which can enhance food security by reducing risk and improving production. This is supported by literature on the relationship between land access and food security (Alemu & Geda, 2011). Households which take part in urban agriculture report a significantly higher average monthly income (17,849.70 Birr) compared to non-urban households (12,202.30 Birr), with the p-value of 0.032, entailing the presence of statistical significance between the two groups. Higher income levels enable better access to food, agricultural inputs, and markets, improving food security. Studies indicate that income is a crucial determinant in enhancing household food security and overall well-being (Barrett, 2010).

Table 3: Economic and institutional characteristics of the study households

Name of Variables	Peri-Urban Agriculture (N=210)	Non-Urban Agriculture (N=210)	Total Households (N=420)	P-Value
Land Size (Hectares)	1.22 (0.91)	0.36 (0.75)	0.79 (0.83)	0.171
Monthly Income (Birr)	17,849.70 (5,060.94)	12,202.30 (4,660.77)	15,026.00 (4,830.86)	0.032**
Distance from Main Roads (Minutes)	17.60 (5.06)	17.01 (4.66)	17.30 (4.83)	0.43
Distance from Main Markets (Minutes)	17.60 (5.06)	17.01 (4.66)	17.30 (4.83)	0.43
Access to Microfinance	72%	48%	60%	0.002***

Note: *** show significance at p<0.01, ** significance at p<0.05
Numbers in brackets are standard deviation
Source: Analyzed from own data (2024)

Both household type's namely urban agriculture practitioners and non practitioners have similar average distances to the main roads, with the latter at 28.01 minutes and the former at 28.60 minutes. The p-value of 0.430 indicates that road access is not a differentiating factor between the two groups. Previous studies suggest that

while road access can impact food security by facilitating market access, other factors such as income and education are more influential (Fafchamps & Shilpi, 2003). Likewise, the distance from the main markets does not show a significant difference between household which practice urban agriculture and which don't with a p-value of 0.430. This suggests that market proximity does not play a key role in determining food security in this case. However, market access still affects food availability and pricing (Minten et al., 2006), though other factors like income may have more impact.

Urban agriculture households have significantly higher access to microfinance (72%) compared to non-urban agriculture households (48%), with a p-value of 0.002, which is statistically significant ($p < 0.01$). This indicates that access to financial resources plays an important role in enabling households to engage in urban agriculture. Microfinance can provide the capital needed for investment in agriculture, which may be more readily available to urban agricultural practitioners. This finding is consistent with literature that suggests access to credit or financial services can support agricultural development and productivity (Ouma et al., 2010). Therefore, access to microfinance is a significant factors influencing participation in urban agriculture, suggesting that financial support play key roles in enabling participation.

4.3 Econometric Analysis

The econometric analysis was deployed to examine the effect of urban agriculture on food security and to identify the most important factors such as income, access to credit and other socioeconomic factors that affect participation of households in urban agriculture. Three variants of models, namely negative binomial, ordered logistic and binary logistic regression have been used. These models help us to address the two main objectives of the study. In one hand the first two models notably the negative binomial and the ordered logistic regression tried to link urban agriculture with two metrics of food security namely dietary diversity and household food scale access condition. The last regression, the binary regression, has been deployed to identify the most important factors that affect participation of urban agriculture.

4.3.1 Dietary diversity and urban agriculture

The table below (Table 4.3) provides a summary of the econometric estimation results. The negative binomial regression model, which suits to modeling of count data, was used to model the factors influencing the HDDS. The dietary variety score in this study falls between 0 and 12. The outcomes of count data are assumed to be Poisson distributed. To assess the robustness of the findings, it was important to evaluate the estimates of Poisson regressions, negative binomial regression, and Ordinary Minimum Squares (MCO) before selecting the best model.

In order to fix the above problems, negative binomial regression was used in a bid to fix the over dispersion of the data. The over dispersion test has shown that there is a

problem of over dispersion in the data. This then calls for the application of negative binomial regression. The set of explanatory variables under consideration were tested in three models and then the final model was determined. Therefore, the determinants of the dietary diversity score were estimated using negative binomial regression since the coefficients were more significant in the negative binomial regression model, and this model was selected according to the likelihood test and the Wald test. However, as the significant factors did not change that much compared to the OLS model, the negative binomial regression results are reliable, robust, and estimated with robust standard errors.

The results of the robust model show the level of education of the head of the household, gender, total family size, monthly income and using urban agriculture are statistically significant variables and important factors determining the HDDS. In general, the results have shown that income categories, monthly income and practicing urban agriculture are important factors that affect dietary diversity. The model results also indicate that age of the head of household, distance from market/ road and marital status were not statistically significant to affect the dietary scores. This can be partly linked to the fact that income is the most important factor that affects the consumption of households

The result has indicated that urban agriculture increases the dietary diversity of households. Participating in urban agriculture significantly enhances dietary diversity by 6.71 percentage point with p= 0.01 level of significance. Urban agriculture households are more likely to have greater dietary diversity. This supports the idea that urban agriculture provides access to fresh produce, which can improve food variety and nutritional intake. Households engaged in urban agriculture may be growing a variety of crops, which directly contributes to their dietary diversity. There are also other variables that affect dietary diversity in addition to participating in urban agriculture. For instance, male headed households tend to consume more diversified food items. A coefficient of 0.0807** in the regression entails a positive and statistically significant effect on dietary diversity at $p < 0.05$. Specifically, males are likely to have slightly higher dietary diversity than females in urban agriculture households. The result suggests that gender plays a role to determine dietary diversity.

The other important factor that affects dietary diversity is the level of education. The result in the below table also shows that a coefficient: 0.00741** level of education significantly influences dietary diversity at $p < 0.05$. The result shows that when level of education increase by one percentage point, dietary diversity increases by 0.7 percentage point. The result is consistent with the view that educated individuals may have better access to nutritional information, better decision-making ability, and more awareness about food variety, leading to greater dietary diversity (Sumberg et al., 2013).

Table 4: Summarized econometric estimation result

Variables	Dietary diversity
Age	(0.000)
	(0.001)
Gender	0.0807**
	(0.040)
Level_education	0.00741**
	(0.003)
Marital_status	(0.067)
	(0.046)
Religion	-0.121*
	(0.066)
Distance_road	(0.000)
	(0.001)
tot_family	0.0121**
	(0.005)
urban_agri	0.0671***
	(0.021)
Monthly_income	4.17e-06***
	(0.000)
lnalpha	(31.920)
	-
Constant	1.758***
	(0.086)
/lnalpha -31.9217	.
alpha 1.37e-14	.

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Own computed (2024)

Where, ln(alpha) and alpha values provide information about the over dispersion of the data in the negative binomial regression model. A very low value for alpha suggests that the negative binomial model is being used to account for over dispersion in the count data (dietary diversity counts, variety of food groups).

Religion: Religion at -0.121* (statistically significant at $p < 0.1$) has varying degrees of influence on dietary diversity. Religion having a negative effect on dietary diversity at $p < 0.1$. This suggests that households from a particular religious group might have slightly less dietary diversity. The exact reason for this could be due to religious dietary restrictions or other sociocultural factors, which would require deeper exploration.

Total Family Size: Coefficient: 0.0121** Total family size significantly influences dietary diversity at $p < 0.05$. Larger family sizes seem to correlate with higher dietary diversity. This could be because larger households may have more resources or more

people contributing to food acquisition, leading to a wider variety of foods being available.

Monthly Income: The coefficient: 4.17e-06*** in monthly income has a significant positive effect on dietary diversity at $p < 0.01$. Higher income increases dietary diversity, as wealthier households have greater purchasing power to buy a wider range of food items, including those that are nutritionally diverse.

4.3.2 Intensity of Food insecurity and peri urban agriculture

The role of urban agriculture in terms in helping households not to fall into severe or modest forms of food insecurity has been examined. In this regard, Household Food Scale Access Condition has been used to measure the intensity of household food insecurity. The metric helps to categorize into severely food insecure, modestly food secured, mildly food secured, and food secured. Since these categorization has hierarchical formal and specified order, ordered logistic regression has been used to explore the role of urban agriculture on food security. The results from the ordered logistic regression provided additional insights into the study into how different variables influence these levels.

The coefficient values for age in all categories of food security (severely food insecure, modestly secured, mildly food secured, and food secured) are relatively small and statistically insignificant, as indicated by the high p-values. For instance, in the severely food insecure group, the p-value is 0.815, suggesting that age does not significantly affect the likelihood of being severely food insecure or in any other food security category. This finding aligns with other studies that have found mixed results regarding age as a determinant of food security. A researcher conducted by Ecker et al. (2012) and Imai et al. (2012) indicate that while age may be a factor in some contexts (particularly when considering elderly populations or young dependents), its effect is not always statistically significant in larger household-based analyses. Similar findings are reported in Tesfaye et al. (2015), where the impact of age on food security was minimal in rural Ethiopia, suggesting that age alone does not have a direct and significant effect on food security outcomes. This may be due to the presence of other more dominant variables, such as household income and agricultural practices, which have more direct impacts on food security.

Gender does not appear to significantly influence food security status, with p-values greater than 0.05 in all groups. The coefficient for gender in the severely food insecure group is 0.055 (p = 0.155), which is not statistically significant, indicating that being male or female does not significantly impact the probability of being in different food security categories. According to Abebe et al. (2012) found that gender inequality and women's control over household resources significantly influenced food security.

Access to microfinance shows a significant positive association with being severely food insecure, with a coefficient of 0.258 and a p-value of 0.002, which is highly significant. This suggests that households with access to microfinance are more likely to experience severe food insecurity, which may reflect that financial support might not be sufficient to address other underlying factors of food insecurity. In addition, the profile of households who benefit from microfinance show that these types of households are severely poor such that they tend to be more food insecure compared to other types of households. Conversely, households with access to microfinance are significantly less likely to be in the "mildly food secured" and "food secured" categories, with negative and statistically significant coefficients (-0.0939 and -0.171, respectively). This is consistent with findings from Yemiru et al. (2017), who showed that access to microfinance in rural Ethiopia can improve household income, but its effect on food security can be limited due to the small loan sizes and high-interest rates.

Education has a significant negative relationship with food insecurity, especially in the "mildly food secured" and "food secured" categories. The coefficient for the severely food insecure category is -0.0326 (p = 0.000), and for the food secured category, the coefficient is 0.0283 (p = 0.000). This suggests that as the level of education increases, the likelihood of being severely food insecure decreases, while the probability of being food secured increases. This is consistent with studies by

Fekadu et al. (2017), which found that higher education levels were associated with improved food security due to better knowledge and decision-making abilities, as well as enhanced access to markets and agricultural inputs. Education helps in managing resources more effectively and increasing household resilience to food insecurity.

Table 5: Household food security level

	Severely food insecure	Modestly food secured	Mildly food secured	Food secured
VARIABLES				
Age	0.000295	2.18e-05	-6.13e-05	-0.000256
	(0.00439)	(0.000322)	(0.000913)	(0.00380)
Gender	0.0550	0.00406	-0.0114	-0.0477
	(0.155)	(0.0117)	(0.0332)	(0.134)
1.haveaccess_microfinance	0.258***	0.00702	-0.0939***	-0.171***
	(0.0669)	(0.0126)	(0.0318)	(0.0355)
Level_education	-0.0326***	-0.00241**	0.00678***	0.0283***
	(0.00716)	(0.00117)	(0.00238)	(0.00587)
agri_exper	0.0249***	0.00184	-0.00518***	-0.0216***
	(0.00388)	(0.00117)	(0.00159)	(0.00415)
2.Marital_status	0.214	-0.00516	-0.0721	-0.137**
	(0.146)	(0.0221)	(0.0627)	(0.0653)
3.Marital_status	-0.0526	-0.00678	0.00858	0.0508
	(0.233)	(0.0376)	(0.0277)	(0.243)
4.Marital_status	-0.00789	-0.000801	0.00158	0.00711
	(0.146)	(0.0155)	(0.0284)	(0.133)
Monthly income	1.15e-06	8.46e-08	-2.38e-07	-9.93e-07
	(1.21e-06)	(8.68e-08)	(2.52e-07)	(1.04e-06)
Peri- urban practice	0.0658	0.00486	-0.0137	-0.0570
	(0.0515)	(0.00505)	(0.0127)	(0.0438)

Observations	210	210	210	210

Source: Own computed (2024)

Agricultural experience is significantly associated with food security status. A positive coefficient of 0.0249 in the severely food insecure category suggests that individuals with more agricultural experience are more likely to be severely food insecure, which may reflect the challenges of agricultural productivity and market access. However, agricultural experience is negatively related to the "mildly food secured" and "food secured" categories, suggesting that with more experience, households tend to be in less food-insecure categories. For example, in the "food secured" group, the coefficient is -0.0216 (p = 0.000), suggesting that agricultural expertise leads to better management of food resources. According Tadesse et al. (2018) agricultural experience may provide a foundation for food production, external factors such as weather patterns and market access play a more significant role in determining food security in Ethiopia.

Marital status shows a mixed pattern across different food security categories. In the severely food insecure category, marital status has a positive coefficient (0.214), but it is not statistically significant (p = 0.146), indicating that marital status may not strongly influence food insecurity in this group. However, in the "food secured" category, marital status has a negative and statistically significant coefficient of -0.137 (p = 0.065), suggesting that married households are less likely to be food secure. This might imply that marital dynamics and the associated responsibilities, such as household size and care giving roles, influence food security. A research conducted by Mulugeta et al. (2016) also find that larger households, especially those with many children, are more likely to experience food insecurity due to increased consumption needs and a lack of resources.

According to Mengistu et al. (2014) found that while income is an important factor for food security, it alone does not explain the disparities in food security. Other variables, such as access to land, social capital, and market conditions, may have a stronger influence on household food security.

Although urban agriculture does not show a significant effect on food security in this analysis. However, a research conducted by Sewnet et al. (2018) showed that urban agriculture has the potential to improve food security in Ethiopia, particularly in urban areas where food accessibility and affordability are major concerns. Urban agriculture can provide a supplementary food source and income, thus improving the food security of households in cities like Addis Ababa.

4.3.3 Factors influencing participation in urban agriculture

To identify the factors that influence household participation in urban agriculture

binary logistic regression analysis was conducted. This is because the dependent variable is a binary one where 1 assigned for participates while 0 for none participate. This regression helps to identify factors influencing participation in Peri-urban agriculture (PA) in Akaki Kality.

The results of the logistic regression have also revealed that there are important variables that affect the participation of households in urban agriculture. In this regard, the two most important variables that affect the participation of households in urban agriculture are land size and access to irrigation. For instance, the probability of participating in urban agriculture increases by 0.268 if households have access to irrigation. Likewise, when land size increases by one hectare of land the probability of households to participate in urban agriculture increases 0.371. Both are significant at 1 percent. These results have also been supported by the focus group discussion where households have explained that three factors notably access to land, availability of water for irrigation and labor are the most important factors that affect the engagement of households in urban agriculture.

The result also highlighted that the probability of practicing urban agriculture is higher for households who are married than those who are not. In addition to this, the probability of practicing urban agriculture decreases when family size increases. In this regard, the probability of practicing urban agriculture tends to decrease by 0.549 if the heads of the household is male compared to female headed household with 1 percent of level of significance. The result also shows that the probability of households participating in urban agriculture decreases by 0.081 when family size increases by one. This entails that larger households are less likely to participate in urban agriculture compared to those with smaller family sizes. This is possibly due to higher non-agricultural income needs or resource constraints.

Table 6: Logistics regression of factors affecting household participation UPA

Variables		
Age	0.00	
	(0.00)	
Gender	-0.549***	
	(0.03)	
Level_education	0.01	
	(0.01)	
agri_exper	0.00	
	(0.00)	
Marital_status	0.08	
	(0.17)	

Marital_status	-0.423***	
	(0.03)	
Religion	0.202***	
	(0.06)	
Distance_markets	(0.00)	
	(0.00)	
tot_family	-0.0815***	
	(0.02)	
haveaccess_microfinance	(0.05)	
	(0.07)	
Access_irrigation	0.268***	
	(0.05)	
land_urban	0.371***	
	(0.06)	

Source: own computation (2024)

4.4 Discussion

This study provides critical insights into the factors influencing participation in urban agriculture, household food security levels, and the comparative characteristics of urban agriculture and non-urban agriculture households. By examining multiple dimensions such as socioeconomic factors, access to resources, and dietary diversity, this research highlights the multifaceted role of urban agriculture in improving household livelihoods in the Akaki Kality Sub-City. The findings align with and add to the existing body of knowledge on urban agriculture and food security.

4.4.1 Factors Influencing Participation in Urban Agriculture

The negative binomial regression results reveal that access to microfinance is a key determinant of participation in urban agriculture. Urban households with access to financial resources are significantly more likely to engage in urban farming. Households with access to microfinance are more likely to engage in urban agricultural activities, consistent with findings by Sina et al. (2020) who highlight the role of financial resources in enabling urban households to invest in small-scale farming. This underscores the importance of microfinance institutions in facilitating urban agricultural practices, especially for low-income households. In addition, the role of microfinance in reducing financial barriers to agricultural inputs, tools, and technologies, which are crucial for small-scale urban farmers. Similar findings have been reported by Zezza & Tasciotti (2010), who argue that financial inclusion is critical for enabling urban agriculture to thrive in low-income settings. Additionally, other studies have demonstrated that microfinance can improve productivity and resilience among urban farmers by fostering long-term investment in sustainable agricultural practices (Njiraini & Guthiga, 2013).

Additionally, agricultural experience is positively associated with urban agriculture participation. Experienced households are better equipped to navigate the challenges of urban farming, including limited space, water scarcity, and market access. According to studies by Foeken and Owuor (2008) illustrate that households with prior farming experience are more likely to adopt innovative practices such as vertical gardening. This experience provides a competitive edge, enabling farmers to navigate challenges and recognize the economic and nutritional benefits of urban agriculture. Similarly, agricultural experience positively influenced participation, implying that households with more experience are better equipped to overcome challenges associated with urban farming. Agricultural experience also facilitates better planning and use of inputs, enhancing productivity and household food security (Dossa et al., 2011).

However, education level shows an inverse relationship, suggesting that households with higher education levels may pursue alternative livelihood strategies outside of agriculture. This supports findings by Shimelis (2009), who found that education often redirects household labor toward formal employment or higher-income opportunities. In addition, finding supports research by Tacoli et al. (2013), which

highlights that less educated households often rely on agriculture as a subsistence strategy in urban areas. However, education plays a dual role while it may reduce direct participation, it enhances the capacity to adopt innovative techniques or entrepreneurial approaches to farming (Crush et al., 2011).
Interestingly, while gender was not statistically significant, male-headed households were slightly more likely to participate in urban agriculture, consistent with traditional gender roles in agricultural activities. This emphasizes the need for gender-sensitive policies to encourage greater participation of women, who often face additional barriers to accessing resources and land (FAO, 2019). This finding aligns with other studies that identify male dominance in decision-making and land access in agricultural activities (Njenga et al., 2013). However, women often play an equally crucial role, particularly in subsistence farming and nutrition management. Gender sensitive policies, such as access to credit for women farmers and targeted training programs, are essential to ensure equitable participation.

4.4.2 The Role of peri Urban Agriculture on Household Food Security

Urban agriculture plays a pivotal role in enhancing household food security, particularly in rapidly urbanizing areas where access to fresh and affordable food is increasingly constrained. By integrating food production within urban spaces, households can improve their dietary diversity and access to nutritious foods, contributing to reduced vulnerability to food insecurity. Numerous studies have highlighted the potential of urban agriculture to address food insecurity, particularly in low-income households (Zezza & Tasciotti, 2010). For urban dwellers facing fluctuating food prices and limited access to markets, growing their own food provides a buffer against economic shocks and enhances their ability to meet daily nutritional needs.
The multinomial logistic regression analysis reveals the significant role of urban agriculture in determining household food security. Access to microfinance emerges as a critical factor in reducing severe food insecurity. Households with access to financial support are less likely to fall into the severely food-insecure category, as microfinance enables them to invest in income-generating activities, purchase food, and reduce vulnerability to shocks. This finding is consistent with studies that link financial inclusion to improved household resilience and food security (FAO, 2019).
The relationship between education level and food security is also notable. Higher education levels are associated with a lower likelihood of severe food insecurity and a higher likelihood of being food secure. Educated households are better positioned to access information, diversify income sources, and adopt improved agricultural practices, which collectively enhance food security. This aligns with Sumberg et al. (2013), who emphasize the importance of education in achieving food security outcomes. Agricultural experience plays a dual role. While it reduces the likelihood of severe food insecurity, its modest impact on achieving full food security suggests that experience alone is insufficient without complementary factors like access to resources, infrastructure, and markets. The findings also indicate that marital status

has a nuanced effect, with married households being slightly more food secure, likely due to shared labor and financial resources.

4.4.3 Dietary Diversity and Nutrition

Urban agriculture significantly enhances dietary diversity, as observed in households practicing urban farming. This study revealed that urban agriculture households had higher Household Dietary Diversity Scores (HDDS), indicating better access to varied food groups compared to non-farming households. Such findings are consistent with Crush et al. (2011), who reported that urban farming households consume more fruits, vegetables, and other nutritious foods than their non-farming counterparts. Improved dietary diversity is associated with better health outcomes, particularly for children and women, who are often the most vulnerable to nutritional deficiencies in urban settings (Smit et al., 2001).

The analysis of dietary diversity scores (HDDS) highlights the nutritional benefits of urban agriculture. Urban agriculture households have significantly higher HDDS compared to non-urban agriculture households, indicating greater access to diverse food groups. This suggests that urban farming directly contributes to improved dietary quality by providing fresh vegetables, fruits, and other food products. Previous studies (Zezza & Tasciotti, 2010; FAO, 2019) corroborate this finding, emphasizing the role of urban agriculture in enhancing household nutrition, especially in resource-constrained settings.

The observed dietary diversity also underscores the importance of integrating urban agriculture into urban planning policies to address nutritional deficiencies and promote healthier diets. Urban agriculture can complement market-based food access, particularly for low-income households, by ensuring a steady supply of nutritious food. In addition to improving direct access to food, urban agriculture contributes to food security by generating income for households. Income earned from selling surplus produce allows households to purchase other food items, diversify their diet, and save for emergencies. Studies by Foeken and Owuor (2008) support these findings, emphasizing that urban agriculture reduces household expenditure on food, freeing up resources for other essential needs. In contexts where formal employment is scarce, urban farming offers a supplementary income stream that strengthens resilience against economic instability.

4.4.4 Comparison of peri Urban and Non-Urban Agriculture Households

The binary logistic regression analysis provides a comparative perspective, revealing significant differences between urban agriculture and non-urban agriculture households. Access to microfinance is notably higher among urban agriculture households, indicating that financial inclusion plays a pivotal role in enabling urban farming. Additionally, urban agriculture households are more likely to be married, suggesting that family structure influences participation in urban agriculture. These findings align with Tibesigwa et al. (2017), who highlight the importance of

household dynamics in agricultural decision-making.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 Concluding remarks

This study, conducted in Akaki Kality Subcity, Addis Ababa, focused on the "Role of Peri-Urban Agriculture for Household Food Security," with an emphasis on understanding the dynamics of Peri-Urban agriculture (PA) and its contribution to alleviating food insecurity in peri-urban contexts. The research explored factors influencing participation in urban agriculture, its impact on household food security, and the institutional and policy frameworks shaping the sector in the Ethiopian context.

The findings unequivocally highlight that urban agriculture is a crucial strategy for enhancing household food security in Akaki Kality Subcity. Households engaged in urban agriculture demonstrated improved food security levels compared to non-participating households, attributable to increased dietary diversity, stable food availability, and augmented household incomes. These findings align with global evidence that urban agriculture contributes significantly to the resilience of urban households by addressing food supply gaps and promoting self-sufficiency (Alemayehu, 2023; Tadesse et al., 2021).

Factors influencing participation in Peri-urban agriculture were multifaceted. Access to microfinance was identified as a key enabler, providing urban farmers with financial resources to procure essential inputs and improve production. Educational attainment positively influenced food security outcomes, as households with higher

education levels exhibited better adaptability to innovative practices and policies. Agricultural experience further strengthened participation by enhancing skills and productivity. However, socio-demographic factors such as marital status and household size also played significant roles, demonstrating the complexity of urban agriculture participation in diverse urban settings.

Despite the clear benefits, urban agriculture in Akaki Kality faces institutional and policy-related constraints. A lack of coordinated policy frameworks, limited land access, and insufficient support systems restrict the potential of urban agriculture as a sustainable solution to food insecurity. In particular, land-use competition in densely populated urban areas poses a significant challenge. These findings resonate with prior research emphasizing the need for an integrated approach to urban agriculture, where policies address both land tenure security and resource allocation (Gebremariam et al., 2022; Bekele & Kassa, 2022).
The study also revealed significant disparities in food security status across households. Severely food-insecure households often faced multiple barriers, including limited access to resources, lack of knowledge, and institutional exclusion. These disparities underline the need for targeted interventions, particularly for marginalized and vulnerable groups, to ensure inclusivity in urban agricultural development.

5.2. Recommendations

Based on the findings from the study conducted in Akaki Kality Subcity, Addis Ababa, the following recommendations are proposed to enhance the role of peri-urban agriculture (PA) in ensuring household food security and promoting sustainable urban development:

- Urban agriculture should be recognized as a key component of urban development policies. Local governments, in collaboration with urban planners, need to allocate specific land parcels for urban farming to reduce land-use competition and secure access for urban farmers. Policies should also promote mixed land-use practices to harmonize agriculture with residential and industrial needs, ensuring sustainable urbanization.
- Access to microfinance and affordable credit schemes should be expanded to urban farmers to enable them to purchase essential inputs, adopt modern farming techniques, and scale up production. Financial institutions should develop tailored financial products for urban agriculture, such as low-interest loans or savings plans.

- Educational programs and training tailored to urban farmers' needs should be implemented to enhance their skills and productivity. Workshops, extension services, and farmer-to-farmer knowledge sharing can improve practices in crop selection, water management, and innovative techniques such as vertical farming and composting. Partnerships with universities and research institutes can further enhance access to new technologies and best practices.
- Targeted interventions should address the specific needs of vulnerable groups, such as women-headed households, low-income families, and landless urban farmers. Support programs should include subsidies for inputs like seeds and tools, as well as access to shared community farming spaces. Addressing these disparities can ensure equity and inclusivity in urban agricultural development.
- Effective collaboration between local government authorities, community organizations, and private actors is essential. A multi-stakeholder approach should be adopted to design and implement policies that address barriers such as land tenure insecurity, resource allocation, and institutional support. Establishing dedicated urban agriculture departments or task forces can streamline efforts and create a unified framework for development.
- Encouraging environmentally sustainable farming practices is vital. Peri-Urban farmers should be supported in adopting eco-friendly techniques, such as organic farming, rainwater harvesting, and waste recycling. Integrating urban agriculture with green infrastructure like rooftop gardens and urban parks can also enhance environmental sustainability and resilience to climate change.
- Creating efficient market linkages can boost urban farmers' income and food security. Local authorities should facilitate the establishment of urban farmers' markets, cooperatives, and supply chains that connect producers directly with consumers. Digital platforms and mobile technologies can also be leveraged to expand market access.
- Community participation in urban agriculture should be fostered through

awareness campaigns highlighting its benefits for food security, income generation, and environmental sustainability. Establishing community-based urban farming initiatives, such as collective gardens or school-based agriculture projects, can increase local ownership and participation.

- Further research is needed to better understand the dynamics of urban agriculture in Akaki Kality and other Ethiopian urban areas. Studies focusing on economic viability, environmental impacts, and the social dimensions of PA can inform more effective policy-making and program design.

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Appendixes 1: Household survey questionnaire

Dear respondent,

My name is Tizita Girma. I am a post graduate student at Center for Food Security Studies, College of Development Studies, Addis Ababa University. Currently, I am doing my MSc thesis entitled the "the role of urban and peri urban agriculture on household food security" in Akaki Kality sub-city, Central Ethiopia. The main objective of this questionnaire is to collect primary data to undertake an assessment on role of urban and peri urban agriculture for household food security. Your responses to the questions are valuable and will be held in utmost confidentiality to be used only for the analysis of this research. You will not be identified by name in any case. You have been selected randomly from different Keble's. If you accept to participate in this research, you will be doing so voluntarily and there will not be any monetary returns. You are also free to refuse to respond to any questions, you do not feel comfortable answering or to withdraw from the research all together. This interview will take about an hour of your time to respond to the questions.

Date of the interview……(DD/MM/YYYY)

Interviewer name……...

Household ID ……

Supervisor name ----------

Section 1: Demographic Information

1. Address of Household: Region city sub-/city wereda
2. Age of respondent a. 18-24 b. 25-34 c. 35-44 d. 45-54 e. 55 and above
3. Gender of respondents a. male b. female
4. Family size: - Female Male Total
5. Family size in age category: (1) 1-3 (2). 4-6 (3) 7& more

6.Number of Household members attending formal education:
(1) Male_____ (2) Female_____ Total

8.Household type: - a. Male headed b. Female headed
9.Marital status of household: - a. Married b. Single c. Divorced d. Widowed
10. Education level of the household? a. No formal education. b. Primary school c. Secondary school d. College/University e. Postgraduate
11.Religion: - a. Muslim b. Orthodox c. Protestant d. Waqefata e. Catholic
12. Main householder income source? a. From agricultural activity b. Nonagricultural activity c. casual labor work d. Government employer
13. Household monthly income range: a. less than 1,000 birr b 2,000 – 4,000 birr
c. 4,000 – 6,000 d. 6,000 – 10,000 birr e. above 10,000 birr

Section 2: Factors Influencing Participation in Urban Agriculture

1. Are you currently involved in any urban or peri-urban agriculture activities in Akaki Kality Sub-City? a. Yes b. No
2. How long have you been involved in urban and peri-urban agriculture activities in Akaki Kality Sub-City? a. Less than 1 year b. 1-3 years c. 3-5 years d. More than 5 years
3. How frequently do you participate in UA activities? a. Daily b. Multiple times per week
   c. Once a week d. Few times per month e. Rarely
4. What specific UA activities are you engaged in? (Select all that apply)
   a. Vegetable cultivation b. Poultry farming c. Beekeeping
   d. Fish farming e. Livestock rearing f. Other (please specify)
5. Do you engage in any form of animal husbandry in Akaki Kality Sub-City?
   a. Yes b. No
6. If yes, please specify the types of livestock you raise:
   a. Cattle b. Sheep c. Goats d. Poultry e. Other (please specify) _____
7. What motivated you to initially get involved in UA activities? (Select all that apply)
   a. Desire to grow or produce own food
   b. Availability of land or space for cultivation
   c. Potential to generate income or savings
   d. Health and well-being benefits of consuming fresh and locally grown produce
   e. Environmental sustainability reasons
   f. Influence of family or community members practicing UA
   g. Other (please specify) _____

8. How do you perceive the benefits of participating in UA? (Select all that apply)
   a. Improved access to fresh and nutritious food b. Cost savings on food expenses
   c. Enhanced food security for households d. Employment or income generation

opportunities
e. Environmental sustainability reasons f. Strengthened community cohesion and social connections g. Other (please specify) _____

9. What are the main challenges or obstacles that prevented you from participating in UA activities? (Select all that apply)
   a. Limited access to land or space b. Lack of access to resources (seeds, tools, etc.)
   c. Insufficient knowledge or skills in UA practices d. Financial constraints
   e. Time constraints f. Other (please specify) _____
10. Have you received any support or assistance from local authorities, organizations, or other
    stakeholders in your UA activities? a. Yes b. No
14. How has participating in UA contributed to your household's food security and access to nutritious food?
    a. Significantly b. Moderately c. Slightly d. Not at all
12. Have you been able to generate income from your UA activities?
    a. Yes b. No
13. How do social networks or interactions with other UA practitioners influence your participation in UA?
    a. Strongly influence b. Moderately influence
    c. Slightly influence d. Do not influence
14. How do you perceive the role of UA in sustainable urban development and environmental
    conservation? How has engaging in urban agriculture (UA) activities impacted the diversity of food items available in your household?
    a. Significantly increased diversity b. Moderately increased diversity
    c. Slightly increased diversity d. No significant increase in diversity e. Decreased diversity

Section 3: Role of Urban Agriculture for Household Food Security

1. Have you observed an improvement in the availability of fresh produce since engaging in UA activities?
   a. Yes, significantly improved availability b. Yes, moderately improved availability
   c. Yes, slightly improved availability d. No significant improvement in availability
   e. Decreased availability

2. How often do you consume the produce from your UA activities compared to store-bought food?
   a. Mostly consume UA produce
   b. About equal consumption of UA produce and store-bought food
   c. Mostly consume store-bought food d. Rarely consume UA produce
3. Have you noticed an improvement in the accessibility of fresh and nutritious food since
   engaging in UA activities?
   a. Yes, significantly improved accessibility b. Yes, moderately improved accessibility
   c. Yes, slightly improved accessibility d. No significant improvement in accessibility
   e. Decreased accessibility
4. How has participating in UA activities affected the availability of staple crops in your household?
   a. Significantly increased availability b. Moderately increased availability
   c. Slightly increased availability d. No significant increase in availability
   e. Decreased availability
5. Have you experienced an increase in the production of staple crops through UA activities?
   a. Yes, significant increase b. Yes, moderate increase
   c. Yes, slight increase d. No significant increase e. Decreased production
6. How has engaging in UA activities influenced the availability of animal products (e.g., eggs, milk, meat) for your household?
   a. Significantly increased availability b. Moderately increased availability
   c. Slightly increased availability d. No significant increase in availability
   e. Decreased availability
7. Have you noticed an improvement in the accessibility of animal products since engaging in UA activities?
   a. Yes, significantly improved accessibility b. Yes, moderately improved accessibility
   c. Yes, slightly improved accessibility d. No significant improvement in accessibility
   e. Decreased accessibility
8. How often do you consume animal products produced through UA activities?
   a. Daily b. Multiple times per week c. Once a week
   d. Few times per month e. Rarely or never
9. To what extent has engaging in UA activities increased the overall food production for your household?
   a. Significantly increased production b. Moderately increased production
   c. Slightly increased production d. No significant increase in production
   e. Decreased production
10. Have you noticed a decrease in the cost of purchasing food items since engaging in UA activities?
   a. Yes, a significant decrease b. Yes, a moderate decrease c. Yes, a slight decrease

d. No, there has been no decrease e. Not applicable, I did not track the expenses

11. How has engaging in UA activities influenced the availability of organic or pesticide-free food for your household?
    a. Significantly increased availability b. Moderately increased availability
    c. Slightly increased availability d. No significant increase in availability
    e. Decreased availability
12. Have you noticed an improvement in the nutritional quality of food consumed since engaging in UA activities?
    a. Yes, significant improvement b. Some improvement c. No significant improvement
13. Has engaging in UA activities reduced the reliance on external food sources for your household?
    a. Yes, significantly reduced reliance b. Yes, moderately reduced reliance
    c. Yes, slightly reduced reliance d. No, there has been no reduction in reliance
    e. Not applicable, I did not rely on external sources before
14. How has engaging in UA activities affected the overall food security of your household?
    a. Significantly improved food security b. Moderately improved food security
    c. Slightly improved food security d. No significant effect on food security e. Worsened
    food security
15. Have you faced any challenges in diversifying your UA activities to enhance food security? Please select all that apply:
    a. Limited access to diverse crop varieties or animal breeds
    b. Lack of knowledge on crop rotation or livestock integration
    c. Limited space for expanding UA activities d. Financial constraints to invest in expanding UA activities
    e. Other (specify) _____ f. No, I have not faced any challenges

16. Have you received any training or support to improve the diversity and productivity of yoururban agriculture (UA) activities? a. Yes b. No
17. How important is it for you to have a diverse range of food items available through UA activities?
    a. Very important b. Important c. Neutral d. Not important e. Not sure
18. Have you noticed any improvements in the overall health and well-being of your household members since engaging in UA activities?
    a. Yes, significant improvements
    b. Some improvements
    c. No significant improvements
19. How would you rate the overall impact of UA on improving the diversity, accessibility, and availability of food for your household?
    a. Very positive impact b. Positive impact c. Neutral impact
    d. Negative impact e. Very negative impact

Section 4: Challenges and Opportunities of Urban Agriculture

1. What are the main challenges you perceive in UA in Akaki Kality Sub-City? (Select all that apply)

a. Limited access to land b. Lack of water supply for irrigation
c. Lack of knowledge and skills
d. Limited access to agricultural inputs (seeds, fertilizers, etc.)
e. Limited market opportunities for UA products
f. Lack of government support and policies
g. Other (please specify): _____

2. What are the main obstacles you face in accessing suitable land for practicing urban or peri-urban agriculture in Akaki Kality Sub-City?
    a. Limited availability of land b. High competition for land c. Land tenure issues
    d. Regulatory restrictions on land use e. Other (please specify) _____
3. How does the limited availability of land impact your ability to expand and diversify your farming activities?
    a. Limits the scale of production b. Restricts crop diversification
    c. Hinders expansion of operations d. Other (please specify) _____

4. Do you face any challenges regarding the availability of water for irrigation in Akaki Kality Sub-City? a. Yes b. No
5. If yes, please specify the water-related constraints that affect your agricultural productivity:
    a. Limited access to water sources b. Inadequate water infrastructure
    c. Seasonal water scarcity d. Poor water quality e. Other (please specify) _____
6. What measures have you taken to address water scarcity or inefficient irrigation practices?

a. Improved water conservation techniques b. Use of efficient irrigation systems
c. Water recycling and reuse practices d. Collaboration with water management authorities
e. Other (please specify) _____

7. What are the major pest and disease problems you encounter in urban or peri-urban agriculture?
a. Insect pests b. Plant diseases c. Weeds d. Rodents and other vertebrate pests
e. Other (please specify) _____
8. How do these pests and diseases affect your crop yields and overall productivity?
a. Reduction in crop yields b. Quality deterioration of produce c. Increased production costs
d. Crop loss and economic impact e. Other (please specify) _____
9. What strategies or methods do you employ to manage and control pests and diseases in your farming practices?
a. Biological control methods b. Integrated pest management techniques
c. Proper sanitation and hygiene practices d. Use of resistant crop varieties
e. Other (please specify) _____
10. How do you handle agricultural waste and by-products in Akaki Kality Sub-City?
a. On-site composting b. Recycling and reuse practices
c. Waste disposal in designated areas d. Collaboration with waste management authorities
e. Other (please specify) _____
11. Are there any challenges you face in effectively managing and disposing of agricultural waste?
a. Limited waste collection and disposal infrastructure
b. Lack of awareness and knowledge on proper waste management
c. Financial constraints for implementing waste management practices
d. Other (please specify) _____

12. What are the challenges you experience in accessing markets for selling your agricultural products?
a. Limited market opportunities b. Lack of market information
c. Transportation and logistics constraints d. Market price fluctuations
e. Other (please specify) _____
13. Are there any specific barriers that hinder your ability to reach consumers or establish marketing channels?
a. Limited market infrastructure b. Inefficient value chain linkages
c. Marketing regulations and policies d. Quality certification requirements
e. Other (please specify) _____
14. Have you explored alternative marketing strategies or value-added opportunities for

your produce?

a. Yes b. No

15. How do the costs of inputs (seeds, fertilizers, pesticides, etc.) impact your profitability in urban or peri-urban agriculture?

a. High input costs reduce profitability b. Limited availability of affordable inputs

c. Dependence on external input suppliers d. Other (please specify) _____

16. Do you face any challenges in accessing affordable and high-quality agricultural inputs?

a. Yes b. No

17. Have you adopted any cost-saving measures or alternative input sources to mitigate input costs?

a. Use of organic fertilizers and bio pesticides b. Seed saving and exchange initiatives

c. Other (please specify) _____

Appendix 2: Checklist for Key Informant Interview (KII)

1. As a key informant with expertise in agriculture in this wereda, what do you consider to be the main agricultural practices, both in terms of crop and livestock production?

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2. In your opinion, how does urban agriculture contribute to ensuring food security in this wereda?

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3. From your perspective, what are the key challenges faced by urban agriculture in this wereda, particularly in terms of accessing markets and government support?

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4. Based on your expertise and experience, what potential solutions do you see for addressing the challenges related to urban agriculture in this wereda?

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5. In terms of environmental impact, how do you perceive the contribution of urban agriculture in this wereda?

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6. From your observations, does urban agriculture in this wereda contribute to job creation and other social interactions? If so, could you provide some examples?

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7. In your opinion, what are the key factors that influence participation in urban agriculture in this wereda?

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8. How do you perceive the economic impact of urban agriculture in this wereda? Does it contribute to the local economy in any significant way?

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Appendice 3: Checklist for focus group discussion (FGD)

1. How do you perceive the role of urban agriculture in improving household food security in your wereda?

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2. What are the main factors influencing participation in urban agriculture in your wereda?

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3. How do you think urban agriculture contributes to the local economy in your wereda?

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4. Are there any specific benefits or drawbacks of urban agriculture that you have observed in your wereda?

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5. In your opinion, what are the key opportunities for expanding and strengthening urban agriculture in your wereda?

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