Addis Ababa University

College of Technology and Built Environment

School of Built Environment

Assessing the Integration of Urban Agriculture in Housing Developments of Addis Ababa to Enhance Sustainability

The Case of Two Neighborhoods in the Gofa Area

This thesis is submitted to the School of Built Environment (SBE), Addis Ababa University (AAU) for partial fulfillment of all requirements of Master of Science in Housing and Sustainable Development.

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This thesis is submitted to the School of Built Environment (SBE) and the School of Graduate Studies of Addis Ababa University for partial fulfillment of all requirements of Master of Science in Housing and Sustainable Development.

Thesis Title: **Assessing the Integration of Urban Agriculture in Housing Developments of Addis Ababa to Enhance Sustainability:** *The Case of Two Neighborhoods in Gofa Area*

Tsion Tewodros Assefa
November 2025

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Declaration

I declare that this thesis, prepared for the partial fulfillment of the requirements for the degree of Masters of Science in Housing and Sustainable Development, is my original research work prepared independently by my effort with the close advice of my advisers. I also declare that this thesis has not been presented in any university, and all sources of materials that I have used or quoted have been appropriately acknowledged in the references.

Tsion Tewodros Assefa

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Certification

Here, we state that Tsion Tewodros Assefa has carried out this research work on "Assessing the Integration of Urban Agriculture in Housing Developments of Addis Ababa to Enhance Sustainability: The Case of Two Neighborhoods in Gofa Area," under our supervision, and it is sufficient for submission for the partial fulfillment for the award of the MSc Degree in Housing and Sustainable Development.

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Abstract

Rapid urbanization in Addis Ababa has caused an ever-increasing demand for housing and food. Expropriating agricultural land for residential developments in the city has resulted in the loss of a productive landscape and increased food insecurity. The Addis Ababa City Administration has shown interest in urban agriculture (UA) as a tool for sustainable development by encouraging citizens to start farming inside their residences. This study aimed to investigate the practice, impact, and sustainability of UA in residential developments in Addis Ababa, employing a mixed-methods research approach. A case study method was used to assess the practice of UA among 180 farmers in the Gofa neighborhood. Socially, UA promoted food security, employment, social interaction, health, recreation, and inclusion of marginalized groups. Economically, it generated diversified income and lowered the cost of food. Environmentally, it prevented pollution, infiltrated rainwater, and minimized waste. While horticulture thrived in residential areas, insufficient access to tap water and the lack of alternative water sources, such as greywater, have limited year-round production. Animal husbandry faces challenges in obtaining permits, accessing affordable animal feed, and community acceptance due to its potential risks. The lack of integrated housing and infrastructural planning approaches has undermined the multifunctionality of UA, leading to a missed opportunity for circular urban metabolism. Despite the stakeholders' common understanding of the significance of UA, the integration of UA in housing has been hindered by legal and institutional barriers. To realize the multiple functions of UA, cross-sectoral collaboration, policy reforms, and sustainable infrastructural investments are recommended.

Keywords*: Sustainability, Housing, Neighborhood, Urban Agriculture*

Acknowledgment

First and foremost, I would like to extend my deepest gratitude to God, who gave me His unconditional love, strength, and guidance. This research would not have been possible without His grace and mercy. Thank You, Lord, for giving such supportive advisors, family, and friends.

> *'Now unto the King eternal, immortal, invisible, the only wise God, be honor and glory forever and ever. Amen.'*
>
> - *1 Timothy 1:17 (KJV)*

I would like to thank my advisors, Mr. Yonas Alemayehu and Mr. Biruk Kebede, for their invaluable guidance, support, and feedback throughout this research. My heartfelt appreciation also goes to my beloved family, Shalom Lemma, Tewodros Assefa, Birhane Worku, Marta Tewodros, Frehiwot Tewodros, Yared Takele, Zenebech Tekle, Lemma Mamedo, and everyone who has constantly prayed for me. I would also like to thank my friends and colleagues for their support and motivation. Last but not least, I would like to extend my appreciation to all respondents who welcomed me into their homes, as well as to government officials and professionals who provided the essential information and resources for this research.

Tsion Tewodros Assefa
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List of Abbreviations

AACPPO	Addis Ababa City Planning Project Office
AAFUADC	Addis Ababa City Government, Farmers and Urban Agriculture Development Commission
AAHDAB	Addis Ababa Housing Development and Administration Bureau
AAHDC	Addis Ababa Housing Development Corporation
AAHA	Addis Ababa Housing Agency
AU	African Union
BoTID	Bureau of Trade and Industry Development
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization of the United Nations
FUAO	Farmers and Urban Agriculture Office at Sub City Level
IHDP	Integrated Housing Development Programme
KII	Key Informant Interview
LDP	Local Development Plan
MoUDC	Ministry of Urban Development and Construction
MoUID	Ministry of Urban and Infrastructure Development
MUDHCo	Ministry of Urban Development, Housing, and Construction
NDP	Neighborhood Development Plan
SDG	Sustainable Development Goal
UA	Urban Agriculture
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Programme
UNEP	United Nations Environment Programme
UPA	Urban and Peri-urban Agriculture

Meaning of Local Terms

Amharic	A local language commonly used in Addis Ababa.
Derg	A military regime of Ethiopia that overthrew Emperor Haile Selassie in 1974
Kebele	The smallest administrative unit in Addis Ababa, which is now replaced by the Woreda
Safar/ Sefer	The Amharic word for 'Neighborhood'
Woreda	The smallest administrative division in Addis Ababa
Kosta	Swiss Chard
Akaki-Kality	One of the 11 sub cities in Addis Ababa
Nifas Silk Lafto	One of the 11 sub cities in Addis Ababa
Gofa Mebrat Hail	Name of a neighborhood in Nifas-Silk Lafto Sub City

General Notes

- The Gregorian calendar is used to state dates and years.
- The system of measurement used for this research is the metric system.
- The unit of currency used in the study is the Ethiopian Birr (ETB).
- Names of respondents are pseudonymized to maintain confidentiality.

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The 21st century is known as the "Urban Century" since more than half of the world's population (4.4 billion people) now resides in urban areas (Martin-Moreau and Ménascé 2019, World Bank 2025). Due to rapid urbanization, cities are faced with the pressing challenge of expanding their infrastructure to meet the demands for food, housing, and other amenities (Lu and Grundy 2017, World Bank 2025). Food insecurity and the shortage of housing have become a parallel crisis that has affected several cities. It was anticipated that in 2023, up to 757 million people worldwide would face hunger, and among these people, more than 20% would be in Africa (FAO, IFAD, UNICEF, WFP and WHO 2024). At the same time, the lack of affordable housing in cities has left 100 million people homeless and one in four people living in slums (UN-Habitat 2024a). About 40% of the global population is expected to demand decent and affordable housing by 2030 (UN DESA 2025), necessitating the daily construction of about 96,000 new affordable dwelling units (UN-Habitat 2024a).

The growing demand for housing has led to significant changes in land use. Cities have been prioritizing land for housing and industrial developments, often rezoning farmlands (Zeeuw and Drechsel 2015). Although this approach is essential in addressing the ever-increasing housing needs, it has also led to the loss of valuable farmlands, which were once considered a key part of urban life, and exacerbated the challenges of food security and urban sustainability (James 2013, Pauleit, El Wafa and Pribadi 2019, Dobele and Zvirbule 2020).

Urban agriculture (hereafter UA) has been a major source of income and a vital means of survival in cities (Deelstra and Girardet 2000); however, as a result of the Industrial Revolution, there was a shift in urban planning priorities, favoring housing and industrial developments that were economically more profitable but rarely maintained the productive nature of the lands (FAO, Rikolto and RUAF 2022, Edwards and Turrent 2000, Dobele and Zvirbule 2020, Martin-Moreau and Ménascé 2019). Moreover, fierce competition for scarce urban resources further hindered agricultural activities in numerous cities (Deelstra and Girardet 2000, FAO, Rikolto and RUAF 2022). On the other hand, cities like Havana and Rosario adapted UA into their urban development

policies to enhance resilience when faced with different shocks and stresses like wars, pandemics, and climate change (FAO 2007, Ackerman, et al. 2012, Haas 2017, Drescher 2000, Mbiba and Veenhuizen(Ed.) 2001, UN DESA 2025).

The continuous loss of farmland in urban areas has far-reaching consequences. It reduces agricultural output; increases food insecurity; raises food miles[1], energy costs, and CO_2 emissions; and hampers the ability of future generations to grow their food (Mpofu 2013, Bricas and Conaré 2019, Edwards and Turrent 2000). In addition, the lack of proper urban planning backed by practical environmental impact assessments often causes environmental problems such as erosion and flooding, as seen in cities like Dhaka, Bangladesh, and Calabar, Nigeria (Yaro, et al. 2018, Sajib and Moniruzzaman 2022).

The high interest in UA in the early 21st century was driven by factors such as rapid urbanization, high unemployment rate, the growing demand for fresh food, and inadequate food distribution systems (Mulugeta 2013, Martin-Moreau and Ménascé 2019). Local food production has become a critical factor in the success and sustainability of future cities because nearly 80% of the world's food consumption is projected to occur in urban areas in 2050 (Haas 2017, Martin-Moreau and Ménascé 2019). Architects and urban planners in several cities have also started recognizing the multifunctional roles of UA in addition to food production, such as economic development, health, environmental management, and social development in addition to its production function (FAO 2007, Proksch 2017).

Another driving factor for the resurgence of UA in cities was the availability of low-cost resources like urban organic wastes and wastewater (FAO 2007). Cities are more resourceful and capable of transforming consume-dispose (open loops) into consume-process-reuse (closed loops) (Smit and Nasr 1992). Urban outputs must be essential inputs into urban production systems, with regular organic material recycling and composting for use on local farmland (Deelstra and Girardet 2000).

The successful integration of UA into urban planning requires a multifunctional land-use approach, which harmonizes ecological processes, food systems, and social

[1] Food mile is the distance between the primary production and consumption of food (Viljoen 2005).

dynamics. Multifunctional urban spaces that integrate UA not only promote efficient land use but also help preserve the productive nature of urban landscapes while meeting broader planning objectives (Zeeuw and Drechsel 2015). Residential areas have offered ideal conditions for UA integration by incorporating individual and communal gardens into public housing and slum upgrading projects (Veenhuizen 2006, FAO 2007). This is due to the availability of organic waste and wastewater that can be repurposed for nutrient recycling and irrigation (Renting, et al. 2013). When appropriately planned, housing developments can support UA and get social, economic, and environmental benefits (FAO 2007, Dvorak and Ali 2016).

In Ethiopia, however, UA had been neglected and considered a less important activity in terms of its contribution to the urban economy and the sustainable use and protection of natural resources (BoTID 2013). Despite the hostility and the lack of defined norms and laws, it has long been conducted on plots and off-plots of urban areas (BoTID 2013). In Addis Ababa, the capital city of Ethiopia, UA has been a permanent component of the riverfront landscape in the inner city as well as expansion areas, stabilizing the price of vegetables and horticultural goods (Teshome and Abate 2020). Over half of Addis Ababa's field crops and 70% of its vegetable production were used for home use, contributing to a well-balanced diet (Pauleit, El Wafa and Pribadi 2019). According to the report by the Addis Ababa City Government, Farmers and Urban Agriculture Development Commission (AAFUADC), more than 138,000 producers were engaged in UA producing various plant and animal-based food products in Addis Ababa in 2021.

1.2. Statement of the Problem

Rapid urbanization, driven by high population growth and rural-to-urban migration in Addis Ababa, has resulted in an acute housing shortage, urban sprawl, and the alarming loss of valuable agricultural land. In response to the housing crisis, the city prioritized mass housing development (Delz 2014); however, these projects have come at the cost of valuable agricultural land and open spaces (UN-Habitat 2011a), and in some cases, without adequate environmental consideration (Berhanu 2019). Large-scale mass housing schemes such as the Integrated Housing Development Programme (IHDP) have contributed to significant land use changes, and the conversion of previously permeable agricultural lands into impervious urban surfaces has intensified issues such

as flooding, as seen in the case of the Jemo I Condominium project (AACPPO 2017, Berhanu 2019).

Although UA plays a significant role in achieving multiple urban planning roles in Addis Ababa, it has been marginalized (BoTID 2013, Pauleit, El Wafa and Pribadi 2019), due to challenges such as land tenure insecurity, weak institutional coordination, limited integration into urban planning, and fierce competition for land and other urban resources (Marshall, et al. 2009, Tilahun Dires, et al. 2021, MUDHCo 2014, Pauleit, El Wafa and Pribadi 2019, Gebremichael, et al. 2014). Between 2006 and 2011, Addis Ababa lost 24% of its agricultural land to urban expansion, while housing development increased by 8.5% (multistory buildings increased by 170% and single-story houses increased by 43%) (Woldegerima, Yeshitela and Lindley 2016). Recent studies have also confirmed that the rate of farmland loss is spiking in the face of rapid urbanization (Badasa and Obsi 2021, Alemu, et al. 2024).

According to the Addis Ababa Housing Development and Administration Bureau (hereafter AAHDAB) (2022), the city of Addis Ababa plans to construct two million housing units over the next decade, primarily through government initiatives and private sector investments. As a result, a significant amount of agricultural land is expected to be converted into residential areas (MoUI 2022). The expropriation of farmlands is characterized by imbalances between accommodating housing units and the loss of productive urban land.

Even though policy initiatives, such as the 2013 Urban and Peri-Urban Agriculture Policy and the 2015 Urban Productive Safety Net Program, have encouraged the practice of UA in residential developments (BoTID 2013, AARPO 2020), the renewed momentum was mainly in response to the COVID-19 pandemic, which broke out in 2019. The 2020 Urban Farming Initiative, the 2022 Yelemat Terufat, and NGO-initiated projects such as Farm Africa have promoted UA to enhance food security, reduce urban poverty, and create jobs in the city (World Bank 2015, Teshome and Abate 2020, Dessie, et al. 2023). The majority of these activities are carried out as campaigns, raising concerns about the initiative's sustainability (Gebremedhin, et al. 2023).

A study by Gebremedhin, et al. (2023) has focused on the situational analysis of UA and its potential to link with social protection programs including the Urban Productive

Safety Net Program, School Feeding Program, and Urban Consumer Cooperative Associations to help vulnerable households access healthy foods; however, the spatial, architectural, and policy mechanisms for integrating UA into housing development have not been investigated. Their research shows that UA continued to face obstacles, such as limited access to land, insufficient access to water, unavailable technology, lack of credit, food safety issues, underutilized urban spaces, political interference, pest and disease outbreaks, and unmet expectations for free inputs from the AAFUADC (Gebremedhin, et al. 2023).

Several studies have examined UA broadly in relation to urban resilience, food systems, and livelihoods in Addis Ababa. For instance, a study by Habtemariam et al. (2018) explored a sustainable livelihood perspective to explore how households from two typical communities in Addis Ababa- the condominium neighborhood (Jemo One, Biruh Tesfa Condominium House Owners Cooperative) and UA cooperatives (Mekanissa-Gofa-Saris Vegetable Farmer's Cooperative)- use water-related strategies to build resilience for the city's water scarcity challenges. Their work has highlighted the complex relationship between water access and livelihood security. However, their analysis focused primarily on water management and household coping mechanisms, rather than on how residential neighborhoods can be intentionally designed to integrate productive landscapes, or on how housing development frameworks and spatial planning tools can operationalize UA to enhance environmental, social, and economic sustainability.

Few studies (Yifru 2014, Abera 2019) have explored the integration of UA in housing and neighborhood developments; however, their study lacks a comprehensive approach to incorporate UA in a sustainable and resource-efficient manner. There is limited empirical evidence on how the current practice of UA in different residential settings has contributed to the social, economic, and environmental sustainability of housing in Addis Ababa. The extent to which UA has been integrated into the development of sustainable housing in the city also remains under-researched. This gap shows the need for empirical research assessing the current practice of UA in Addis Ababa housing, its socio-economic and environmental roles to enhance neighborhood sustainability, and how far legal and institutional frameworks of housing development in the city have embedded UA to improve sustainability.

1.3. Objectives of the Study

1.3.1. General Objective

This study examined the practice of UA in residential areas of Addis Ababa, aiming to assess its social, economic, and environmental contributions to neighborhood sustainability and identify key housing-related challenges.

1.3.2. Specific Objectives

The specific objectives of this research are:

- To explore the practice of UA in the residential areas of Addis Ababa;
- To assess the contribution of UA to the social, economic, and environmental sustainability of housing in Addis Ababa;
- To investigate the key housing-related challenges farmers in Addis Ababa face when practicing UA in their residential areas; and
- To analyze how legal and institutional frameworks governing housing development in Addis Ababa facilitate or hinder the integration of UA.

1.4. Research Questions

The research questions for this study are:

1. How is UA practiced in the residential areas of Addis Ababa?
2. How does the practice of UA contribute to the social, economic, and environmental sustainability of neighborhoods in Addis Ababa?
3. What housing-related challenges do farmers in Addis Ababa face when practicing UA in their residential areas?
4. How do the legal and institutional frameworks governing housing development in Addis Ababa facilitate or hinder the integration of UA?

1.5. Scope of the Study

1.5.1. Thematic Scope

The research is thematically centered on the integration of UA within housing and neighborhood planning to enhance its social, economic, and environmental sustainability. The practice of UA in three housing types, which were common in Addis

Ababa, including condominium housing, private housing, and kebele[2] housing was studied. Key themes include sustainable urban development, housing and neighborhood planning and development, and urban agriculture (UA).

1.5.2. Spatial Scope

The geographic scope of this study is limited to two neighborhoods that extensively practice UA in Woreda[3] 6 of the Nifas Silk Lafto Sub City of Addis Ababa. These are the Gofa Gabriel Neighborhood (Cluster 53) and the Gofa Mebrat Hail Condominium.

1.6. Significance of the Study

Addis Ababa offers practical insights into how UA can be effectively integrated into housing and neighborhood planning to enhance food security, livelihoods, and environmental sustainability in the face of rapid urbanization. By addressing key urban challenges, the research can inform architects, urban planners, UA professionals, and policymakers toward evidence-based housing planning. At the national level**,** the study supports Ethiopia's broader development goals by promoting integrated approaches that balance housing provision with sustainable food systems and resource management. It also provides a model for other Ethiopian cities that are rapidly urbanizing. It is estimated that more than half of the world's population facing hunger in 2030 will be in Africa (FAO, IFAD, UNICEF, WFP and WHO 2024). The research presents a replicable framework for addressing food insecurity in addition to housing issues and contributing to continental goals like Agenda 2063 (AU 2015). Globally, the study contributes to sustainable urban development discourse and supports progress toward key Sustainable Development Goals (SDGs)—including Zero Hunger, Sustainable Cities, and Climate Action—by highlighting how UA and circular resource practices can be integrated into urban systems, particularly in the Global South (UN DESA 2025).

1.7. Limitations of the Study

One of the criteria for selecting case study sites was the number of urban farmers engaged in various UA activities. However, data from the Addis Ababa Farmers and

[2] Kebele used to be the smallest administrative unit in Addis Ababa.

[3] Woreda is the current smallest administrative units in Addis Ababa

Urban Agriculture Development Commission (AAFUADC) showed significant discrepancies compared to the data in sub city (*Kifle-Ketem*a) and woreda-level UA offices. Verifying these numbers at each sub city and woreda was beyond the scope of the research due to time and budget constraints. Therefore, the three sub-cities with the highest number of urban farmers (Kirkos, Akaki Kality, and Nifas Silk Lafto sub cities) were selected to verify the data. Visits were made to the relevant sub city and woreda-level Farmers and Urban Agriculture Office to verify and cross-check the reported figures. Of the three sub-cities, Nifas Silk Lafto and Akaki Kality Sub Cities had a similar number of farmer population, consistent with the AAFUADC reports.

A second challenge appeared during data collection. The number of farmers registered in the woreda FUAO is not updated regularly; therefore, at the time of data collection, the actual number of farmers who were actively engaged in UA was less than what was reported. As the number of urban farmers fluctuates due to seasonal factors, market demand, and input availability, keeping track of the farmer population was a challenge for the woreda-level Farmers and UA Office (FUAO). The list of urban farmers does not necessarily show that the stated number of farmers is actively engaged in UA. Some had an interest, so they only took seed; some had to stop working on UA for various reasons, such as a change in priorities, lack of water supply, or lack of motivation. To tackle this limitation, a snowball sampling method was employed to identify the active urban farmers. The final limitation arose with financial data. Although the survey questionnaire was administered to more than 180 farmers, not all were willing to disclose financial information, including monthly income, expenses, and profits from UA activities, even though they were assured that their identity and information would be handled confidentially. As a result, the data collection period was extended beyond the initially scheduled timeframe to surpass the minimum sample population of 174.

1.8. Description of the Study Area

The research is conducted in Addis Ababa, geographically located between 8°46’0’’ to 9°11’30’’ North Latitude and 38°35’30’’ and 38°57’30’’ East Longitude, covering an area of 520 km^2 (Addis Ababa Plan and Development Commission, 2024). The city is divided into 11 sub-cities, namely: Addis Ketema, Akaki-Kality, Arada, Bole, Gulele, Kirkos, Kolfe-Keranio, Yeka, Lideta, Nifas Silk-Lafto, and Lemi Kura, which was established in 2020 by combining parts of Bole and Yeka sub-cities. Each sub-city is

further divided into localities (Woreda). This research is limited to two neighborhoods in Nifas Silk Lafto Sub City, Woreda 6. A case study approach was employed to study and assess the practice of UA in various residential settings. Selection criteria for the neighborhoods include: (1) high urban farmer population in residential areas; (2) diversity of UA disciplines (horticulture, animal husbandry, and integrated farming); (3) diversity of farmer's residence/ housing types in the neighborhood (private housing, kebele housing, condominium, and informal housings); (4) increasing number of exemplary UA practices as per the Woreda and Subcity level Farmers and Urban Agriculture Office (FUAO), and (5) availability of data about the farmers from the Woreda FUAO.

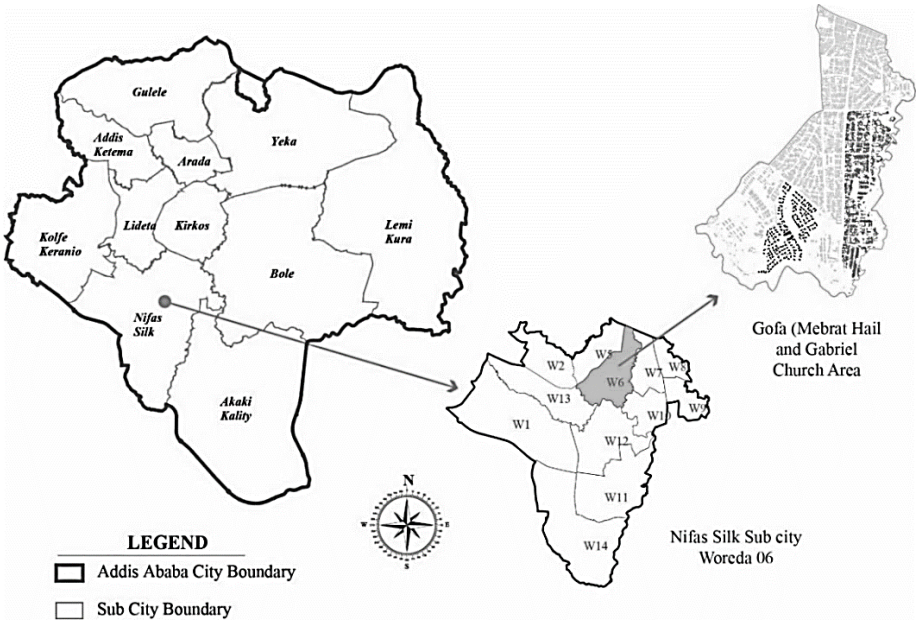


Figure 1-1 Location Map of the Case Study Areas in Addis Ababa
Source – Addis Ababa Plan and Development Commission (2024)

1.9. Organization of the Document

The research paper is organized into six chapters. Chapter 1 includes the Introduction, which provides an overview of the research. Chapter 2 is the Literature Review, offering a comprehensive review of theories and contexts related to UA and housing. In Chapter 3, the Research Methodology section is presented, explaining the research type and methods used. The Results and Discussion section answers the questions- what has been found and how the data collected has been analyzed and interpreted. The last chapter consisted of the conclusion and recommendations parts for this research.

CHAPTER TWO: LITERATURE REVIEW

This chapter has two main components- the conceptual framework and the contextual review. The first explores the different dimensions of sustainable housing development to understand the various indicators of sustainable housing through the use of UA. Additionally, it examines a wide range of academic sources to find out how UA can be integrated into housing developments to enhance environmental, economic, and social sustainability. The contextual review examines the development of housing and urban agriculture (UA) in Addis Ababa to identify the enabling and inhibiting factors for integrating UA into the housing development of Addis Ababa.

2.1. Conceptual Framework

2.1.1. The Concept of Sustainable Development

Sustainable development is a broad, interdisciplinary concept that emerged in the 1960s (McKenzie 2004, Rogers, Jalal and Boyd 2008). An international discussion, emphasizing the importance of environmental protection in development, started at the UN Conference on the Human Environment in Stockholm in 1972 (Rogers, Jalal and Boyd 2008). The commonly used definition for the term "sustainable development" in the 1987 Brundtland Commission report called “Our Common Future” by the UNs, World Commission on Environment and Development (UN WCED 1987, pp. 2) states:

> *“Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

Stephen McKenzie (2004) noted that, prior to the establishment of the three pillars concept, sustainable development primarily focused on the environmental dimension. His claim was supported by Leon Glicksman (2006), who noted that the overarching goal of sustainable development is to protect and improve the global environment by reducing harmful emissions, conserving non-renewable resources, and enhancing the quality of life for future generations.

UN’s Conference on Human Settlements (Habitat II) report (UN 1996, pp. 18) stated:

> *“Sustainable development is essential for human settlements development, and gives full consideration to the needs and necessities of achieving economic growth, social development and environmental protection.”*

Currently, sustainable development is viewed as a multifaceted process that integrates environmental protection with economic, social, and cultural development; therefore,

it embraces four interconnected dimensions: society, economy, environment, and culture (UN-Habitat 2012b).

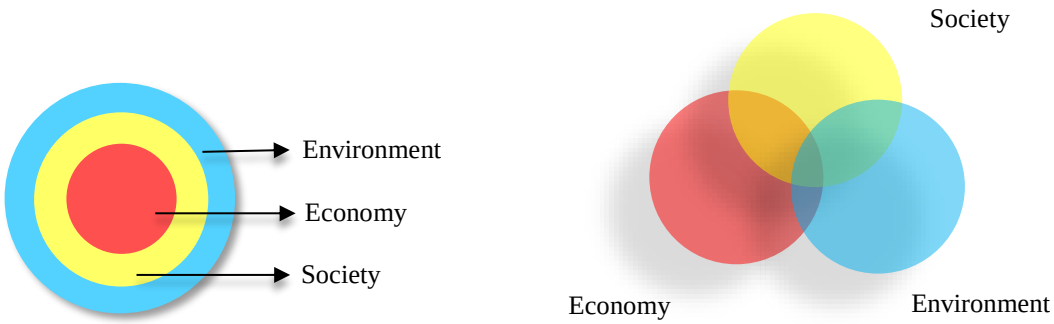
Social Dimension: The social aspect is concerned with (i) equity of access to key services including health, education, transport, housing, and recreation; (ii) fairness between generations, which means that the actions of the current generation will not disadvantage future generations; (iii) a framework for intercultural relations that values and protects the positive qualities of other cultures and supports and encourages cultural fusion when desired; (iv) the broad political engagement of the public at a local level; (v) transferring of the knowledge of social sustainability from one generation to the next; (vi) a sense of communal accountability for preserving that transmission system; (vii) ways for a community to recognize its needs and strengths as a whole; (Viii) community action for common need; and (ix) political advocacy to address issues that cannot be met by the community initiatives (McKenzie 2004).

Economic Dimension: The concept of sustainability in economic development is different from conventional economic growth due to the following criteria: (i) it is an economic change that is considered together with the social, cultural, and ecological alteration; (ii) it increases the resources available to truly impoverished people so they can ensure their physical and social well-being and prevent themselves from getting worse off; (iii) its assures long-term ecological, social, and cultural capacity for fostering economic activity and structural transformation; and (iv) it cannot be fully captured by any idea of direct and measurable economic advantage because the quantitative and qualitative elements are mutually reinforcing and interconnected (Barbier 1987). Some academics stated that the relationship between economic growth and the utilization of natural resources is the central idea in the definition of economic sustainability, while others think that the fundamental idea is founded on capital's long-term performance (Rasouli and Kumarasuriyar 2016).

Environmental Dimension: The environmental dimension of sustainable development ensures that the environmental impact of developments remains within the planet's capacity to recover by following the rule of input/output (Sutton 2004). The output rule requires that a project's waste emissions do not exceed the local environment's ability to absorb and assimilate them without impairing future waste absorption or other crucial functions, whereas the input rule stipulates that the harvest rate of renewable resources

should not surpass the natural system's regenerative capacity, and the depletion rate of non-renewable resources should align with the rate of human innovation and investment in developing renewable alternatives (Goodland 1995). It also focuses on the capacity to maintain natural capital and preserve its valuable qualities over time by using renewable resources, embracing recycling, redesigning processes to avoid toxic byproducts, and protecting and restoring natural habitats (Sutton 2004, Goodland 1995).

McKenzie (2004) adapted two models from the Western Australian Council of Social Services to represent the interrelationship between the social, economic, and environmental dimensions of sustainability (see Figure 2-1). The first model, which is represented as concentric spheres, portrays the social and economic aspects as dependent on environmental health. Whereas the second model, which is a recent one, portrayed the three dimensions as equally influential and overlapping.



a. Concentric Spheres b. Overlapping Circles

Figure 2-1 Venn diagrams adapted from Stephen McKenzie (2004)

2.1.1.1. Significant Challenges of Sustainable Urban Development

Cities are home to 4.4 billion people, which accounts for more than half of the world's population (World Bank 2025). Even though, urban areas occupy only 2% of the earth's surface, the size of the urban population is expected to be more than double its size in less than thirty-year time resulting in the addition of 1.2 million square kilometers of new urban built-up area to the world in 2030 (Lu and Grundy 2017, World Bank 2025). The expected trend of increasing world population and urbanization contributes to cities' continuous expansion as users of global resources and demand centers for basic needs, leaving urban planners with a major responsibility to act fast in controlling the

expansion while providing essential food, housing, infrastructure, and services (Lu and Grundy 2017, World Bank 2025).

Globally, over a billion urban populations live in slum areas, while 2 billion are expected to be added in 2050 (UN DESA 2025). In developing countries, the housing challenges are characterized by excessive overcrowding, inadequate housing, high building material costs, high rates of interest, limited access to financing, and weak policy framework (Igwe, et al. 2017). In countries like the Central African Republic, political crises, civil war, and natural disasters are the primary causes of slum growth in cities. Whereas in Chad, the lack of finance for social housing and the high number of refugees resulted in a housing shortage (CAHF 2022). In Ethiopia, rapid urbanization, mainly caused by the high rate of rural-to-urban migration, has resulted in adequate housing deficits and uncontrolled urban sprawl (CAHF 2022).

Similarly, ensuring food security and proper nutrition for the urban population in many developing nations, particularly the poorest households, has been a real issue (FAO 2007). It was anticipated that in 2020, between 720 and 811 million people worldwide faced hunger (21% of the population lived in Africa); 282 million people in Africa were under-nourished, and 37% of the world's stunted children and more than 11 million wasted children lived in Sub-Saharan Africa (FAO, IFAD, UNICEF, WFP and WHO 2024). There are many contributing factors to food insecurity in cities. One factor is the lack of a resilient urban food system, often affected by various shocks and stresses such as a pandemic, war, climate change, rising inequality, and so on (UN DESA 2025). For instance, the COVID-19 pandemic caused a major hunger problem in many cities (UN DESA 2025) . According to the WFP (2023), there is more than enough food produced for everyone on this planet; nevertheless, one-third of the food produced gets lost or wasted (FAO, IFAD, UNICEF, WFP and WHO 2024, WFP 2023). About 13% of food was projected to be lost globally after harvest and before it even reached consumers (UN 2022).

The current urban food systems are also causing environmental challenges. Food that is grown on rural fields gets transported to the city, where a portion of it is consumed, and the remaining becomes waste that is either composted or landfilled, where it releases greenhouse gases (Salle and Holland 2010). Studies show that nearly 80% of the food consumed in the world is expected to be in urban areas, and the amount of

consumption will inevitably lead to a large generation of organic waste, which makes up two-thirds of all urban waste (Mougeot 2000, Martin-Moreau and Ménascé 2019). In cities of the developing world, the waste streams do not sufficiently replenish nutrients in the cycle of nature, because their major focus has been on disposal (Veenhuizen 2006, Proksch 2017, Zeeuw, Introduction 2003, Zeeuw and Drechsel 2015).

One of the core ecological concepts for the construction and planning of sustainable cities is the recycling process, which closes the loops of material flow within an urban area (Chen 2012). With very little of the nutrients being returned to the soil and the nutrient levels in agricultural soil declining, new minerals and resources, such as fertilizers, must be mined and added (Salle and Holland 2010). To ensure their viability and the long-term sustainability of the surroundings on which they depend, cities need to develop circular metabolic systems (Deelstra and Girardet 2000).

2.1.1.2. Definition of Circular Metabolism and Circular Economy

A significant obstacle to urban sustainability, in terms of its high monetary and environmental cost, is the linear metabolism system- the "extract, make and dispose" method of production and consumption of nutrients, water, and energy (Girardet 1996, Nehls, et al. 2016). Most modern cities have a linear metabolic system that differs significantly from the metabolism of nature's ecosystems- every organism's output is an input, renewing and sustaining the entire living environment (Deelstra and Girardet 2000). As Tjeerd and Herbert (2000, p. 50) put it,

> *"The metabolism of many traditional cities was circular, whereas that of most "modern" cities is linear: Resources are funneled through the urban system without much concern about their origin and the destination of wastes; inputs and outputs are treated as largely unrelated."*

From largely open-loop systems with a one-way flow of resources (in) and waste (out), a paradigm of urban regions has been shifting to primarily closed-loop systems where the difference between resources and wastes becomes indistinct (Smit and Nasr 1992). In contrast to the linear system, a circular system reduces the reliance on raw material inputs, keeps waste production to a minimum, preserves the value of goods, materials, and resources in the economy for as long as possible, and lowers the costs for the transportation, handling, and disposal of waste (Girardet 1996, Nehls, et al. 2016, UNEP; IRP 2022).

The concept of 'Circular Economy' has been used to address the sustainability challenges related to the degradation of the socio-ecological system (Lindner, Mooij and Rogers 2017). In this concept the value of products, materials, and resources is maintained in the economy for as long as possible, and the generation of waste is minimized (UNEP; IRP 2022). It has attracted the attention of municipalities as an opportunity to efficiently use resources through a merged ambition of sustainability and economic growth (Lindner, Mooij and Rogers 2017). Due to their potential to close local resource loops, reduce greenhouse gas emissions, improve environmental quality, foster healthier, safer, and more accessible communities, and support local job opportunities, social inclusion, and community empowerment, neighborhoods are essential for sustainable urbanism (Barton 2000).

2.1.2. Sustainable Housing and Neighborhoods

A sustainable neighborhood meets the needs of the present generation without compromising the needs of the future generation to meet their own. According to the UN (1996, pp. 18),

> *"Human settlements shall be planned, developed and improved in a manner that takes full account of sustainable development principles and all their components, as set out in Agenda 21 and related outcomes of the United Nations Conference on Environment and Development. Sustainable human settlements development ensures economic development, employment opportunities and social progress, in harmony with the environment."*

Scholars have proposed different principles to measure and achieve this by integrating socio-economic and environmental dimensions of urban planning. B. A. Kazimee (2002) emphasized that applying integrated ecological and biological planning techniques is essential to balance human activities and environmental systems. He outlined five fundamental variables for measuring the human-environmental exchanges through input-output modeling techniques: air quality, water quality, energy conservation, land and resource conservation, and human ecology. Accodring to Gareth Haysom (2009), the sustainability of neighborhoods relies on the interdependence of four important focal areas - where people live and work (housing), how the food is produced (agriculture), the fuel that powers their way of life (energy), and how they and their commodities commute (transport). The UN-Habitat (2015) has provided five design strategies for planning sustainable neighborhoods. The strategies emphasized

land-use mixity and limited land-use specialization. The former fosters local employment, production, and consumption by allocating 40% of floor space for economic activities, while the latter limits single-function blocks to less than 10% of the neighborhood to ensure diversity in lot sizes, housing types, and population densities capable of supporting local services.

A comprehensive approach to sustainable neighborhoods ensures the proper integration of housing and other amenities (Araya, Workalemahu and Zeberga 2006). In this study 'Housing' refers to the process of creating and maintaining the stock of dwelling units (Turner 1991). It is one of the most basic social factors that determines people's and places' quality of life and well-being (UN-Habitat 2012b).

The general ideology of sustainable housing is also linked with the definition of sustainable development given in the 1987 Brundtland report. It prioritizes energy efficiency and relies on ecological design strategies that live in harmony with nature (Edwards and Turrent 2000, UN-Habitat 2012b). It also promotes socio-economic empowerment, cultural identity, institutional facilitation, and resource efficiency, which in turn contribute to a broader understanding of sustainability (Syn-Consult Africa 2006).

Global research on sustainable buildings has grown in response to climate change, yet developed countries still lead the field while developing regions, including Africa, remain underrepresented (Mushi, Nguluma and Kihila 2022). According to a review by Frank Victor Mushi, Huba Nguluma, and Jacob Kihila (2022), African research, with Nigeria, South Africa, Ghana, and Egypt contributing most of the work, has largely mirrored global trends by focusing on social issues, costs, policies, technologies, and management. Although there is notable progress in assessing economic and social aspects, several gaps such as limited performance data on existing green buildings, insufficient studies on locally sourced materials, a lack of user-focused post-occupancy research, weak theoretical frameworks explaining green building adoption, inadequate policy and legislative analysis, and a shortage of sustainability education and training in academic and vocational programs have persisted (Mushi, Nguluma and Kihila 2022).

Many African scholars have questioned the direct transferability of the Western-originated sustainability rating systems to the African context, as well as the need to

develop context-specific sustainability frameworks (Mugah and Letema 2025). Mushi, Nguluma, and Kihila also emphasized the need for region-specific research grounded in local knowledge, stronger policy support, and improved integration of sustainable building concepts into educational systems to advance green building practices across Africa (Mushi, Nguluma and Kihila 2022). The table below summarizes the sustainability indicators of housing and neighborhoods that have been commonly adopted in the developed and developing regions of the world.

Table 2-1 Indicators of Sustainable Housing and Neighborhoods

	Indicators

Environmental	▪ Protect the environment by minimizing harmful impact
	  ▪ Restore degraded land
	  ▪ Create a physical and psychological health
	  ▪ Pollution and waste treatment strategies
	▪ Creation of natural habitats that are harmoniously integrated with housing
	▪ Minimize resource consumption (energy, water, materials, and land)
	  ▪ Use renewable, recyclable, or recycled resources (wind, sun, etc.)
	  ▪ Capture of rainfall for certain water uses
	  ▪ Maximize resource reuse (reuse materials, water, and land)
	▪ Compact layout
	▪ Construction using renewable and environmentally friendly materials
	▪ Local Food Production

Social	▪ Use of open space to facilitate social interaction ▪ Urban layout that creates shelter and safety ▪ Healthy, comfortable, secure homes ▪ Disabled access (no steps) ▪ Maximize access to healthy environments and support services (recreation, food, health, and education) ▪ Foster participation and empowerment of residents in decision-making ▪ Creating a sense of community, place, and identity
Economic	▪ High-density, mixed-use, and diversified tenure ▪ Energy saving (efficiency and renewable energy); resource conservation ▪ Housing affordability and mix for diverse income groups ▪ Supporting economic activities and enterprise (e.g., work-from-home setups) ▪ Housing management and maintenance: Durability ▪ Promoting petty landlordism and self-help housing

Sources- (Edwards and Turrent 2000, Huong and Soebarto 2003, Winston 2008, Turcotte and Geiser 2010, Ross, Bowen and Lincoln 2010, Yakob, Yusof and Hamdan 2012, UN-Habitat 2011a, UN-Habitat 2012b).

Cities may build resilient, inclusive, and environmentally friendly communities that tackle both short-term and long-term socioeconomic issues by incorporating UA concepts into neighborhood development. Leadership in Energy and Environmental

Design (LEED) for Neighborhood Development (LEED-ND) rating system has operationalized this principle by integrating the protection and conservation of agricultural land and local food production within new neighborhood designs. This framework underscores the importance of food security alongside the development of a sustainable built environment by awarding credit points for both aspects (USGBC 2014, USGBC 2021). Similarly, the Green Star rating system for the Sustainable Precinct has awarded a credit point for access to fresh food within walking distance of where occupants live and for a local food production strategy that integrates productive landscape in South Africa (GBCSA 2025).

2.1.3. Urban Agriculture

Agriculture has long been viewed as a traditional, rural activity that does not fit urban environments, leading to the perception that even the term 'urban agriculture' seems an oxymoron (Smit, Nasr and Ratta 2001). The concept of UA has evolved and been defined in various ways over time. The popular definition that is frequently adopted by several researchers studying the subject is by Luc J.A. Mougeot (2000, pp. 11):

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

Historically, UA was a common and essential urban practice, providing income and sustenance for millions (Deelstra and Girardet 2000). However, with the Industrial Revolution in the 19th century, its significance in urban planning diminished, leading to a disconnection between cities and food production (Deelstra and Girardet 2000, Dobele and Zvirbule 2020, Martin-Moreau and Ménascé 2019). In the early 21st century, the increasing urbanization, growing demand for fresh food, crippled domestic food distribution systems, the rising unemployment and number of retirees, as well as the limited land-use regulations in urban areas, contributed to the resurgence of interest in UA (Mulugeta 2013, Martin-Moreau and Ménascé 2019). Its role in various urban policy areas (health, socio-economic, and environmental development), and its significance as a coping mechanism in times of multiple shocks and stresses such as a pandemic, war, climate change, rising inequality, and so on, has attracted numerous

local authorities to integrate local food production in their urban policies UNEP (Haas 2017, UN DESA 2025, FAO 2007).

UA is a high-input, high-output system for year-round production of grains, vegetables, fruits, meat, and dairy for local use (Novo and Murphy 2000, Zeeuw and Drechsel 2015, Kennard and Bamford 2019). UA varies widely based on the environment, technology, and cultural preferences (Lovell 2010). It can be classified based on scale (micro, meso, macro), ownership (private, corporate, public), and form, location, or product type. Examples include commercial city farms, community gardens and orchards, indoor vertical farms, hydroponic greenhouses, rooftop gardens, aquaponics, beekeeping, and small-scale homestead farms (Pearson, Pearson and Pearson 2010).

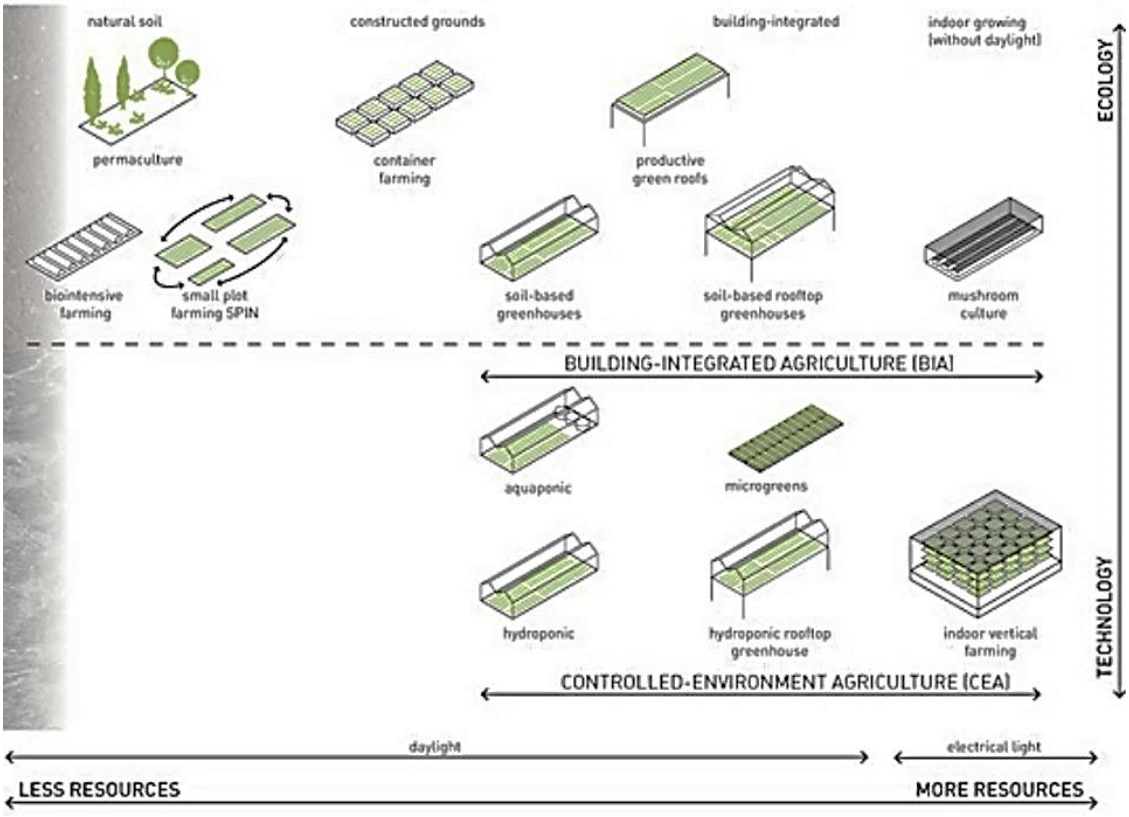


Figure 2-2 Matrix of Growing Systems used in UA
Source- (Proksch 2017)

While large-scale livestock and crop cultivation need extensive land, horticultural crops thrive in smaller areas and can be grown in urban gardens, backyards, vacant lots, rooftops, and indoor spaces (Benis, Reinhart and Ferrão 2017). UA can also be integrated into different urban scales (lot, city block, district, etc.) (Mougeot, Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture 2005,

Veenhuizen 2006). UA can occur on a smaller scale in parks, along riversides, on balconies, in containers, and on roadsides (Mulugeta 2013). It efficiently uses urban land, whether integrated with other uses or practiced as a standalone practice, and can maximize both horizontal and vertical space through multi-cropping and integrated farming (Smit, Nasr and Ratta 2001). It also recycles urban by-products, converts vacant urban areas into agricultural spaces, and conserves natural resources (Smit and Nasr 1992).

UA involves a diverse range of actors, including urban farmers, community organizations, non-governmental organizations, governmental bodies, institutions, private firms, and international agencies (Smit, Nasr and Ratta 2001). It is accessible to people of all income levels (Smit, Nasr and Ratta 2001). Participants include individuals from various socioeconomic backgrounds, including low-income individuals, government officials, teachers, and wealthy investors (FAO 2007, Dubbeling, Zeeuw and Veenhuizen 2010). Women play a significant role due to their household food responsibilities and the proximity of farming plots to their homes (FAO 2007).

According to Mougeot (2000), UA is a crucial component of urban systems, utilizing resources like land, water, and labor, influencing aspects such as food security, poverty, ecology, and health, and shaped by urban factors such as policies and market conditions. UA has also emerged as a natural focal point with the potential to advance some SDGs, such as zero hunger (SDG 2), good health and well-being (SDG 3), reducing inequality (SDG 10), besides sustainable cities and communities (SDG 11), in addition to several environmental dimensions of land, water, and climate (IRP 2022).

While conventional agriculture has many advantages, it also presents health and environmental risks. Key concerns include crop contamination from pathogens, mosquitoes spreading diseases, agrochemical pollution, heavy metals from traffic and industry, and zoonotic diseases from close animal proximity (Veenhuizen 2006). Overuse of chemicals, wastewater from poultry farms, and improper farming can contaminate water supplies and harm ecosystems (Veenhuizen 2006). Nonetheless, UA is often seen as more beneficial overall despite these challenges (AACPPO 2017). Some of the constraints to the practice of UA in cities are the lack of access to land, safe water for irrigation, finance, appropriate training, and extension services (World Bank 2013).

According to FAO, Rikolto and RUAF (2022, pp. 24)

> *"Urban areas, where land and water resources may be limited and subject to competing uses, production goals and processes require suitable crops and other commodities be identified as well as production practices that optimize scarce resources. In particular, UPA is characterized by highly insecure land tenure and space limitations. Agricultural areas are often on land where other uses create conflicts requiring state intervention to regulate land ownership and stipulate fewer competitive economic activities. City or metropolitan governments do not always perceive that these issues are a priority, which is maybe why they often fail to integrate farming into urban planning."*

2.1.4. Housing/Farming Dichotomy

Many cities have integrated low-cost housing projects into their urban policies to address the shortage of affordable housing and mitigate urban sprawl. While these housing initiatives aim to provide adequate housing, they often require large tracts of urban land. This led to high competition with farmlands, particularly in urban and peri-urban areas, where farmlands are rapidly being converted to residential zones. As Sarah W. James (2013) noted, urban planners often struggled to balance the demand for new housing with the preservation of farmland and local food production. This rivalry led to the rise of the housing-versus-farming dichotomy in many cities, where residential developments typically take precedence, often neglecting long-term ecological and socio-economic impacts.

Ideally, any shift from agricultural to residential land use should be based on thorough ecological assessments (Yaro, et al. 2018). Unfortunately, this is not always the case. In Dhaka, Bangladesh, for instance, nearly 47% of agricultural land was lost to housing and infrastructure development over thirty years, leading to environmental damage and microclimatic changes (Sajib and Moniruzzaman 2022). Similar trends have been observed elsewhere. In Mexico, the expansion of housing developments at the expense of farmlands increased the percentage of impervious surfaces (Nadal, et al. 2022). In Calabar, Nigeria, the transformation of an entire farming settlement into a housing district triggered major ecological repercussions, including flooding and erosion (Yaro, et al. 2018).

Residential areas are substantial generators of organic solid waste and wastewater. According to the World Bank (2025), in 2019, about 61% (570 million tons) of the world's food waste came from households. Utilizing compost and wastewater irrigation in residences can enhance nutrient recycling, reduce fertilizer and energy use, improve

agricultural productivity, boost food security, and strengthen urban resilience (Deelstra and Girardet 2000, Veenhuizen 2006, Proksch 2017, Drechsel and Kunze 2001, Zeeuw and Drechsel 2015). Moreover, it can highly improve the sustainability of the housing development.

2.1.5. Sustainable Urban Agriculture

Eve Balfour (1977) summed up the definition of sustainable UA in a single word, "*permanence,"* referring to practices that maintain soil fertility indefinitely, use only renewable resources whenever possible, do not significantly harm the environment, and promote life and energy within the soil and throughout the cycles of all involved food chains. Therefore, it integrates the disciplines of food security, nutrient cycling, water quality and supply, soil health, energy efficiency, pest control, breeding, animal and plant physiology, and ecology (Nandwani and Nwosisi 2016). Philips (2013) also claims that sustainability in UA relates to the level of consideration given to ecological issues. According to the Cornell Law School (2024), sustainable agriculture is defined by the USDA as

> *"An integrated system of plant and animal production practices having a site-specific application that will, over the long-term: (1) satisfy human food and fiber needs; (2) enhance environmental quality and the natural resources base upon which the agricultural economy depends; (3) make the most efficient use of non-renewable resources and integrate, where appropriate, natural biological cycles and controls; (4) sustain the economic viability of farm operations; and (5) enhance the quality of life for farmers and society as a whole*".

FAO (2007) related the sustainability of UA to its multiple functions and contribution to making cities socially, economically, and environmentally sustainable. Lovell (2010) explained how justifying the use of scarce urban land solely for its production function has become an adverse process. As a result, planners had to devise alternative ways of integrating UA back into urban planning. One approach was to develop UA as a multifunctional urban space. Renting, et al. (2013) also emphasized that the feasibility and sustainability of UA depend on whether it can meet multiple urban planning objectives by adjusting to the resources at hand.

After reviewing several pieces of literature, the various indicators of sustainable UA are summarized in the table below.

Table 2-2 Dimensions of Sustainable Urban Agriculture

Dim.	Indicators
Social	Employment; disposable family income; inclusion (no. of youth trained in life skills, patients, migrants, or ex-convicts); participation (men and women); property rights (tenure); equity coefficients; dietary improvement & food security; community engagement, innovation, & learning; recreational spaces; personal well-being (physical, intellectual, and psychological); aesthetics open spaces; and level of awareness about healthy food production
Economic	Yield trends; income per head and ha; modified Gross National Product; value of total food produced; value of land with UA; productivity; willingness to pay; local food production; hedonic price method; cost of depletion and pollution; jobs created & income opportunities; diversity of the income streams; reduction in the cost of solid waste and wastewater disposal /treatment; high yield per unit area by intercropping, multi-cropping, and vertical farming; and high yield per unit of input
Environmental	Bio-indicators (clean air, biodiversity); pollution indicators; material and energy flows and balances; heavy metals in crops; soil health (organic matter, etc.); food miles (local food produced); organic waste recycled; depletion; high rainwater infiltration; expanded green spaces; carbon sequestration; conservation of biodiversity; clean production; water efficiency & rainwater harvesting; lowered heat island effect; improved biodiversity; and environmental education
Cultural	Traditional practices and local knowledge (biological pest management, rainwater use for irrigation); maintained "food culture and identity" of urban migrant groups; urban farmers as a cultural unit; and preserved traditional culinary and medical practices

Adapted from FAO (2007), Vásquez-Moreno and Córdova (2013), Dubbeling, Veenhuizen and Halliday (2019), Proksch (2017)

2.1.5.1. The Concept of Multifunctionality in Sustainable Urban Agriculture

UA is a versatile concept that can occur in various settings and adapt to different social, economic, and political systems to meet the needs of diverse stakeholders (RUAF 2006). Besides meeting the needs of urban residents for food, UA provides additional social, cultural, economic, and environmental services such as energy conservation, waste management, microclimate control, urban greening and biodiversity, economic revitalization, community socialization, human health, cultural heritage, and education (Lovell 2010). This also helps connect different urban flows for resource recovery and creates a spatial synergy, an indispensable principle in building a resilient urban food system (Zeeuw and Drechsel 2015).

UA greatly improves food security and nutrition, especially for the urban poor, who struggle with unreliable access to food and low purchasing power (FAO 2007). In Asia, it helped poorer households consume more nutritious diets (Zezza and Tasciotti 2010). In cities in Latin America, community gardens have been established in vulnerable areas to provide access to fresh foods and reduce food imports, as well as integrate local producers into markets to ensure fair distribution of food (Dubbeling, Santini, et al. 2017, Gomes, Gomes and Souza 2019). The importance of UA was also highlighted during the COVID-19 pandemic, demonstrating its capacity to alleviate stresses in the food system through coordinated municipal actions and the support of the community (Friedmann 2020, Mees 2020).

UA can reduce poverty, promote social integration for vulnerable groups (e.g. HIV/AIDS-affected HH, disabled people, female-headed households with children, older people without pensions, and jobless youth) by providing livelihoods and reducing social issues like drugs and crime, while also offering recreational, educational, and community-building opportunities (FAO 2007). Since the largest portion of income (50–70 percent) of the poor households typically goes to food, UA provides a significant income source, helps reduce their food expenditures, and supports microenterprise development in areas like agricultural input production, product processing, and service provision (FAO 2007).

Local governments focus on the environmental aspect of urban areas or encourage a transition to sustainable and multifunctional agriculture if they are primarily concerned about the unfavorable living conditions in urban areas, the growing waste management issues, or the detrimental effects of industrial UA on the environment or human health (FAO 2007). UA can address the increasing problem of waste disposal in cities by converting urban waste into valuable resources (compost, vermiculture, and wastewater for irrigation), contributing to city greening, improving the urban micro-climate, helping maintain biodiversity, and reducing the city's ecological footprint by minimizing energy use for transportation, packaging, and cooling (FAO 2007). It also conserves soil, improves landscape management (parks, buffer zones, areas that are valuable ecologically and should not be developed), and provides opportunities for leisure and recreational activities (Veenhuizen 2006, FAO 2007, Lovell 2010). Since it relies on more environmentally friendly procedures, it supports the rebalancing of significant flows of the carbon, nitrogen, phosphorus, and water cycles (Proksch 2017).

The concept of UA as a large-scale component of the process of urban design and physical planning should be considered as part of the green infrastructure of a city's planning system matrix (Philips 2013). The management of stormwater, waste, energy, open space, and natural resources is just a few of the infrastructural systems that UA may integrate (Philips 2013). Lovell (2010) summarized the various functions of UA as shown in the table below.

Table 2-3 Multiple Functions of UA

Function	**Justification**	**Supportive Planning Strategies**
Production	UA produces fruits, vegetables, mushrooms, herbs, medicinal plants, meats, milk, cheese, eggs, etc.	Provide a suitable, accessible, and safe space with good solar access and an irrigation source.
Conservation of Energy	Producing food locally reduces the embodied energy associated with inputs, transportation, and packaging.	Developing transportation systems and networks to get food to consumers efficiently.
Waste Management	Turning organic waste into compost and wastewater, stormwater, and greywater into irrigation for growing food closes the nutrient loop.	Identify systems to collect, divert, and transport organic wastes away from landfills to UA.
Biodiversity	UA supports a wide range of species, including some native plants, as crops or associated plants.	Convert some open space areas of low diversity (*i.e.*, turf) to community gardens and farms.
Microclimate Control	UA can positively alter microclimate through humidity control, wind protection, and shade.	Allow edible plantings inside built areas to combat the heat island effect and other unfavorable climatic conditions.
Urban Greening	Community and backyard gardens contribute to the greening of urban areas, improving aesthetics, & providing space for recreation and relaxation.	Support efforts to convert vacant and neglected lands into productive green spaces for use
Economic Revitalization	Offer new employment opportunities for neighborhood residents and vitality through improved community economics.	Create networks to connect laborers, farmers, and markets, helping to retain and grow new ventures.
Community Socialization	Community members often find gardening to be a social activity through sharing food, knowledge, and labor, which also helps lower crime.	Along with community garden spaces, integrate other activities and features to encourage socializing.
Human Health	UA offers healthy food and encourages physical activity.	Develop community programs in farming as a healthy lifestyle.
Cultural Heritage	UA can provide access to rare ethnic foods that are typically not available in current markets.	Integrate a community garden in areas known to have high immigrant populations and link it with local culture.
Education	Everyone learn about foods, nutrition, cooking, economics, environment, and culture.	Offer gardening and UA activities within existing programs, particularly during summer.

Source - Lovell (2010).

The role of UA in Circular Urban Metabolism/ Circular Economy

UA is a crucial component of a circular economy because it supports the transformation of linear flows of matter, energy, and water into more circular flows resembling natural ecosystems (Nehls, et al. 2016, Martin-Moreau and Ménascé 2019). One of the driving factors for the resurgence of UA in cities was the availability of low-cost resources like urban organic wastes and wastewater (FAO 2007). Cities are more resourceful and capable of transforming consume-dispose (open loops) into consume-process-reuse (closed loops) (Smit and Nasr 1992). Nutrient Looping is the method by which waste organic resources can be transformed into a variety of valuable goods (Ellen MacArthur Foundation 2019).

Urban outputs are essential inputs into urban production systems, with regular organic material recycling and composting for use on local farmland (Deelstra and Girardet 2000). UA is a significantly expanding industry that processes urban wastewater and solid waste to fill ecological gaps in vacant land and aquatic bodies (Smit and Nasr 1992). The benefits of this underutilized sector include better nutrition and health, a better living environment, enhanced entrepreneurship, and increased equity (Smit and Nasr 1992). Buildings can produce waste or gather and store materials that can be converted into fertilizer for agriculture, such as rainwater, greywater, and organic waste that can be composted (Orsini, et al. 2017). The use of these resources can be used to significantly cut the emissions caused by agricultural activities (Orsini, et al. 2017).

In many cities, waste disposal has become a significant issue (FAO 2007) because most continue to maintain waste streams that don't sufficiently replenish nutrients in the natural cycle (Veenhuizen 2006, Proksch 2017). According to WHO (2006) Guidelines for the Safe Use of Wastewater, Excreta and Greywater, the following factors were responsible for the growing use of greywater and excreta in agriculture globally: (1) growing water scarcity and stress and degradation of fresh water resources; (2) increasing population growth and the demand for food and fibre; (3) a high recognition of resource value of excreta and greywater and nutrients they contain; and (4) MDGs goal to ensure environmental sustainability and for eradicating poverty and hunger. The guideline states that the environment will most benefit from the safe treatment and use of excreta and greywater, including resource recycling, alleviating pressure on

freshwater resources, reducing downstream pollution from waste discharges, and reducing the potential environmental impact of various chemicals (WHO 2006).

Although less harmful than wastewater, untreated greywater may have microorganisms and contaminating chemicals requiring risk management strategies. The multiple barrier strategy recommended by the WHO (2006) includes on-site and off-site treatment to reduce pathogens; crop restrictions; proper handling and application; appropriate food preparation measures, which include washing, disinfecting, peeling, cooking; and human exposure control and hygiene education.

Proper sewage disposal and management of biodegradable solid waste through the production of compost and manure will foster a stronger interdependency between the agricultural and urban communities and transform a potential urban issue into a valuable agricultural resource (Weise and Isaac Boyd 2001). UA can play a role in improving nutrient recycling and reducing fertilizer use and energy consumption by the productive reuse of urban organic wastes (composting, vermiculture, and wastewater irrigation) (Deelstra and Girardet 2000, Veenhuizen 2006). It also helps to reduce the production of methane, which is one of the most harmful greenhouse gases (Proksch 2017).

Compost is a substance comparable to soil that is made from decomposed materials and has over 50% dry organic content (Ellen MacArthur Foundation 2019). Organic material is broken down by microorganisms (bacteria and fungus) in the presence of oxygen to create soil with a high organic (humus) content (Ellen MacArthur Foundation 2019). The amount of nitrogen, phosphorus, and carbon in the composition of the nutrients varies depending on the feedstock (Ellen MacArthur Foundation 2019). In addition to providing plants with high-quality soil that can encourage plant growth, compost closes the nutrient loop (Salle and Holland 2010). Even though methane and carbon dioxide are both produced during composting, they are formed at a lower rate than in landfills (Ellen MacArthur Foundation 2019). Commercial composting can be done in many ways, such as "in-vessel" for post-consumer food waste and "open-windrow" for "green waste" that is not made of food (Ellen MacArthur Foundation 2019).

Cities are primarily made up of extended sealed surfaces (such as streets, roofs, and parking lots) and are increasingly at risk of flooding and landslides because of

challenges with stormwater management (Lupia and Pulighe 2015). UA can indirectly help with urban water management since green spaces allow precipitation and runoff to pass through the soil (rainwater infiltration) and reduce the need for expensive stormwater drains and drainage systems (Lupia and Pulighe 2015). Investment in UA is therefore just as important as creating a system of channels and drains (Deelstra and Girardet 2000). UA also improves water management by keeping low-lying zones free from construction to reduce flood risks; reusing urban wastewater to save freshwater for higher-value uses, and reducing emissions from wastewater treatment (Dubbeling, Veenhuizen and Halliday 2019). Cities provide potentially significant amounts of rainfall that can easily be collected off the rooftops as a substitute water source (Proksch 2017).

The heat island effect raises the average temperature in metropolitan areas, extending the urban growing season (Proksch 2017). In exchange, UA provides cooling and prolonged evapotranspiration to lessen the heat in cities by increasing the surface of green areas (Proksch 2017, Dubbeling, Veenhuizen and Halliday 2019). In summary, cities give UA access to its underutilized resources, such as open areas, waste heat (2 - 3 degrees Celsius warmer than the nearby countryside), the low-cost organic nutrients contained in its household and green waste, runoff water, etc. (FAO 2007, Martin-Moreau and Ménascé 2019). Utilizing waste products for plant cultivation reduces the risk of groundwater contamination; provides jobs and income for the urban poor; and lowers the volume of biodegradable trash dumped in landfills, which in turn reduces the production of methane (Zeeuw, Introduction 2003, Proksch 2017).

2.1.6. Summary of Conceptual Review

Initially, the concept of Sustainable development was more focused on environmental protection; however, it evolved to comprise four interlinked dimensions, including social, economic, environmental, and cultural dimensions. The social dimension is concerned with community needs, strengths, and respectful interaction. Equitable access to housing and services is also part of this dimension. The economic dimension focuses on the use of natural resources and economic growth. The environmental dimension ensures that development's impact is within the capacity of the environment to recover.

Cities are urbanizing at a rapid rate, making it difficult to meet the basic needs of residents for food and housing. Food insecurity and inadequate housing are two of the major issues faced by several cities in developed and developing nations. Other issues like poverty, unemployment, climate change, waste management issues, and the linear urban metabolism systems are getting recognized in recent literature. Cities have been addressing the shortage of affordable housing by rezoning urban land. The loss of productive urban land for housing has contributed to food insecurity and created a distance between food and cities.

Mougeout's definition for UA, which is the most frequently adapted definition, is the growing of food or raising animals within a city by using/reusing largely human and materials found in the city and returning resources to the urban area. Currently, UA has gained high interest from architects and urban planners who seek to address several urban planning objectives. Besides meeting the needs of urban residents for food, UA contributes to various social, economic, environmental, and cultural functions. The multifunctionality of UA in promoting the sustainability and ecological resilience of the city has gotten some attention in recent studies. Integrating urbanism with sustainable food systems is required for a sustainable city in the twenty-first century (Philips 2013).

2.2. Contextual Review

Addis Ababa was established by Emperor Menelik II and his Queen Empress Taitu in 1886, after confiscating Finfinnee, an area popular for its fertile land, sloppy terrain, and hot spring area (Tufa 2008). Initially, the imperial palace was temporarily situated at the top of Entoto Mountain; however, it moved to a permanent location around the hot springs area in 1888 (Tufa 2008, Gebremichael, et al. 2014). Following this, Taitu proposed that military officials settle (see Figure 2-5 Addis Ababa Master Plan approach during 1888-1974) strategically around the palace for security reasons; therefore, military officials during that time were granted a tract of land to accommodate their families and subordinates (Tufa 2008).

This cluster of traditional settlements that also represented the social status of the officials (*the Ras, Dajazmach, Fitawrari, and so on*) was called '*Safar'* (Tufa 2008). The construction of churches close to the palace and the Safars, and the market center led to the formation of new settlements in the city (Tufa 2008).

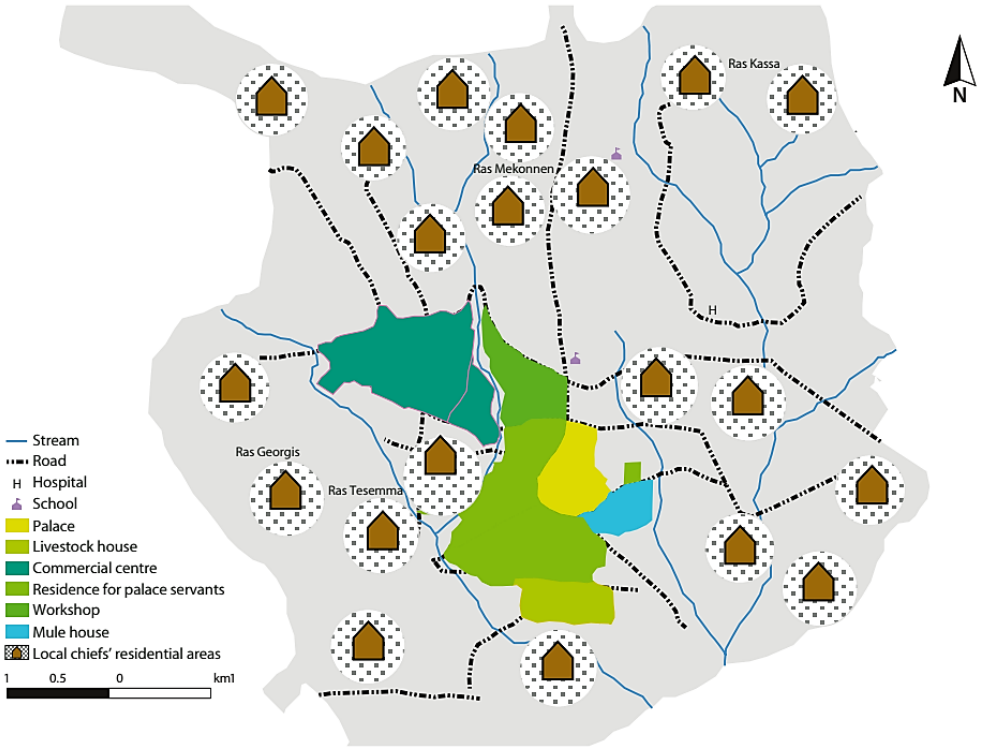


Figure 2-3 Original Settlements of Addis Ababa

Source: Yirgalem (2008)

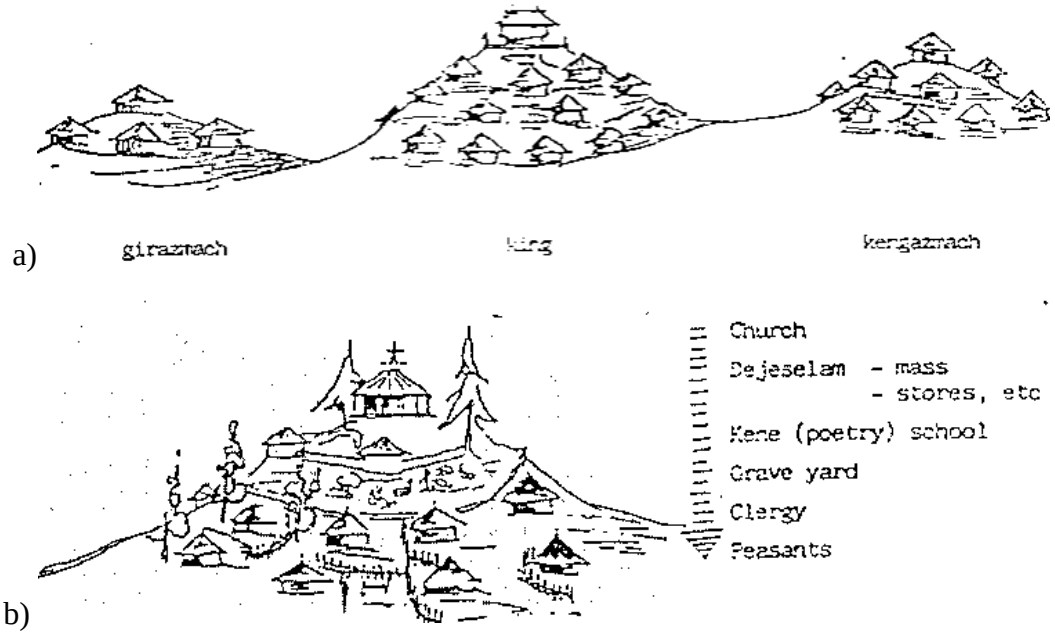
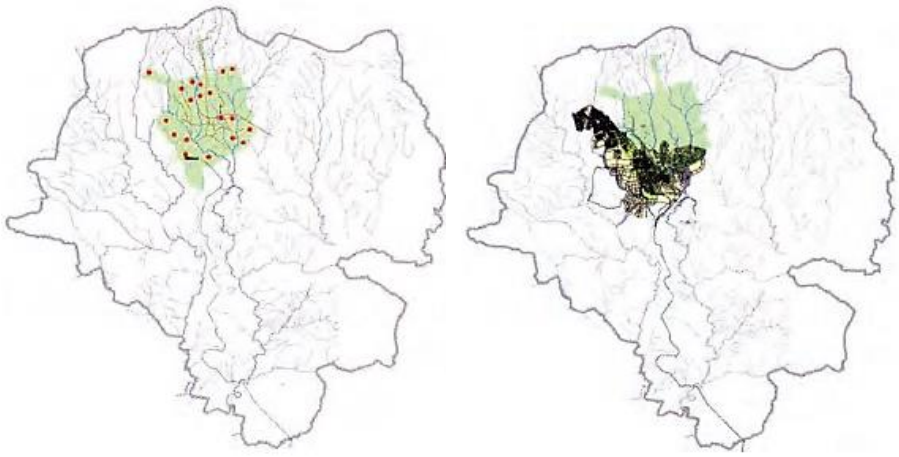


Figure 2-4 (a) The Garrison (Safar) and (b) Church Village

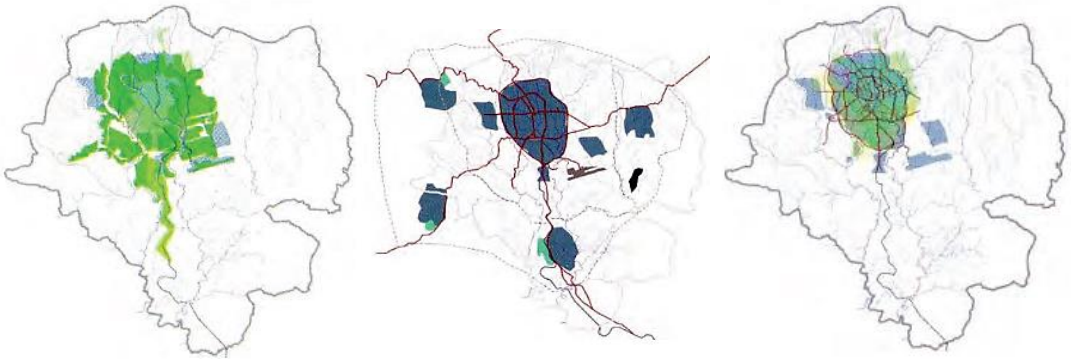
Source: Tufa (2008)

Between 1909 and 2003, Addis Ababa experienced various phases of urban planning, which were influenced by shifting political systems and external factors. The city's initial growth progressed from organic settlements to infrastructure-focused

development after a municipal government was formed in 1909 (Yifru 2014). During the Italian occupation (1936–1941), master plans that aimed to modernize the city were largely unimplemented (Tufa 2008). Following this period, British planners introduced neighborhood concepts that featured green belts, and these concepts were partially implemented during the Imperial time (Tufa 2008). During the Derg regime (1974–1991), the city's development declined because of the political instability and land nationalization (Tufa 2008, Yifru 2014). After 1991, the ORAAMP developed and executed a new master plan that prioritized sustainability and infrastructure (Yirgalem 2008). Nonetheless, challenges related to land use for UA and green spaces persisted in the plans (Yifru 2014).



Empress Taitu (1888) Addis Ababa Master Plan approach (1936-1941)



Abercrombie (1956) Bolton and Hennessy (1959) Luis De Marien (1965)

Figure 2-5 Addis Ababa Master Plan approach during 1888-1974
Source: Tufa (2008)

Several local and international instruments have considered the provision of housing and food as fundamental human rights. Both 1948’s Universal Declaration of Human

Rights as well as 1966's International Covenant on Economic, Social, and Cultural Rights were signed by Ethiopia; therefore, they are considered part of the law of the land. The agreements recognize citizens' right to a suitable standard of living. The FDRE constitution (FDRE 1995) in its social objective or Article 90 (1) stated that

> *"To the extent the country's resources permit, policies shall aim to provide all Ethiopians access to public health and education, clean water, housing, food and social security."*

2.2.1. Housing Development in Addis Ababa

Over the years, several policy changes have shaped the development of housing in Addis Ababa. Before 1975, there was no formal housing policy; therefore, housing was primarily supplied by the private sector under free market principles, which allowed landlords to lease urban property without restrictions and build residential dwellings for tenants (Ayele 2006). Most of the urban poor were housed in unplanned, very congested, and poorly serviced neighborhoods (Ayele 2006).

After the Derg regime took power in 1974, all urban land and *'extra'* houses were nationalized under Proclamation No. 47/1975, 'Government Ownership of Urban Lands and Extra Houses', to promote fair land distribution across the country (The Provisional Military Administrative Council 1975). Housing became primarily government-controlled through the Kebele housing, which was low-cost rental housing for the poor, and government-owned rentals, which were better-quality villas and apartments with higher rental rates (Erena D. et.al 2017). Private investment in housing was severely limited as the government remained the primary housing provider (Tufa 2008). Free land was provided by the government for its employees who proved to have no housing (Tufa 2008).

All land was the property of the national government and was leased, not sold, for development. The Urban Lands Lease Holding Proclamation No. 80/1993 stated that lease-holding duration depended on the level of the urban center and the type of land use: for dwelling houses, the duration was from 60-99 years since it is used for private use or for letting and for UA, which was categorized under other land uses, the duration of lease holding ranged from 50-90 years (The Transitional Government of Ethiopia 1993). In addition, the proclamation mentioned that (1) the rent of urban land was made lower for low-cost houses, (2) at least 90% of the revenue collected by the town administration from land leases had to be utilized for building urban infrastructure and

for the expansion of low-cost houses, and (3) the government may grant urban land freely or without public tendering to be utilized for social service establishments, investments that the government supports, or other uses that directly benefit the public (The Transitional Government of Ethiopia 1993).

After the Derg regime collapsed, housing policy reserved public land ownership to increase affordable housing in 1994; however, the private sector was unable to meet the demand for affordable housing (UN-Habitat 2011a). As a result, the informal sector became the largest housing supplier between 1996 and 2003 (Haregewoin 2007).

The 1995's Constitution of the Federal Democratic Republic of Ethiopia (FDRE) under Article 90(1) granted citizens the right to housing and other basic needs (FDRE 1995). However, land remained under state and public ownership, even though the government could expropriate land for public purposes with advance compensation (FDRE 1995).

With the high rate of urbanization and population growth, the demand for serviced, healthy, affordable housing also increased; however, the effective demand, which was a demand based on the ability and willingness to pay, was low (UN-Habitat 2011a). Therefore, the government launched a large-scale low-cost housing (LCH) program in 1999, reducing building costs by 40% (GTZ and Ministry of Federal Affairs 2003).

With the partial initiation of the change in national development policy, the second phase of the LCH project that expanded the earlier experiments into a full-scale housing program was launched (2002-2006) (Delz 2014). This was followed by the 2003 Condominium Proclamation No. 370 (FDRE 2003)**,** allowing for regulated condominium[4] development and management. Condominiums have common elements or spaces that exclude the dwelling units and are managed by the unit owners' association[5]. In 2005, the IHDP was initiated by the Ministry of Works and Urban Development (hereafter MWUD) to provide affordable housing for low-income groups (UN-Habitat 2011a). Site selection for these developments involved extensive environmental, infrastructural, and social impact assessments before approval by the

[4] As per the Condominium Proclamation No. 370/2003, a Condominium refers to a residential or other structure with five or more independently owned apartments and common components, whether in a high-rise building or a row of homes, and includes the building's land holding.

[5] Unit owner's association is an organization created to manage the condominium on behalf of the unit owners; provide mutual benefits for unit owners other than securing or sharing profits; and determines the terms for the use of the common elements

Land Board (UN-Habitat 2011a). Since 1996 EC, about 380,000 houses have been constructed by the government (MoUDC 2020).

2.2.1.1. Neighborhood Development in Addis Ababa

A neighborhood is a specific locality of an urban setting developed at a certain period, which is at best a grouping of residential clusters with self-contained services and functions (Araya, Workalemahu and Zeberga 2006). As per the Neighborhood Planning and Design Manual, the various planning tiers needed for neighborhood development in Addis Ababa are the structure plan, Local Development Plans (LDP), and Neighborhood Development Plans (NDP) (Araya, Workalemahu and Zeberga 2006). NDP is the third stage of planning focused on residential development and includes detailed plans for the layout and design of the infrastructure, floor plans for homes and buildings, plans for social and community services, and preliminary building designs (Araya, Workalemahu and Zeberga 2006). NDP in Addis Ababa can be either prepared for redevelopment of inner city area, which is intended to improve slum and squatter settlement areas and/or increase the density and efficiency of land utilization of inner city areas, or for the planning of new settlement area in expansion or refill vacant areas and farming areas, to reduce housing backlog (Araya, Workalemahu and Zeberga 2006).

According to the Norms and Standards of the Addis Ababa Structure Plan Components, the standard of social mixity in housing development was set in a proportion of 74% for the low-income, 21% for the middle-income group, and 5% for the high-income group, whereas the assigned plot areas for a unit in square meters were 75 sqm, 95 sqm, 105 sqm, and 120 sqm for low-income; 150 sqm and 175 sqm for middle-income; and 300 sqm and 500 sqm for high-income groups (ORAAMP 2002).

2.2.1.2. Current State of Housing Deficit

Addis Ababa has struggled to provide adequate and affordable housing, especially for low-income residents. The main issues were the shortage of affordable housing; expansion of slums; increase in urban population; low-income levels of urban residents; lack of housing finance; insufficient building materials and labor; restrictions on integrated infrastructure provision; inadequate land preparation and provision; inability

to adhere to legal frameworks to facilitate housing development; and the lack of a well-organized institution (FDRE 2013, AACPPO 2017, AAHDAB 2022).

The current revised housing strategy aims to ensure housing accessibility to all sections of society, provide rental housing for low- and middle-income people through joint ventures, mixed-use housing, and housing development by the Federal Housing Corporation; limit the government's involvement in supplying materials as needed and control quality; establishing an independent national fund for housing and so on (MoUDC 2020). The eight housing options are 10/90, 20/80, 40/60, Specialty Housing Development, Housing Cooperatives, Private Housing Development, Real Estate Housing Development, and Public Housing through Private Partnership (MoUDC 2020).

The urban population in Ethiopia in 2020 was estimated to be 22,000,000, with an average household size of 3.7 (MoUDC 2020). The housing backlog back then was estimated to be 1,000,000; however, it was expected to grow to 35,000,000 by 2030 (MoUDC 2020). The number of houses required in the coming decade is estimated to be 5,513,000. A study conducted by the MoUDC in collaboration with the World Bank in 2019 showed that by 2025, about 471,000 homes per year and on average up to 486,000 homes are required annually by 2035 (MoUDC 2020).

2.2.1.3. Housing and Urban Green Infrastructure Development

Many consider Addis Ababa to be the greenest city, boasting both natural and artificial flora (AACPPO 2017). In 2017, the green spaces accounted for 37% of its total land area; however, this did not imply that it was adequately safeguarded because the proportion of green areas has decreased, and green spaces have been violated on a large scale by the public sector and UA has been non-existent (AACPPO 2017). According to the Ministry of Urban Development and Construction, Addis Ababa's green coverage stands at just 1.47% of its total area, which is among the lowest globally (Ali 2019).

There has been a very low level of control over planning violations; therefore, green areas have been used for illegal construction, garbage disposal, etc., and not serving the needs of the community (MoUDC 2016b, MoUI 2022). The Urban Housing Policy and Strategy document (2016b) states that the government encourages every person to collectively cover their residential area and neighboring open spaces and nearby places

with green areas; manage solid and liquid waste disposal systems to restore cleanliness and collect the rainfall from rooftops.

Depending on the density zone of the city, the recreational and green areas in a housing development may take 5-15% of the total settlement area (ORAAMP 2002). The norms and standards for upgrading and renewal projects note that the minimum requirement for green area in both upgrading and renewal projects is 2 sqm per person for 1st and 2nd level urban centers and 1 sqm for 3rd level urban centers (Mathewos Consult and The Federal Urban Planning Institute 2005). A study by Tilahun Fikadu (2025) showed that green space development in East African cities lacks consideration for green infrastructure concepts such as integration, multi-functionality, and social inclusion.

2.2.2. Urban Agriculture Development in Addis Ababa

UA in Addis Ababa emphasizes the intensive and market-driven production of fresh and high-value agricultural goods like vegetables, dairy, and poultry (AACPPO 2017). Mushrooms, beekeeping, cattle fattening, decorative plants, flowers, and tree seedling production are also growing businesses in the city (AACPPO 2017). Crop and livestock production made up more than 70% of the overall revenue of the city's farming population, with crop cultivation accounting for 30% and livestock accounting for 40% (AACPPO 2017).

The population of Addis Ababa was accustomed to raising cattle, sheep, and chickens on plots adjacent to their homes, as well as growing rain-fed crops such as maize and vegetables (G. Egziabher, et al. 1994). UA was carried out both formally and informally, with practitioners employing their spare land at home and on idle public property (MUDHCo 2014). It has been a permanent component of the riverfront landscape in the inner-city as well as expansion areas that provided maintenance to the urban poor, contributed to the urban economy by stabilizing the price of vegetables and horticultural goods, and improved the sustainable use and conservation of natural resource (G. Egziabher, et al. 1994, BoTID 2013, Teshome and Abate 2020).

Axumite G. Egziabher (1994) noted that UA in Addis Ababa was poorly understood by urban planners and decision-makers; therefore, it has largely gone unnoticed. UA was not properly acknowledged, since many considered it a poor substitute for rural agricultural operations; therefore, it was neither promoted nor integrated into the planning process as cities grow (MUDHCo 2014). Moreover, it was perceived as a less

significant activity that is traditionally practiced with unclear policies and laws supporting it (BoTID 2013).

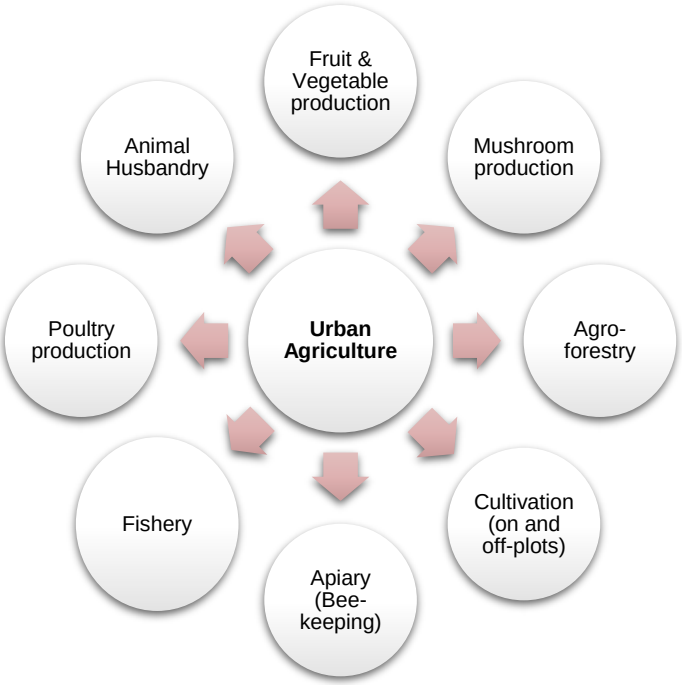


Figure 2-6 UA Disciplines in Addis Ababa
Source – AAFUADC 2022

Thus, urban land use plans for UA have been severely constrained due to the sector's limited focus (MoUDC 2016a). Despite the hostility and the lack of defined norms and laws, UA continued to exist (BoTID 2013). In addition, municipal administrations in several cities in Ethiopia were also adapting it as part of their poverty-reduction programs (MUDHCo 2014). The increasing urban population, high rural-to-urban migration, the shortage of food, increasing unemployment, and the high number of low-income societies were additional factors behind the growth of UA in the city (BoTID 2013).

In 2003, the Addis Ababa City Government established the Urban Agriculture Office to assist smallholder farmers; offer quarantine services for animals and plants; foster forest development; issue and monitor professional licenses for UA enterprises; design strategies for the production and supply of high-quality agricultural products; expand investments and implement them after approval; facilitating the ways for the distribution of improved agricultural technology products by choosing seed and

fertilizer, and monitoring the results thereof; providing education and training as well as providing professional support (MUDHCo 2014).

From 2007 to 2020, UA became one of the six development packages under the Bureau of Trade and Industry Development (BoTID) that supported sustainable urban development in the city (BoTID 2013). Land for UA was not distributed through lease, negotiation, or auction; however, it was temporarily given to Micro and Small Enterprises, due to the absence of clear policies or procedures that authorize or deny UA access to land (BoTID 2013). Cooperatives and Micro and Small Enterprises working on UA used open places without possessing ownership certificates for these lands, which made them less likely to plan longer-term investments and limited the number of support services and other resources, including money (BoTID 2013).

2.2.2.1. Urban and Peri-Urban Agriculture Policy

The first Addis Ababa Urban and Peri-Urban Agriculture policy and strategy document was prepared by the Addis Ababa City Administration, BoTID in 2023. The document laid out a sound policy and implementation framework for UPA to improve food security, income, and employment in the urban community by environmentally friendly, socially inclusive, and gender-sensitive means. The policies forwarded strategies to ensure suitable land was made available for UA in the city; ensure that safe and sustainable water was accessible in the city; and improve the production and economic feasibility of UA through training, business development, advisory, research, finance, and inputs; ascertain that there were no threats to one's health or the environment; improving the legal framework and raising awareness about the UPA as a legitimate use of urban land, and ensure that the UPA initiatives take into account the gender and social dimensions of UA (BoTID 2013).

In 2015, the Ethiopian Government launched the Urban Productive Safety Net Program with the help of the World Bank. The program was implemented in 11 cities, including Addis Ababa, to tackle the rising urban poverty and increase the income of low-income households (World Bank 2015). As a result, people who are physically capable but poor receive conditional money transfers in exchange for engaging in labor-intensive public works such as UA (World Bank 2015).

2.2.2.2. Significance of Urban Agriculture in Addis Ababa

The advantages of UPA in Addis Ababa may be classified and addressed in terms of urban food security and nutrition, local economic growth, social impact, and environmental management (AACPPO 2017). It transformed urban areas from being exclusive consumers of agricultural output (mostly food) to producers of agricultural products, enhanced public health, created jobs, reduced poverty, and minimized the effects of urban growth (MoUDC 2016a, AACPPO 2017) .AACPPO (2017), citing the Addis Ababa City Development Plan (2004-2014), stated that UA provided a source of income for 51,000 residents and covered 13.82% (7,175 hectares) of the city's total area. In addition, it has been able to involve micro-enterprises to participate in the production of inputs, processing, packaging, and selling of UA products in various cities (Mpofu 2013). Until the end of 2018, around 71,108 micro and small enterprises (13.7%) were engaged in UA (MoUDC 2020).

As compared to other investment possibilities, the industry does not require a huge amount of capital and may benefit a wide portion of the people (MoUDC 2016a). As one component of urban greenery, UA also improves the microclimate of cities, boosts biological variety, and enhances the aesthetics and recreational functions of cities (Mpofu 2013).

The government is critical to the development of UA (MUDHCo 2014). Some of the opportunities are: (1) existing favorable policy environment and political commitment, (2) rapid economic growth in the country as a whole and Addis Ababa in particular, (3) the availability of well-developed infrastructure and a concentrated food market, suitable agro-ecology, (4) the presence of a productive labor force, (5) access to modern technologies, and (6) global partnerships in the area of value chain development (AACPPO 2017).

2.2.2.3. Extension Services

UA Extension Service has been able to fulfill the city's expanding food demand, protect the environment by ensuring food security, supplying fresh and high-quality agricultural products, and improving the local food system (MoUDC 2016a). Its primary goal was to provide the community with access to skill training, consulting services, marketing, and other information to identify the most advanced technologies

and effective practices, as well as to provide the necessary monitoring and support to the community (MoUDC 2016a).

2.2.2.4. Land for Urban Agriculture

As per the Urban Agriculture Strategy document (MoUDC 2016a), many land holdings have been and are anticipated to remain unoccupied for a long time, for several reasons. Hence, these sites should be utilized for permanent or temporary UA development that is in line with local requirements (MoUDC 2016a). This strategy would also apply to open spaces, riverbanks, schools, institutes of higher learning, colleges, jails, hospitals, condominiums, government offices, non-governmental organizations, military camps, parks, recreation areas, expansion areas, and private and public catchments (MoUDC 2016a). UA can be temporarily practiced in areas designated for other uses, such as those designated as 'special land use', 'reserved,' 'protected' (with chemical use restrictions), and 'social service' areas designated for education, health, sports fields, and government institutions; and in residential areas designated in the Structure Plan (AACPPO 2017). Furthermore, retail and exhibition facilities will be established in consumer-friendly locations so that products from the various zones may be brought directly to the community (MoUDC 2016a).

Table 2-4 UA Zones and Permitted Functions

Zones	Permitted Functions
UA zone	Crop, permanent fruit tree and vegetable farming; livestock, poultry; dairy farming and other related activities; and fuel wood production
River buffer zone	Permanent fruit tree planting and beekeeping
Multifunctional forest	Permanent fruit tree planting and beekeeping

Source- (AACPPO 2017)

Some of the goals of the structural plan regarding UA were (1) meeting at least half of Addis Ababa's demand for high-value agricultural products (vegetables, milk, poultry meat, and egg) with food produced within the city; (2) increasing farmers' annual income from UA; (3) creating employment opportunities for half a million residents; (4) reducing environmental pollution and degradation in UPA by 80%; and (5) increasing the supply of raw materials for agro-industries (milk, poultry meat, and egg) (AACPPO 2017). The implementation strategies for achieving the set goals were to improve access to farm inputs (such as compost and irrigation water); facilitate the

decentralized production and distribution of such resources (for example, by establishing low-cost facilities for sorting organic waste and producing compost, animal feed, or biogas); implement pilot projects that have decentralized collection and treatment of wastewater generated by households with a small number of inhabitants; and link grain, vegetable and fruit markets to other market centers at a Woreda level (AACPPO 2017).

Land for UA would be equipped with essential requirements such as power, water, and other necessary infrastructures (MoUDC 2016a). As per the Urban Agriculture Strategy document, a cluster-based strategy would be used for the major UA sectors, so that an integrated infrastructure (road, water, energy, production and sales, Tele, and others) will be easily provided in a coordinated manner (MoUDC 2016a). It is also vital to implement better technologies and build the capacities of those involved in managing solid and liquid waste, and if there is enough space, compost preparation is an ideal waste management strategy (BoTID 2013). Moreover, by following the urban development plans, marketplaces will be temporarily provided for UA enterprises, so that they can supply fresh agricultural products for daily consumption (MoUDC 2019). The marketplace will also be set-up in condominiums and crowded areas of cities (MoUDC 2019). Various water collection techniques, such as roof water harvesting systems, collecting floodwater, and well-drilled locations, have to be identified since they will increase crop and livestock productivity by subsidizing clean and treated water, easing access to UA, and expanding irrigation infrastructure and technology (MoUDC 2019).

Box 2-1 Grey Water Reuse for UA in Ethiopia

In Ethiopia, the reuse of greywater presents a unique opportunity to enhance hydrological nutrition through gardening, especially with keyhole gardens designed for arid regions and vertical gardens suitable for high-density urban areas. Although these strategies minimize space and water use, the potential for fecal contamination in greywater poses serious health risks. Some studies, like the ROSA project, found dangerously high levels of coliform bacteria, suggesting fecal matter enters greywater from unknown sources—likely linked to washing diapers but needing further investigation. Despite these issues, sub-surface drip irrigation used in keyhole and vertical gardens provides some protection against contamination. However, bagged vegetable gardens pose an even greater risk due to unfiltered greywater application to surfaces instead of using subsurface methods.

Source- (Bakker and Boelee 2013)

Box 2-1 Grey Water Reuse for UA in Ethiopia

ROSA Project in Arba Minch

Resource-oriented sanitation concepts were suggested by Project ROSA for peri-urban areas in Africa as a means of achieving sustainable sanitation and the UN Millennium Development Goals. In 2006, the ROSA project conducted research on sanitation and identified various sanitation options (involving safe disposal and re-use) with Arba Minch University and other international partners working on the ROSA project. Resources-oriented sanitation systems view household waste materials, such as human excreta and wastewater, as resources that should be made available for reuse. To maximize the potential for reuse, these systems are focused on closing material flow cycles and collecting and treating various effluent flows separately.

Arba Minch, one of Ethiopia's fastest-growing towns in Ethiopia, was facing numerous sanitation issues. According to a baseline survey conducted by the ROSA[6] project in 2007, 94% of the greywater was regarded as waste and therefore not recycled. A greywater tower was chosen for the town as one of the approaches that can be used to treat and safely reuse greywater, and eight of these units that did not require expert labor were built. Vegetables can be effectively grown in the units using grey water. As knowledge of the unit has increased in the neighborhoods, a prospective demand was generated.

Source- *(Wudneh Ayele and Bogale Gelaye 2010)*

Given the fact that it had been tested in South Africa and Kenya, a greywater tower was suggested and built in nine of the individual compounds in the town to process and safely reuse greywater. The greywater tower is a circular bag filled with a mixture of soil, ash, and compost, with a gravel pillar in the middle. Greywater, which is water used for bathing, washing clothing, and utensil cleaning, was treated with it and then reused. Household greywater from residences was put directly into the gravel column, and leafy plants or vegetables were planted in holes drilled into the sides of the bag itself. The materials needed to build one greywater tower were five 2-meter-tall poles, a bucket without a bottom, 1 m x 2.5 m cloth cover, 0.05 m^3 soil, 0.2 m^3 compost, 0.14 m^3 ash, and 0.085 m^3 gravel.

Source (ROSA-Arba-Minch Team 2009, Wudneh Ayele and Bogale Gelaye 2010)

Figure 2-7 Process of making Greywater Tower

[6] *Resource-Oriented Sanitation concepts for peri-urban areas in Africa*.

Box 2-1 Grey Water Reuse for UA in Ethiopia

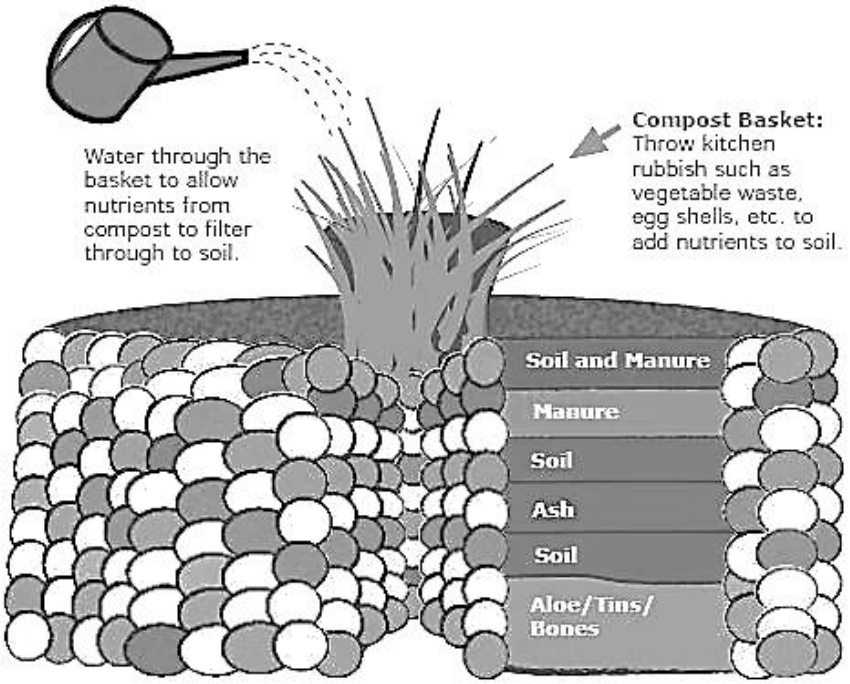


Figure 2-8 Keyhole garden design
Source - *(Bakker and Boelee 2013)*

2.2.2.5. Urban Agriculture in Neighborhood Planning Schemes

According to the Structural Plan of Addis Ababa (2017), when a residential function is found integrated with other appropriate activities, the mixed-use design reduces journeys and encourages working, living, and obtaining services close to home, it encourages a lively environment (economically and socially). Samuel Araya, Liku Workalemahu, and Lulit Zeberga (2006) developed a model prototype for grid-patterned neighborhoods in Addis Ababa. In their model, communal spaces were provided for communal activities such as gardening to take place. They claimed that the built-up areas of the inner city are hotter in the summer and colder in the winter than those in the suburbs and the countryside; therefore, including gardens in the design of new settlements improves the microclimate (Araya, Workalemahu and Zeberga 2006). Expansion area developments, on the other hand, have enough areas to accommodate a relaxed neighborhood; therefore, design goals should aim towards the appreciation of existing nature where the built environment complements natural forms and contours (Araya, Workalemahu and Zeberga 2006). A compost site within walking distance from

residential units was also an important aspect of the model neighborhood plan (Araya, Workalemahu and Zeberga 2006).

Box 2-2 Neighborhood Planning and Design Principles

> *"creating a livable and active environment; encouraging the mixity of various compatible functions and activities within the neighborhood (to create home-based employment opportunities and working spaces in addition to providing services within walking distance); incorporating significant natural and man-made characteristics, including rivers and trees; develop ecologically friendly and economically sound neighborhoods with community recycling backyard spaces and biogas digesters; small organic farming operations through community gardens and rooftop gardens that create a favorable climate; trees and green areas; and reduce hard surfaces and maximize green fields to create a favorable microclimate* (Araya, Workalemahu and Zeberga 2006, pp. 7)*."*

2.2.2.6. Challenges of Urban Agriculture

In the past, the organizational structure of the UA sector was diminishing in terms of mission, resource allocation, institutional capability, and service coverage, leaving it unable to successfully perform its obligations (AACPPO 2017). This challenge was visible in the lack of institutional coordination; lack of extension services; lack of understanding, knowledge, and skills of urban management at all levels of management, executive, and community; problems with input supply and quality; inadequate work to develop and adopt suitable technologies for UA through research and higher education institutions; failure to fully identify land that can be used for UA; lack of national information, and lack of coordination among stakeholders (MoUDC 2019). Moreover, waste management issues, the negative attitude of the Woreda administration, and other market-related issues were barriers to UA in Addis Ababa (MoUDC 2019).

Now, the rapid urbanization, high population growth, and rural-to-urban migration have caused an imbalance between the demand and supply of UA products in Addis Ababa (MoUDC 2019). Even though UA could have thrived in the city's pleasant environment, it must also compete for limited resources like land, water, energy, and labor, which are also needed for other urban schemes (Gebremichael, et al. 2014). Whether the agricultural system is soil-based or not, it needs some space, and land is and will continue to be a resource of importance to urban farmers (BoTID 2013).

The fierce rivalry for land with other sectors has been one of the major difficulties faced by urban farmers, as they have been pushed towards the outskirts of the city for other

development endeavors to take over because the return per unit area from UA cannot be compete with industry or other services (BoTID 2013). Unfortunately, UA cannot effectively compete against other land uses unless it is recognized for its significant contribution to the lives of the urban poor, waste management, the city's environment, and residents' health (BoTID 2013).

One of the negative effects of urban expansion in Addis Ababa on the physical environment was the utterly irrational and unfeasible use of urban land, which leads to problems of urban sprawl and the rapid and illegal conversion of productive agricultural land into squatter settlements (MUDHCo 2014). This reduced agricultural land, caused farmers to face significant insecurity and limited resources to protect their land from development pressures (Gebremichael, et al. 2014). Between 2006 and 2011, about 24% of Addis Ababa's agricultural land was lost for various uses (Woldegerima, Yeshitela and Lindley 2016). The IHDP also claimed agricultural land and greenery locations offered around Jemo for large-scale housing projects (AACPPO 2017).

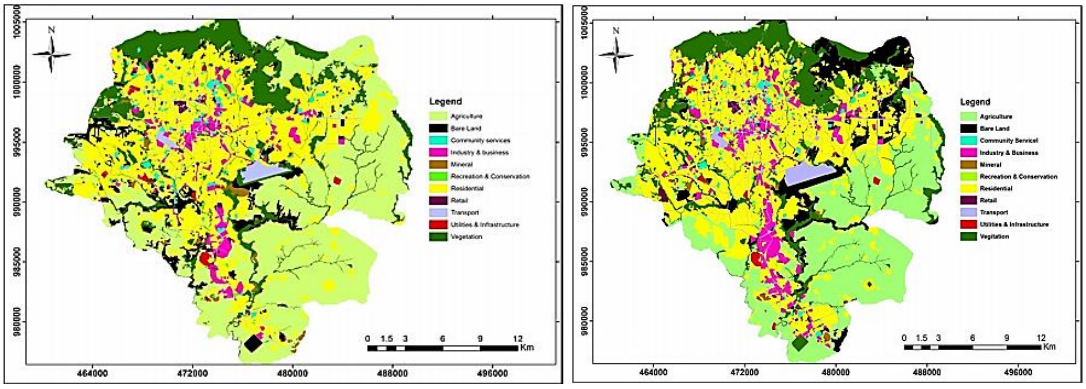


Figure 2-9 Urban Morphology Map of Addis Ababa in 2006 (Left) and 2011 (Right)

Source: (Woldegerima, Yeshitela and Lindley 2016)

Land conversion for large-scale housing resulted in the displacement of farmers. The FDRE constitution gives everyone a right to commensurate monetary or alternative compensation, which may include relocation with adequate State assistance if displaced or adversely affected because of State programs (FDRE 1995). The State, on the other hand, shall protect the environment, undertake all measures to expand employment opportunities for its citizens, and ensure that all citizens live in a clean environment (FDRE 1995).

Urban Lands Lease Holding Proclamation No. 721/2011 discussed the entitlement of the people displaced due to urban renewal programs in Article 12, sub-articles 3 and 4. The farmers had to receive training and other assistance that would aid in their transition to urban livelihoods, plus a substitute land, no less than 150 square meters, and no more than 500 square meters, depending on the size of their expropriated farmland (MoUDC 2011).

2.2.2.7. The Demand and Supply Gap of Food in Addis Ababa

The demand-supply analysis indicated that there will be a supply gap of 30%-75% of high-value agricultural items in the year 2027 (AACPPO 2017). The situation is projected to worsen if suitable planning measures are not implemented to fulfill the rising demand for such high-value agricultural goods, which will be propelled by population and economic growth (AACPPO 2017).

Table 2-5 Demand & Supply of High-Value Agricultural Products in Addis Ababa

UA Product	Per capita consumption (2013)	Demand met by UA (2013)	Estimated deficit (2027)
Vegetables	109.5 kg	30%	70%
Milk	17 liters	65%	35%
Meat	19 kg	Less than 25%	75%
Poultry Products	5 kg	30%	70%

Source- (AACPPO 2017)

2.2.3. Summary of Contextual Review

In Addis Ababa, UA was undermined and lacked attention from researchers and decision-makers; however, it was practiced mainly by the low-income groups around riversides, backyards, and open spaces. Food takes the biggest share of Addis Ababa's households. Yet there is little attention given to the local production of high-value agricultural products in LDP and NDP. Currently, the structure plan aims to supply half of the city's food demand through UPA. The political movement, the establishment of the AAFUADC, and Farmers and Urban Agriculture at the Subcity and Woreda Level, has increased awareness about UA. However, access to land is still a major challenge in the city as the size of land for UA continues to decrease. Even though there is land allocated for UA in the master plan of the city, it does not guarantee that the areas will not be expropriated. Rapid urbanization results in a formal expropriation of agricultural

land and an informal conversion of land by urban sprawl. In addition, the lease duration for UA in Addis Ababa is 15 years or less, which creates a challenge for farmers in planning long-term investments. There is a need for systematic integration of UA in major urban developments, especially in housing, so that the productive nature of the urban landscape expropriated for the development is restored. In addition, the lease duration for housing is 99 years, which means the integration of UA guarantees long-term planning for any household and lessens the rivalry of land with other land uses, as well as finding the necessary resources for UA, such as water, labor, soil, compost, and so on.

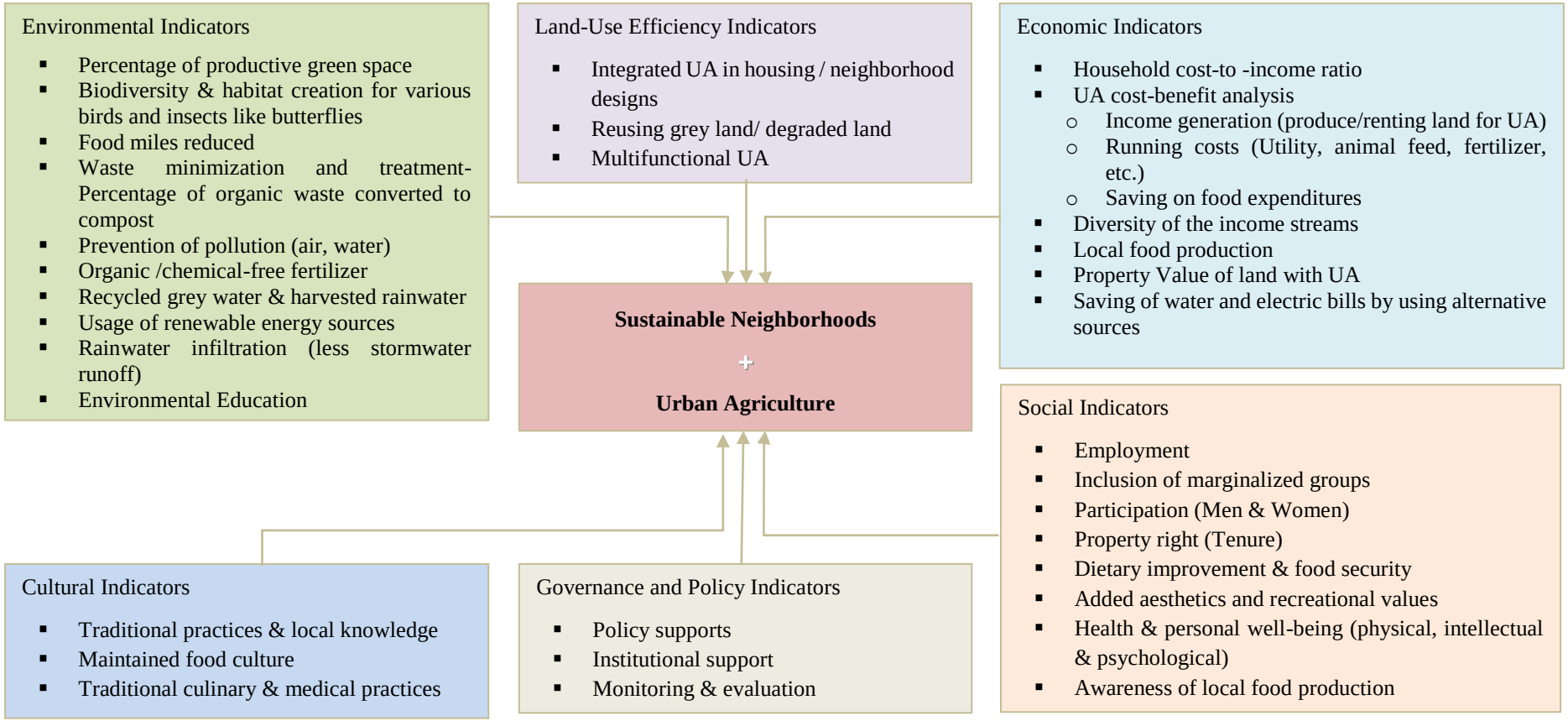


Figure 2-10 Contextualized Indicators for Sustainable Integration of UA in Housing

(Source- Synthesized from Literature Review)

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter covers the research methods section of this research. It covers how the case study areas were selected, the methodology used, and why it was chosen for this research. In addition, the methods utilized to acquire the data, sampling procedures, data analysis, and presentation, as well as the method for validating the data, are thoroughly explained below.

3.1. Research Design

This study aims to assess the practice of UA in residential areas of Addis Ababa, its significance, and the challenges of integrating UA into housing developments in Addis Ababa. To do that, it is important to first understand how UA is practiced in residential areas. According to Robert K. Yin (2018), case study research is more pertinent if the main aim of the research is to describe a current situation, such as "how" a certain social phenomenon works, or to study the explanation of a certain issue in depth. For these reasons, the research employed a case study method to explore how the practice of UA impacts the social, economic, and environmental sustainability of neighborhoods in Addis Ababa. The research, therefore, viewed UA as an independent variable and the sustainability of housing as a dependent variable (see Table 3-2 Methodological Framework).

3.2. Site Selection

Akaki Kality and Nifas-Silk Lafto sub cities were initially considered for selecting case study sites due to their large populations engaged in UA. In these sub-cities, potential neighborhoods were selected following a Key Informant Interview (KII) with UA officials in AAFUADC, Nifas Silk Lafto FUAO, and Akaki Kality FUAO. The criteria used for selecting the candidate neighborhoods included: the number of urban farmers, the diversity of housing types, the diversity of their UA disciplines, the presence of an increasing number of model farmers, and the availability of enough and reliable data at the woreda or sub city level. Model farmers are residents recognized by FUAO in each Woreda for their exemplary UA practices, which include high productivity, hygienic operation, use of sustainable technologies, positive impact on their communities, and so on. Based on these criteria, the Gofa neighborhood was selected as a case study neighborhood. The table below shows the evaluation of the potential case areas.

Table 3-1 Selection of the Case Study Area

Criteria	Jemo	Gofa	Saris	Mamo
A large number of urban farmers	✓	✓	X	✓
Diversity of UA disciplines	✓	✓	✓	✓
Diversity of residence type	X	✓	✓	X
Diversity of resources used for UA	X	✓	X	✓
An increasing number of Model farmers	✓	✓	✓	✓
Availability of sufficient and reliable data at the woreda or sub-city level	X	✓	X	X

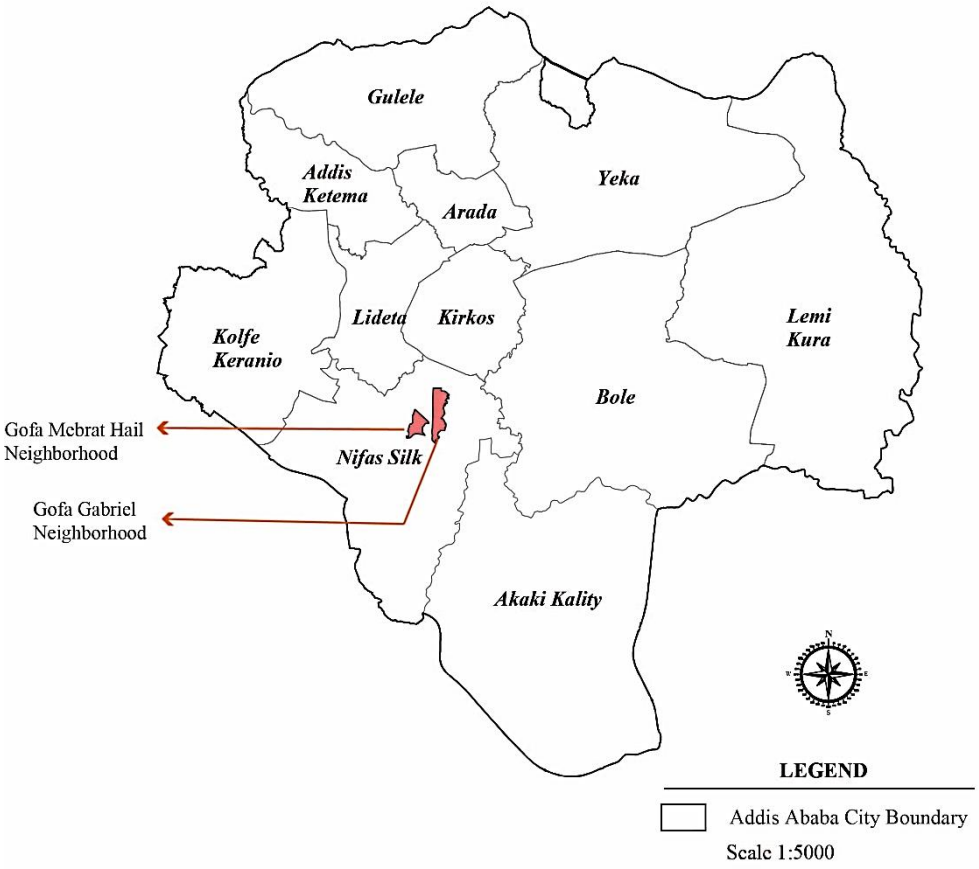


Figure 3-1 Location Map of the Gofa Neighborhood

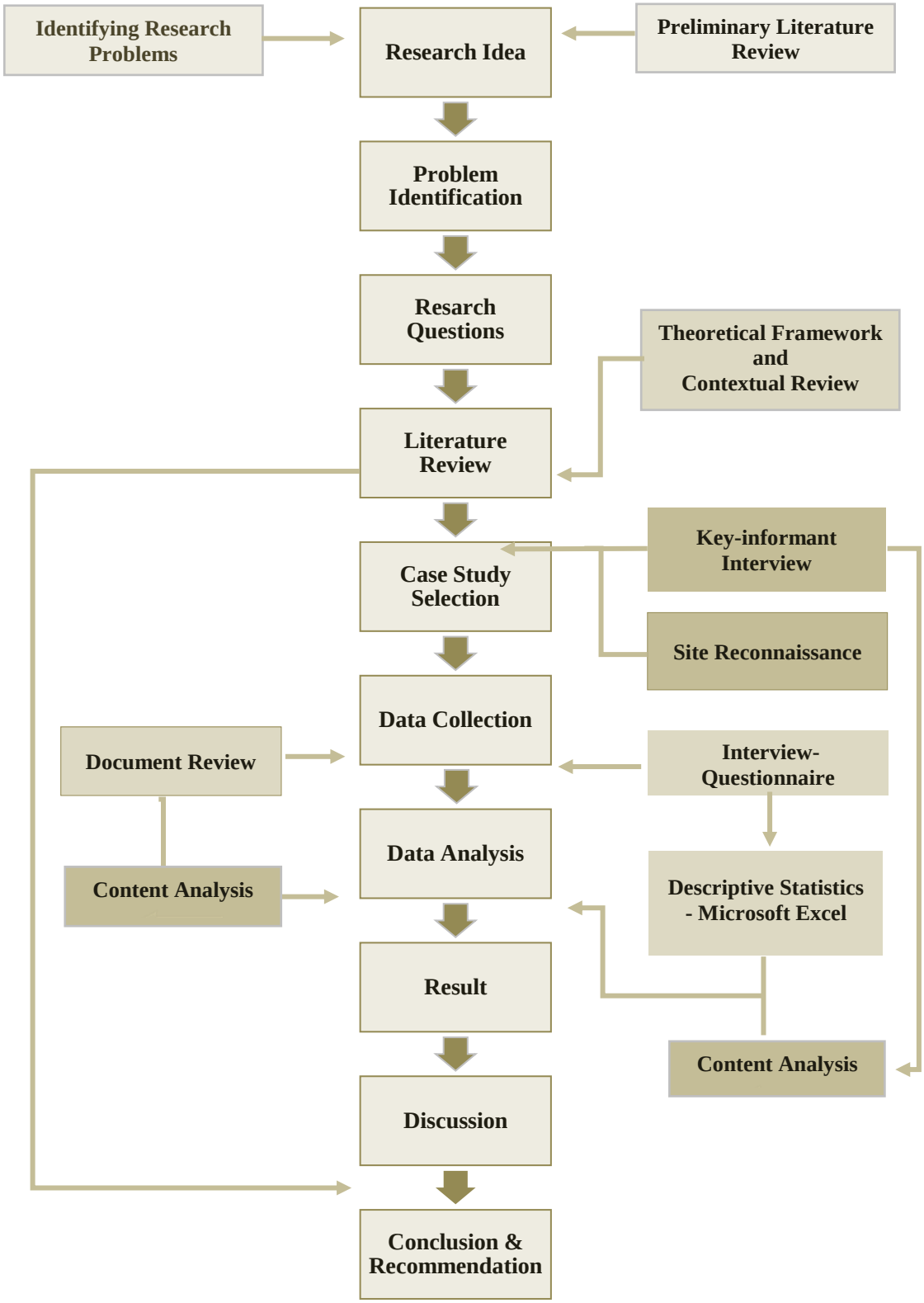


Figure 3-2 Research Design

(Modified from (Introduction to Research Methods (Preparatory module for Addis Ababa University graduate programs) 2009))

Table 3-2 Methodological Framework

No	Research Questions	Data to Collect	Data Source	Method	Data Collection Tools	Analysis	Presentation Format
1.	*To study the practice of UA in different housing typologies of Addis Ababa*	▪ Socio-economic characteristics of the farmers ▪ Housing profile ▪ UA Production (Inputs, process, and outputs)	▪ Farmers ▪ UA Experts ▪ Urban planners ▪ Housing Experts	Mixed Method	• KII • Questionnaire • Site Reconnaissance	Descriptive Statistics & Content Analysis	• Photograph • Texts • Graphs • Charts • Tables
2.	*To assess the contribution of UA to the social, economic, and environmental sustainability of housing in Addis Ababa*	▪ Indicators of sustainable neighborhoods through UA ▪ Perception of the urban farmers, UA professionals, and housing experts on the contribution of UA	▪ Farmers ▪ UA Experts ▪ Urban planners ▪ Housing Experts	Mixed Method	• KII • Questionnaire • Site Reconnaissance	Descriptive Statistics & Content Analysis	• Photograph • Texts • Tables
3.	*To investigate the key challenges farmers in Addis Ababa face when practicing UA in their residential areas*	▪ Challenge of UA practice in Addis Ababa housing	▪ Farmers ▪ UA Experts ▪ Urban planners ▪ Housing Experts	Mixed Method	• KII • Questionnaire • Site Reconnaissance	Descriptive Statistics & Content Analysis	• Photograph • Texts • Tables
4.	*To analyze how legal and institutional frameworks governing housing development in Addis Ababa facilitate or hinder the integration of UA*	▪ Housing and neighborhood planning policies, regulations, guidelines, project reports, and so on	▪ Urban Planners & Housing Experts	Qualitative	• KII • Document Review • Site Reconnaissance	Content Analysis	• Text • Photograph

3.3. Types of Data

To understand the practice, challenge, and role of UA in sustainable housing, collecting both qualitative and quantitative data were crucial. A mixed method was employed was a complex and sequential where the qualitative data collection from the KII and observation was followed by the quantitative method (semi-structured questionnaire), which allowed methodological and data triangulation.

3.4. Sources of Data

To obtain information on the study context, both primary and secondary data sources were used. Primary data was collected through site reconnaissance (site visits, observation, and photographs), survey questionnaire with urban farmers, and KII with some of the stakeholders including farmers, UA extension workers at woreda and sub-city levels, experts from AAFUADC, and housing and neighborhood planning professionals.

Interviews were also conducted with key housing professionals from three institutions including Ministry of Urban and Infrastructure Development (MOUD)**,** Addis Ababa Housing Development Corporation (AAHDC), and the Addis Ababa Housing Agency (AAHA). The participants included a Housing Development Expert and Housing Alternative Standard Design Preparation Support, and the Supervision Directorate**,** from MOUD; a Housing Development Expert, Contract Administration Group Leader**,** and the Construction, Infrastructure Development Control, and Supervision Directorate Director at AAHDC; and the Design Preparation Directorate Director at AAHA (see

Table 3-4).

Secondary data consisted of archival records and documents related to UA, housing, neighborhoods, and sustainable urban development. These included Ethiopian constitutions, policies, proclamations, regulations, directives, guidelines, manuals, norms, and standards, sourced from government archives, institutional offices, academic publications, reports, and credible online sources (*see Appendix C: Documents Reviewed).*

3.5. Sampling Design

More than 138,000 producers are engaged in UA, producing various plant and animal-based food products in Addis Ababa. However, this research was limited to two

neighborhoods around the Gofa area, which have various characteristics of UA practices in different housing typologies. Urban farmers were grouped based on their farming discipline and housing type so that stratified sampling could be carried out.

3.5.1. Sampling Techniques

The study utilized both probability and non-probability sampling techniques. A multi-stage random sampling method (a probability sampling approach) and snowball sampling method (a non-probability sampling approach) were used. Urban farmers from the selected neighborhoods were first grouped based on their housing type and then their farming discipline. From these strata, respondents were selected using simple random sampling for the quantitative study. However, tracking the number of active urban farmers was challenging for the Woreda-level Farmers and UA Office (FUAO). This is because the number of farmers fluctuates due to seasonal factors, market demand, and input availability. Moreover, the official list of urban farmers was not always accurate. Some individuals listed had only expressed interest (for example by collecting seeds) but were no longer actively farming, while others had stopped farming due to changing priorities, shortage of water, or lack of motivation. To address this limitation snowball sampling method was used to identify additional participants who were actively engaged in UA.

3.5.2. Sample Population

The data from the Nifas Silk Lafto Sub City FUAO showed that about 258 households in Gofa Mebrat-Hail Neighborhood (Cluster 53) and 225 households in the Gofa Mebrat Hail Condominium practice UA. A total of 481 households are engaged in horticulture and animal husbandry in both cases.

3.5.3. Sample Size

The sample size needed for the questionnaire was determined using the formula shown below. The confidence level used for the calculation was 90%.

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

Where,
z - z-score = 2.576
p - Response Distribution = 50%
e - Margin of Error = 5%
N - Population size = 481

Based on the calculation, with a population number of 481, the minimum sample size needed for this research was 174. A total of 180 households from the two case areas filled out the survey.

Table 3-3 Population Size and Sample Size taken from each Case Area

Location	Type of UA	Population Size	Percentage	Samples Taken
Gofa Gabriel Area (Cluster 53)	Vegetable Production	224	87%	84
	Poultry	11	4%	4
	Dairy Production	6	2%	2
	Small Ruminant	2	1%	1
	Integrated Farming	15	6%	6
	Total	**258**	**54%**	**97**
Gofa Mebrat-Hail Condominium	Vegetable Production	221	99%	82
	Integrated Farming	2	1%	1
	Total	**223**	**46%**	**83**
Total Population		**481**	**100%**	**180**

3.6. Method of Data Collection

According to Yin (2018), a case study research method usually draws on documents, archival records, interviews, direct observations, participant observation, and physical artifacts. This research applies a combination of these methods, detailed below:

A. Site Reconnaissance (Observation): Observation is a method of watching an occurrence as it occurs that is deliberate, methodical, and selective. It is a systematic and purposeful method suited for complex situations requiring in-depth understanding (Kumar 2011). Photographing and mapping were used to support data collection and documentation.

B. Semi-Structured Interviews: To understand how various professionals perceived the practice, and role of UA and analyze how housing/neighborhood planning and developments in Addis Ababa have integrated UA to enhance sustainability, a KII was conducted with some of the key stakeholders. This helped to evaluate the enabling or hindering factors for the integration of UA in housing and neighborhood developments. Interviews offer valuable insights into human experiences and help explain how and why certain phenomena occur (Kvale 2007, Yin 2018). All the key informants are listed in the table below. Fictional names have been used to keep their anonymity.

Table 3-4 List of Key Informants

No		Job Position	Office	YoE
1	*Abebe*	*Housing Development Expert*	Ministry of Urban and Infrastructure Development	15
2	*Kebede*	*Alternative Housing Standard Design Preparation, Support, and Supervision Directorate*	Ministry of Urban and Infrastructure Development	9
3	*Mohammed*	*Spatial Planning Expert*	Addis Ababa Land Development and Management Bureau	8
4	*Abdi*	*Housing Development Expert*	AAHDAB	8
5	*Solomon*	*Contract Administration Group Leader*	AAHDCB	20
6	*Haile*	*Construction, Infrastructure Development Control, and Supervision Directorate Director*	AAHDCB	22
7	*Esubalew*	*Design Preparation Directorate Director*	Addis Ababa Housing Agency	8
8	*Dr. Asnakech*	*Architect and Landscape Design Consultant*	SBE	15
9	*Samson*	*Animal Science Expert*	Nifas-Silk Lafto Sub city FUAO	32
10	*Zeritu*	*Plant Science Expert*	Akaki-Kality Sub city FUAO	14
11	*Biniyam*	*Reuse and Recycle Expert*	Akaki-Kality Sub city Sanitation Office	28
12	*Alex*	*Awareness and Community Participation Expert*	Akaki-Kality Subcity Sanitation Administration Office	7

YoE- Years of Experience

C. Questionnaires: It was designed around sustainability indicators to assess UA practices and their contribution to sustainable housing and neighborhood development. It included both open- and closed-ended questions within six sections, covering the socio-economic characteristics of the farmers, housing profile, UA inputs/outputs, infrastructure access, and its contribution to the socio-economic and environmental sustainability of housing, validating other data sources. It was first written in English and translated in to the Amharic[7] Language.

D. Archival Records: Relevant secondary data (local and international) that were related to UA development, housing and neighborhood developments, and

[7] The Amharic Language is the commonly used local language in Addis Ababa.

sustainability were collected and reviewed. The documents include but not limited to the Ethiopian constitutions, UA and housing policies, neighborhood design guidelines, building codes, and so on (see Appendix C: Documents Reviewed).

3.7. Ethical Considerations and Data Collection Protocol

After a site reconnaissance, the survey questionnaire was pilot-tested using 18 respondents. This was to assess its effectiveness of the instrument and gather feedback. The questionnaire initially introduced the researcher, the purpose of the study, and how the collected information would be used. Before data collection, participants were asked for consent and were assured of the confidentiality of their information and their anonymity to encourage honest responses. Data from interviews and questionnaires was handled ethically.

The Information from the woreda-level informant indicated that some farmers may not be able to complete questionnaires independently; therefore, the questionnaire was administered through interviews conducted by a team of five people and the author to ensure consistency. The interviewers received training on how to approach respondents and collect data, and their work was closely supervised to ensure data quality and reliability. Site reconnaissance was also conducted firsthand by the author to ensure the validity of the research findings.

3.8. Method of Data Analysis

A descriptive and Inferential data analysis approach was used to analyze the quantitative data. These methods were used to assess the contribution of UA in the sustainability of housing and neighborhoods. Sustainability indicators were formulated by integrating environmental, social, and economic dimensions of housing and UA. Data collection focuses on observing and documenting current practices using quantitative tools such as household surveys for socio-economic and environmental analysis. It is then analyzed using descriptive and statistical methods such as mean, frequencies, and percentages, using Microsoft Excel. Descriptive analysis was employed to present an overview of the housing characteristics and UA practices. Inferential analysis was used to test the relationship between the type of UA, plot size, income generation, health impacts, level of support and monitoring, and sustainability outcomes.

The semi-structured interviews with policymakers, urban planners, architects, housing experts, and landscape architects have provided the study with key insights. Content analysis method was used to analyze findings from interviews with key stakeholders and policy review. The response from the interview was first transcribed and organized thematically according to the ten guiding questions attached in the annex section.

3.9. Method of Data Presentation

Quantitative data are presented in charts and tables, whereas pictures, maps, architectural drawings, and narration were used to present the qualitative data.

3.10. Validity and Reliability

Validity in research confirms whether that the instruments used in the research actually measure what they are intended to measure, while reliability focuses on the consistency of findings over time (Kumar 2011). One way to construct the validity of a case study research is to use multiple sources of evidence and look for patterns that explain the findings (Yin 2018). This is called triangulation, and it involves using data from various sources, samples, times, or methods to reach a consistent conclusion. To ensure reliability, this research used data triangulation (farmers, professionals, and observation), methodological triangulation (mixed methods), and perception triangulation for evaluation.

CHAPTER FOUR: RESULTS AND DISCUSSION

In this section, the results of the study, obtained from 180 farmers and 12 key informant interviews, are presented. The qualitative and quantitative data have been systematically organized and explored for trends, relationships, and implications. The findings are then discussed in the context of existing literature to highlight alignments and divergences.

Table 4-1 Equivalent Statement of the Research Question

Research Questions	Equivalent Statements
1. How is UA practiced in different housing typologies of Addis Ababa?	• Introduction to the Case Studies • The Practice of UA in Residential Areas
2. What is the contribution of UA to the social, economic, and environmental sustainability of housing in Addis Ababa?	• The Role of UA in Enhancing Housing Sustainability ▪ Social Dimensions ▪ Economic Dimensions ▪ Environmental Dimensions ▪ How are these contributions of UA perceived?
3. What are the key housing-related challenges farmers in Addis Ababa face when practicing UA in their residential areas?	• Challenge of UA practice in Addis Ababa housing
4. How do the legal and institutional frameworks governing housing development in Addis Ababa facilitate or hinder the integration of UA?	▪ Legal and Institutional Frameworks Influencing the Integration of UA in Housing Development of Addis Ababa

4.1. Introduction to the Case Studies

To study the practice of UA in housing developments in Addis Ababa, two neighborhoods in the Gofa area of Woreda 6, Nifas Silk Lafto Sub City, were selected.

Case I is the Gofa Gabriel neighborhood (also known as Cluster 53), one of the city's oldest neighborhoods and home to 258 farmers practicing horticulture, animal husbandry, and integrated farming. Some model farmers utilize various technologies to sustain the practice of UA, including drip irrigation, biogas, composting, and rainwater harvesting, among others.

Case II is the Gofa Mebrat Hail Condominium neighborhood, one of the oldest and largest LCH projects in Addis Ababa. According to the Nifas Silk Lafto Sub City FUAO, it is home to the highest number of UA practitioners living in condominium housing in the sub city. Recent data from the Woreda 6 FUAO showed that 223 farmers

practice horticulture, and some attempted to integrate poultry. There is one parcel that the FUAO recognizes at the woreda and sub-city levels as a model neighborhood project. A model parcel is a title given to a parcel that best represents an ideal living environment for the residents. The sub-city has provided nine criteria for the model parcels, one of which is the practice of UA (both horticulture and poultry). Other criteria include sufficient parking, a green area, a library, a kids' playground, and communal areas for the elders.

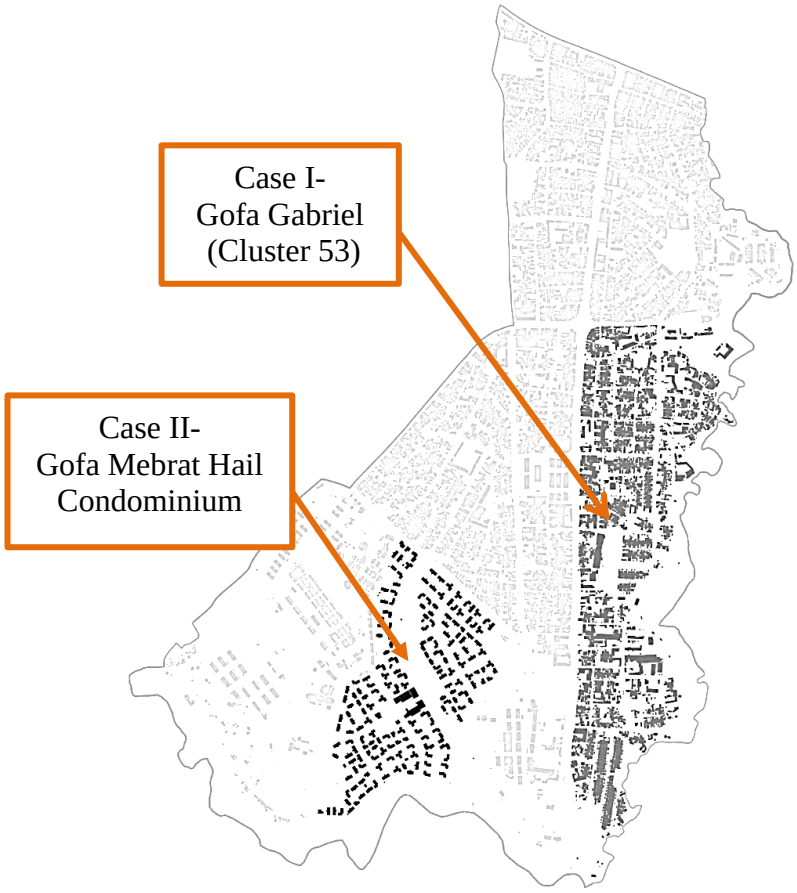


Figure 4-1 Location Map of Case I and Case II in Nifas Silk Lafto Sub City, Woreda 06

Source: Sample survey result

Of the 481 farmers residing in the two neighborhoods, 180 households completed the survey questionnaire. Approximately 54% of the respondents lived in Case I (97 households), while 83 participants (46%) lived in Case II.

4.2. Case I

Of the 258 households practicing UA in this neighborhood, 97 farmers filled out the questionnaire. The socio-economic characteristics, housing profile, practice of UA, resource utilization, and waste management of the respondents are described below.

4.2.1. Socio-economic Profile of Farmers

From the 97 sample households taken in this neighborhood, 243 people were engaged in UA. The socio-economic data from the survey showed that the average household size in both neighborhoods was 5. On average, three family members practiced UA in their residential area. Female farmers constituted 44% of the practitioners, while male farmers comprised 56%. Nearly half of the farmers (49%) were adults and within the working-age group (30-65 years). The literacy rate of farmers indicates that 26% of farmers were illiterate, 20% finished primary school, and 18% were high school graduates. More than one-fourth of the farming population (29%) has completed vocational training, while only 7% hold a Bachelor's degree or higher. Most of the farmers worked in the private sector, 34% were unemployed, 11% worked in governmental institutions, and 8% were retired. Only 15 farmers make a living out of UA. The table below summarizes the socio-economic data collected from the respondents in the two neighborhoods.

Table 4-2 Socio-economic Profile of Respondents in Case I

Characteristics		Frequency (n = 243)	Percentage
Gender	Male	136	56%
	Female	107	44%
Age	children (< 14)	7	3%
	Youth (15-29)	92	38%
	Adults (30-65)	119	49%
	Elderly (65 <)	24	10%
Highest level of Education	No formal education	49	20%
	Kindergarten	15	6%
	Primary (1-8)	49	20%
	Secondary (9-12)	44	18%
	Diploma	70	29%
	Bachelor's Degree and Above	17	7%
Primary Occupation	Farming	15	6%
	Government Employee	27	11%
	Private Sector	97	40%
	Unemployed	83	34 %
	Retired	19	8%

Source: Sample survey result.

4.2.2. Housing Profile

Many of the respondents (72%) reside in private housing, 22% live in Kebele housing, and 6% live in informal housing. Some of the respondents who dwell in kebele housing have been cultivating land along riverbanks for more than two decades.

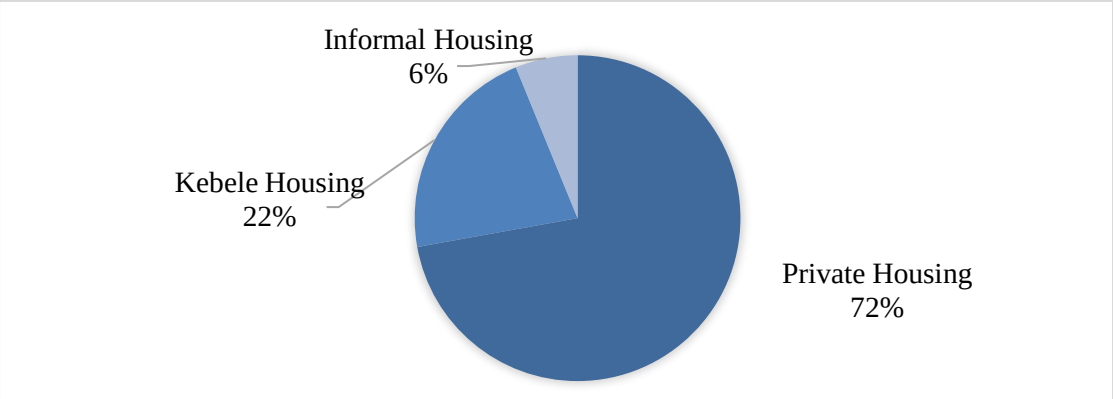


Chart 4-1 Type of Housing

Source: Sample survey result

Homeownership is predominant among farmers. Most farmers (72%) owned their accommodation, 15% were informal settlers, 10% were tenants, and the remaining 3% were trustees. The majority of the respondents (63%) have lived in the neighborhood for more than 10 years, 22% have lived for 5-10 years, while 15% have lived in their residence for less than 5 years. The starting year of UA for most farmers indicated that they began practicing UA around the time of their move.

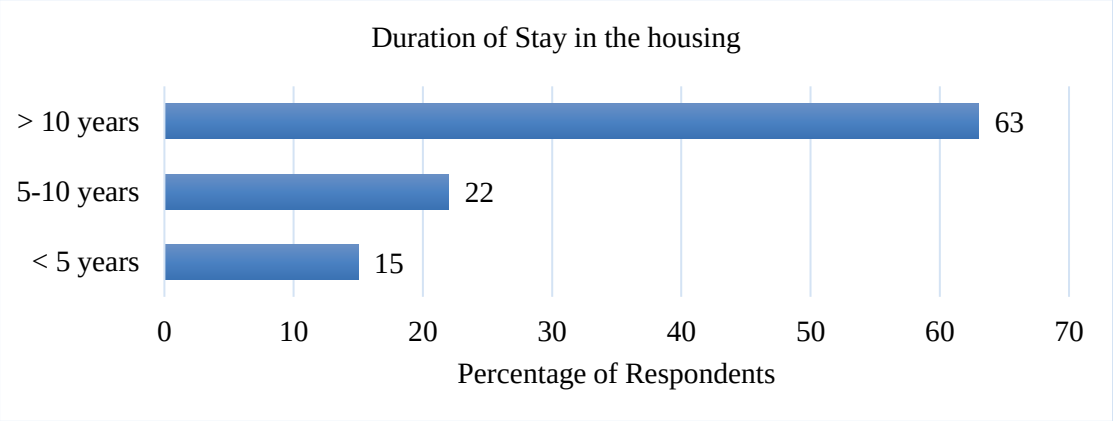


Chart 4-2 Duration of Stay in the Residence

Source: Sample survey result

4.2.2.1. Plot Size

The plot size of the residences varied significantly based on the type of housing and the block on which they are located. The average plot size was 234 sqm for private homes, 180 sqm for kebele housing, and 176 sqm for informal housing. Overall, the plot area ranges from 75 sqm to 1,485 sqm.

Figure 4-2 Sample blocks from Case I

Source: Sample survey result

4.2.2.2. Shared Space and Resources

Most households (88%) exclusively use their compound, while 12% share their compound with others (see Figure 4-14). The latter share spaces such as a kitchen (12%), a toilet (28%), a green area (95%), an open space (95%), and resources like water (36%) and electricity (19%). The table below summarizes the details. The table below describes the shared spaces and resources in the residential areas of the farmers.

Table 4-3 Shared Resources in Case I

Questions	Response	Frequency	Percentage
Are there additional households in the compound?	Yes	11	12%
	No	86	88%
	Total no. of hh	**97**	**100%**

Questions	Response	Frequency	Percentage
Which spaces or resources do you share in the compound?	Water	4	36%
	Electricity	2	19%
	Kitchen	2	19%
	Toilet	3	28%
	Green Area	10	95%
	Open Space	10	95%
	Total no. of hh	**11**	**100%**

Source: Sample survey result

4.2.2.3.Water Management

All respondents use tap water for household activities, despite experiencing irregular access to municipal tap water. Half of the respondents (51%) receive tap water only twice a week, while 40% receive it either once a week or three times a week. Less than 10% get municipal water four or more days a week.

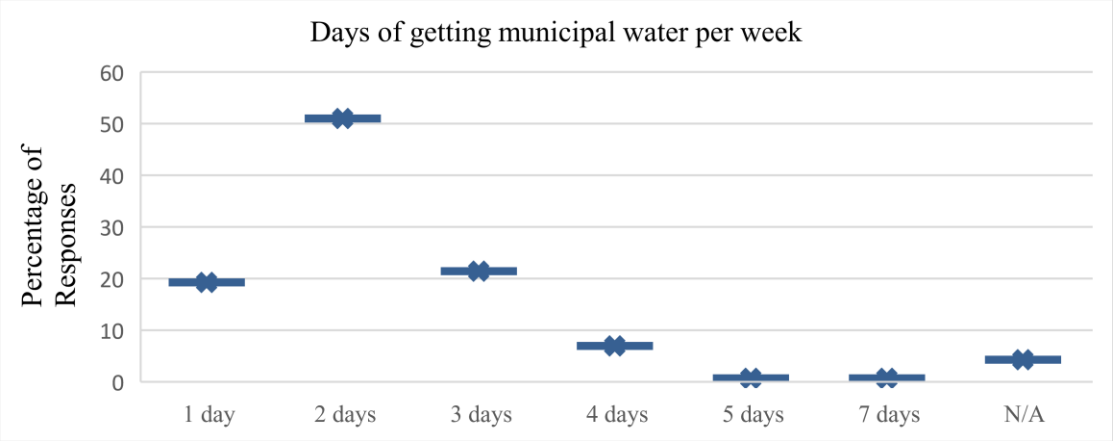


Chart 4-3 Percentage of tap water access per week among respondents

Source: Sample survey result

4.2.2.4. Waste Management

Solid waste from each household in the case neighborhood is collected by cooperatives and taken to a temporary waste sorting area, where it is sorted and then transported to a landfill site or recycled into compost. More than half of the residents (65%) have a sewerage system connected to the city sewer, while some dispose of their grey water on the street or in open ditches (31%), and the rest dump it in the nearby river (4%). On the other hand, black water is disposed of through septic tanks (75%) and pit toilets (20%). Only 4% of hhs, particularly dairy farmers, use biogas technology to generate energy for cooking.

4.2.3. The Practice of Urban Agriculture

Horticulture is the dominant type of UA practiced by 92% of the respondents (89 hhs). The respondents have planted various vegetables, fruits, herbs, and other crops in their backyards and neighborhood open spaces. Only 4% of the households practice animal husbandry, and the rest (7%) practice integrated farming (See Chart 4-4 Type of UA practiced in Case I). For 66 households (68%), UA was mainly practiced for household consumption; on the other hand, 31 households (32%) generate income by selling their surplus produce

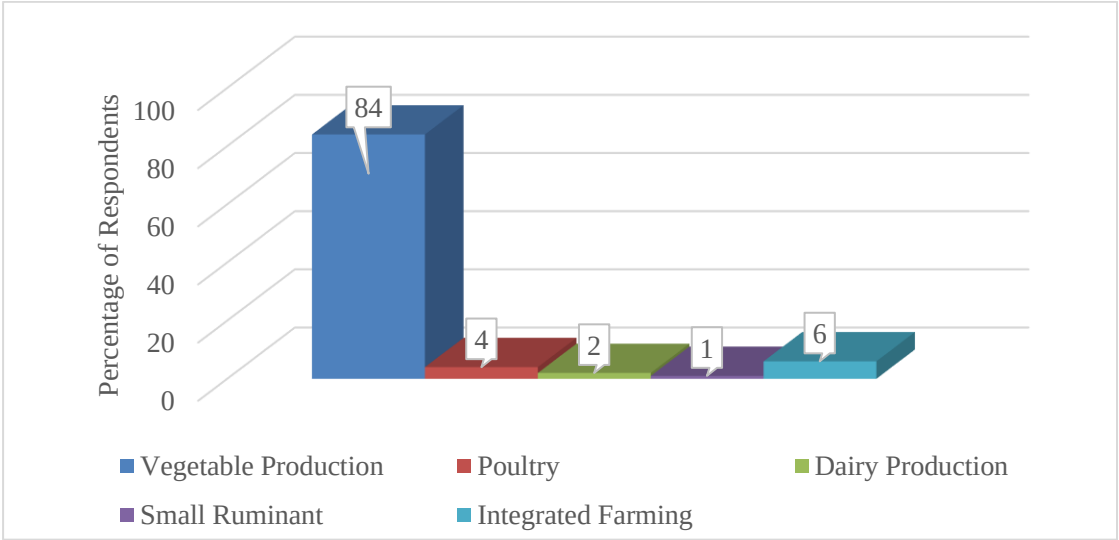


Chart 4-4 Type of UA practiced in Case I

Source: Sample survey result

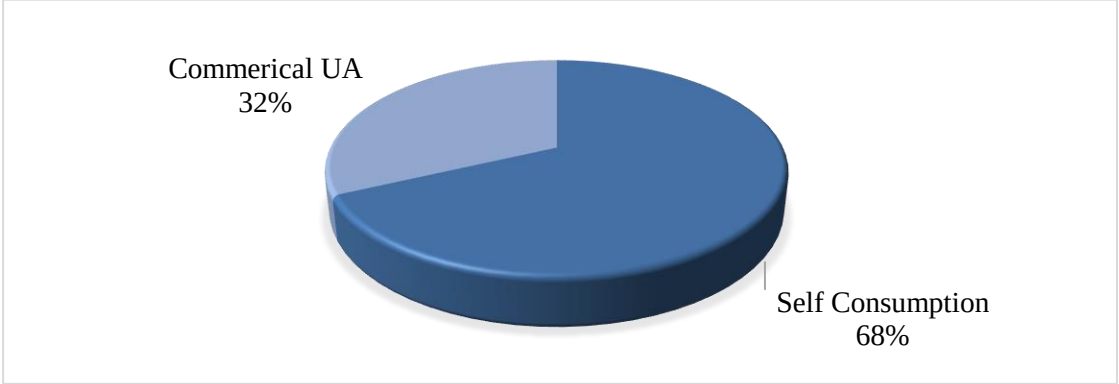


Chart 4-5 Purpose of UA

Source: Sample survey result

4.2.3.1. Urban Agriculture-Related Trainings

Eighteen respondents reported taking agriculture-related training and courses (see Table 4-4). Some of them hold a Bachelor's Degree in Agricultural Science and Veterinary Medicine, while others have completed short-term courses in agriculture, poultry, hybrid agriculture, drip irrigation, and composting. These households have applied that training and improved their product and productivity. Some of the training mentioned was offered at the Nifas Silk Lafto Sub City FUAO and Woreda 06 FUAO in the sub-city.

Table 4-4 UA-related Courses

Questions	Response	Frequency	Percentage
Did you take any course/ training related to UA?	Yes	18	19%
	No	79	81%
	Total	**97**	**100%**

4.2.3.2. Horticulture

Vegetable Production: Fast-growing leafy vegetables such as lettuce (86%), Swiss chard (83%), and kale (79%) were common. Other plants like onion, tomato, green pepper, and carrot were also grown. The production of root vegetables like potatoes, cabbage, beetroot, sweet potatoes, and garlic was low.

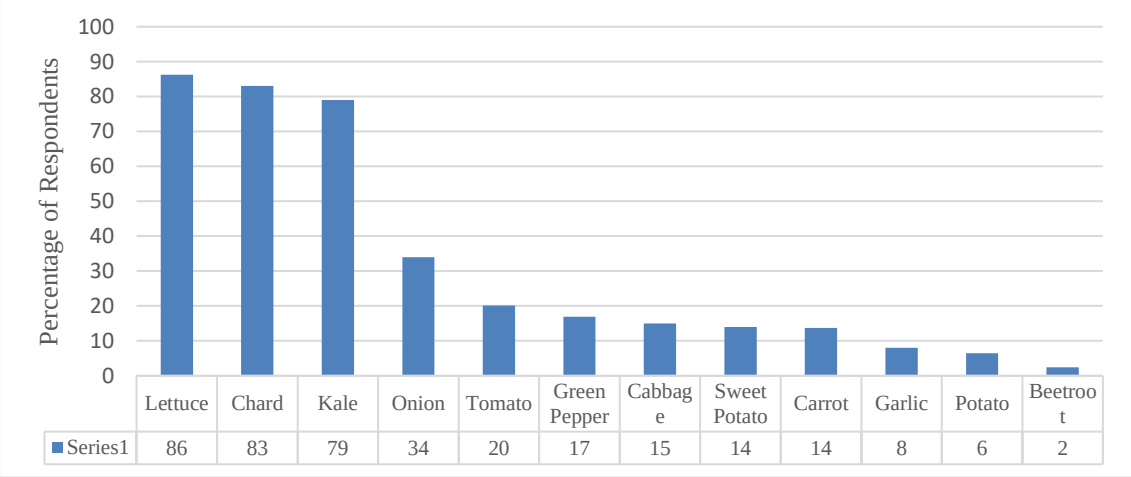


Chart 4-6 Vegetable Production
Source: Sample survey result (n=97)

Fruit Production: Because of the ample space they required, fruit trees were not as common as vegetable plants. Avocados, Bananas, and Papaya were the most popular

fruit trees in both neighborhoods, while other fruit trees, such as apples, guava, plums, and oranges, had a limited presence (see Chart 4--).

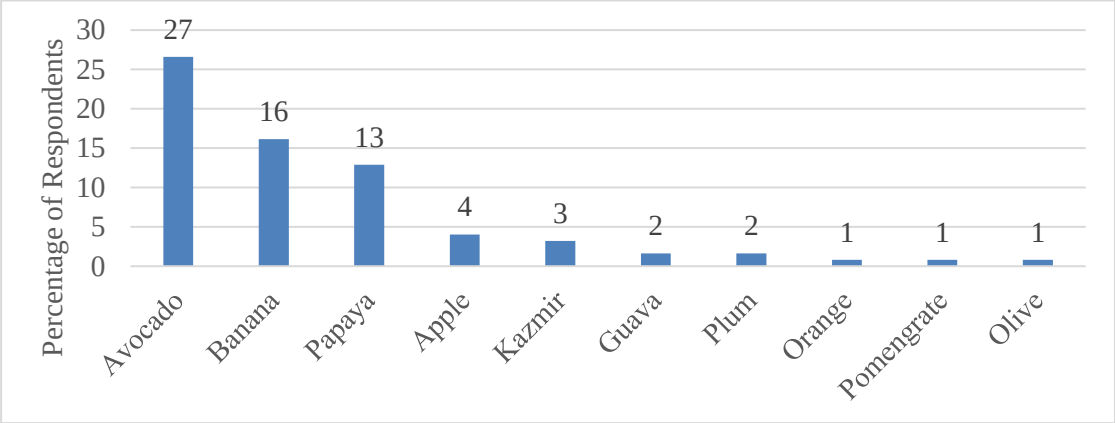


Chart 4-7 Fruit Production
Source: Sample survey result (n=97)

Medicinal Plants and Herbs: Some households grew herbs and medicinal plants such as rue, basil, dill, rosemary, hibiscus, ashwagandha, and parsley, as well as other crops like false banana, corn, hops, coffee, beans, and sugarcane.

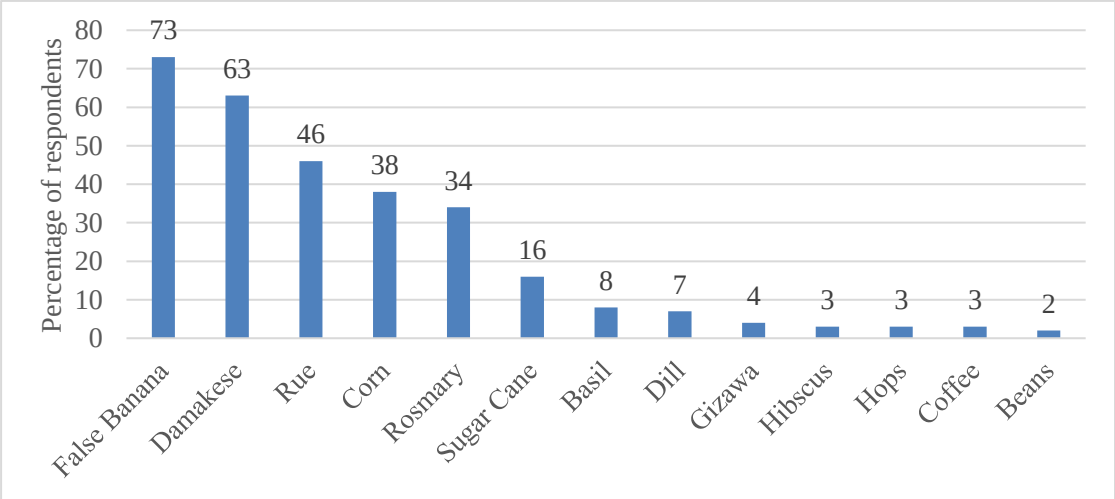


Chart 4-8 Herbs, Staples, and Special Use Crops

Source: Sample survey result (n=97)

4.2.3.3. Animal Husbandry

Around 30% of the farmers raise dairy cows and small ruminants, while only 3% engage in cattle fattening. The most common type of animal husbandry in the neighborhoods is poultry, which is the small-scale production of eggs and chicken meat. It is practiced by 50% of the animal keepers, due to the small amount of space and initial investment it needs compared to other forms of animal husbandry. The farmers

owned between 3 and 250 chickens. The average number of chickens owned by a farmer was 35. The farmers replace the bedding, which is made out of straw and sawdust, every three to four months. However, poultry waste is primarily used for livestock feed and as a fertilizer for plants. The waste is directly applied to the garden where it becomes compost. In some cases, these wastes are shared with vegetable producers in the neighborhood free of charge or sold to livestock keepers.

Farmers mostly obtain chicks from suppliers outside the neighborhood (82%). In some cases, the woreda FUDO provides chicken, feed, and a cage for the interested residents. Since poultry farming is a sensitive activity, it needs laborers to clean the cages or chicken houses, feed, and care for the chickens. Farmers typically build small-scale chicken coops when their primary goal is to raise the animals for self-consumption. For more than 50 chickens, a standard chicken coop that is vertically built or a bigger space is required.

Figure 4-3 Various Scales of Chicken Coops in Case I

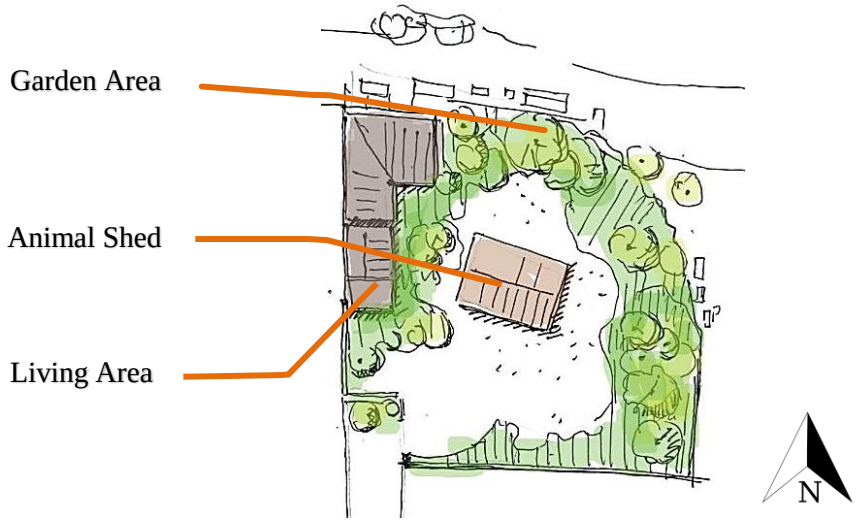


Figure 4-4 Site Plan of Private Residence with Animal Shed and Horticulture

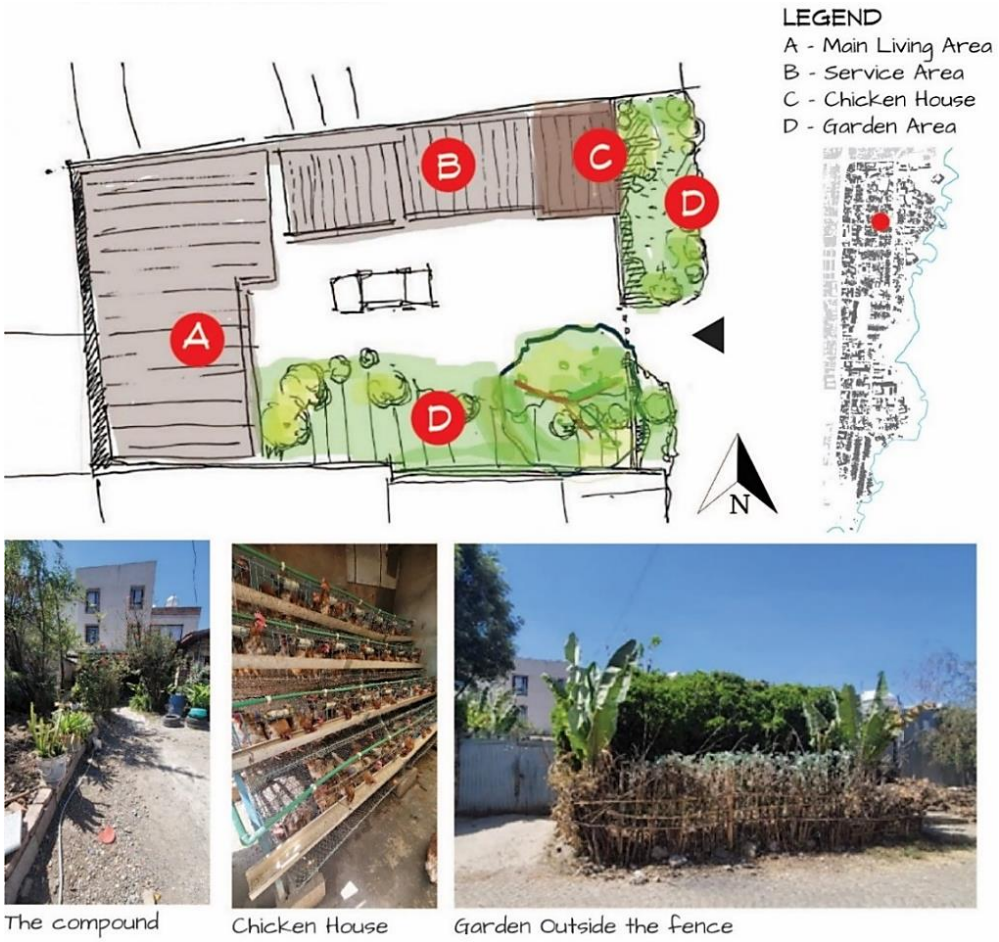


Figure 4-5 Poultry Farming in Private Residence

Drawn by the Author

Larger animal sheds are primarily built using wire mesh, wooden posts, corrugated iron sheets (walls and roofing), HCB walls, and concrete flooring. Some households have also added plastic coverings to improve the waterproofing of old structures. The size of these sheds differs based on the number of animals kept, with areas ranging from 6 sqm to 500 sqm and an average of 48 sqm.

Figure 4-6 Various Animal Sheds

4.2.3.4. UA Inputs

For horticulture, the primary inputs needed for cultivation include water, soil (or growing medium), seeds, fertilizer, land, pesticides, and access to sunlight. For animal husbandry, the necessary inputs include water, land, a shed, feed, waste management facilities, breed, and artificial insemination (for livestock keepers).

Water: The most crucial input for UA is water, yet it is of limited supply. The vast majority of farmers use tap water to sustain their agriculture during the dry season (56%), while some also purchase water from local suppliers (5%), or utilize alternative water sources, such as Well water (3%) and surface water (4%). The remaining 32% wait for the rainy season to grow their food. A significant portion of the farmers (93 households) reported using rainwater for UA; some harvest rainwater from their rooftops and store it in water tankers, plastic water bottles, or jerrycans. Additionally, approximately 43% of the respondents utilize greywater for cultivation and other UA-related purposes.

Growing Medium: All respondents use traditional soil-based cultivation systems. Very few respondents (35%) have planted using pots. Most production occurs on the ground, as the practice of vertical farming is relatively minimal.

Seed: Although there are a limited number of seed providers in the neighborhood, most farmers (85%) obtain various types of seeds free of charge from the Woreda FUAO. Some (6%) mentioned that they save seed from their production to sow for the upcoming season. Others (9%) purchase seeds from affordable suppliers.

Land: Most respondents grow vegetables only inside their compounds, while some have extended their cultivation outside their plot area. The growing area ranges from 2 sqm to 500 sqm, with an average plot size of 70 sqm. The riverside cultivation, however, covered an area of up to 0.9 ha. The private and Kebele housing commonly used stone piles for delineating UA areas, adding a different approach to defining cultivation areas.

Fertilizer: Approximately 31% of the respondents (30 households) reported composting their kitchen scraps and chicken waste for UA, and some animal keepers use it as animal feed. The majority of households (69%) buy fertilizer from manufacturers, usually livestock keepers within and outside the neighborhood.

Figure 4-7 Households that extended cultivation outside their compound

Figure 4-8 UA on a large plot area

Figure 4-9 Kitchen waste application (Left) and Biogas System (Right)

Pesticides and Insecticides: Among the 90 households practicing horticulture, 35% use biopesticides or natural pesticides, which are made from a mixture of vinegar, ginger, and garlic. About 39% of the participants use chemical insecticides such as malathion. Approximately 19% of households do not use any form of pest control. Pest infestations pose a serious challenge for these households, affecting their plants and overall productivity.

Table 4-5 Recycling

Questions	Response	Frequency (n= 97)	Percentage
Do you use greywater for UA?	Yes	42	43%
	No	55	57%
Do you harvest rainwater for UA?	Yes	93	96%
	No	4	4%
Do you compost kitchen scraps?	Yes	30	31%
	No	67	69%
Do you use alternative energy and power sources such as solar power or biogas?	Yes	9	9%
	No	88	91%
What kind of pesticides do you use?	Natural	34	35%
	Chemical	38	39%
	None	18	19%
	N/A	7	7%

Source: Sample survey result

The number of farmers who use renewable energy and alternative power and energy sources, such as solar panels and biogas, was very low. Only 7% of the participants use renewable energy sources. The use of biogas technology was quite common among livestock farmers.

4.2.3.5. Support for Urban Agriculture

The most common form of support for UA (61%) is the supply of inputs such as horticultural seeds and artificial insemination for animal husbandry, which is usually provided by the woreda FUAO. Nifas Silk Lafto Subcity FUAO also provides training and technical support, and introduces technology for urban farmers, except that it does not handle land provision.

> *"In the past, input sourcing was inconsistent, but recent government initiatives have improved access to high-quality seeds and seedlings. Since the establishment of the UA office in 2019, urban farmers have received more support, including technical assistance for both horticulture and animal husbandry. The establishment of AAFUADC has also led*

to better input supply and health monitoring, despite budget limitations for medical supplies."

- A division team leader for animal husbandry at Nifas Silk Lafto Subcity FUAO

The second most common form of support farmers receive is capacity building and training, which benefited only 11% of the respondents.

"The previous efforts of the UA Offices under the Micro and Small Enterprises framework limited UA's potential. Since the establishment of AAFUADC, there have been significant improvements in connecting farmers to input providers and resources. Plus, demonstration prototypes of UA have been constructed in various locations to showcase integration possibilities."

-Plant Science expert at the Nifas Silk Lafto Subcity FUAO

Figure 4-10 Prototype of Vertical Gardening at the Nifas Silk Lafto Sub City (2022)

Although the supply of land is an indispensable initiative for UA, only 6% of the households have benefited from it. Other forms of support, including monetary support, tax incentives, loan facilitation, design services, and market connectivity, are very low. Approximately 27% of the participants reported not receiving any form of support. The correlation between the UA type and support for the practice was weak and not statistically significant ($r = –0.12$, $p = 0.12$). This suggests that support for UA does not differ meaningfully across the different UA types.

Table 4-6 Type of Support of UA

Support of UA	Frequency (n=97)	Percentage
None	26	27%
UA Input Supply	59	61%
Training & Capacity Building	11	11%

Support of UA	Frequency (n=97)	Percentage
Land Supply	7	7%
Monetary Support	5	5%
Infrastructure Supply	4	4%
Market Linkages	4	4%
Health Checkups (n=5)	4	80%
Tax Reduction/ Exemption	2	2%
Facilitating Work Permits	1	1%

Source: Sample survey result

4.2.3.6. Monitoring of Urban Agriculture

To ensure efficiency and sustainability, UA has to be monitored. The majority of households (74%) reported that no officials have monitored their UA activities. The animal keepers are continuously monitored by the UA officials in the Woreda (80%). Some efforts are being made to ensure the implementation of rules and guidelines, including meeting sanitation and hygiene standards (24%), enhancing income and productivity (7%), renewing work permits (11%), and promoting efficient resource utilization (5%). The table below outlines the different types of support and monitoring mentioned by the respondents.

Table 4-7 Type of Monitoring of UA

Monitoring of UA	Frequency (n=97)	Percentage
None	72	74%
Hygiene Monitoring	23	24%
Work Permit Monitoring	11	11%
Implementation of rules and guidelines	9	9%
Income/ Productivity	7	7%
Resource Utilization	5	5%
Health Monitoring (n=5)	4	80%

Source: Sample survey result

The correlation between the UA type and practice monitoring was weak and not statistically significant ($r = –0.12$, $p = 0.13$). This suggests the monitoring of UA does not differ meaningfully across the different UA types.

Box 4-1 Life Story 1 (Case I)

Mr. Yakob is a 37-year-old model farmer residing in the Gofa Gabriel area (Case I). He has lived in Kebele Housing (333 sqm) with his sisters and their families for many years. After earning a diploma, he has been working in a factory for several years. Due to a workplace accident that happened five years ago, he became disabled. After a year of treatment, he recovered but could not return to his work. He was unemployed for another year before he decided to start UA. He has been practicing both horticulture and animal husbandry for over three years.

Before Yakob started UA, he had shown his compound to the FUAO of Nifas-Silk Lafto Woreda 06, and they provided him with essential training on integrated farming practices and some seeds. The training covered topics such as identifying seasonal vegetables, planting times, animal husbandry, and compost making. He now cultivates Kale, Swiss Chard, Lettuce, Tomatoes, Green Peppers, Beetroot, Carrots, Avocados, Mango, False Banana, and Maize. He also grows medicinal plants, such as fennel, rue, rosemary, and Ocimum lamiifolium. In addition, he raises 50 chickens and two sheep.

Yakob receives seeds for free from the woreda and makes compost using kitchen scraps and animal manure. He sometimes shares his compost with neighbors, which fosters his social interaction within the community. As a pesticide, he uses ginger and garlic juice. His main monthly expenses include 5,000 ETB for food, 2,000 ETB for water, 5,000 ETB for animal feed, and an annual rental fee of 3,000 ETB. The family receives tap water only once a week, which makes it challenging to meet all their household needs, as well as the water demand for UA. Hence, Yakob purchases water from suppliers in the woreda and stores it in a 1000-liter water tanker, which he has designated just for his UA activities. Moreover, he uses greywater, which he mentioned has been of great help to him.

For Yakob, UA has provided his family with fresh vegetables and poultry products. Additionally, it enhanced his social interaction, created recreational opportunities, and had a positive impact on his mental well-being. His family's knowledge of healthy food and nutrition has also improved. Working from home kept him physically active and allowed him to maintain a profitable business, especially during the holiday season. Although his income is seasonal, he shared that it has been sufficient to sustain his UA efforts.

Yakob appreciates the support he receives from the Woreda FUAO, as they have been assisting him with seeds, capacity building, and regularly monitoring the health of his animals and the progress of his horticulture. He is interested in expanding his animal husbandry if he can secure more space and resolve issues related to clean water. He noted that the high cost of animal feed has been a significant challenge for him and his neighbors, who are involved in poultry farming.

> *"Most of us purchase the feed from producers in Debrezeit. A quintal of chicken feed is 5000 ETB. One of my neighbors who previously owned 250 chickens has stopped due to the high expense and limited availability of chicken feed."* Yakob shared.

On the positive side, his younger sister has recently started raising poultry in the compound with 10 chickens. She also helps him with the garden work.

Box 4-1 Life Story 1 (Case I)

Figure 4-11 Yakob's Residence

Figure 4-12 Yakob's Integrated Farming

Box 4-2 Life Story 2 (Case II)

Mrs. Zenebech is a 46-year-old married woman with four children. She holds diplomas in Marketing and Clothing Design. After quitting her job to become a stay-at-home mom, she focuses on caring for her kids while her husband is the family's breadwinner, earning 45,000 ETB per month. The family purchased a 3-bedroom unit in Gofa Mebrat Hail in 2010. In 2022, she began gardening, a passion she inherited from her family. She organized a group of housewives to engage in UA and requested a working area within the condominium. So far,

Box 4-2 Life Story 2 (Case II)

she has harvested kale, Swiss Chard, green peppers, cabbage, and beetroot. She has also recently planted an avocado tree and various herbs.

Figure 4-13 Garden and Seating Area in Gofa Mebrat Hail Condominium

When asked about recycling greywater for her garden, Zenebech explained that water scarcity is an issue in the neighborhood. They receive tap water only every other day, forcing them to manage it carefully. They typically collect greywater for flushing toilets. Living on the fourth floor makes it difficult for her to carry greywater down to the plants. Instead, she prepares a natural fertilizer. She soaks kitchen scraps, such as vegetable peels, in water and lets it sit for a few days —a technique she learned from an online source.

Zenebech expressed concern about safety in the neighborhood, citing a high unemployment rate among local youth, which has led to incidents of theft. It has prompted discussions about building fences around their property. She believes that while UA has fostered connections among neighbors, it is not a comprehensive solution for social security, as only seven out of twenty-five residents in her block are homeowners. Most of the gardeners around her parcel are stay-at-home moms, and UA has provided them with opportunities to meet and socialize. They have even created a seating area around the garden for relaxation.

Most of their income is spent on food. Zenebech reports that they allocate 15,000 ETB for groceries, 4,035 ETB for education, 100 ETB for water, 550 ETB for Wi-Fi, and 1,700 ETB for transportation.

> *"I can't say UA has fully secured our food supply, but it has contributed to some extent. I am confident in the healthiness of the food I grow, and it has brought me closer to nature, enhancing my psychological well-being as I work from home to care for my children,*" she shared.

Zenebech believes that UA enhances community ties, fosters a sense of ownership, raises environmental awareness, provides recreational value, contributes to food security, and encourages physical activity among stay-at-home mothers. It also lowers food prices and creates opportunities for self-employment. Some residents have hired security guards to help with weeding and watering, creating additional job opportunities and food for the community. One challenge Zenebech faced in starting her urban garden was the area's red sand, which was unsuitable for cultivation. She had to purchase soil and redo the site work to make it viable for gardening. She had to spend 3,000 ETB for a truckload of soil and search for local animal husbandry to buy compost.

4.3. Case II

Of the 223 households practicing UA in Gofa Mebrat Hail Condominium, 83 farmers filled out the questionnaire. The socio-economic characteristics, housing profile, UA practices, resource utilization, and waste management of the respondents are described.

4.3.1. Socio-economic Profile of Farmers

The survey reveals that the average household size of the respondents is 5, and on average, one individual from each household was involved in UA. A total of 94 farmers were living in the sampled households. More than half of the farmers (54%) were adults and within the working-age group (30-65 years)**.** Female farmers constituted 36% of the practitioners, while male farmers comprised 64%**.** The literacy rate of farmers indicates that 22% of farmers were illiterate, 14% finished primary school, and 24% were high school graduates. The largest population (28%) has completed vocational training, while only 9% hold a Bachelor's degree or higher. Forty percent of the farmers worked in the private sector, the second-largest group (35%) worked in governmental institutions, and about 18% were retired. None of the respondents makes a living out of UA. The table below summarizes the socio-economic data collected from the respondents in the neighborhood.

Table 4-8 Socio-economic Profile of the Respondents in Case II

Characteristics		**Frequency (n=94)**	**Percentage**
Gender	Male	60	64%
	Female	34	36%
Age	children (< 14)	3	3%
	Youth (15-29)	33	35%
	Adults (30-65)	51	54%
	Elderly (65 <)	7	8%
Highest level of Education	No formal education	20	22%
	Kindergarten	4	4%
	Primary (1-8)	13	14%
	Secondary (9-12)	23	24%
	10+ or Diploma	26	28%
	Bachelor's Degree and Above	8	9%
Primary Occupation	Farming	0	0%
	Government Employee	33	35%
	Private Sector	37	40%
	Unemployed	7	8%
	Retired	17	18%

Source: Sample survey result

4.3.2. Housing Profile

All of the respondents (83) in this case are residents of the Gofa Mebrat Hail Condominium. It is a low-cost housing project constructed in 2005 and transferred to the owners in 2008. It covered 38 hectares of land and has 5,580 units. Most of the residents were relocated people from the Arat Kilo, Cherkos, and Lideta redevelopment sites. Other residents included lottery winners placed by the government, individuals who purchased houses from the lottery winners, and tenants.

The distribution of farmer houses across different condominium floor levels showed a relatively balanced presence of farmers across all levels. As shown in the chart below, 20% of the respondents live on the ground floor, 19% on the first floor, 24% on the second floor, 15% on the third floor, and 22% on the fourth floor.

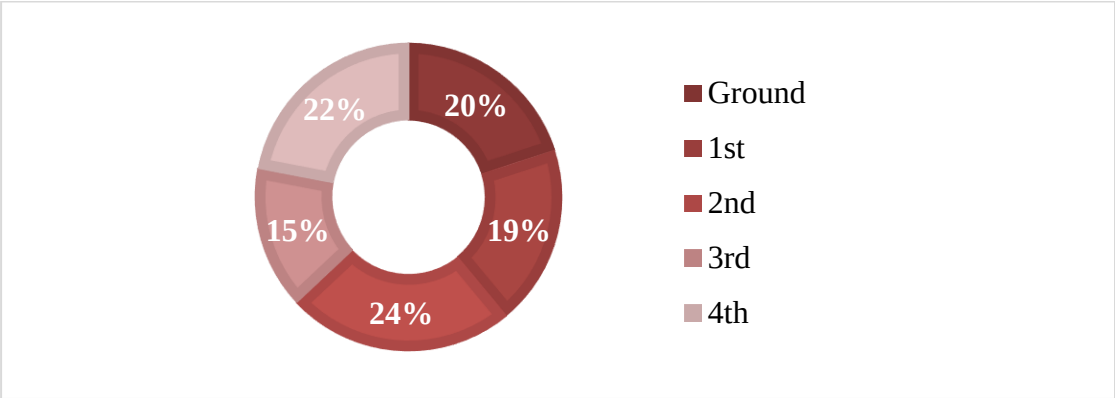


Chart 4-9 Distribution of Farmers in Condominium Housing

Source: Sample survey result (n=83)

The majority of respondents (56%) have lived in the condominium for more than 10 years, 32% have lived there for 5-10 years, while 12% have lived in their residence for less than 5 years (Chart 4--). The starting year of UA for most farmers also indicated that they began practicing UA around the time of their move. Seventy-eight respondents (94%) were homeowners, while the remaining 6% were tenants.

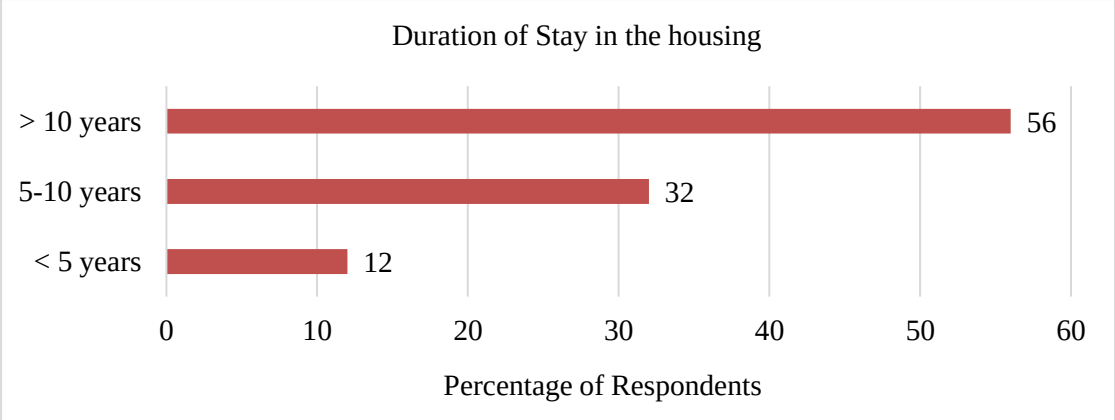


Chart 4-10 Duration of Stay in the Residence in Case II

Source: Sample survey result (n=83)

4.3.2.1. Size of the Condominium Units

The condominium blocks have areas ranging from 200 sqm to 440 sqm, whereas the condominium units range from 37 sqm to 80 sqm. The condominium units have an area of 24 sqm for studio type, 43 sqm for the one-bedroom units, 58 sqm for the two-bedroom units, and 80 sqm for the three-bedroom units.

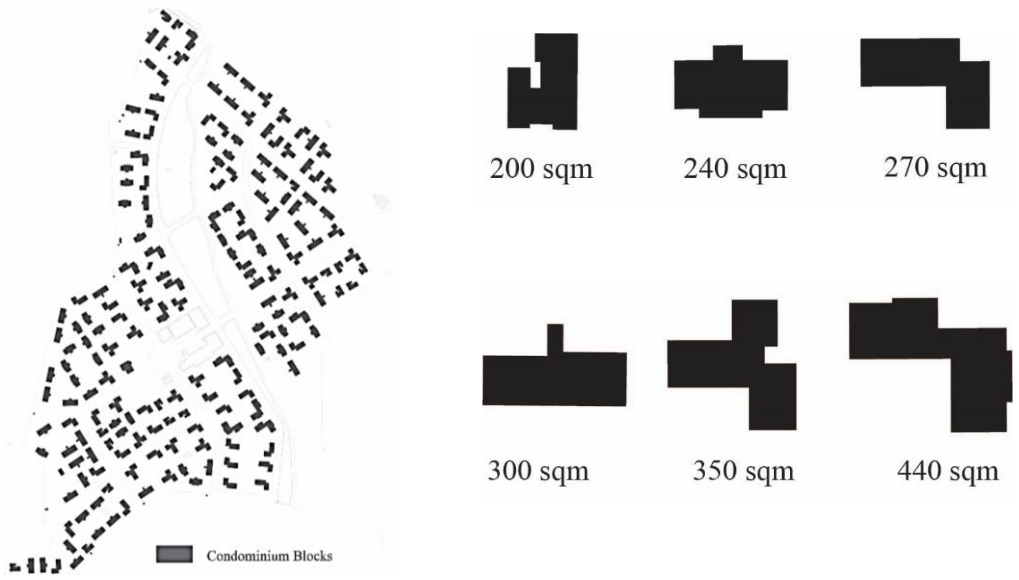


Figure 4-14 Built-up Area and Open Space in Case II and Block Typologies (Right)

4.3.2.2. Shared Spaces and Resources in Compounds

All residents in this case share communal buildings, open spaces, and green areas. The figure below shows the built-up space and the available open space, which is used as a green area, parking, walkway, children's playground, and so on. A portion of these open spaces has been used for UA production.

Figure 4-15 Open Space in Case II
Modified from Nortec Map of Addis Ababa

4.3.2.3. Water Management

All residents get tap water once or twice a week. All respondents store as much water as they can for a week's use. About 62% of the respondents receive tap water twice a week, while 38% receive it only once a week. The chart below illustrates the days respondents receive tap water.

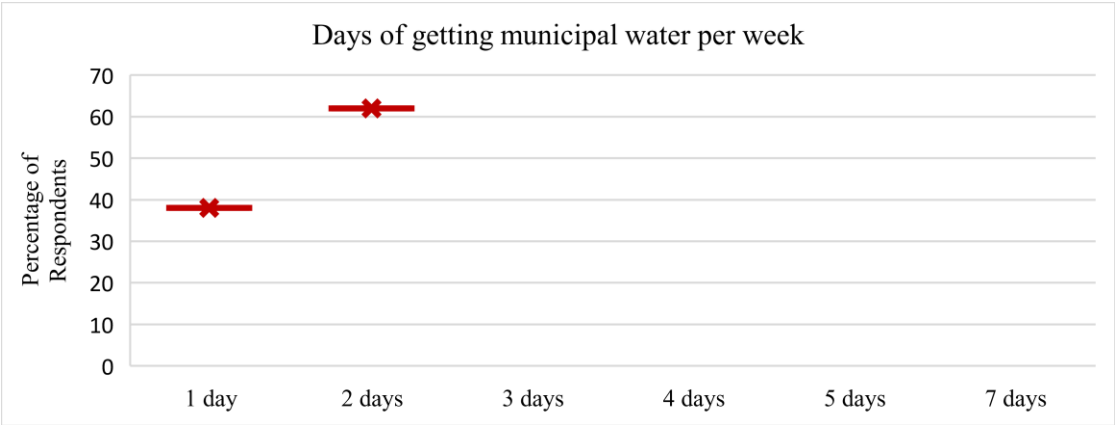


Chart 4-1 Percentage of Tap Water Access per week in Case II
Source: Sample survey result (n=83)

4.3.2.4. Waste Management

Solid waste from the households is collected by cooperatives and taken to a temporary waste sorting area, where it is sorted and then transported to a landfill site or recycled

into compost. All condominium residents have a greywater disposal system connected to the city's sewer system. Black water is also collected in septic tanks, and none of the respondents utilize black water for biogas energy.

4.3.3. The Practice of Urban Agriculture

All farmers in the Gofa Mebrat Hail Condominium practice horticulture in the available open spaces and green areas. Two residents from this neighborhood have attempted to integrate poultry; one of these residents has completed the questionnaire. The respondents have planted a variety of vegetables, fruits, herbs, and other crops. For 76 households (91%), UA was mainly practiced for household consumption, with only 9% (7 households) selling surplus produce (See Chart 4 5 Purpose of UA).

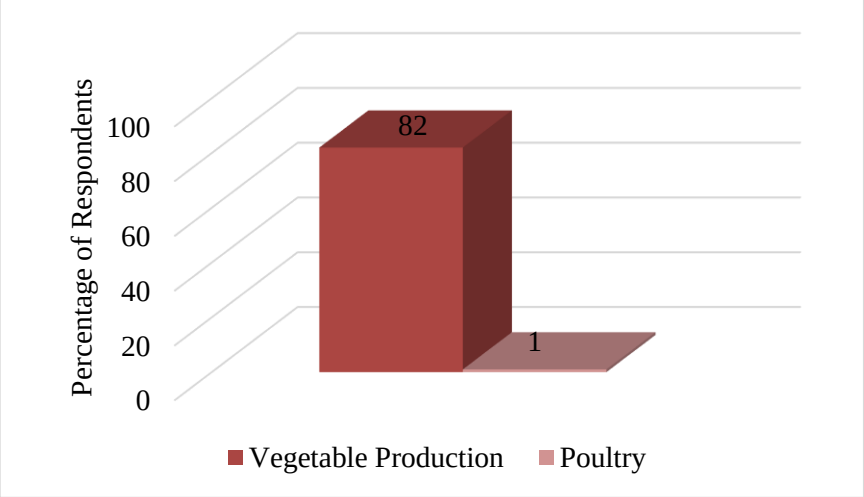
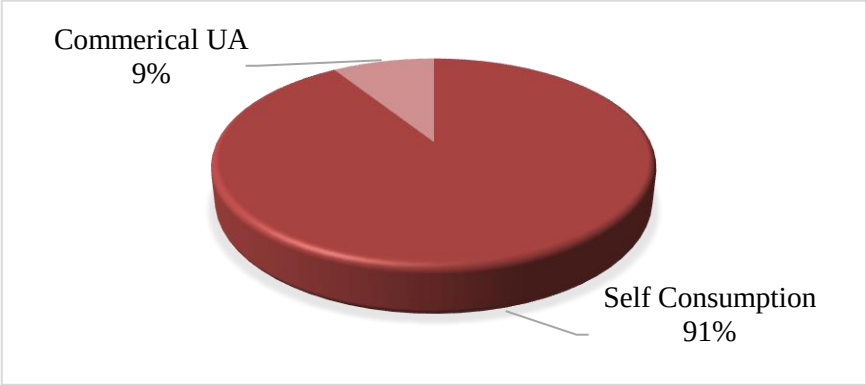


Chart 4-11 Type of UA practiced and attempted in Case II

Source: Sample survey result (n=83)

Chart 4-12 Purpose of UA

Source: Sample survey result (n=83)



4.3.3.1. Urban Agriculture-Related Trainings

Nine respondents reported taking agriculture-related training and courses, while 89% have no educational experience with agriculture. Some of the farmers hold a Bachelor's Degree in Agricultural Science and Veterinary Medicine, while others have completed

short-term courses in agriculture, poultry, hybrid agriculture, drip irrigation, and composting. These households have applied that training and improved their product and productivity. Some of the training mentioned was offered at the Nifas Silk Lafto Sub City FUAO and Woreda 06 FUAO in the sub city.

Table 4-9 UA-related Courses

Questions	Response	Frequency	Percentage
Did you take any courses or training related to UA?	Yes	9	11%
	No	74	89%
	Total	**83**	**100%**

4.3.3.2. Horticulture

Vegetable Production: Vegetables such as lettuce (78%), Swiss chard (72%), and kale (52%) were commonly grown in the neighborhood. Other plants, such as onions, tomatoes, green peppers, and carrots, were also grown. The production of root vegetables, such as potatoes, cabbage, beetroots, sweet potatoes, and garlic, was low.

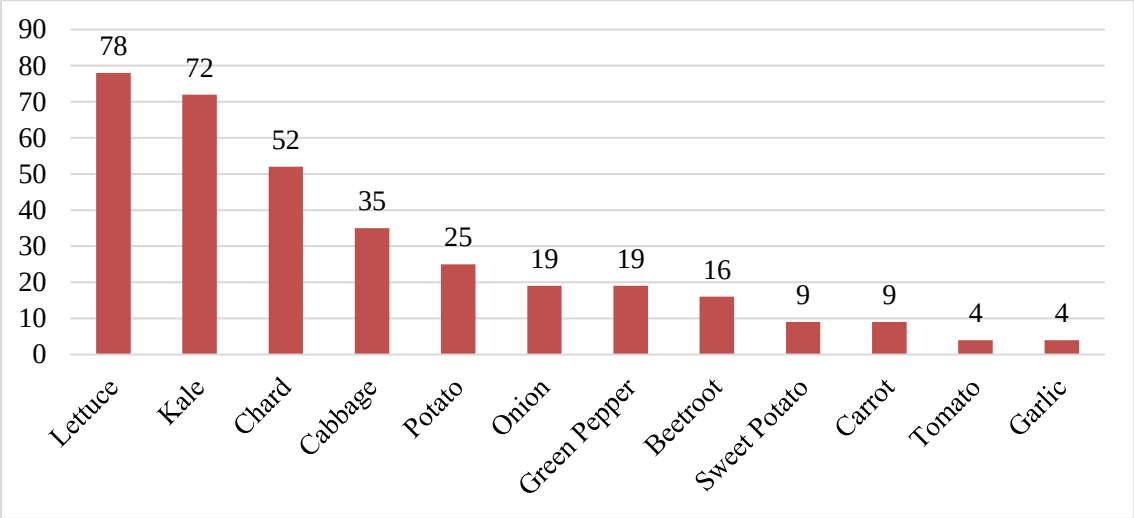


Chart 4-13 Vegetable Production
Source: Sample survey result (n=83)

Fruit Production: Because of the large space they required, fruit trees were not as common as vegetable plants. Avocados, Bananas, and Papaya were the most popular fruit trees in both neighborhoods, while other fruit trees, such as apples, guava, plums, and oranges, had a limited presence.

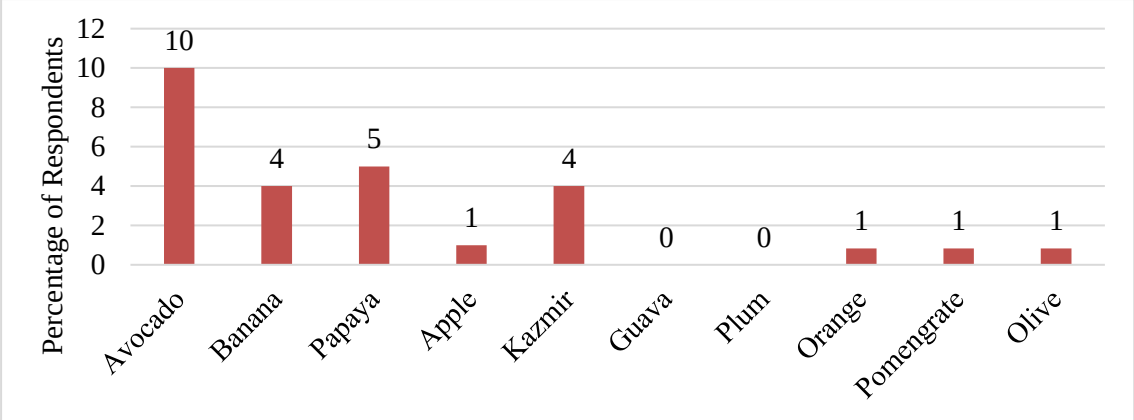


Chart 4-14 Fruit Production
Source: Sample survey result (n=83)

Medicinal Plants and Herbs: Some households grew herbs and medicinal plants such as rue, basil, dill, rosemary, hibiscus, ashwagandha, and parsley, as well as other crops like false banana, corn, hops, coffee, beans, and sugarcane.

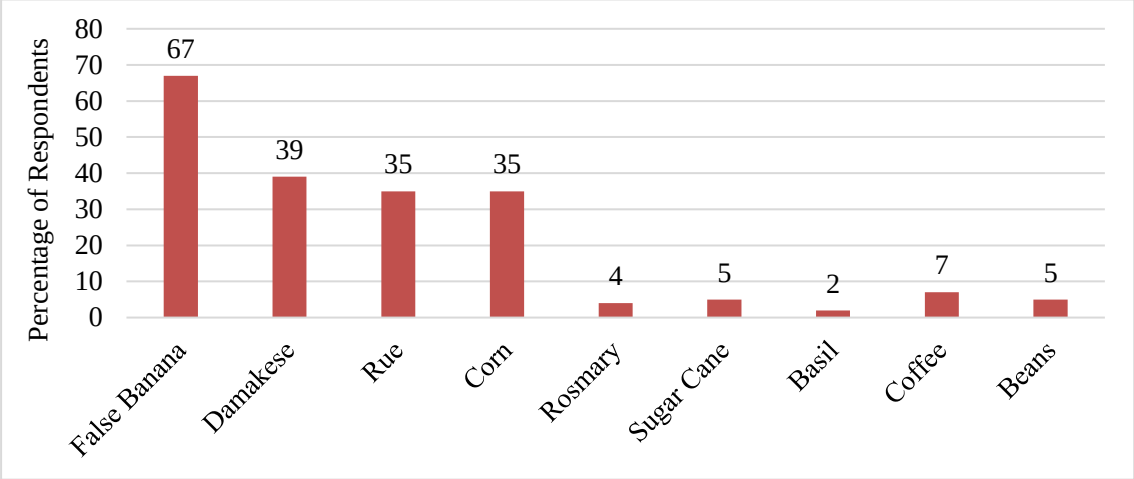


Chart 4-15 Herbs, Staples, and Special Use Crops
Source: Sample survey result (n=83)

4.3.3.3. Animal Husbandry

Of the 83 respondents, one has attempted to practice integrated farming by combining horticulture and poultry inside the condominium compound. The interview with this particular respondent is presented as a life story (See Box 4-3). The interview included details about his UA practice and the challenges he faced.

4.3.3.4. UA Inputs

For horticulture, water, soil (growing medium), seeds, fertilizer, land, pesticides, and access to sunlight are the primary inputs needed for cultivation. In contrast, animal

husbandry requires water, land, a shed, feed, waste management facilities, breed, and artificial insemination (for livestock keepers) as inputs.

Water: All respondents reported using tap water for cultivation, except during the rainy season. As mentioned earlier, water is available for only 2 days, which hinders the practice of UA during the dry season and renders it a seasonal activity for some farmers.

> *"Most condominium residents in this neighborhood who registered under the woreda FUAO have stopped UA or never even started because of the water scarcity in the neighborhood, and most of the households that do practice UA were unable to cultivate their food during the dry season due to the scarcity of tap water,"* Resident of Case II.

The vast majority of the farmers (92%) said they use rainwater for UA; some harvest rainwater from their rooftops and store it in water tankers, plastic water bottles, or jerrycans. Additionally, approximately 53% of the respondents utilize greywater for cultivation and other UA-related purposes. One respondent dug a water well 13 meters deep and 60 centimeters wide to collect surface water, which he uses for farming and flushing toilets until the rainy season replenishes the water supply every six months.

Seed: Most farmers (83%) obtain various types of seeds from the Woreda FUAO. Some respondents (14%) purchase seeds from affordable suppliers like Seed Ball Ethiopia. Few respondents (3%) produce seed from their cultivation to use for their production. The image below depicts how some farmers recorded the type, sources, and receiving data of the seeds.

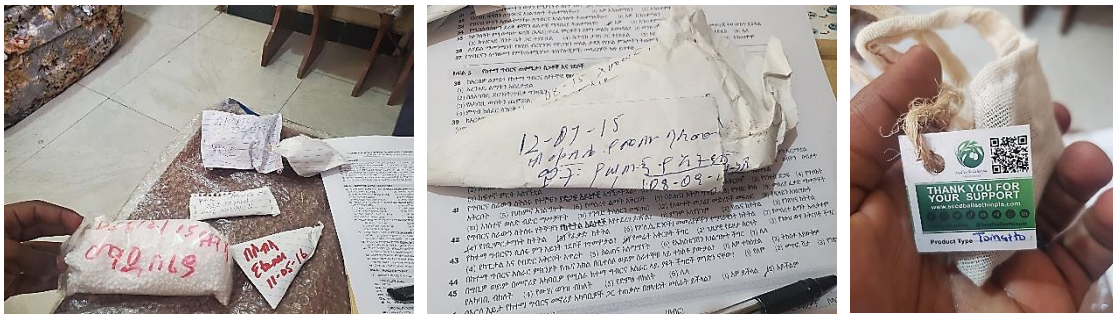


Figure 4-16 Seeds used for UA

Growing Medium: All respondents in this case use traditional soil-based production systems. Very few respondents (13%) have planted using pots. None of the respondents use vertical farming.

Land: Some cultivation spaces in case II lack clearly defined boundaries because the plants have grown randomly (See Figure 4-17). As a result, the exact size of the farming plots used by the residents is undetermined. Residents have fenced their garden areas

using various materials. The images below display low-cost, nature-based fencing using locally available materials such as wooden poles, branches, and dried plant materials (See Figure 4-18, page 87). Even though these fences provide affordable protection, they have aesthetic and durability issues.

Fertilizer: Approximately 31% of the respondents (36 households) reported composting their kitchen scraps to make fertilizer. Most of the condominium dwellers mentioned that they directly apply the organic kitchen wastes on the soil (see Figure 4-9). The majority of households (69%) buy fertilizer from manufacturers, usually livestock keepers within and outside the neighborhood.

Pesticides and Insecticides: From the 83 households practicing horticulture, 28% use biopesticides or natural pesticides, while 32% use chemical insecticides such as malathion. Some residents use Neem tree juice as an insecticide, and others use a mixture of vinegar, ginger, and garlic. Approximately 19% of households do not use any form of pest control. Pest infestations pose a serious challenge for these households, affecting their plants and overall productivity.

Table 4-10 Recycling

Questions	Response	Frequency (n=83)	Percentage
Do you use greywater for UA?	Yes	44	53%
	No	39	47%
Do you harvest rainwater for UA?	Yes	76	92%
	No	7	8%
Do you compost kitchen scraps?	Yes	26	31%
	No	57	69%
Do you use alternative energy and power sources such as solar power or biogas?	Yes	4	5%
	No	79	95%
What kind of pesticides do you use?	Natural	23	28%
	Chemical	27	32%
	None	33	40%

Source: Sample survey result

The number of farmers who use renewable energy and alternative power and energy sources, such as solar panels and biogas, was very low. Only 5% of the participants use renewable energy sources such as solar energy; however, it was for household use and not for UA. None of the households uses biogas technology to generate energy.

Animal Feed: Many of the respondents (63%) buy animal feed from outside the neighborhood, 21% buy it from inside the neighborhood, 9% buy it from producers in their compound, and only 7% manufacture the feeds.

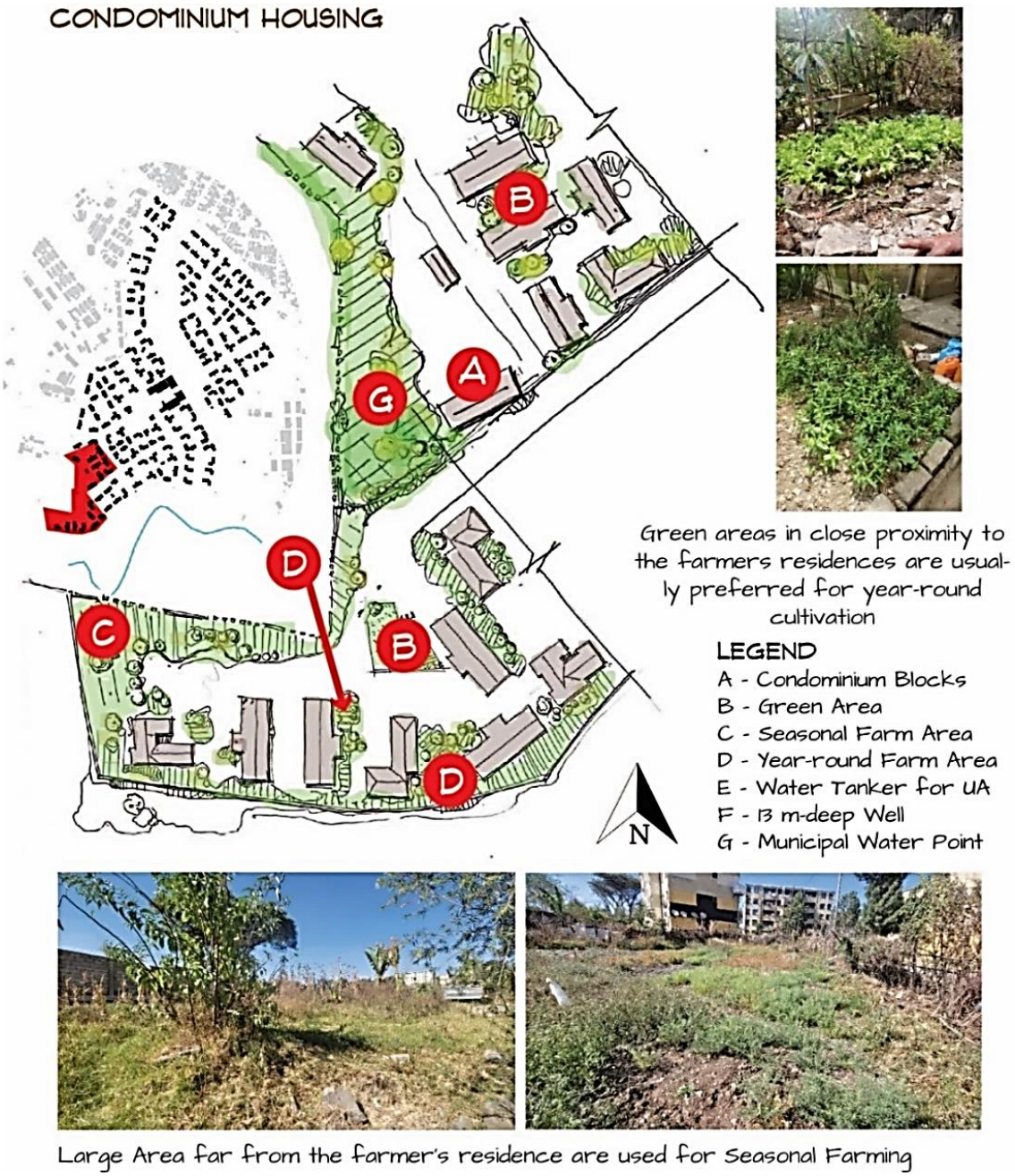


Figure 4-17 Cultivation in Condominium

Figure 4-18 Various fence materials used for UA

Box 4-3 Kosta Sefer

An area in the Gofa neighborhood called "Kosta Sefer," which means Chard Neighborhood. It is a riverbank UA site that mainly grows and sells leafy vegetables, mainly Swiss Chard. According to one of the farmers in Kosta Sefer, riverbank cultivation has been practiced for more than 3 decades. 228 farmers are working, and all of them are members of a farmers' cooperative.

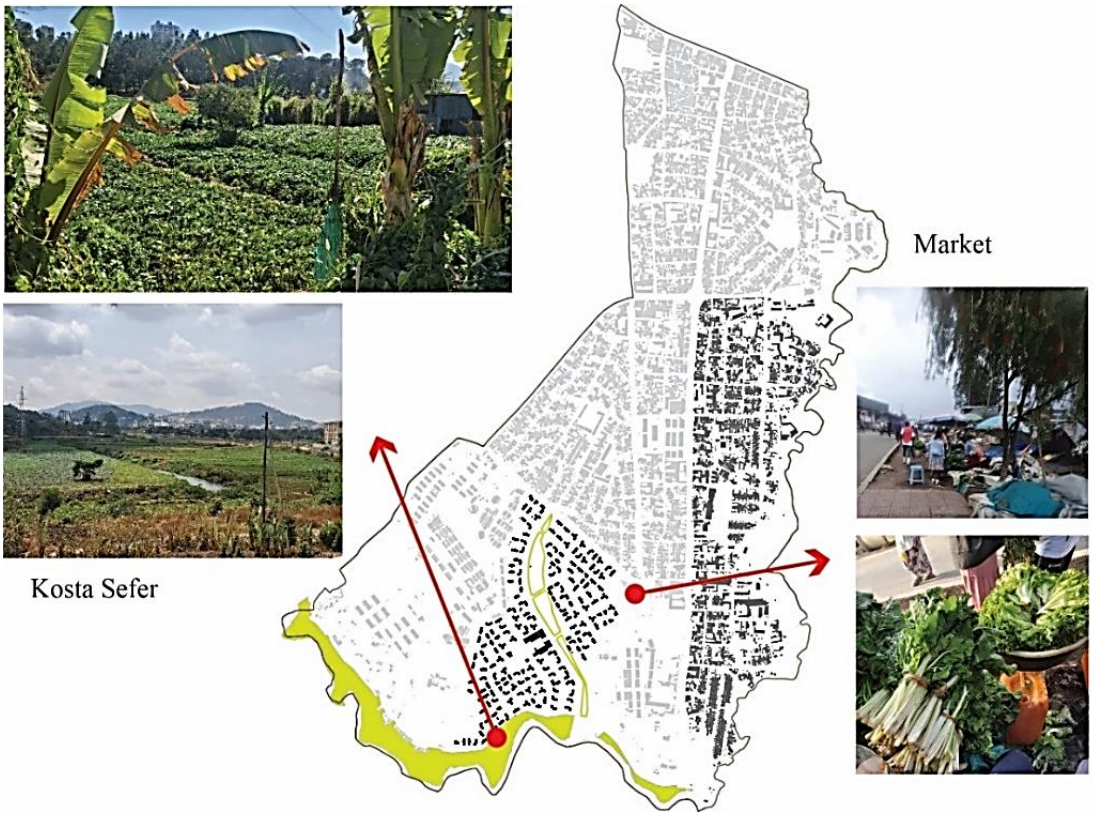


Figure 4-19 Kosta Sefer and the produce from the River Bank Farming

Box 4-4 Life Story of Mr. Shewaye (Case II)

Mr. Shewaye is a 50-year-old resident who has lived in the Gofa Mebrat Hail condominium for over 13 years. He is married and has four children. After getting his diploma, he has been working in the construction sector for many years. He currently runs his own business in the neighborhood. For many years, Shewaye and his neighbors have transformed the available open space into a community garden. Farming has been a passion for him and many others in the area. The Woreda 6 FUAO recognized their efforts and has been providing Shewaye and the residents of Parcel 8 with seeds, water tankers, and fertile soil, while closely monitoring their progress. So far, Shewaye has invested 140,000 ETB. He cultivates a variety of crops, including kale, Swiss chard, potatoes, sweet potatoes, corn, avocados, and medicinal plants. He is engaged in both soil-based and container farming.

Box 4-4 Life Story of Mr. Shewaye (Case II)

Figure 4-20 Open Space (top) and UA (bottom) in Parcel 8

Figure 4-21 Mr. Shewaye's water containers for rainwater harvesting from broken downpipe (Left), well, and a portion of his garden area (Right)

He owns a private water meter and receives municipal water once a week. He has also dug a well 13 meters deep and 60 centimeters wide to collect surface water, which he uses for farming and flushing toilets until the rainy season replenishes the water supply every six months. He also purchased four containers to collect rainwater from the roof of his building through broken downpipe. He also avoids using chemical pesticides by making a natural pesticide from neem tree leaves, which he soaks in water overnight and sprays on his plants. When asked if he uses grey water for gardening, he replied,

"No, I see my plants like my children. So, I only feed them the best inputs."

Shewaye also creates compost from kitchen scraps, using a pit at first. However, due to complaints from neighbors about the smell, he switched to vermicomposting. He saves eggshells and uses leftovers from coffee brewing to maintain a consistent supply of compost.

Box 4-4 Life Story of Mr. Shewaye (Case II)

For many years, he has employed a 78-year-old gardener who also serves as a security guard in the parcel.

Shewaye shared some limitations residents faced with UA. First, the number of urban farmers dropped from 90 to 46 in two years. This was due to the Woreda's introduction of model neighborhood development (see Figure 4-22), which includes space for horticulture and animal husbandry, areas for communal activities, green spaces, and sufficient parking.

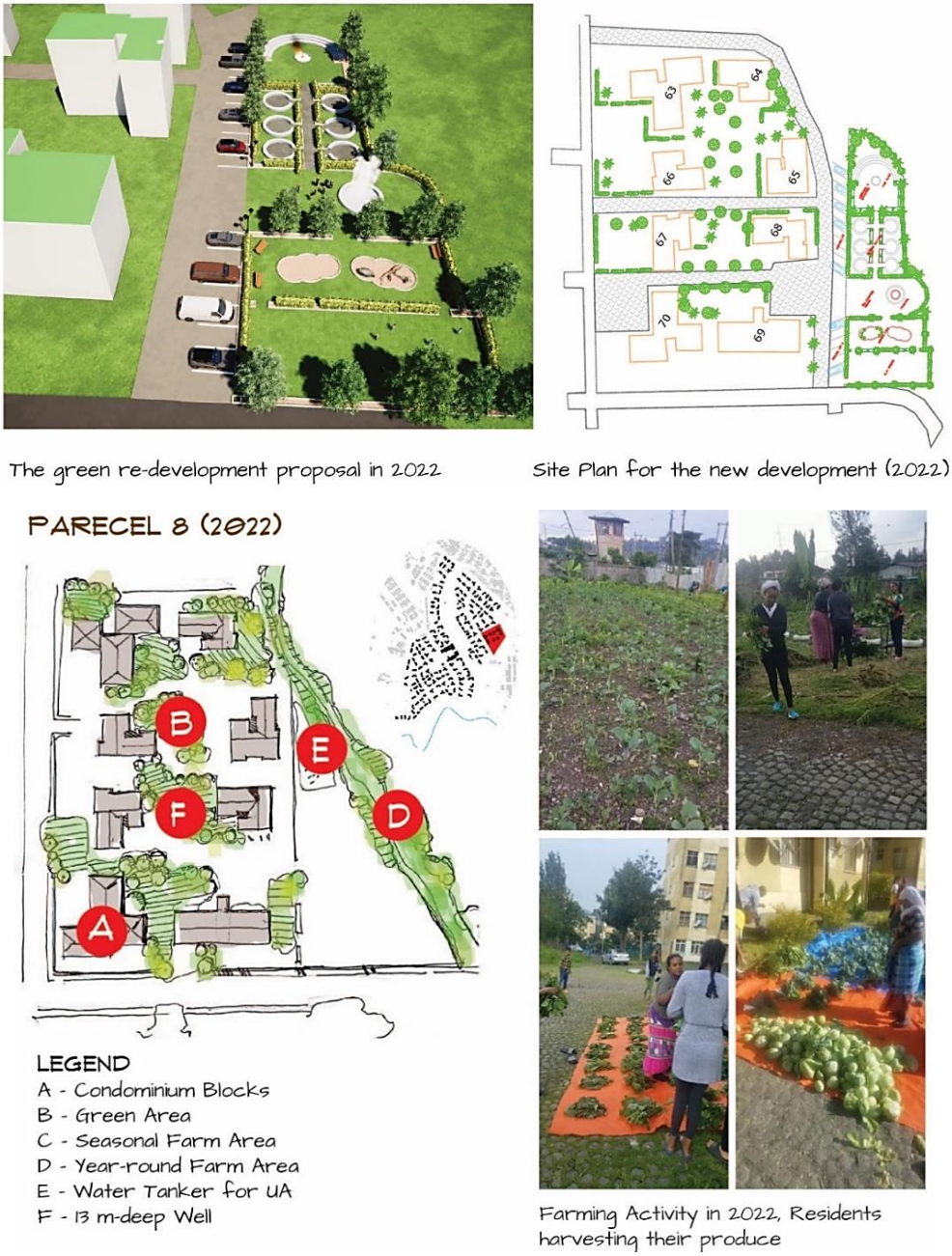


Figure 4-22 Former community garden area (Bottom) turned into other uses (Top)
Source: Mr. Shewaye in 2022

Secondly, Shewaye completed a poultry training course given at Wingate Polytechnic College, hoping to start an additional business in the condominium. His idea was highly supported by

Box 4-4 Life Story of Mr. Shewaye (Case II)

Woreda FUDO. Nevertheless, when he set up the chicken coop in the shared open space, other residents opposed it. Their concerns were related to noise, hygiene, environmental pollution, and health risks. Although he received ten chickens and a coop from the Woreda, he chose to keep them at his mother's private residence to avoid disputes with the community. Even though Shewaye's training included resolutions to these issues, the community still resisted.

"*Many residents misunderstand the potential for odorless and quiet poultry farming,*" he shared.

He also emphasized another misconception about UA, particularly regarding composting. Many residents believe composting will create unpleasant odors and occupy shared space. Shewaye thinks the most significant benefit of UA is fostering community interaction, knowledge exchange, and sharing produce; however, the successful integration of UA requires community understanding and cooperation.

4.3.3.5.Support for Urban Agriculture

UA is supported in various ways. Approximately 20% of participants reported receiving no support. The most common form of support for UA (73%) is the supply of inputs such as horticultural seeds, which is usually provided by the woreda FUAO. Although training and capacity-building are indispensable initiatives for UA, only 46% of households have benefited from them. Other forms of support, including infrastructure supply and facilitating work supply, are very low.

Table 4-11 Type of Supports of UA

Support of UA	Frequency (n= 83)	Percentage
None	17	20%
UA Input Supply	61	73%
Training & Capacity Building	38	46%
Infrastructure Supply	3	4%
Facilitating Work Permits	3	4%

Source: Sample survey result

4.3.3.6. Monitoring of Urban Agriculture

To ensure efficiency and sustainability, UA has to be monitored. The majority of the households (41%) reported that their UA activities have never been monitored by any officials. The animal keepers are continuously monitored by the UA officials in the Woreda. Some efforts are being made to ensure the income and productivity of UA are enhanced (52%); the rules and guidelines are implemented (36%); sanitation and hygiene standards are met (13%); and utilization of resources is efficient. The survey showed that UA in the neighborhoods was supported and monitored through various

means. The table below outlines the different types of support and monitoring mentioned by the respondents.

Table 4-12 Type of Monitoring of UA

Monitoring of UA	Frequency (n= 83)	Percentage
None	34	41%
Income/ Productivity	43	52%
Implementation of rules and guidelines	30	36%
Hygiene Monitoring	11	13%
Resource Utilization	2	2%

Source: Sample survey result

4.4. Cross-Case Analysis

4.4.1. Socio-economic Profile of the Farmers

The socio-economic profile of the farmers in the two case study areas shows that the average household size is 5. The average number of farmers in Case I is greater than in Case II, which implies that UA is more integrated into the daily household routines of Case I. The lower level of engagement per household in Case II is due to various constraints such changing priorities, lack of water, and lack of a sense of belongingness to the open space in the neighborhood. The majority of the farmers in both cases were adults within the working age group (30-65 years). This is because UA is a laborious activity. This may also explain why it is a male-dominated activity. The educational background of the farmers shows that most farmers have taken vocational training. Case II shows a better educational profile than Case I; therefore, there is a smaller number of unemployed populations, a higher number of government employees and retired citizens, and less dependency on UA for living in Case II.

Table 4-13 Socio-economic Profile of Respondents in the two cases

Characteristics		Case I (n= 97)	Case II (n=83)	Both Cases	Comparison
Gender	Male	56%	64%	60%	Higher in Case II
	Female	44%	36%	40%	Higher in Case I
Age	< 14 (children)	3%	3%	3%	Equal
	15-29 (Youth)	38%	35%	36%	Higher in Case I
	30-65 (Adults)	49%	54%	52%	Higher in Case II
	65 < (Elderly)	10%	8%	9%	Higher in Case I
Highest level of Education	No formal education	20%	22%	21%	Higher in Case II
	Kindergarten	6%	4%	5%	Higher in Case I
	Primary (1-8)	20%	14%	17%	Higher in Case I

Characteristics		Case I (n= 97)	Case II (n=83)	Both Cases	Comparison
	Secondary (9-12)	18%	24%	21%	Higher in Case II
	Diploma	29%	28%	28%	Higher in Case I
	Degree & Above	7%	9%	8%	Higher in Case II
Primary Occupation	Farming	6%	0%	3%	Higher in Case I
	Government Employee	11%	35%	23%	Higher in Case II
	Private Sector	40%	40%	40%	Equal
	Unemployed	34 %	8%	21%	Higher in Case I
	Retired	8%	18%	13%	Higher in Case II

Source: Sample survey result

Twenty-seven farmers from both cases have taken agriculture-related training. Some have a Bachelor's Degree in Agricultural Science or Veterinary Science, while others took short-term vocational courses that are very specific, such as poultry, composting, hybrid farming, drip irrigation, and so on. Most of these trainings were given by the FUAO at the Woreda and Sub City Levels. However, the number of farmers who have taken agriculture-related training in Case I was double that of Case II. This shows that institutional support in the form of training and capacity building is low in Case II.

4.4.2. Housing Profile and Available Resources

In both cases, homeownership was dominant among the farming population. Case II has more number of homeowners than in Case I This is due to the presence of informal settlements in Case I. Case II is a low-cost mass housing project; therefore, open space and green areas are shared among the residents. About 88% of Case I households have exclusive access to their plot area, whereas the condominium dwellers share all the available space outside of their units. Case I also has households that share spaces and resources. Both cases experience irregular access to tap water; therefore, residents use water tanks and jerry cans to store water.

Table 4-14 Cross-Case Analysis: Housing, Land Use, Tenure, and Utilities

Aspect	Case I	Case II
Type of housing	A mix of private, kebele, and informal housing	Condominium housing with 5,580 units
Homeownership	72% are homeowners	94% are homeowners
Tenants	10%	6%
Informal Settlers	15%	None
Average Plot Size	234 sqm – Private housing 180 sqm – Kebele housing	37- 80 sqm- housing units

Aspect	Case I	Case II
	176 sqm – Informal housing Overall (75 -1,485 sqm)	200- 440 sqm- Condominium blocks
Exclusive use	88% use compound exclusively	N/A
Shared compound use	Share kitchen (12%), toilet (28%), green/open space (95%), water (36%), electricity (19%)	All share green and open space
Spatial Distribution of Housing	N/A	20% Ground Floor, 19% 1st floor, 24% 2nd flood, 15% 3rd floor, 22% 4th floor
Water Source	Tap water (municipal)	Tap water (municipal)
Water Access Frequency	51% – twice a week 40% – once or twice a week	Once or twice a week for all
Water Coping Mechanism	Store water in water tankers, plastic water bottles, or jerrycans	Same
Grey Water	65% dump in streets or ditches 31% connected to the city sewer The rest were dumped in the river/toilet	Condominium grey water is disposed of via the sewer system
Black Water	75% use septic tanks, 20% pit toilets, 4% use biogas	Connected to the city sewer system
Solid Waste	Collected by cooperatives	Same
Biogas Use	4% (dairy farmers)	N/A

Source: Sample survey result

4.4.3. Urban Agriculture

In both cases, 173 households cultivate fast-growing leafy vegetables like lettuce, Swiss chard, and kale were very common. Other vegetables like onion, tomato, green pepper, and carrot were also grown. The production of root vegetables like potatoes, cabbage, beetroot, sweet potatoes, and garlic was low. Because of the large space they required, fruit trees were not as common as vegetable plants in Case II, but in case I, potatoes, cabbages and beetroot were practiced by one in three or four households. Avocados, Bananas, and Papaya were the most popular fruit trees in both neighborhoods, while other fruits such as apples, guava, plum, and orange had limited presence. Some households grew herbs and medicinal plants such as rue, basil, Ocimum lamiifolum, dill, rosemary, hibiscus, ashwagandha, and parsley, as well as other crops like false banana, corn, hops, coffee, beans, and sugar cane. Poultry is the common type of animal husbandry in Case I (50%). It is followed by dairy farming and keeping livestock. Although two residents from Case II attempted to integrate poultry it was unsuccessful, since the residents were against it.

The majority of households in both cases practiced UA for household consumption. Compared to Case II, Case I has a large number of residents who sell their produce (32%).

Table 4-15 UA Practice Summary– Case I & Case II

Aspect	Case I	Case II
Main type of UA	▪ 89 households (92%) practice horticulture	▪ 83 households (100%) practice horticulture
Animal Husbandry	▪ Practiced by 4% of the respondents • Half of these raise poultry • 30% dairy & small ruminants	▪ Poultry was attempted by 2% of the households
Integrated Farming	▪ 7% of the households	▪ Attempted by 2%
Purpose of UA	▪ Self-consumption- 68% ▪ Selling surplus- 32%	▪ Self-consumption- 91% ▪ Selling surplus- 9%
Vegetables	C- Lettuce, Swiss chard, Kale O- Onion, Tomato, Green Pepper, Carrot L- Potato, Beetroot	C- Lettuce, Swiss chard, Kale O- Cabbage, Potato, Beetroot, Green Pepper, onion L- Tomato, Garlic, Sweet Potato
Fruit Trees	C- Avocado, Banana, Papaya O-Apple, Kashmir, Guava L- Orange, Plum	C- Avocado, Banana, Papaya, Kashmir O-Apple, Orange, Olive L- Pomegranate, Guava, Plum
Other Plants	C- False Banana, Damakese, Rue, Corn, Rosemary O- Sugar Cane, Basil, Dill L- Coffee, Hops, Hibiscus, Beans	C- False Banana, Rue, Corn O- Coffee, Sugar Cane, Basil, Rosemary, Beans L- Hops, Hibiscus, Dill

C-Common, O- Others, L- Less Common

Source: Sample survey result

Table 4-16 Cross-Case Comparison: UA Inputs, Support, and Monitoring

Aspect	Case I	Case II
Water Use	▪ 56% use tap water ▪ 32% are rain-dependent ▪ 43% use greywater ▪ 93 households harvest rainwater	▪ All use tap water (when available) ▪ 92% use rainwater ▪ 53% use greywater
Water Availability	▪ water available for 2 days/week ▪ mitigated by rain harvesting & greywater use	▪ Very limited ▪ water available for 2 days/week ▪ makes UA highly seasonal or unsustainable
Growing Medium	▪ 100% traditional soil-based ▪ 35% use pots ▪ Minimal vertical farming	▪ 100% soil-based ▪ 13% use pots ▪ No vertical farming
Seed Access	▪ 85% from FUAO ▪ 9% purchase ▪ 6% save seeds	▪ 83% from FUAO ▪ 14% purchase ▪ 3% save seeds
Land Access & Use	▪ Average 70 sqm plot ▪ up to 0.9 ha for riverside UA	▪ Undetermined plot sizes

Aspect	Case I	Case II
	▪ Stone piles used to mark plots	▪ Natural growth with makeshift fences from local materials
Fertilizer Use	▪ 31% compost kitchen/chicken waste ▪ 69% buy from livestock keepers	▪ 31% compost kitchen waste ▪ 69% buy fertilizer
Pesticide Use	▪ 35% natural ▪ 39% chemical ▪ 19% none	▪ 28% natural (Neem tree juice) ▪ 32% chemical ▪ 40% none
Alternative Energy Use	▪ 7% use renewable energy (mostly biogas by livestock keepers)	▪ 5% use solar (for household, not UA) ▪ No biogas use
Composting	▪ 31% of households	▪ Same
Use of Greywater	▪ 43%	▪ 53%
Rainwater Harvesting	▪ 96%	▪ 92%
Support Received	▪ 73% received input supply ▪ 11% training ▪ 6% land ▪ Low levels of monetary, infrastructure, & market support ▪ 27% received no support	▪ 73% input supply ▪ 46% training ▪ Minimal infrastructure and work permit support ▪ 20% received no support
Monitoring	▪ 74% report no monitoring ▪ Animal keepers monitored frequently (24%) hygiene ▪ 7% income	▪ 41% report no monitoring ▪ 52% monitored for income/productivity ▪ 36% for rule adherence

Source: Sample survey result

4.5. The Role of Urban Agriculture in Sustainable Housing

There is a similar understanding of the definition of sustainable housing among the key stakeholders, and the need to balance social, economic, and environmental dimensions was thoroughly discussed in all of the KII. However, each of the respondents had a distinct interpretation of what sustainable housing constitutes. Understanding their perception of each dimension was important to know how it is achieved through local interventions and how they can measure the contribution of UA. The responses are analyzed using the sustainability indicator framework, consisting of three dimensions: environmental, social, and economic sustainability.

According to *Mr. Abdi,* an architect and urban planner who is currently serving as Deputy Chief at AAHDCB, the sustainability of housing development is highly related to the provision of adequate housing, since housing serves as a source of income, and an asset for the community in addition to being a shelter.

> *"The role of UA in sustainable housing development is multidimensional. Socially, UA supports food security for poor households; economically, by generating income; and*

environmentally, by bringing food closer to consumers and promoting green development. There was a significant rise in UA initiatives in residential areas during the COVID-19 pandemic, driven by city administration efforts. I even heard news that one UA cooperative was making millions of ETB during this period. Unfortunately, the momentum has not been sustained," he stated.

Mr. Esubalew is an architect and urban planner who served as the Director of the Construction Design Agency Directorate at the AAHA for more than three years. His office offers design consultancy services for neighborhood planning, typology design, and site work. They collaborate with the AAHDCB, which provides specifics about housing areas, materials, and other criteria. The team plans block layouts, determines the number of housing units, and outlines typologies based on this input. Previously, the office sent rough NHD plans to consultants for review. Now, they handle NHD and typology design in-house, submitting these directly to the AAHDCB. The agency adheres to internal and international standards. In space allocation, 40% is for buildings, 30% for green areas, and 30% for circulation. *Esubalew* defines sustainable housing as:

"A residential development that not only minimizes environmental impact but also enhances the socio-economic condition of the dwellers. Socially, it builds community cohesion by providing communal spaces that accommodate diverse age groups, with features like seating areas and playgrounds. Economically, the focus is on using locally available materials and skilled labor, recommending labor-intensive methods over prefabricated solutions, which creates fewer job opportunities. Environmental sustainability focuses on energy usage, passive lighting and ventilation, and protecting green spaces. This is no limitation in understanding what sustainable housing constitutes; the gap is with implementation, which can be costly and often requires skilled labor."

Mr. Haile is a site engineer at the *Addis Ababa Housing Development Corporation,* whose office is tasked with providing affordable housing that positively impacts society, the economy, and the environment. To date, it has facilitated the construction of over 150,000 homes and is exploring alternative housing supply and financing by engaging the private sector and real estate developers. He mentioned that

"The housing initiatives in Addis Ababa have fostered social benefits by promoting interaction through communal spaces such as seating areas, green space development, sports fields, and community buildings. Housing developments have created job opportunities not only during construction but also throughout the buildings' lifetimes, since companies providing essential resources like water and electricity. Additionally, mixed-use housing developments incorporate shops and market areas that further generate employment. The environmental impacts of neighborhood development are minimized by undergoing environmental impact assessments. Notably, studies were underway to utilize biogas and establish waste recycling plants in pioneer projects like the Mikililand Condominium Project."

Mr. Mohammed, a spatial planning expert working at the *Addis Ababa City Government Plan and Development Commission*, highlighted that sustainable thinking in NDP incorporates social, economic, and environmental dimensions.

> *"UA promotes diversity and supports marginalized groups; encourages mixed-use developments, and emphasizes resource protection and waste management. UA is increasingly included in NDPs of Addis Ababa to enhance food security, boost the local economy, and provide self-employment opportunities; therefore, it should be encouraged. However, implementation challenges remain,"* he shared.

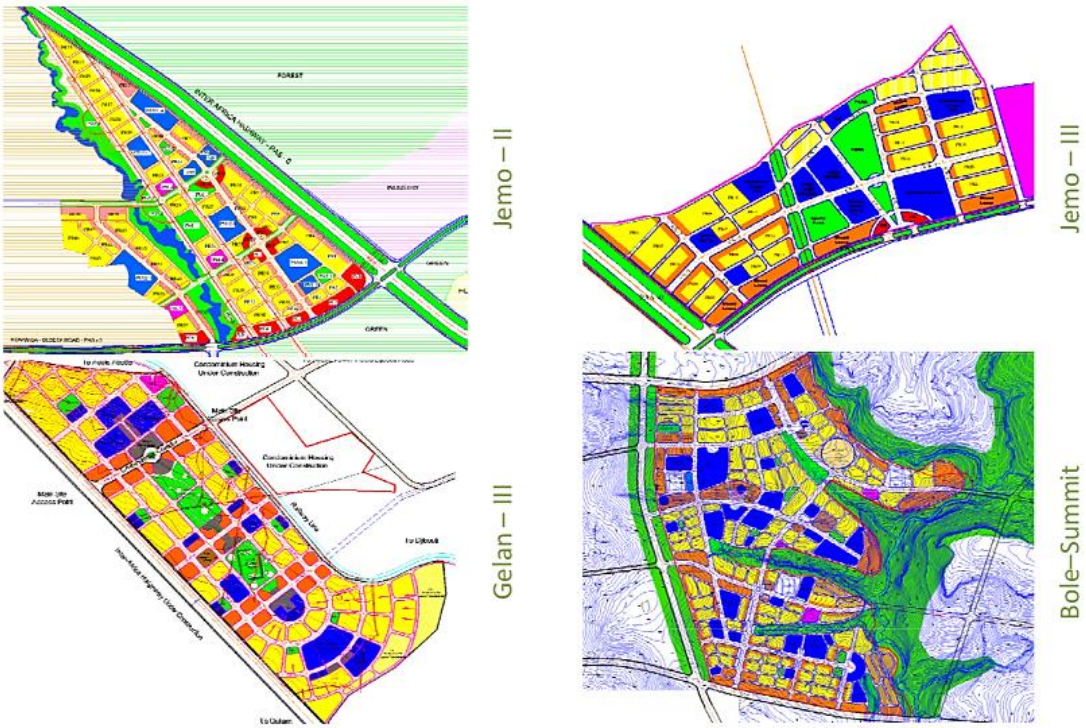


Figure 4-23 Some of the LPDs designed by PACE that included Community Greens
Source: AAHDAB (2022)

4.2.3. The Role of UA in Environmentally Sustainable Housing

UA has demonstrated several environmental benefits to the sustainability of housing in the studied case sites. The percentage of productive green space, the enhancement of biodiversity and habitat creation, food miles reduced, waste minimization and recycling, prevention of pollution, organic food production, usage of renewable energy, flood mitigation, and environmental education are discussed below.

In Case I, the average open-space area ranges from 80 sqm to 290 sqm. When calculating the average size of productive land from these open spaces, it ranges from 7 sqm to 23 sqm, which is from 7-12% of the open space (see Figure 4-24, page 99).

Regarding biodiversity and habitat creation, about 37% of respondents stated that their UA has increased the populations of various birds and insects, such as butterflies and bees. The survey findings also showed that the plot size of the household and the total number of plant species have a moderate positive correlation (r = 0.5). This suggests that as the pot size increases, so does the growing area. There is some level of association between the two; however, it is not very strong. On the contrary, plot size and the number of animals kept showed a very strong positive correlation (r = 0.88). This implies that larger plots tend to keep more animals; therefore, the availability of land is a strong factor that determines the upscaling of animal husbandry.

Figure 4-24 Compounds and percentage of productive space of sample blocks
Source: Adapted from the Nortec map of Addis Ababa

Food miles refers to the distance that food production inputs and the produce travel before reaching consumers. According to a Plant Science expert in the Nifas Silk Lafto Subcity, Woreda 06 FUAO, the best seeds are imported from abroad. Moreover, the

survey findings revealed that more than half of the respondents (63%) buy animal feed from outside the neighborhood. Some buy it from Debreziet and nearby cities, which are located outside of Addis Ababa. Only 31% produce fertilizer by processing kitchen waste and changing it to compost, 7% buy from neighbors, and 4% from outside the neighborhood. Some participants mentioned that neighbors who own a poultry farm give away the chicken manure for free or at a lower price. Buying inputs from outside the city and the country would increase the food miles of UA production. On the positive side, some respondents produce their own inputs while others buy them from producers in the neighborhood.

About 78% of the respondents stated that UA contributed to reducing air pollution and lowering carbon emissions, as it promotes green development (67%). It also utilizes grey land that was either left open or used as a dumping site for solid waste. About 46% of the respondents mentioned that UA has enhanced environmental beauty, and one-third of respondents (34%) claimed that UA prevented environmental pollution.

All residents use organic, chemical-free fertilizer made from composted organic household waste. Animal keepers also reuse the animal waste to make fertilizer. Residents who own a biogas digester also produce organic fertilizer from the digestate.

Regarding waste minimization and treatment, the survey found that nearly one-third of respondents converted their organic waste into compost. This minimizes the amount of organic solid waste sent to the landfill. Only 31% produce fertilizer by processing kitchen waste into compost, while 7% buy it from their neighbors. Nearly half of the respondents (46%) recycle their grey water, and numerous participants cultivate during the rainy season. The survey results revealed that the most frequently recognized benefit of UA is its ability to use rainwater effectively (94%). Very few harvest rainwater from broken downpipe; however, the vast majority use the surface water to grow their food.

Only 4 respondents use alternative energy sources such as solar power, biogas energy, and so on. Whereas, one-fourth of the participants have claimed that UA reduces flood risk and soil erosion in their neighborhoods. According to 30% of the respondents, UA has also improved the awareness of environmental safety and protection.

Table 4-17 Contribution of UA to Environmental Sustainability of the Respondents

Environmental Sustainability Indicators	Frequency	Percentage
It recycles rainwater	169	94%
It helps us and the neighbors find fresh food nearby	148	82%
It reduces air pollution and carbon emissions	140	78%
It promotes green development	121	67%
It utilizes unused grey land	86	48%
It recycles graywater	86	48%
It enhances environmental beauty	83	46%
It increases the number of birds and butterflies	67	37%
It prevents environmental pollution	59	33%
It utilizes biodegradable household waste	56	31%
It improves environmental safety and protection awareness	54	30%
It reduces flood risk and soil erosion	45	25%

Source: Sample survey result (n=180)

Dr. Asnakech, architect and landscape design expert, emphasized that effective integration of UA into housing development improves environmental sustainability through initiatives like composting organic household waste, harvesting rainwater for irrigation, and local food production.

Esubalew shared that there were attempts to incorporate farming into a G+21 building at one of the Legehare sites, utilizing balconies and terraces for vegetable gardening. However, high wind pressures caused these efforts to fail, and balconies are often repurposed for additional living space. In the Basha-Wolde Condominium, an UA was tried for flood mitigation. He also mentioned that underground parking solutions are being adapted to free up space for greenery, although predicting how residents will utilize green spaces remains unknown without clear guidelines. He explained that some green spaces have been repurposed for informal markets, undermining their intended use. The Addis Ababa River Basin Development Authority monitors policies related to green areas in housing; however, residents or condominium associations are the ones managing them.

> *"The AAHDCB has limitations to enforce green area protection regulations in Addis Ababa housing,"* he added.

When asked about these issues, Abdi pointed out to the fact that there are many open spaces available for food production in housing developments. And residents have the right to use this space to meet their food needs; however, some green spaces have been invaded by informal settlers. This is due to government negligence, revealing gaps in planning and implementation. In some cases, areas designated for parks or playgrounds

have been repurposed for construction, showing the lack of awareness regarding green areas. He also mentioned an incident where a resident began farming in a playground, emphasizing the need for better communication among stakeholders to define which green areas are designated for UA clearly.

Figure 4-25 Green area in Gelan Condominium that is being used as a market area

When asked about other sustainability attempts to recycle waste, *Esubalew* responded that such measures were not directly targeted at sustaining UA. Few projects have introduced two trash chutes for residents to segregate organic and inorganic waste, and efforts to recycle greywater are underway. However, these initiatives are not standard across all housing designs. There are no sustainability guidelines or regulations in place, but the office incorporates some sustainable practices independently. Currently, there is no legal framework for integrating UA into housing developments in Addis Ababa. On the other hand, Abdi stated there are plans to implement on-site waste recycling initiatives, such as composting and rainwater harvesting, but these have not yet been executed due to the need for in-depth studies.

Currently, the housing sector is playing a crucial role in the development of UA in Addis Ababa by identifying green areas in residential neighborhoods and notifying the AAFUADC. For example, the Abado Housing Project, which spans 62 hectares, was constructed between 2012 and 2015. Since its completion, 7 hectares of fertile land remain unused, highlighting the missed opportunity for food production.

Haile also mentioned that in the Abado Condominium Project, of the 350 blocks constructed, 31 feature flat roofs intended for water storage and elevator access. These spaces could be repurposed for growing plants, but such integration requires careful planning and design thinking. Haile emphasized that integrating UA is most effective during the planning stages of housing development. Dr. Asnakech also supported the integration of UA into housing planning processes and suggested the establishment of

common spaces for UA, raising public awareness, and developing supportive policies. Overall, her insights underline the importance of a comprehensive approach to integrating UA into urban planning to foster sustainable neighborhoods.

4.2.4. The Role of UA in the Economic Sustainability of Housing

UA provides several economic benefits for many of the farmers. The household cost-to-income ratio, income generation, running costs, saving on food expenditures, diversity of the income streams, local food production, property value of land with UA, and saving water and electric bills by using alternative sources were discussed below.

According to the survey, the average household expense is 15,000 ETB. By taking the average household size of 5, the amount of money spent per person per month is 3000 ETB. Food is the dominant expense of households, accounting for 42% of the total expenses. The average monthly spending on food is 6,409 ETB. Many households hire house-helps who help with domestic work and UA activities, which showed a significant expense (13%). Education fees also have a noticeable share (11%). Electric bills and transportation or fuel costs also appear to have high costs. Other household expenses have a small share (see Chart 4-16).

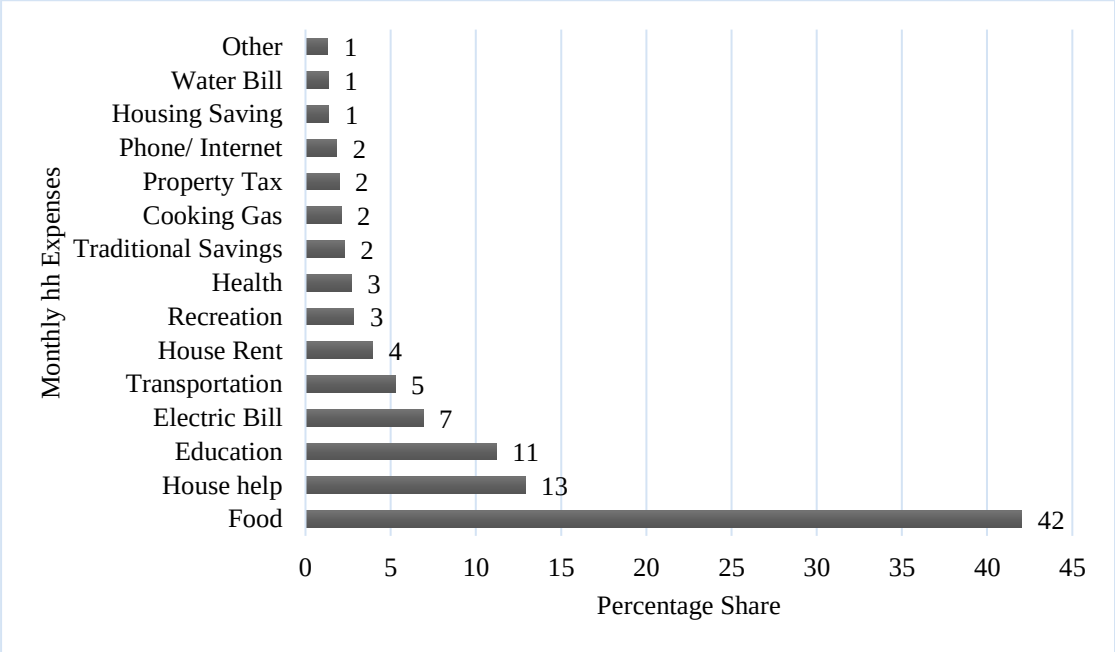


Chart 4-16 Respondents' Monthly Expenses (Percentage)
Source: Sample survey result (n= 180)

The highest expense for the farmers is the cost of health, constituting more than one-fourth of the expenditure (29%). Labour is the second largest cost (21%). Loan

payment, animal feed, and pesticide have lower expenses. The profitability of horticulture and animal husbandry is compared in terms of initial investment, operation costs, and monthly income. As summarized in the table below, the starting capital and the monthly running cost of animal husbandry are much higher than horticulture. This implies that livestock farming is capital-intensive.

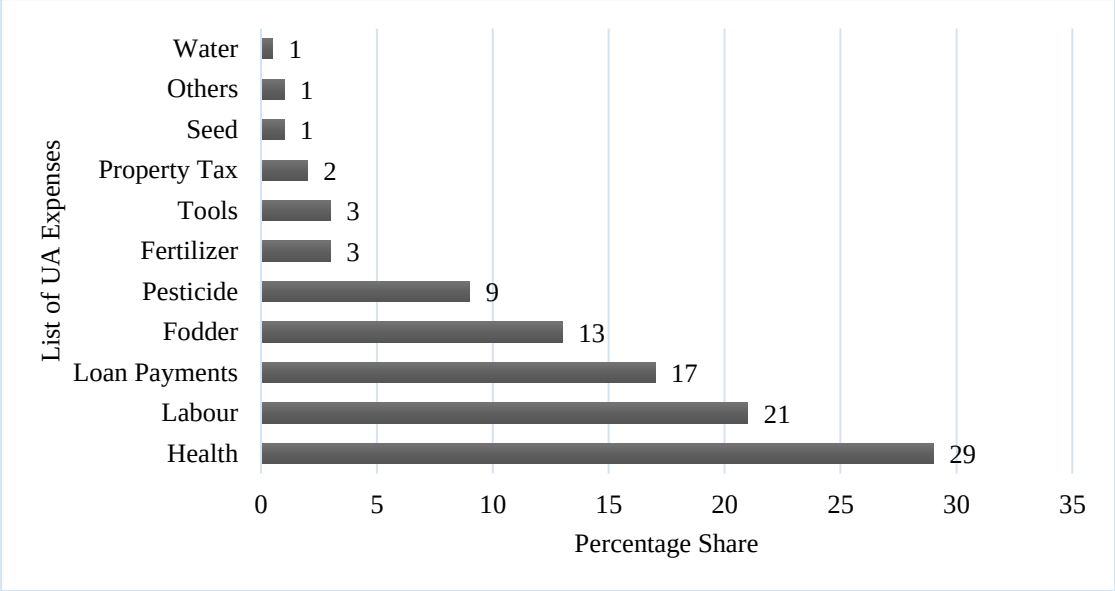


Chart 4-17 UA Expenses of the Respondents
Source: Sample survey result (n=180)

Table 4-18 Cost-Benefit Analysis of UA

Cost-Benefit	Horticulture	Animal Husbandry
Average Starting Capital	900 ETB	25,000 ETB
Average Running Cost (Monthly)	450 ETB	6,000 ETB
Average Income (Monthly)	1550 ETB	13,700 ETB
Average Yearly Profit	13,200 ETB	92,400 ETB

Source: Sample survey result (n=180)

Table 4-19 Contribution of UA to the Economic Sustainability

Economic Sustainability Indicators	Frequency (n=180)	Percentage
It reduces food costs	120	67%
It increases household income	97	54%
It increases agricultural productivity	83	46%
It increases market connectivity	49	27%
It creates employment for many	38	21%
It enables the efficient use of domestic resources	31	17%
It regulates food price inflation in the city	16	9%
It increases property value	2	1%

Source: Sample survey result

Two-thirds of the respondents have emphasized the significance of UA in reducing food costs. More than half of them have pointed to income generation (54%), while others noted that UA increases agricultural productivity (46%) and creates employment opportunities for many (21%). Although more than half of the respondents highly emphasized the positive impact of UA on food security and household income, food expenses still take the lion's share of household expenditure. The influence of UA on increasing property value and efficient use of domestic resources is minimal.

Abdi explained how neighborhoods are designed with mixed land use, incorporating various amenities and services like schools, clinics, and police stations, which also create job opportunities for residents. He also shared that the challenge faced in slum upgrading projects is that many low-income individuals need means for income generation. Previously, many residents owned shops or sold goods to neighbors, often supported financially by their community. When relocated to new areas, they struggle to sustain their livelihoods. As a result, it is common for poor households provided with condominium housing to leave their new, clean apartments, rent them out, and return to cheaper squatter settlements. Many are also deeply attached to their land and backyards, in addition to their social networks. The development has not adequately met housing demands, and farmers or urban residents who have been expropriated are often resettled in the same neighborhoods to preserve their social ties.

Esubalew explained that many displaced individuals struggle to manage government compensation, leading to financial instability. UA can significantly benefit displaced farmers by providing them with sustainable livelihoods and lowering social segregation through a mutually beneficial system with new residents. Properly integrated UA could generally support their long-term well-being. Esubalew recommends creating terrace gardens for relocated farmers to continue UA, though this idea has yet to be studied or implemented.

4.2.5. The Role of UA in the Social Sustainability of Housing

The integration of UA in housing development in the case study areas has displayed many social advantages. Both men and women practice UA. Of the 337 UA practitioners in the sample households, 196 were male (58%), and 141 were female (42%). All age groups also participate in UA. 3% were children who helped out their family, about 37% were in the youth category, 51% were adults, and 9% were elders.

The KII in the Nifas Silk Lafto Subcity, FUAO, has also revealed that people with disabilities in the city are highly encouraged and supported to practice UA. It allows them to work from the comfort of their own homes. One of the respondents was a participant in this program (See Life Story 1 (Case I), pp 76).

According to the survey, 21% of the participants have created a job for others. This shows that UA provides employment opportunities in residential neighborhoods. The laborers are mostly immigrants from rural areas who work as daily laborers or security guards.

Home ownership was predominant among the farmers in both cases. Overall, 83% of the respondents owned their housing/ residential unit. However, when it comes to the UA space, the sense of ownership of the cultivation area is very low among the Gofa Mebrat Hail condominium residents. This is due to the shared ownership of the open spaces among the residents. In case I, the majority of the residents in case I (private, kebele, and condominium residents) solely use their compound with others. UA has also improved the aesthetic value of the landscape and enhanced the recreational opportunities for the occupants.

UA has enabled the delivery of fresh local food for 93% of the participants (167 households). Plus, the food security of 133 households was improved. About 16% of the respondents mentioned that the practice of UA has expanded their knowledge regarding local food production and healthy nutrition. It has also enhanced the respondents' physical (59%), intellectual (16%), and psychological well-being (19%).

Table 4-20 Contribution of UA to Social Sustainability of the Respondents

Social Sustainability Indicators	Frequency	Percentage
It enabled the delivery of fresh food to the local population	167	93%
It improves food security	133	74%
It encouraged physical activity	106	59%
It creates recreational opportunities	77	43%
It strengthens social cohesion	59	33%
It supports gender equality	59	33%
It improves a sense of place	56	31%
It encourages youth development	52	29%
It creates employment opportunities	38	21%
It improves psychological well-being	34	19%
It expands knowledge about healthy nutrition	29	16%
It increases land ownership Opportunities	11	6%

Source: Sample survey result (n= 180)

The survey findings showed that the most recognized (93%) social significance of UA is the delivery of fresh produce to households and the local population. Similarly, 133 respondents agreed that UA ensured their food security. Over half of the participants (106) have noted that UA encouraged them to be physically active and fit. Other noteworthy significances are strengthening social cohesion (33%) and creating employment opportunities for the members of the family and others (21%). It is practiced by both men and women, which implies that UA encourages gender equality. It also provides recreational opportunities for the farmers and the local communities (43%) and promotes youth development. However, its impact on land ownership opportunities and the expansion of knowledge regarding healthy nutrition was minimal.

A cohesive society is interconnected in various ways, especially in low-income communities where social bonds are strong. Sustainable neighborhoods must maintain these social connections. According to Abdi, recent slum upgrading and renewal projects have relocated residents to different condominium sites, disrupting social institutions like Iqub and Eder, which are important Ethiopian cultural and financial systems. Displaced individuals have reported feelings of loneliness and difficulty in building social cohesion in their new neighborhoods, leading to diminished ownership and increased safety issues, such as youth intoxication and robbery. Maintaining social norms that promote peace and security is crucial, and these aspects are considered in the LDP and NDP. Therefore, for new housing developments, it is preferable to avoid expropriating densely populated urban areas. Instead, areas that are less densely populated and face less resistance, such as farmers' properties, are targeted. The social bonds in inner-city communities are very strong, enhancing the quality of life.

4.6. Challenges of Urban Agriculture in Residential Areas

The respondents have mentioned several limitations and problems that hinder the effective implementation and sustainability of their UA practice in their neighborhood. 84% of the respondents stated that the supply of clean water is their most significant limitation. 28% have space limitations, and 20% face capital and credit supply issues. More than half of the respondents (54%) also mentioned that bad smells and environmental pollution are the risks associated with UA integration in their neighborhood.

Table 4-21 Challenges associated with UA

Questions		Frequency (n=180)	Percentage
Limitations	Clean Water Supply	151	84%
	Lack of Sufficient Land	50	28%
	Lack of Capital & Credit Supply	36	20%
	Lack of Training	20	11%
	Extension Service Problem	4	2%
	Temporary Tenure System	4	2%
Problems	None	50	28%
	Bad Smell	97	54%
	Environmental Pollution	92	51%
	Water Pollution	29	16%
	Noise Pollution	2	1%
Health risks	Yes, I had health problems	9	5%
	No, I never faced health risks	171	95%

Source: Sample survey result

The survey also asked if they had faced any health risks related to UA. Only 5% had health issues related to the practice. A chi-square test of independence was conducted to examine the relationship between recycling resources, such as greywater use and composting, and the occurrence of health problems among household members engaged in UA. The associations were not statistically significant; the Chi-Square p-values are 0.91 for greywater use and 0.93 for composting. These values indicate that households recycling their household waste did not report health issues at rates significantly different from those who do not.

The idea of mixing UA in future housing developments was also introduced to the respondents and key informants to gather feedback and recommendations. Almost all urban farmers (97%) agreed that UA can be integrated with future housing developments in Addis Ababa if existing problems and limitations are addressed. Most participants emphasized that horticulture should be considered a permanent component of Addis Ababa housing developments. Only 3% of the respondents disagreed that certain types of UA, such as poultry and livestock keeping, should be restricted from neighborhoods because of the potential health and environmental risks they pose.

Table 4-22 Integration of UA into Future Housing Developments in Addis Ababa

Questions	Frequency (n=180)	Percentage
Yes, it can be integrated	175	97%

Mixing UA and housing in Addis Ababa	No, UA should not be mixed with housing.	5	3%

Source: Sample survey result

Mr. Birhan discussed that while horticulture is easier to integrate into housing developments, livestock keeping faces more regulatory challenges. *Mrs. Aberash* added that animal husbandry requires larger plots and initial investment, leading to challenges with local authorities regarding permits for animal sheds. The office is still working to facilitate the issuance of these permits.

When asked about these challenges, *Esubalew* highlighted that many farmers with animal shed permits have converted the sheds into rental units or additional rooms for their families. This issue affects both private households and condominium residents, who often attempt to develop their green areas without obtaining proper authorization. In response to these challenges, Esubalew suggests that his office design greenhouses for horticulture, although the appropriate integration of animal husbandry with residential developments remains unaddressed. Another challenge mentioned by the expert regarding animal husbandry was the hygiene and safety issues that come with keeping animals. The lack of proper waste management systems in some farms has led to environmental pollution, which is why implementing effective sanitation protocols is necessary to mitigate these risks.

Dr. Asnakech noted that UA has historically been a vital source of vegetables for city residents but has faced significant decline due to issues like lack of space, inadequate support, and pollution from irrigation water. When describing the UA practices in residential neighborhoods, she said it is underutilized, primarily focusing on herbal plants due to limited resources. She also highlighted the challenge of land scarcity and urban resources, such as water, which has led many UA initiatives to occur near polluted riverbanks.

While he does not know if there are projects integrating UA into housing development plans, Haile noted that horticulture could be practiced in green areas. However, integrating animal husbandry, particularly livestock, poses challenges due to the need for large spaces, a high water supply, and proper waste management. The limited availability of land and water makes this difficult, although poultry farming could be feasible with vertical construction. According to Haile, incorporating poultry farming

into condominium projects is simpler than livestock keeping, which requires significant investment and resources.

Some households utilize biogas technology to convert human waste and animal manure into a source of energy. Since the system requires a high initial investment and significant amounts of organic waste and manure, it is not adopted by many households. Similarly, households do not practice composting due to space limitations, a lack of knowledge, and the need for a garden. However, in condominiums, composting can be done using medium-sized plastic containers, and plastic bottles can be repurposed as planters.

4.7. Legal Frameworks Influencing the Integration of UA in Housing Development of Addis Ababa

The 1948 Universal Declaration of Human Rights and the 1966 International Covenant on Economic, Social, and Cultural Rights were signed by Ethiopia; therefore, they are considered part of the law of the land. Both agreements recognize everyone's right to an adequate standard of living, including food, clothing, and housing. The 1995 constitution under Article 90(1) granted citizens the right to housing, food, and other basic needs. However, land remained under state and public ownership, even though the government could expropriate land for public purposes with advance compensation.

The Urban Lands Lease Holding Proclamation No. 80/1993, in its Article 13, stated that the government may grant urban land freely or without public tendering to be utilized for social service establishments, investments that the Government supports, or other uses that directly benefit the public (The Transitional Government of Ethiopia 1993). It also indicated that the lease holding period for UA was 50-90 years; however, this was reduced to 15 years by the Re-enactment of the Urban Lease Holding Proclamation No. 272/2002 (FDRE 2002). In the latter document, it gives a ceiling of 5 years for the lease period to economic and social development activities planned to be invested in urban lands not designated for use within a short period, which may be renewed for the same period where it is necessary. The short lease periods discourage long-term investments and planning by urban farmers, as they cannot be assured of their land for extended periods.

Land conversion for large-scale housing resulted in the displacement of farmers. Urban Lands Lease Holding Proclamation No. 721/2011 discussed the entitlement of the

people displaced due to urban renewal programs in Article 12, sub-articles 3 and 4 (FDRE 2011). The farmers had to receive training and other assistance that would aid in their transition to urban livelihoods, plus a substitute land, no less than 150 square meters, and no more than 500 square meters, depending on the size of their expropriated farmland (MoUDC 2011). However, this did not guarantee the continuation of UA.

Although there are areas designated particularly for UA in the city's recent land use maps, there have been two opposing viewpoints on the land usage for UA. The first one is a traditional view that sees UA as a transient activity that occurs until it is supplanted by other "more urban" purposes, and the second view claims UA as a permanent land use (AACPPO 2017). As many land holdings were anticipated to remain unoccupied for a long time, the Urban Agriculture Strategy document recommended that these sites be utilized for permanent or temporary UA development that is in line with local requirements (MoUDC 2016a). This strategy also implied open spaces, riverbanks, schools, institutes of higher learning, colleges, jails, hospitals, condominiums, government offices, non-governmental organizations, military camps, parks, recreation areas, expansion areas, and private and public catchments (MoUDC 2016a).

Supporting this the recent structure plan document supported the idea for UA to be temporarily practiced in areas designated for other uses, such as 'special land use', 'reserved,' 'protected' (with chemical use restrictions), and 'social service' areas designated for education, health, sports fields, and government institutions; and in residential areas designated in the Structure Plan (AACPPO 2017). Although these are positive initiatives, there is a gap in implementation and the measures are temporary and do not sustain UA in the city.

Findings from the field observation in Gelan, Genet Menafesha, Bole Bulbula, Jemo I, Jemo II, Summit, Bole Arabsa, and Yeka Abado condominium sites revealed that the community green areas and open spaces have been used as a construction material storage area, waste disposal area, market, and parking area.

No one is allowed to enclose and use any parcel of land that is near their legitimately owned property without the proper authorization, even if it is for UA (FDRE 2002). UA does not require a permit if it occurs on the private property of households, unless surplus goods are sold (MoUDC 2019). Therefore, it is essential to integrate agriculture

and community gardens into other projects to combat poverty, boost the local economy, create jobs, and support urban youth initiatives (BoTID 2013).

Figure 4-26 Green areas and open spaces in condominium sites that are being used as parking, market, and storage areas

Figure 4-27 Designated Green Areas in Various Condominium Sites

4.8. Discussion

The Practice of Urban Agriculture in Residential Areas

The demographic characteristics of the farmers are an essential aspect that shaped the practice of UA in housing developments in the case study areas. According to the survey findings, the average household size was 5, with an average of two members actively engaging in UA, implying that a nuclear family type is predominant in both cases. The majority of practitioners are mainly within the working age range of 30-65 (52%).

The gendered dynamics of UA is multifaceted. Women's dominance over UA is linked to subsistence, and men's involvement is higher in market-oriented activities (Ambrose-Oji 2009). Survey results show 60% of UA practitioners are men, and a notable proportion of women are involved in watering, planting, and garden management. A study by Alemu, et al. (2024) and FAO (2007) also shows that women or spouses take care of most of the production and management activities in small-scale farms, and children usually help their parents. This aligns with a study by Habtemariam et al. (2018) regarding women's key involvement in UA activities such as selling their produce.

Notably, many farmers (97%) had employment outside of UA, especially in the private sector (40%). A recent study also described UA as a part-time occupation (FAO, Rikolto and RUAF 2022). Some benefit from the additional income and the fresh food they produce in their backyard.

Few have taken UA-related training. Eight percent hold their Bachelor's and Master's degrees in agriculture or veterinary medicine, in both cases. In contrast, others have taken courses related to animal husbandry, horticulture, drip irrigation, and composting, some of which are often offered by their Woreda FUAO. Even though the majority of households did not have any formal education related to UA, they possessed agricultural skills from other sources, such as family, peers, or online platforms. This illustrated the gap between formal training in UA and engagement, as well as the vital role of community-based knowledge in sustaining UA in the neighborhoods. While the benefits of transferring local knowledge are many, there is little opportunity to pursue a more productive and sustainable approach to UA using new technologies. The level of education is also positively correlated with income generation and investment decisions in UA (Mougeot, Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture 2005).

UA was mainly practiced for household consumption (79% or 142 households), with only 21% (38 households) selling surplus produce. According to the AAFUADC, households raising less than 50 chickens are typically considered self-consumption producers, while those who own 50 or more are regarded as commercial poultry farmers. Based on this, 20% of the farmers in Case II were commercial farmers, while the rest kept chickens for self-consumption.

Land ownership has an impact on engagement in UA. 80% of the practitioners owned their homes, which is similar to the findings from a study done on Mekanissa-Gofa-Saris Vegetable Farmers' Cooperative (Habtemariam, et al. 2018). The average plot sizes differed by housing type- 37 sqm to 80 sqm for condominiums and 75 sqm to -1,240 sqm for the others. Most residents had lived in their neighborhoods for several years, often starting UA shortly after moving in.

The survey result showed that more than half of the households exclusively use their compound, while others share spaces like green areas, kitchens, and toilets, and resources like water. Access to municipal tap water was irregular in all four neighborhoods. Many of the respondents receive municipal tap water only once or twice a week. In addition, the majority of households use open ditches or the street for sewage disposal, which highlights the need for improved infrastructure to support water recycling for UA.

Horticulture is the dominant type of UA in the neighborhood rather than animal husbandry because it demands less capital and operational costs associated with it. Most of the respondents (89%) are engaged in horticulture, cultivating vegetables, fruits, and herbs mainly for household consumption (76%). There are diverse crops, and the commonly grown plants include fast-growing leafy vegetables (e.g., Swiss chard, lettuce, kale) and a variety of herbs and medicinal plants. The production of root vegetables such as carrots, onions, garlic, and potatoes was relatively low; this could be due to the longer time they take to harvest. Moreover, fruit production is limited, with avocados and bananas being the most popular. Despite the challenges of water scarcity, many households utilized traditional farming methods, with some engaging in innovative practices like rainwater harvesting.

Poultry is the most common form of animal husbandry in the neighborhoods, followed by dairy farming. This is because of the small plot size and the initial capital required

to run. The profitability analysis indicated that animal husbandry is more capital-intensive than horticulture, yet it offers higher potential income. This disparity underscores the economic viability of different agricultural practices. Eventhough two-thirds of the respondents have revealed that UA significantly reduces their food costs, the financial analysis still showed that the average monthly household expenses were substantial, with food being the most significant expenditure (42%).

The survey indicated a lack of adequate support for UA, with most farmers receiving only input supplies. Monitoring of UA practices was limited, emphasizing the need for better oversight and support systems to enhance the sustainability of urban agriculture initiatives. Respondents identified a clean water supply as the most significant limitation to effective UA, followed by insufficient land and capital. Environmental concerns, such as pollution and bad odors from waste disposal, also pose challenges. Despite these issues, a vast majority of farmers expressed interest in integrating UA with future housing developments, provided that existing limitations are addressed.

The proximity of land to residential areas, along with other aspects, is an essential factor in determining how UA is practiced. Residents on the ground floor were more likely to use grey water for UA and to practice UA year-round. Another factor is the size of the UA space and the socio-economic background.

Mr. Zerubabel, a key informant who works at the *AAFUADC*, clarified common misconceptions about the space required for UA. He emphasized that UA is different from traditional crop production and does not require large tracts of land. Instead, it is small-scale farming conducted within urban areas for income generation or self-consumption. For example, households with fewer than 50 chickens are typically engaged in self-consumption, while those cultivating over 250 square meters should consider commercial farming.

Multiple Functions of UA in the Case Studies

The local production of food in residential areas significantly reduces the embodied energy that results from inputs, transportation, and packaging (Lovell 2010). However, many inputs, such as animal feed and soil, are sourced from outside the neighborhood or city. Only 8% of the animal keepers and 31% of the horticulture farmers produce their feed and fertilizer. Moreover, the seeds provided by the woreda are also imported from outside the country. Although these are necessary to sustain UA, they increase the

embodied energy of the food produced. Therefore, local input production in the neighborhoods has to be encouraged.

Organic waste collected from households in Addis Ababa is either sent to the Repi Waste-to-Energy Plant or used to create compost. There are composting cooperatives (one in each subcity) and numerous reuse cooperatives organized by the woreda Sanitation Office in the Nifas Silk Lafto Sub City. These cooperatives, typically consisting of 5 to 10 members, collect organic waste to produce compost suitable for UA. These sanitation cooperatives receive assistance from the government and organizations like UNDP, and local farmers also purchase compost, especially during the rainy season. The government supports these cooperatives by purchasing their compost, which is then used for UA and green development, particularly in new riverside projects. The Repi Waste-to-Energy Plant buys organic waste from collectors at 0.70 ETB per kilogram, though the energy produced is not sufficient to meet the demands of the entire city.

Household waste is composed of approximately 70% organic matter, and training is provided by the Sanitation Office at the Sub City to help households create compost. Inorganic fertilizers are significantly more expensive, costing ten times more than the organic compost sold by cooperatives. Selling compost has proven to be a profitable venture; however, the composting and sorting sites are temporary and may be expropriated at any time.

In the *Department of Sanitation* in every Sub City in Addis Ababa, there is an *Awareness and Community Participation Division* that focuses on sorting, minimizing, and reusing waste. The office, sponsored by various investors who provide sanitary equipment such as brooms and wheelbarrows, gives door-to-door training on recycling and waste reuse as per the Solid Waste Management Regulation No. 100/2018. Plastic bottles and water containers are being used for vertical gardening in the case area. The application of compost in households is still a challenge because there is a lack of awareness, and many families struggle to sort their waste due to a lack of two separate waste bags; however, efforts to connect compost cooperatives with farmers are underway. In the two case studies, a few households (31%) compost organic waste, while others purchase fertilizers. Only 4% of households use biogas technology to generate energy for cooking. Many of the condominium households use stormwater for

cultivation, only a few harvest rainwater from broken downpipes. According to Habtemariam et al. (2018), it is prohibited to modify downpipes for water harvesting.

Few recycle their grey water for UA. According to Gelila Tesfaye (2020), around 10.42 liters of greywater is produced per person in residential areas, where 8.56 liters of it can be used for toilet flushing, and 1.86 liters of water remains for other purposes, such as UA. Another study done by Tsion Adugna in 2019 showed that 84.1% of the entire waste generated in housing areas is organic waste that can be composted (Adugna 2019). If organic solid waste is separated at the source (by providing a garbage chute), recycled, composted, and added to the green space of condominiums, it will have a substantial positive impact on both the environment and the residents (Adugna 2019).

Even if there are concerns about possible health risks associated with reusing greywater in UA, this study found no statistical evidence of such problems in the sampled communities. The lack of association ($p = 0.91$) suggests that greywater consumption is not associated with a higher incidence of reported health concerns. This could indicate that only less-contaminated sources of greywater are being used for UA. This result does not mean that using greywater is risk-free because the study did not evaluate water quality or hygiene procedures. The WHO (2006) has provided health protection measures that can be adopted in this context.

The potential of UA to close the nutrient loops in neighborhoods is limited. The lack of resource recycling in the neighborhood has led most households to practice seasonal farming. The study also showed that farmers who have been recycling their greywater usually live close to their farm plot. So, the distance between housing and farm sites has an impact on the reuse of grey water for irrigation. Other households that do not recycle grey water either wait for the rainy season or struggle to water the plants, as their plants wilt because of a lack of water. On the other hand, river-side vegetable farmer cooperatives have the advantage of year-round access to irrigation water.

The survey findings showed that only 37% of the respondents were able to increase the population of birds and pollinating insects, such as bees and butterflies, because of UA. This could be due to limited flowering plants and trees in their neighborhoods. Moreover, residents also plant Kale, Swiss Chard, and Lettuce, which are perishable produce that do not attract pollinators. Many of the respondents also stated that UA has improved their outdoor environment, reduced air pollution and carbon emissions, and

contributed to neighborhood greening. Half of the respondents confirm that UA enhanced the aesthetics and provided them the opportunity to exercise and relax.

Commercial farmers constitute 21% of the respondents. They provide fresh food for the local markets at a reasonable price, contributing to the local economy. The lower number of commercial farmers could be due to warning notifications and media coverage of contamination of riverbank-cultivated vegetables, which eventually reduced the marketability of the goods and risked the livelihoods of farming communities (Habtemariam, et al. 2018). Most of these farmers employed people, mostly migrants from the countryside. 34% of the respondents agreed that UA creates employment opportunities for many, while 29% stated that it promotes youth development. The potential of UA to provide a circular economy through market linkages between horticulture producers, livestock and poultry farmers, and compost cooperatives has not been fully realized yet. Respondents also shared the need for better market linkages and supply chain connections.

UA fostered social interaction for 43% of the households. Sharing produce and manure strengthened social ties, and the tradition of exchanging herbal medicines built the community's resilience. It also provided three-fourths of the respondents with fresh food and increased physical activity, especially among retirees and housewives. However, there is a lack of community programs or initiatives centered at UA.

Sharing medicinal plants has helped preserve cultural heritage and local knowledge about herbal medicines. Most farmers have inherited their agricultural skills from their families. This highlights the cultural role of UA in transferring and preserving local knowledge. Very few individuals had formal education related to UA, underscoring the need to bridge the gap between traditional and institutional knowledge systems.

Challenges of UA

KII with government officials revealed a shared understanding of the sustainability of housing and neighborhood development. All participants have emphasized the need to balance social, economic, and environmental dimensions, though each of them had unique interpretations of sustainability. The urban planners and housing development professionals highlighted the various efforts to incorporate UA into NDPs as a strategy to enhance sustainability; however, there are challenges in implementation. UA development professionals highlighted the improvements in support and resources,

even though there are ongoing challenges related to land permits and investment needs. Unreliable tenure status is one of the reasons urban farmers are unable to access formal bank credit and insurance (Habtemariam, et al. 2018).

Additionally, the sanitation departments have discussed the role of composting cooperatives in recycling organic solid waste and producing compost for the local farmers. The overall findings from KII emphasized UA's potential to contribute to sustainable neighborhoods in Addis Ababa, as well as the need for improved integration, policy support, and community engagement.

Interviews with key informants in the case study area highlighted individual experiences within the UA, their successful practices, and challenges, such as water scarcity and soil quality. Their stories underscore the resilience of urban farmers and the community's commitment to sustainable agricultural practices despite facing significant obstacles. Overall, the findings illustrate the multifaceted benefits and challenges of UA, emphasizing its potential for enhancing food security, economic stability, and community cohesion in urban settings.

Legal and Policy Frameworks governing the Integration of Housing and UA

Ethiopia recognized the right to an adequate standard of living by granting citizens the right to housing and food. Land, however, remains under state ownership; therefore, the government may expropriate it for public purposes with compensation. Notably, the lease period for UA has drastically reduced from 50-90 years to a maximum of 15 years, and this discourages long-term investment in UA. Moreover, competing land uses and urban sprawl further marginalized agricultural activities. Insufficient institutional support also led to fragmented policies that do not effectively promote UA. The negative perceptions of UA as a rural activity also hindered its development in Addis Ababa. The Urban Lands Lease Holding Proclamation No. 721/2011 has addressed the displacement of farmers due to urban renewal projects, encouraging affected farmers to receive training and compensation. However, these efforts did not encourage the continuation of agricultural practices in the city. Inadequate infrastructure and resources, particularly in water supply and waste management, present additional challenges that limit the viability of UA.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The survey findings suggest that household dynamics, education, and UA-related training are essential factors shaping UA. About 40% of the household members are actively engaged in the production and processing of UA. There is a gap between formal training in UA and engagement, since only 7% of the respondents have taken UA-related training. It also shows the vital role of community-based knowledge in sustaining UA in the neighborhoods. UA is also practiced for family consumption, since Many of the respondents practice UA for household consumption (79% of horticulture producers and 20% of the animal keepers).

Homeownership and plot size are factor that impacts the practice of UA in residential developments. About 83% of the respondents own their land/ housing unit, and more than half use their property exclusively. Residents with larger plots are encouraged to practice animal husbandry. Even though woreda administrators have been supporting the practice of both horticulture and poultry in condominium housing as part of their sustainable neighborhood scheme, only horticulture thrived, because of challenges of community acceptance due to its potential risks.

The marked horticulture activities expose the degree of flexibility that households demonstrate in resource use, although their potential is drastically undermined by a lack of access to water, infrastructure, and market systems. Biodiversity conservation, waste, and energy conservation through UA, as well as greywater and rainwater harvesting, still have a long way to go in being implemented. However, UA fosters social cohesion and revitalizes the economy. It also helps reduce household expenses, provides local employment, helps access fresh produce, and educates people about food and the environment. Nonetheless, UA professionals are needed in the institutional structures of housing development offices for the success of UA integration and productivity.

UA does not need large land areas as it includes small-scale farming for self-consumption or income generation; however, since vertical gardening has not been widely practiced, it limits the number of species grown in residential areas. Through

the AAFUADC, urban farmers are provided with better access to inputs and resources like funding, essential training, and technical support.

While animal husbandry poses some issues with getting permits from the local authorities, horticulture is easier to implement. There are several attempts to create a circular economy where waste from UA is used for making compost and biogas. UA enhanced the beauty of urban areas, improved food security, aided the employment landscape, and helped marginalized people. Planners are advised to include UA within housing and urban plans to create self-sustaining communities. Without proper hygiene practices in place, farms, especially animal farms, can increase pollution and cause foul odors.

The combination of international human rights obligations, national laws, and specific UA policies informs the incorporation of UA into the housing policies of Addis Ababa. These frameworks together respond to the state urban policy on urban development, food security, and farmers' rights, which contributes to the complex nature of urban planning that seeks to bridge the gap between housing and UA. Even with the policy provisions on the right to adequate housing and food, the prevailing land tenure system and short leasehold periods stifle UA investments. Fragmented policies, along with urban expansion, negative attitudes towards UA, and inadequate support services further escalate the marginalization of UA activities. On the other hand, the determination and strong sense of optimism to implement sustainable practices among the practitioners is notable because a good number rely on informal knowledge and family labor systems.

The KII results suggest that the incorporation of UA within the spatial planning and design of neighborhoods in Addis Ababa is fundamental for achieving social, economic, and environmental sustainability. There is a common understanding of sustainability among the respondents that captures the three dimensions, but they noted specific gaps in the integration of UA into housing planning. These barriers are classified as institutional, legal, and infrastructural. Policies have not sufficiently addressed the need for essential infrastructure, such as water supply and waste management systems, which are critical for the viability of UA. Addressing these barriers is necessary for promoting sustainable urban development and enhancing food security in the city.

UA does not require a permit if practiced on private property, but permits are needed for selling surplus goods. Moreover, the recent UA Strategy and Structure Plan encourages utilizing unoccupied land for agricultural development, including various public open spaces in residential neighborhoods. Site reconnaissance has shown that community green areas are being misused for construction material storage, waste disposal, and informal settlements, which undermines the agricultural potential of the sites.

5.2. Recommendations

This study reveals that, despite the unique opportunities that UA offers to enhance housing sustainability, significant barriers, including resource gaps, regulations, and a lack of implementation, arise when incorporating UA. The following recommendations are designed to achieve the research objectives and are based on the findings of the household surveys and key informant interviews conducted during the study.

Recommendation on the Practice of UA in the Case Study Areas: To ensure year-round food production in condominium neighborhoods, it is essential to address water scarcity. Subsidized, low-cost rainwater harvesting tanks and greywater recycling systems, provided through community cooperatives or microfinance institutions, can guarantee a reliable water supply for UA activities.

The distance between the UA land and the housing units can significantly impact the seasonality of UA practice; therefore, it is recommended to bring the food production close to the farmer's residence through vertical gardening or container gardening on balconies.

New neighborhood development schemes are converting UA spaces into children's playgrounds, parking, and community gathering areas, discouraging community farming activities. Urban Planners should consider UA as a permanent land use and encourage its integration into other neighborhood activities to enhance sustainability by incorporating multifunctional spaces that combine food production, recreation, and waste recycling. It is also vital to encourage vertical gardening to reduce over-reliance on horizontal ground space and improve species diversity.

To resolve the issue related to the community resistance, the FUAO should create awareness among residents and properly train UA practitioners in the safe and hygienic

practice of poultry before integrating it with condominium neighborhoods. The office should also facilitate the development of neighborhood markets and mobile vending platforms to enable urban farmers to sell surplus produce locally and sustainably. FUAO Extension workers ought to regularly monitor the sustainability, productivity, hygiene, and other aspects of UA in the neighborhoods

Recommendations for the Integration of UA in Residential Neighborhoods: Housing Development Offices should facilitate the coordination of UA activities by designating specific units within the housing development offices for UA. Plus, it is recommended to shift away from just locating vacant sites for the AAFUADC towards the active designing of neighborhood patterns that enable sustainable UA. The issues with the permit process for renovating animal shelters should also be addressed.

Housing typologies in new developments should incorporate UA-friendly designs that accommodate flat roofs for roof gardening, large balconies for container gardening, designated composting areas, rainwater harvesting, and greywater recycling systems that use natural plant-based purification or keyhole gardening techniques. UA should be used as a platform for neighborhood socialization, health promotion, and community resilience building. It can also preserve indigenous agricultural knowledge and community traditions, if its cultural significance is appropriately recognized.

The housing development office should consider integrating animal husbandry, such as poultry, fishery, and beekeeping, in housing designs, particularly as part of roof-based systems, by adopting international best practices in Zero Acreage Farming that include hydroponics, aquaponics, chicken coops, and beehives on rooftops, which maximizes productivity without expanding land use. Moreover, incentivizing sustainable housing projects that integrate sustainable UA technologies is highly recommended.

Urban Planners should consider UA as a permanent component of neighborhoods to enhance sustainability. Incorporating multifunctional urban spaces that combine food production, recreation, and waste recycling within residential neighborhoods is also recommended to offset the loss of productive land use.

To enhance the sustainable practice of UA in the neighborhood, UA experts should (1) bridge the gap between institutional knowledge and traditional practices through community-based training programs and knowledge-sharing platforms; (2) foster inclusive participation across all age groups and genders in UA initiatives, with special

programs for youth, the elderly, and women; (3) provide regular, accessible training on sustainable UA practices, including vertical farming, composting, greywater reuse, and integrated farming systems that incorporates sustainable UA technologies, (4) set up neighborhood-scale compost cooperatives that support both individual farmers and local greening efforts; (5) encourage and incentivize rainwater harvesting and greywater recycling systems for agricultural use; (6) encourage vertical gardening to relieve the over-reliance on ground horizontal space and improve species diversity, especially when there is limited plot size; (7) strengthen market linkages between horticulture producers, animal keepers, and compost cooperatives to enhance local food systems and minimize food miles; and (8) support the development of neighborhood marketplaces and mobile vendors to boost access and income for urban farmers.

Regulatory and Policy Recommendations: Many housing professionals during KII indicate an intention to adopt UA if a proper guideline is established for the integration and long-term investments of UA in residential neighborhoods. Delegating the housing development offices- the design and regulation of residential greenhouses and animal sheds can facilitate the safe and lawful incorporation of UA into housing developments. Circular urban metabolism should be promoted by encouraging resource loops (e.g., waste-to-compost, water reuse) to reduce urban ecological footprints.

Future Research Directions

The study highlights a few crucial areas for future research to enhance the sustainability of housing and neighborhoods through UA in Addis Ababa. Some of the research recommendations include (1) formulating housing policies for incorporating UA within housing developments, (2) developing high-rise urban farming innovations for real estate developments, (3) conducting an in-depth study of UA's role in circular economy concepts as well as other UA functions including economic revitalization, social cohesion, health, energy conservation, waste management, and so on. The investment rationale for integrating different forms of UA, as well as SMART UA technologies (hydroponics and aquaponics) in residential neighborhoods, should also be studied. It is also important to create contextualized indicators of sustainability that represent Addis Ababa's socio-economic and environmental realities and inform UA–housing integrated planning.

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APPENDICES

Appendix A: Publishable Manuscript

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Assessing the Integration of Urban Agriculture in Housing Developments of Addis Ababa to Enhance Sustainability: *The Case of Two Neighborhoods in Gofa Area*

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Abstract

Rapid urbanization in Addis Ababa has caused an ever-increasing demand for housing and food. Expropriating agricultural land for residential developments in the city has resulted in the loss of a productive landscape and increased food insecurity. The Addis Ababa City Administration has shown interest in urban agriculture (UA) as a tool for sustainable development by encouraging citizens to start farming inside their residences. This study aimed to investigate the practice, impact, and sustainability of UA in residential developments in Addis Ababa, employing a mixed-methods research approach. A case study method was used to assess the practice of UA among 180 farmers in the Gofa neighborhood. Socially, UA promoted food security, employment, social interaction, health, recreation, and inclusion of marginalized groups. Economically, it generated diversified income and lowered the cost of food. Environmentally, it prevented pollution, infiltrated rainwater, and minimized waste. While horticulture thrived in residential areas, insufficient access to tap water and the lack of alternative water sources, such as greywater, have limited year-round production. Animal husbandry faces challenges in obtaining permits, accessing affordable animal feed, and community acceptance due to its potential risks. The lack of integrated housing and infrastructural planning approaches has undermined the multifunctionality of UA, leading to a missed opportunity for circular urban metabolism. Despite the stakeholders' common understanding of the significance of UA, the integration of UA in housing has been hindered by legal and institutional barriers. To realize the multiple functions of UA, cross-sectoral collaboration, policy reforms, and sustainable infrastructural investments are recommended.

***Keywords**: Sustainability, Housing, Neighborhood, Urban Agriculture*

INTRODUCTION

The 21st century is known as the "Urban Century" since more than half of the world's population (4.4 billion people) now resides in urban areas (Martin-Moreau and Ménascé 2019, World Bank 2025). Due to rapid urbanization and high population growth, cities face the pressing challenge of expanding their infrastructure and services to meet the demands for food, housing, and other amenities (Lu and Grundy 2017, World Bank 2025). It was anticipated that in 2023, between 713 and 757 million people worldwide would face hunger, and among these people, more than 20% lived in Africa (FAO, IFAD, UNICEF, WFP and WHO 2024). Similarly, the lack of affordable housing in cities has left 100 million people homeless and one in four people living in slums (UN-Habitat 2024a). According to the United Nations Department of Economic and Social Affairs (UN DESA) (2025), 40% of the global population will demand decent and affordable housing by 2030, necessitating the daily construction of 96,000 new affordable dwelling units (UN-Habitat 2024a).

Cities have been prioritizing land for housing and industrial developments, often rezoning farmlands (Zeeuw and Drechsel 2015). Although this approach is essential in addressing the ever-increasing housing needs, it has also led to the loss of valuable farmlands, which were once considered a key part of urban life, and exacerbated the challenges of food security and urban sustainability (James 2013, Pauleit, El Wafa and Pribadi 2019, Dobele and Zvirbule 2020).

Urban agriculture (hereafter UA) has been a major source of income and a vital means of survival in

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cities (Deelstra and Girardet 2000); however, the fierce competition for scarce urban resources has hindered agricultural activities in numerous cities (Deelstra and Girardet 2000, FAO, Rikolto and RUAF 2022). On the other hand, cities like Havana and Rosario adapted UA into their urban development policies to enhance resilience when faced with different shocks and stresses like wars, pandemics, and climate change (FAO 2007, Ackerman, et al. 2012, Haas 2017, Drescher 2000, Mbiba and Veenhuizen(Ed.) 2001, UN DESA 2025).

Local food production has become a critical factor in the success and sustainability of future cities because nearly 80% of the world's food consumption is projected to occur in urban areas in 2050 (Haas 2017, Martin-Moreau and Ménascé 2019). Architects and urban planners in several cities have also started recognizing the multifunctional roles of UA in addition to food production, such as economic development, health, environmental management, and social development in addition to its production function (FAO 2007, Proksch 2017). Multifunctional urban spaces that integrate UA not only promote efficient land use but also help preserve the productive nature of urban landscapes while meeting broader planning objectives (Zeeuw and Drechsel 2015).

Residential areas offered ideal conditions for UA integration by incorporating individual and communal gardens into public housing and slum upgrading projects (Veenhuizen 2006, FAO 2007). This is due to the availability of organic waste and wastewater that can be repurposed for nutrient recycling and irrigation (Renting, et al. 2013). When appropriately planned, housing developments can support UA and get social, economic, and environmental benefits (FAO 2007, Dvorak and Ali 2016).

In Ethiopia, however, UA had been neglected and considered a less important activity in terms of its contribution to the urban economy and the sustainable use and protection of natural resources (BoTID 2013). Despite the hostility and the lack of defined norms and laws, it has long been conducted on plots and off-plots of urban areas (BoTID 2013). In Addis Ababa, the capital city of Ethiopia, UA has been a permanent component of the riverfront landscape in the inner city as well as expansion areas, stabilizing the price of vegetables and horticultural goods (Teshome and Abate 2020). Over half of the city's field crops and 70% of its vegetable production were used for home use, contributing to a well-balanced diet (Pauleit, El Wafa and Pribadi 2019). UA was marginalized (BoTID 2013, Gebremichael, et al. 2014, Pauleit, El Wafa and Pribadi 2019) because of land tenure insecurity, weak institutional coordination, limited integration into urban planning, and fierce competition for land and other urban resources (Marshall, et al. 2009, Tilahun Dires, et al. 2021, MUDHCo 2014, Pauleit, El Wafa and Pribadi 2019, Gebremichael, et al. 2014). According to the report by the Addis Ababa City Government, Farmers and Urban Agriculture Development Commission (AAFUADC), more than 138,000 producers were engaged in UA producing various plant and animal-based food products in the city in 2021.

Rapid urbanization driven by high population growth and rural-to-urban migration in Addis Ababa has resulted in acute housing shortages, urban sprawl, and the alarming loss of valuable agricultural land. In response to the housing issue, the city prioritized mass housing development (Delz 2014); however, these projects have come at the cost of valuable agricultural land and open spaces (UN-Habitat 2011a), and in some cases, without adequate environmental consideration (Berhanu 2019). Large-scale mass housing schemes, such as the Integrated Housing Development Programme (IHDP), have contributed to significant land use changes, and the conversion of previously permeable agricultural lands into impervious urban surfaces has intensified issues such as flooding, as seen in the case of the Jemo I Condominium project (AACPPO 2017, Berhanu 2019).

Between 2006 and 2011, the Addis Ababa lost 24% of its agricultural land to urban expansion, while housing development increased by 8.5% (multistory buildings increased by 170% and single-story houses increased by 43%) (Woldegerima, Yeshitela and Lindley 2016). Recent studies also confirmed that the rate of loss of farmland is spiking (Badasa and Obsi 2021, Alemu, et al. 2024). According to Addis Ababa Housing Development and Administration Bureau (AAHDAB) (2022), the city intends to build two million housing units over the next decade, primarily through government initiation and private sector investments. As a result, a significant amount of agricultural land is expected to be converted into residential areas (MoUI 2022). This transformation features troubling imbalances between accommodating the housing units and losing productive urban land.

Various policy initiatives like the 2013 Urban and Peri-Urban Agriculture Policy, the 2015 Urban Productive Safety Net Program, the 2020 Urban Farming Initiative, and the 2022 Yelemat Terufat, along with NGO-initiated projects such as Farm Africa, have promoted UA to enhance food security, reduce urban poverty, and create jobs in Addis Ababa (BoTID 2013, World Bank 2015,

AARPO 2020, Teshome and Abate 2020, Dessie, et al. 2023). The majority of these activities are carried out as campaigns, raising concerns about the initiative's sustainability (Gebremedhin, et al. 2023).

Several studies have examined UA broadly in relation to urban resilience, food systems, and livelihoods in Addis Ababa. For instance, a study by Habtemariam et al. (2018) explored a sustainable livelihood perspective to explore how households from two typical communities in Addis Ababa- the condominium neighborhood (Jemo One, Biruh Tesfa Condominium House Owners Cooperative) and UA cooperatives (Mekanissa-Gofa-Saris Vegetable Farmer's Cooperative)- use water-related strategies to build resilience for the city's water scarcity challenges. Their work has highlighted the complex relationship between water access and livelihood security. Another study by Gebremedhin, et al. (2023) has focused on the situational analysis of UA and its potential to link with social protection programs including the Urban Productive Safety Net Program, School Feeding Program, and Urban Consumer Cooperative Associations to help vulnerable households access healthy foods.

These studies focused primarily on water management and household coping mechanisms, rather than on how residential neighborhoods can be intentionally designed to integrate productive landscapes, or on how housing development frameworks and spatial planning tools can operationalize UA to enhance environmental, social, and economic sustainability. Few studies (Yifru 2014, Abera 2019) have explored the integration of UA in housing and neighborhood developments; however, their study lacks a comprehensive approach to incorporate UA in a sustainable and resource-efficient manner.

This research gap shows the need for empirical research, which explains the current practice of UA in different housing settings, its socio-economic and environmental roles to enhance neighborhood sustainability, and how far it is embedded within the planning and development processes of sustainable housing and neighborhoods in Addis Ababa.

THEORETICAL FRAMEWORK

Sustainable Development

The commonly used definition for the term "sustainable development" in the 1987 Brundtland Commission report called "Our Common Future" by the UNs, World Commission on Environment and Development (UN WCED 1987, pp. 2) states:

> *"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs."*

Sustainable development is viewed as a multifaceted process that integrates environmental protection with economic, social, and cultural development; therefore, it embraces four interconnected dimensions: society, economy, environment, and culture (UN-Habitat 2012b).

One of the core ecological concepts for the construction and planning of sustainable cities is the recycling process, which closes the loops of material flow within an urban area (Chen 2012). To ensure their viability and the long-term sustainability of the surroundings on which they depend, cities need to develop circular metabolic systems (Deelstra and Girardet 2000).

Circular Economy and Urban Metabolism

A significant obstacle to urban sustainability, in terms of its high monetary and environmental cost, is the linear metabolism system- the "extract, make and dispose" method of production and consumption of nutrients, water, and energy (Girardet 1996, Nehls, et al. 2016). Most modern cities have a linear metabolic system that differs significantly from the metabolism of nature's ecosystems- every organism's output is an input, renewing and sustaining the entire living environment (Deelstra and Girardet 2000).

From largely open-loop systems with a one-way flow of resources (in) and waste (out), a paradigm of urban regions has been shifting to primarily closed-loop systems where the difference between resources and wastes becomes indistinct (Smit and Nasr 1992). In contrast to the linear system, a circular metabolism (Circular Economy) reduces the reliance on raw material inputs, keeps waste production to a minimum, preserves the value of goods, materials, and resources in the economy for as long as possible, and lowers the costs for the transportation, handling, and disposal of waste (Girardet 1996, Nehls, et al. 2016, UNEP; IRP 2022).

Similarly, the concept of 'Circular Economy' has been used to address the sustainability challenges related to the degradation of the socio-ecological system (Lindner, Mooij and Rogers 2017). It is one in which the value of products, materials, and resources is maintained in the economy for as long as possible, and the generation of waste is minimized (UNEP; IRP 2022). It has attracted the attention of municipalities as an opportunity to efficiently use resources through a merged ambition of sustainability and economic growth (Lindner, Mooij and Rogers 2017).

Sustainable Neighborhoods

Due to their potential to close local resource loops, reduce greenhouse gas emissions, improve environmental quality, foster healthier, safer, and more accessible communities, and support local job opportunities, social inclusion, and community empowerment, neighborhoods are essential for sustainable urbanism (Barton 2000). A sustainable neighborhood meets the needs of the present generation without compromising the needs of the future generation to meet their own.

Scholars have proposed different principles to measure and achieve this by integrating socio-economic and environmental dimensions of urban planning. B. A. Kazimee (2002) emphasized that applying integrated ecological and biological planning techniques is essential to balance human activities and environmental systems. He outlined five fundamental variables for measuring the human-environmental exchanges through input-output modeling techniques: air quality, water quality, energy conservation, land and resource conservation, and human ecology. For Gareth Haysom (2009), the sustainability of neighborhoods relies on the interdependence of four important focal areas - where people live and work (housing), how the food is produced (agriculture), the fuel that powers their way of life (energy), and how they and their commodities commute (transport). The UN-Habitat (2015) has provided five design strategies for planning sustainable neighborhoods. The strategies emphasized land-use mixity and limited land-use specialization. The former fosters local employment, production, and consumption by allocating 40% of floor space for economic activities, while the latter limits single-function blocks to less than 10% of the neighborhood to ensure diversity in lot sizes, housing types, and population densities capable of supporting local services. A comprehensive approach to sustainable neighborhoods ensures the proper integration of housing and other amenities (Araya, Workalemahu and Zeberga 2006).

Sustainable Housing

Sustainable housing implies a residential development that meets the needs of current dwellers without compromising the needs of future residents, both in socio-economic and environmental terms (Zakrjevskaia 2012). It prioritizes energy efficiency and relies on ecological design strategies that live in harmony with nature (Edwards and Turrent 2000, UN-Habitat 2012b). It also promotes socio-economic empowerment, cultural identity, institutional facilitation, and resource efficiency, which in turn contribute to a broader understanding of sustainability (Syn-Consult Africa 2006).

Global research on sustainable buildings has grown in response to climate change, yet developed countries still lead the field while developing regions, including Africa, remain underrepresented (Mushi, Nguluma and Kihila 2022). According to a review by Frank Victor Mushi, Huba Nguluma, and Jacob Kihila (2022), African research, with Nigeria, South Africa, Ghana, and Egypt contributing most of the work, has largely mirrored global trends by focusing on social issues, costs, policies, technologies, and management. Although there is notable progress in assessing economic and social aspects, several gaps such as limited performance data on existing green buildings, insufficient studies on locally sourced materials, a lack of user-focused post-occupancy research, weak theoretical frameworks explaining green building adoption, inadequate policy and legislative analysis, and a shortage of sustainability education and training in academic and vocational programs have persisted (Mushi, Nguluma and Kihila 2022).

Many African scholars have questioned the direct transferability of the Western-originated sustainability rating systems to the African context, as well as the need to develop context-specific sustainability frameworks (Mugah and Letema 2025). Mushi, Nguluma, and Kihila also emphasized the need for region-specific research grounded in local knowledge, stronger policy support, and improved integration of sustainable building concepts into educational systems to advance green building practices across Africa (Mushi, Nguluma and Kihila 2022). Table 1 summarizes the sustainability indicators of housing and neighborhoods that have been commonly adopted in the developed and developing regions of the world.

Cities may build resilient, inclusive, and environmentally friendly communities that tackle both short-term and long-term socioeconomic issues by incorporating UA concepts into neighborhood development. Leadership in Energy and Environmental Design (LEED) for Neighborhood Development (LEED-ND) rating system has operationalized this principle by integrating the protection and conservation of agricultural land and local food production within new neighborhood designs. This framework underscores the importance of food security alongside the development of a sustainable built environment by awarding credit points for both aspects (USGBC 2014, USGBC 2021). Similarly, the Green Star rating system for the Sustainable Precinct has awarded a credit point for access to fresh food within walking distance of where occupants live and for a local food production strategy that integrates productive landscape in South Africa (GBCSA 2025).

Table 1: Indicators of Sustainable Housing and Neighborhoods

	Indicators

Environmental	▪ Protect the environment by minimizing harmful impact
	  ▪ Restore degraded land
	  ▪ Create a physical and psychological health
	  ▪ Pollution and waste treatment strategies
	▪ Creation of natural habitats that are harmoniously integrated with housing
	▪ Minimize resource consumption (energy, water, materials, and land)
	  ▪ Use renewable, recyclable, or recycled resources (wind, sun, etc.)
	  ▪ Capture of rainfall for certain water uses
	  ▪ Maximize resource reuse (reuse materials, water, and land)
	▪ Compact layout
	▪ Construction using renewable and environmentally friendly materials
	▪ Local Food Production

Social	▪ Use of open space to facilitate social interaction ▪ Urban layout that creates shelter and safety ▪ Healthy, comfortable, secure homes ▪ Disabled access (no steps) ▪ Maximize access to healthy environments and support services (recreation, food, health, and education) ▪ Foster participation and empowerment of residents in decision-making ▪ Creating a sense of community, place, and identity
Economic	▪ High-density, mixed-use, and diversified tenure ▪ Energy saving (efficiency and renewable energy); resource conservation ▪ Housing affordability and mix for diverse income groups ▪ Supporting economic activities and enterprise (e.g., work-from-home setups) ▪ Housing management and maintenance: Durability ▪ Promoting petty landlordism and self-help housing

Sources- (Edwards and Turrent 2000, Huong and Soebarto 2003, Winston 2008, Turcotte and Geiser 2010, Ross, Bowen and Lincoln 2010, Yakob, Yusof and Hamdan 2012, UN-Habitat 2011a, UN-Habitat 2012b).

Urban Agriculture

The popular definition of Urban Agriculture that is frequently adopted by several researchers studying the subject is by Luc J. A. Mougeot (Mougeot 2000, 11):

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

UA is a high-input, high-output system for year-round production of grains, vegetables, fruits, meat, and dairy for local use (Novo and Murphy 2000, Zeeuw and Drechsel 2015, Kennard and Bamford 2019). It also recycles urban by-products, converts vacant urban areas into agricultural spaces, and conserves natural resources (Smit and Nasr 1992). It can be classified based on scale (micro, meso, macro), ownership (private, corporate, public), and form, location, or product type. Examples include commercial city farms, community gardens and orchards, indoor vertical farms, hydroponic greenhouses, rooftop gardens, aquaponics, beekeeping, and small-scale homestead farms (Pearson, Pearson and Pearson 2010).

While large-scale livestock and crop cultivation need extensive land, horticultural crops thrive in smaller areas and can be grown in urban gardens, backyards, vacant lots, rooftops, and indoor spaces (Benis, Reinhart and Ferrão 2017). UA can also be integrated into different urban scales (lot, city block, district, etc.) (Mougeot 2005, Veenhuizen 2006). It can occur on a smaller scale in parks, along riversides, on balconies, in containers, and on roadsides (Mulugeta 2013). It efficiently uses urban land, either integrating with other uses or as a standalone practice, and can maximize both horizontal and vertical space through multi-cropping and integrated farming (Smit, Nasr and Ratta 2001).

UA is a versatile concept that can occur in various settings and adapt to different social, economic, and political systems to meet the needs of diverse stakeholders (RUAF 2006). Besides meeting the needs of urban residents for food, UA provides additional social, cultural, economic, and environmental services such as energy conservation, waste management, microclimate control, urban greening and biodiversity, economic revitalization, community socialization, human health, cultural heritage, and education (Lovell 2010). This also helps connect different urban flows for resource recovery and creates a

spatial synergy, an indispensable principle in creating a resilient urban food system (Zeeuw and Drechsel 2015). In many cities, UA has emerged as a natural focal point with the potential to advance several SDGs, such as zero hunger (SDG 2), good health and well-being (SDG 3), reducing inequality (SDG 10), and sustainable cities and communities (SDG 11), in addition to several environmental dimensions of land, water, and climate (IRP 2022).

MATERIALS AND METHODS

Study Context: The research is conducted in Addis Ababa, geographically located between 8°46'0'' to 9°11'30'' North Latitude and 38°35'30'' and 38°57'30'' East Longitude. The city is divided into 11 sub-cities. Each sub-city is further divided into localities (Woreda). This research is limited to two neighborhoods in Nifas Silk Lafto Sub City, Woreda 6.

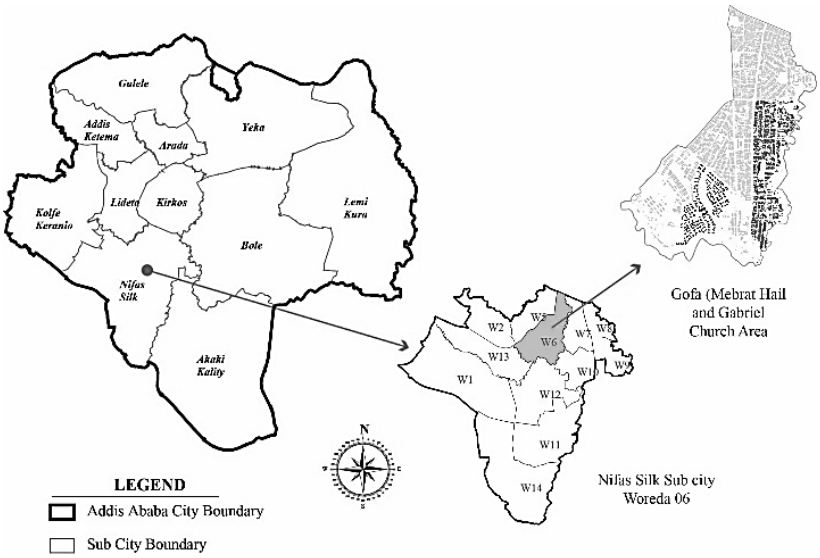

Figure 1: Location Map of Case Study Sites
Source: Addis Ababa Plan & Development Commission (2024)

A case study approach was employed to study the practice of UA in various residential settings. Selection criteria for the neighborhoods include: (1) high urban farmer population in residential areas; (2) diversity of UA disciplines (horticulture, animal husbandry, and integrated farming); (3) diversity of farmer's residence/ housing types in the neighborhood (private housing, kebele housing, condominium, and informal housings); (4) increasing number of exemplary UA practices as per the Woreda and Subcity level Farmers and Urban Agriculture Office (FUAO), and (5) availability of data about the farmers from the Woreda FUAO.

To obtain information on the study context, both primary and secondary data sources were used. Primary data was collected through site reconnaissance (site visits, observation, and photographs), a survey questionnaire with urban farmers, and key informant interviews (KII) with some of the stakeholders, including farmers, UA extension workers at woreda and sub-city levels, experts from AAFUADC, and housing and neighborhood planning professionals.

Participants: Urban farmers were grouped based on their farming discipline and housing type so that stratified sampling could be carried out. A probability sampling approach (multi-stage random sample method) was initially used to select the sample population for the quantitative study. However, the number of urban farmers fluctuates due to seasonal factors, market demand, and input availability; therefore, keeping track of the farmer population was a challenge for Woreda-level Farmers and UA Office (FUAO). Some residents showed interest in UA, so they only took seed, while others were forced to stop working on UA for various reasons, such as a change in priorities, lack of water supply, or lack of motivation. To tackle this limitation snowball sampling method was used.

The latest data from the Nifas Silk Lafto Sub City FUAO showed that about 258 households in Gofa Mebrat-Hail Neighborhood (Cluster 53) and 225 households in the Gofa Mebrat Hail Condominium practice UA. A total of 481 households are engaged in horticulture and animal husbandry in both cases. The sample size needed for the questionnaire was determined using the formula shown below. The confidence level used for the calculation was 90%.

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

Where,
z - z-score = 2.576
p - Response Distribution = 50%
e - Margin of Error
N - Population size

Based on the calculation, with a population number of 481, a confidence level of 90%, and a margin of error of 5%, the minimum sample size required for this research was 174. A total of 180 households from the two case areas filled out the survey.

Data Collection and Analysis: To assess the importance of UA in the sustainability of housing and neighborhoods, a descriptive research approach is used. Sustainability indicators were constructed by integrating environmental, social, and economic dimensions of housing and UA. Data collection focuses on observing and documenting current practices using quantitative tools such as household surveys for socio-economic and environmental analysis. It is then analyzed using descriptive and inferential statistics methods. Descriptive analysis was employed to present an overview of the housing characteristics and UA practices. Inferential analysis was used to test the relationship between the type of UA, plot size, income generation, health impacts, level of support and monitoring, and sustainability outcomes. Content analysis was used to analyze interviews with stakeholders and policy review. The semi-structured interviews with policymakers, urban planners, architects, housing experts, and landscape architects have provided the study with key insights. The response from the interview was first transcribed and organized thematically according to the ten guiding questions attached in the annex section.

RESULT

Introduction to the Case Studies

Case I is the Gofa Gabriel neighborhood (also known as Cluster 53), one of the city's oldest neighborhoods and home to 258 farmers practicing horticulture, animal husbandry, and integrated farming. Some model farmers use various technologies to sustain the practice of UA, such as drip irrigation, biogas, composting, rainwater harvesting, and so on.

Case II is the Gofa Mebrat Hail Condominium neighborhood, one of the oldest and largest LCH projects in Addis Ababa. According to the Nifas Silk Lafto Sub City FUAO, it is home to the highest number of UA practitioners living in condominium housing in the sub city. Recent data from the Woreda 6 FUAO showed that 223 farmers practice horticulture, and some attempted to integrate poultry. There is one parcel that is recognized by the FUAO at the woreda and Sub City level as a model neighborhood project- a title given to a parcel that best represents an ideal living environment for the residents. The Sub city has provided 9 criteria for the model parcels, one of which is the practice of UA (both horticulture and poultry). Other criteria include enough parking area, a green area, a library, a kids' playground, and communal areas for the elders.

Socio-economic Characteristics of Farmers: Of the 481 farmers living in the two neighborhoods, 180 households filled out the survey questionnaire. About 97 of the respondents (54%) resided in cluster 53, and 83 (46%) lived in the Gofa Mebrat Hail Condominium. The socio-economic characteristics and the housing profile of the two neighborhoods are described below.

Table 2: Socio-economic Characteristics of Farmers

Characteristics		Case I		Case II	
		Freq	%	Freq	%
Gender	*Male*	136	56%	60	64%
	Female	107	44%	34	36%
Age	*< 14*	7	3%	3	3%
	15-29	92	38%	33	35%
	30-65	119	49%	51	54%
	65 <	24	10%	8	8%
Highest level of Education	*No formal education*	49	20%	21	22%
	KG	15	6%	4	4%
	1-8	49	20%	13	14%
	9-12	44	18%	23	24%
	Diploma	70	29%	26	28%
	Degree & Above	17	7%	8	9%
Primary Occupation	*Farming*	15	6%	0	0%
	Government Employee	27	11%	33	35%
	Private Sector	97	40%	38	40%
	Unemployed	83	34 %	8	8%
	Retired	19	8%	17	18%

(n= 234 for Case I and 94 for Case II)
Source: Survey Finding

The average household size is 5. The average number of farmers in Case I is greater than in Case II. This implies that UA is more integrated into the daily household routines of Case I. The lower level of engagement per household in Case II is due to various constraints such as changing priorities, lack of water, and lack of a sense of belongingness to the open space in the neighborhood. The majority of the farmers in both cases were adults within the working age group (30-65 years). This is because UA is a laborious activity. This may also explain why it is a male-dominated activity. The educational background of the farmers shows that most farmers have taken vocational training. Case II shows a better educational profile than Case I; therefore, there is a smaller number of unemployed populations, a higher number of government employees and retired citizens, and less dependency on UA for living in Case II.

Twenty-seven farmers from both cases have taken agriculture-related training. Some have a Bachelor's Degree in Agricultural Science or Veterinary Science, while others took short-term vocational courses that are very specific, such as poultry, composting, hybrid farming, drip irrigation, and so on. Most of these trainings were given by the FUAO at the Woreda and Sub City Levels. However, the number of farmers who have

taken agriculture-related training in Case I was double that of Case II. This shows that institutional support in the form of training and capacity building is low in Case II.

Housing Profile: Many of the respondents (72%) in Case I reside in private housing, 22% live in Kebele housing, and 6% live in informal housing. Some of the respondents who dwell in kebele housing have been cultivating land along riverbanks for more than two decades. Homeownership is predominant among farmers. Most farmers in Case I (72%) owned their accommodation, 15% were informal settlers, 10% were tenants, and 3% were trustees. In Case II, the vast majority (94%) of the gardeners were homeowners, and only 6% were tenants. The Gofa Mebrat Hail Condominium was constructed in 2005 and transferred to the owners in 2008. It covered 38 hectares of land and has 5,580 units. Most of the residents were relocated people from the Arat Kilo, Cherkos, and Lideta redevelopment sites, other residents consisted of lottery winners placed by the government, people who bought houses from the lottery winners, and tenants.

In both cases, homeownership was dominant among the farming population. Case II has more homeowners than Case I. This is due to the presence of informal settlements in Case I. Case II is a low-cost mass housing project; therefore, open space and green areas are shared among the residents. About 88% of Case I households have exclusive access to their plot area, whereas the condominium dwellers share all the available space outside of their units. Case I also has households that share spaces and resources. Both cases experience irregular access to tap water; therefore, residents use water tanks and jerry cans to store water.

Plot Size: The plot size of the residences varied significantly based on the type of housing and the block they are located. The average plot size was 234 sqm for private residences, 180 sqm for kebele housing, and 176 sqm for informal housing. Overall, the plot area in Case I ranges from 75 sqm to 1,485 sqm. In the second case, the condominium blocks have areas ranging from 200 sqm to 440 sqm, whereas the condominium units range from 37 sqm to 80 sqm.

The distribution of farmer houses across different condominium floor levels showed a relatively balanced presence of farmers across all levels. Twenty percent live on the ground floor, 19% on the 1st floor, 24% on the 2nd floor, 15% on the 3rd floor, and 22% on the 4th floor.

Nearly two-thirds of the respondents (63%) in Case I have lived in the neighborhood for more than a decade, 22% moved into their house between 6-10 years ago, and 15% of the respondents lived there for less than 5 years. The majority of the farmers in Case II (56%) have lived in the condominium for more than 10 years, 32% have lived for 5-10 years, while 12% have lived in their unit for less than 5 years. The starting year of UA for most farmers also showed that they started practicing UA around the time of moving in.

Shared Space and Resources: Most of the households (88%) in Case I exclusively use their compound, while 12% (11 hhs) share their compound with others (see Figure 2 and 3). The latter share spaces like a kitchen (12%), toilet (28%), green area (95%), open space (95%), and resources such as water (36%) and electricity (19%). The table below summarizes the details. In Case II, the farmers share the green area and open space with the other dwellers in the parcel.

Water Management: All respondents use tap water for household activities despite experiencing irregular access to municipal tap water. Half of the respondents (51%) in Case I receive tap water only twice a week, and 40% either get it once a week or three times a week. In Case II, all residents get tap water once or twice a week. All respondents store as much water to use until they get water again. The chart below illustrates the days of getting tap water among respondents.

Household Waste Management: Solid waste from each household in the case neighborhood is collected by cooperatives and dumped at a temporary waste sorting area until it is collected and transported to a landfill site or recycled into compost. The condominium residents have a grey water disposal system connected to the city sewer, and the rest dump it in the river or the toilet. On the other hand, black water is disposed of through septic tanks (75%) and pit toilets (20%). Only 4% of households use biogas technology to generate energy for cooking. Many hhs (65%) in Case I disposed of their sewage water either on the street or in open ditches, 31% have a system connected to the city sewer, and the rest dump it in the river or the toilet. On the other hand, black water is disposed of through septic tanks (75%) and pit toilets (20%). Only 4% of hhs, particularly dairy farmers, use biogas technology to generate energy for cooking.

The Practice of UA in Case Study Areas

Horticulture is the dominant type of UA in both cases, practiced by 92% of the respondents (89

hhs) from Case I and all respondents from Case II. The respondents have planted various vegetables, fruits, herbs, and other crops in their backyards and open spaces. Only 4% of the households in Case I practice animal husbandry and the rest (7%) practice integrated farming. UA was mainly practiced for household consumption (79%), with only 21% selling surplus produce.

Horticulture: In both cases, 173 households cultivate fast-growing leafy vegetables. In Case I, vegetables like lettuce (86%), Swiss chard (83%), and kale (79%) were prevalent. Other vegetables, such as onions, tomatoes, green peppers, and carrots, were also grown. The production of root vegetables like potato, cabbage, beetroot, sweet potato, and garlic was low.

Because of the large space they required, fruit trees were not as common as vegetable plants. Avocados, Bananas, and Papaya were the most popular fruit trees in both neighborhoods, while other fruits such as apples, guava, plum, and orange had limited presence.

Some households grew herbs and medicinal plants such as rue, basil, Ocimum lamiifolum, dill, rosemary, hibiscus, ashwagandha, and parsley, as well as other crops like false banana, corn, hops, coffee, beans, and sugar cane.

Animal Husbandry: Around 30% of the farmers raise dairy cows and small ruminants, while only 3% engage in cattle fattening. The common type of animal husbandry in the neighborhoods is poultry, which is the small-scale production of eggs and chicken meat. It is practiced by 50% of the animal keepers. This is due to the small amount of space and initial investment it needs compared to other forms of animal husbandry. The farmers owned from 3-250 chickens. The average number of chickens owned by a farmer was 35. According to the AAFUADC, households raising less than 50 chickens are typically considered self-consumption producers, while those who own 50 or more are considered commercial poultry farmers. Based on this fact, 20% of the farmers in Case II were commercial farmers while the rest owned chickens for self-consumption.

The farmers replace the bedding, which is made out of straw and sawdust, every three to four months. However, poultry waste is mostly used for livestock feed and making fertilizer for plants. The waste is directly applied to the garden, where it becomes compost. In some cases, these wastes are shared with vegetable producers in the neighborhood free of charge or sold to livestock keepers.Farmers mostly obtain small chicks from suppliers outside the neighborhood. In some cases, the woreda FUDO provides chicken, feed, and a cage for the interested residents. Since poultry farming is a sensitive activity, it needs laborers to clean the cages or chicken houses, feed, and care for the chickens. Farmers typically build small-scale chicken coops when the primary goal of raising the animals is self-consumption. For more

Table 3: Cross-Case Analysis: Housing, Land Use, Tenure, and Utilities

Aspect	Case I	Case II
Type of housing	Mix of private, kebele, and informal	Condominium housing with 5,580 units
Homeownership	72% are homeowners	94% are homeowners
Tenants	10%	6%
Informal Settlers	15%	None
Average Plot Size	234 sqm – Private housing 180 sqm – Kebele housing 176 sqm – Informal housing Overall (75 -1,485 sqm)	37- 80 sqm- housing units 200- 440 sqm- Condominium blocks
Exclusive use	88% use compound exclusively	N/A
Shared compound use	Share kitchen (12%), toilet (28%), green/open space (95%), water (36%), electricity (19%)	All share green and open space
Spatial Distribution of Housing	N/A	20% Ground Floor, 19% 1st floor, 24% 2nd flood, 15% 3rd floor, 22% 4th floor
Water Source	Tap water (municipal)	Tap water (municipal)
Water Access Frequency	51% – twice a week 40% – once or twice a week	Once or twice a week for all
Water Coping Mechanism	Store water in water tankers, plastic water bottles, or jerrycans	Same
Grey Water	65% dump in streets or ditches 31% connected to the city sewer The rest dumped in the river/toilet	Condominium grey water is disposed of via the sewer system
Black Water	75% use septic tanks, 20% pit toilets, 4% use biogas	Connected to the city sewer system
Solid Waste	Collected by cooperatives	Same
Biogas Use	4% (dairy farmers)	N/A

Source: Survey Finding

than 50 chickens, a standard chicken coop that is vertically built with a bigger space is required.

UA Inputs: Water, soil (growing medium), seeds, fertilizer, land, pesticides, and access to sunlight are the primary inputs needed for cultivation. The inputs used for horticultural food production are described as follows. The most crucial input for UA is water, yet it is of limited supply. The vast majority of farmers use tap water to sustain UA during the dry season (56%), some also buy water from local suppliers (5%) or use alternative water sources such as well water (3%) and surface water (4%). The remaining 32 % wait for the rainy season to grow their food. According to one of the residents in Case II, most condominium residents registered under the woreda FUAO have stopped UA or never even started because of the water scarcity in the neighborhood, and most of the households that do practice UA were unable to cultivate their food during the dry season due to the scarcity of tap water. This rendered the practice of UA a seasonal activity for some farmers. The proximity of land to the residential areas, along with other factors, is an important factor that determines the way UA is practiced. Those residents who were on the ground floor had a greater tendency to use grey water for UA and practice UA throughout the year. Another factor is the size of the UA space and the socio-economic background.

All respondents in both cases use traditional soil-based cultivation systems. Very few respondents (13 % in condominium and 35% in Cluster I) have planted using pots. Most production is happening on the ground as the practice of vertical farming is minimal. Although there are a limited number of seed providers in the neighborhood, most farmers obtain various types of seeds free of charge from the Woreda FUAO. Others purchase seeds from affordable suppliers like Seed Ball Ethiopia. The image below depicts how some farmers recorded the type, sources, and receiving data of the seeds.

Land: Most respondents grow vegetables only inside their compounds, while some have extended their cultivation outside their compounds. The growing area ranges from 2 sqm to 500 sqm, with an average plot size of 70 sqm. The riverside cultivation, however, covered up to 9000 sqm. Some cultivation spaces in case II lack clearly defined boundaries because the plants have grown randomly (See Figure 13). As a result, the exact size of the farming plots used by the residents is undetermined. However, some residents have fenced their garden areas using various materials. The images below display low-cost, nature-based fencing using locally available materials such as wooden poles, branches, and dried plant materials. Even though these fences provide affordable protection, they have aesthetic and durability issues. In addition, the private and Kebele housing stone piles were commonly used as a means to delineate space, adding a different approach to defining cultivation areas.

The plot size of the household and the total number of plant species have a moderate positive correlation ($r = 0.5$). This suggests that as the pot size increases, so does the growing area. There is some level of association between the two; however, it is not very strong. On the contrary, plot size and the number of animals kept showed a very strong positive correlation ($r = 0.88$). This implies that larger plots tend to keep more animals; therefore, the availability of land is a strong factor that determines the upscaling of animal husbandry.

Animal Shed: Larger animal sheds are primarily built using wire mesh, wooden posts, corrugated iron sheets (walls and roofing), HCB walls, and concrete flooring. Some households have also added plastic coverings to improve the waterproofing of old structures. The size of these sheds differs based on the number of animals, with areas ranging from 6 sqm to 500 sqm and an average of 48 sqm.

Support and Monitoring of UA: The most common form of support for UA (70%) is the supply of inputs such as horticultural seeds and artificial insemination for animal husbandry, which is usually provided by the woreda FUAO. Nifas Silk Lafto Subcity FUAO also provides training and technical support, and introduces technology for urban farmers, except that it does not handle land provision. The second most common form of support farmers receive is capacity building and training, which benefited 27% of the respondents. Although the supply of land is an indispensable initiative for UA, only 6% of the households have benefited from it. Other forms of support, including monetary support, tax incentives, loan facilitation, design services, and market connectivity, are very low. 24% of the participants reported that they did not get any form of support. The correlation between the UA type and support for the practice was weak and not statistically significant ($r = –0.12$, $p = 0.12$). This suggests that support for UA does not differ meaningfully across the different UA types.

To ensure efficiency and sustainability, UA has to be monitored. The majority of the households (67%) reported that their UA activities have never been monitored by any officials. The animal keepers are continuously monitored by the UA officials in the Woreda. Some efforts are being made to ensure the implementation of rules and guidelines; sanitation and hygiene standards are met; income and productivity are enhanced; work

permits are renewed; and the health of animals and resource utilization. The survey showed that UA in the neighborhoods was supported and monitored through various means. Table 4 outlines the different types of support and monitoring mentioned by the respondents.

The Role of UA in Sustainable Housing

There is a similar understanding of the definition of sustainable housing among the key stakeholders, and the need to balance social, economic, and environmental dimensions was thoroughly discussed in all of the KII. However, each of the respondents had a distinct interpretation of what sustainable housing constitutes. Understanding their perception of each dimension was important to know how it is achieved through local interventions and how they can measure the contribution of UA. The responses are analyzed using the sustainability indicator framework, consisting of three dimensions: environmental, social, and economic sustainability.

UA in Environmentally Sustainable Housing

UA has demonstrated several environmental benefits to the sustainability of housing in the studied case sites. The percentage of productive green space, the enhancement of biodiversity and habitat creation, food miles reduced, waste minimization and recycling, prevention of pollution, organic food production, usage of renewable energy, flood mitigation, and environmental education are discussed below.

In Case I, the average size of open space ranges from 80 sqm to 290 sqm. When calculating the average size of productive land from these open spaces, it ranges from 7 sqm to 23 sqm, which is from 7-12% of the open space.

About 37% of the respondents have stated that their UA has increased the population of various birds and insects, like butterflies and bees. The survey findings also showed that the plot size of the household and the total number of plant species have a moderate positive correlation (r = 0.5). This suggests that as the pot size increases, so

Table 4: Cross-Case Analysis: Inputs, Support, and Monitoring of UA

Aspect	Case I	Case II
Water Use	▪ 56% use tap water ▪ 32% are rain-dependent ▪ 43% use greywater ▪ 93 households harvest rainwater	▪ All use tap water (when available) ▪ 92% use rainwater ▪ 53% use greywater
Water Availability	▪ Somewhat seasonal ▪ mitigated by rain harvesting & greywater use	▪ Very limited ▪ water available for 2 days/week ▪ makes UA highly seasonal
Growing Medium	▪ 100% traditional soil-based ▪ 35% use pots ▪ Minimal vertical farming	▪ 100% soil-based ▪ 13% use pots ▪ No vertical farming
Seed Access	▪ 85% from FUAO ▪ 9% purchase ▪ 6% save seeds	▪ 83% from FUAO ▪ 14% purchase ▪ 3% save seeds
Land Access & Use	▪ Average 70 sqm plot ▪ up to 0.9 ha for riverside UA ▪ Stone piles used to mark plots	▪ Undetermined plot sizes ▪ Natural growth with makeshift fences from local materials
Fertilizer Use	▪ 31% compost kitchen/chicken waste ▪ 69% buy from livestock keepers	▪ 31% compost kitchen waste ▪ 69% buy fertilizer
Pesticide Use	▪ 35% natural ▪ 39% chemical ▪ 19% none	▪ 28% natural (Neem tree juice) ▪ 32% chemical ▪ 40% none
Alternative Energy Use	▪ 7% use renewable energy (mostly biogas by livestock keepers)	▪ 5% use solar (for household, not UA) ▪ No biogas use
Composting	▪ 31% of households	▪ Same
Use of Greywater	▪ 43%	▪ 53%
Rainwater Harvesting	▪ 96%	▪ 92%
Support Received	▪ 73% received input supply ▪ 11% training ▪ 6% land ▪ Low levels of monetary, infrastructure, & market support ▪ 27% received no support	▪ 73% input supply ▪ 46% training ▪ Very limited infrastructure and work permit support ▪ 20% received no support
Monitoring	▪ 74% report no monitoring ▪ Animal keepers monitored frequently (24%) hygiene ▪ 7% income	▪ 41% report no monitoring ▪ 52% monitored for income/productivity ▪ 36% for rules adherence

Source: Survey Finding

does the growing area. There is some level of association between the two; however, it is not very strong. On the contrary, plot size and the number of animals kept showed a very strong positive correlation (r = 0.88). This implies that larger plots tend to keep more animals; therefore, the availability of land is a strong factor that determines the upscaling of animal husbandry.

According to a plant expert in the Nifas Silk Lafto Subcity, Woreda 06 FUAO, the best seeds are imported from abroad. Moreover, the survey findings revealed that more than half of the respondents (63%) buy animal feed from outside the neighborhood. Some buy it from Debreziet and nearby cities, which are located outside of Addis Ababa. Only 31% produce fertilizer by processing kitchen waste and changing it to compost, 7% buy from neighbors, and 4% from outside the neighborhood. Some participants mentioned that neighbors who own a poultry farm give away the chicken manure for free or at a lower price. Buying inputs from outside the city and the country would increase the food miles of UA production. On the positive side, some respondents produce their own inputs while others buy them from producers in the neighborhood.

About 78% of the respondents stated that UA contributed to reducing air pollution and lowering carbon emissions, as it promotes green development (67%). It also utilizes grey land that was either left open or used as a dumping site for solid waste. About 46% of the respondents mentioned that UA has enhanced environmental beauty, and one-third of respondents (34%) claimed that UA prevented environmental pollution.

All of the residents use organic, chemical-free fertilizer made of composted organic household waste. Animal keepers also reuse the animal waste to make fertilizer. Residents who own a biogas digester also produce organic fertilizer from the digestate.

The survey findings showed that nearly one-third of the respondents converted their organic waste into compost. This minimizes the amount of organic solid waste sent to the landfill. Only 31% produce fertilizer by processing kitchen waste and changing it to compost, while 7% buy it from their neighbors.

Nearly half of the respondents (46%) recycle their grey water, and numerous participants cultivate during the rainy season. The survey results revealed that the most frequently recognized benefit of UA is its ability to harvest rainwater (94%). Only 4 respondents use alternative energy sources such as solar power, biogas energy, and so on. One-fourth of the participants have claimed that UA reduces flood risk and soil erosion in their neighborhoods. It has also improved environmental safety and protection awareness for 30% of the respondents.

UA in Economically Sustainable Housing

UA provides several economic benefits for many of the farmers. The household cost-to-income ratio, income generation, running costs, saving on food expenditures, diversity of the income streams, local food production, property value of land with UA, and saving of water and electric bills by using alternative sources were discussed below.

According to the survey, the average household expense is 15,000 ETB. By taking the average household size of 5, the amount of money spent per person per month is 3000 ETB. Food is the dominant expense of households, accounting for 42% of the total expenses. The average monthly spending on food is 6,409 ETB. Many households hire house-helps who help with domestic work and UA activities, which showed a significant expense (13%). Education fees also have a noticeable share (11%). Electric bills and transportation or fuel costs also appear to be high costs. Other household expenses have a small share.

The highest expense for the farmers is the cost of health, constituting more than one-fourth of the expenditure (29%). Labour is the second largest cost (21%). Loan payment, animal feed, and pesticide have lower expenses. The profitability of horticulture and animal husbandry is compared in terms of initial investment, operation costs, and monthly income. As summarized in the table below, the starting capital and the monthly running cost of animal husbandry are much higher than horticulture. This implies that livestock farming is capital-intensive.

Two-thirds of the respondents have emphasized the significance of UA in reducing food costs. More than half of them have pointed to income generation (54%), while others noted that UA increases agricultural productivity (46%) and creates employment opportunities for many (21%). Although more than half of the respondents highly emphasized the positive impact of UA on food security and household income, food expenses still take the lion's share of household expenditure. The influence of UA on increasing property value and efficient use of domestic resources is minimal.

UA in the Social Sustainability of Housing

The integration of UA in housing development in the case study areas has displayed many social

advantages. Both men and women practice UA. Of the 337 UA practitioners in the sample households, 196 were male (58%), and 141 were female (42%). All age groups also participate in UA. 3% were children who helped out their family, about 37% were in the youth category, 51% were adults, and 9% were elders.

According to the survey, 21% of the participants have created a job for mostly immigrants from the countryside working as daily laborers or as security guards. The KII in the Nifas Silk Lafto Subcity, FUAO, has revealed that UA is one of the disciplines advised for disabled people in the city. It allows them to work from the comfort of their own homes. One of the respondents was part of this program.

Home ownership was predominant among the farmers in both cases. Overall, 83% of the respondents owned their housing/ residential unit. However, when it comes to the UA space, the sense of ownership of the cultivation area is very low among the Gofa Mebrat Hail condominium residents. This is due to the shared ownership of the open spaces among the residents. In case I, the majority of the residents in case I (private, kebele, and condominium residents) solely use their compound with others.

UA has enabled the delivery of fresh local food for 93% of the participants (167 households). Plus, the food security of 133 households was improved. As mentioned earlier, UA has improved the aesthetic value of the landscape and enhanced the recreational opportunities for the occupants It has also improved the physical (59%), intellectual (16%), and psychological well-being (19%) of the respondents and their family members. About 16% of the respondents mentioned that the practice of UA has expanded their knowledge.

Challenges of UA in Residential Areas

The respondents have mentioned several limitations and problems that hinder the effective implementation and sustainability of their UA practice in their neighborhood. 84% of the respondents stated that the supply of clean water is their most significant limitation. 28% have space limitations, and 20% face capital and credit supply issues. More than half of the respondents (54%) also mentioned that bad smells and environmental pollution are the risks associated with UA integration in their neighborhood. The survey also asked if they had faced any health risks related to UA. Only 5% had health issues related to the practice. A chi-square test of independence was conducted to examine the relationship between recycling resources, such as greywater use and composting, and the occurrence of health problems among household members engaged in UA. The associations were not statistically significant; the Chi-Square p-values are 0.91 for greywater use and 0.93 for composting. These values indicate that households recycling their household waste did not report health issues at rates significantly different from those who do not.

The idea of mixing UA in future housing developments was also introduced to the respondents and key informants to gather feedback and recommendations. Almost all urban farmers (97%) agreed that UA can be integrated with future housing developments in Addis Ababa if existing problems and limitations are addressed. Most participants emphasized that horticulture should be considered a permanent component of Addis Ababa housing developments. Only 3% of the respondents disagreed that certain types of UA, such as poultry and livestock keeping, should be restricted from residential neighborhoods because of the potential health and environmental risks they pose.

Legal Frameworks Influencing the Integration of UA in Housing Development of Addis Ababa

The 1948 Universal Declaration of Human Rights and the 1966 International Covenant on Economic, Social, and Cultural Rights were signed by Ethiopia; therefore, they are considered part of the law of the land. Both agreements recognize everyone's right to an adequate standard of living, including food, clothing, and housing. The 1995 constitution under Article 90(1) granted citizens the right to housing, food, and other basic needs. However, land remained under state and public ownership, even though the government could expropriate land for public purposes with advance compensation.

The Urban Lands Lease Holding Proclamation No. 80/1993, in its Article 13, stated that the government may grant urban land freely or without public tendering to be utilized for social service establishments, investments that the Government supports, or other uses that directly benefit the public (The Transitional Government of Ethiopia 1993). It also indicated that the lease holding period for UA was 50-90 years, however, this was reduced to 15 years by the Re-enactment of the Urban Lease Holding Proclamation No. 272/2002 (FDRE 2002). In the latter document, it gives a ceiling of 5 years for the lease period to economic and social development activities planned to be invested in urban lands not designated for use within a short period, which may be renewed for the same period where it is necessary. The short lease periods discourage long-term investments and planning by urban

farmers, as they cannot be assured of their land for extended periods.

Land conversion for large-scale housing resulted in the displacement of farmers. Urban Lands Lease Holding Proclamation No. 721/2011 discussed the entitlement of the people displaced due to urban renewal programs in Article 12, sub-articles 3 and 4 (FDRE 2011). The farmers had to receive training and other assistance that would aid in their transition to urban livelihoods, plus a substitute land, no less than 150 square meters, and no more than 500 square meters, depending on the size of their expropriated farmland (MoUDC 2011). However, this did not guarantee the continuation of UA.

Although there are areas designated particularly for UA in the city's recent land use maps, there have been two opposing viewpoints on the land usage for UA. The first one is a traditional view that sees UA as a transient activity that occurs until it is supplanted by other "more urban" purposes, and the second view claims UA as a permanent land use (AACPPO 2017). As many land holdings were anticipated to remain unoccupied for a long time, the Urban Agriculture Strategy document recommended that these sites be utilized for permanent or temporary UA development that is in line with local requirements (MoUDC 2016a). This strategy also implied open spaces, riverbanks, schools, institutes of higher learning, colleges, jails, hospitals, condominiums, government offices, non-governmental organizations, military camps, parks, recreation areas, expansion areas, and private and public catchments (MoUDC 2016a).

Supporting this the recent structure plan document supported the idea for UA to be temporarily practiced in areas designated for other uses, such as 'special land use', 'reserved,' 'protected' (with chemical use restrictions), and 'social service' areas designated for education, health, sports fields, and government institutions; and in residential areas designated in the Structure Plan (AACPPO 2017). Although these are positive initiatives, there is a gap in implementation and the measures are temporary and do not sustain UA in the city. Findings from the field observation in Gelan, Genet Menafesha, Bole Bulbula, Jemo I, Jemo II, Summit, Bole Arabsa, and Yeka Abado condominium sites revealed that the community green areas and open spaces have being used as a construction material storage area, waste disposal area, market, and parking area.

No one is allowed to enclose and use any parcel of land that is near their legitimately owned property without the right authorization, even if it is for UA (FDRE 2002). UA does not require a permit if it occurs on the private property of households, unless surplus goods are sold (MoUDC 2019). Therefore, it is essential to integrate agriculture and community gardens into other projects to combat poverty, boost the local economy, create jobs, and support urban youth initiatives (BoTID 2013).

DISCUSSION

The demographic characteristics of the UA practitioners in the neighborhoods showed that household dynamics, education, and UA-related training are important aspects that shaped UA. An average household size of 5 and a maximum of two members on average are actively engaging in UA, implying that family labor is significant to sustain the UA. The majority of the practitioners are men and within the working age of 30-65; however, there is a significant presence of female farmers. A study by Alemu, et al. (2024) and FAO (2007) shows that women or spouses take care of most of the production and management activities in small-scale farms, and children usually help their parents. This aligns with a study by Habtemariam et al. (2018) regarding women's key involvement in UA activities such as selling their produce.

Notably, many farmers had employment outside of agriculture, especially in the private sector. This goes in alignment with the recent studies that described UA as a part-time job (FAO, Rikolto and RUAF 2022). Some benefit from the additional income and the fresh food they produce in their backyard.

Few have taken UA-related training. Eight percent hold their Bachelor's and Master's degrees in agriculture or veterinary medicine from both cases, while others have taken courses related to animal husbandry, horticulture, drip irrigation, and composting, some of which are often offered by their Woreda FUAO. Even though the majority of households did not have any formal education related to UA, they possessed agricultural skills from other sources, such as family and peers, or online platforms. This illustrated the gap between formal training in UA and engagement, as well as the important role of community-based knowledge in sustaining UA in the neighborhoods. While the benefits of transferring local knowledge are many, there is little opportunity to pursue a more productive and sustainable approach to UA using new technologies. The level of education is also positively correlated with income generation and investment decisions in UA (Mougeot 2005).

Housing conditions varied, and 80% of the practitioners owned their homes. Land ownership

has a high impact on engagement in UA. 80% of the practitioners owned their homes, which is similar to the findings from a study done on Mekanissa-Gofa-Saris Vegetable Farmers' Cooperative (Habtemariam, et al. 2018). The average plot sizes differed by housing type- 37 sqm to 80 sqm for condominiums and 75 sqm to -1,240 sqm for the others. Most residents had lived in their neighborhoods for several years, often starting UA shortly after moving in.

The survey result showed that more than half of the households exclusively use their compound, while others share spaces like green areas, kitchens, and toilets, and resources like water. Access to municipal tap water was irregular in all four neighborhoods. Many of the respondents receive municipal tap water only once or twice a week. In addition, the majority of households use open ditches or the street for sewage disposal, which highlights the need for improved infrastructure to support water recycling for UA.

Horticulture is the dominant type of UA in the neighborhood rather than animal husbandry because it demands less capital and operational costs associated with it. Most of the respondents (89%) are engaged in horticulture, cultivating vegetables, fruits, and herbs mainly for household consumption (76%). There are diverse crops, and the commonly grown plants include fast-growing leafy vegetables (e.g., Swiss chard, lettuce, kale) and a variety of herbs and medicinal plants. The production of root vegetables such as carrots, onions, garlic, and potatoes are relatively low, this could be due to the longer time they take to harvest. Moreover, fruit production is limited, with avocados and bananas being the most popular. Despite the challenges of water scarcity, many households utilized traditional farming methods, with some engaging in innovative practices like rainwater harvesting.

Poultry is the most common form of animal husbandry in the neighborhoods, followed by dairy farming. This is because of the small plot size and the initial capital required to run. The profitability analysis indicated that animal husbandry is more capital-intensive than horticulture, yet it offers higher potential income. This disparity underscores the economic viability of different agricultural practices. The economic analysis also revealed that UA significantly reduces food costs for about two-thirds of the respondents. However, the average monthly household expenses were substantial, with food being the largest expenditure (42%).

The survey indicated a lack of adequate support for UA, with most farmers receiving only input supplies. Monitoring of UA practices was limited, emphasizing the need for better oversight and support systems to enhance the sustainability of urban agriculture initiatives. Respondents identified a clean water supply as the most significant limitation to effective UA, followed by insufficient land and capital. Environmental concerns, such as pollution and bad odors from waste disposal, also pose challenges. Despite these issues, a vast majority of farmers expressed interest in integrating UA with future housing developments, provided that existing limitations are addressed.

Local production of food in residential areas significantly reduces the embodied energy that results from inputs, transportation, and packaging (Lovell 2010). However, many inputs, such as animal feed and soil, are sourced from outside the neighborhood or city. Only 8% of the animal keepers and 31% of the horticulture farmers produce their feed and fertilizer. Moreover, the seeds provided by the woreda are also imported from outside the country. Although these are necessary to sustain UA, they increase the embodied energy of the food produced. Therefore, local input production in the neighborhoods has to be encouraged.

Few households compost organic waste, while others purchase fertilizers. Many of the condominium households use stormwater for cultivation, only a few harvest rainwater from broken downpipes, even though it is prohibited to modify downpipes for water harvesting (Habtemariam, et al. 2018).

Few households recycle their grey water for UA. According to Gelila Tesfaye (2020), around 10.42 liters of greywater is produced per person in residential areas, where 8.56 liters of it can be used for toilet flushing, and 1.86 liters of water remains for other purposes such as UA. Even if there are concerns about possible health risks associated with reusing greywater in UA, this study found no statistical evidence of such problems in the sampled communities. The lack of association ($p = 0.91$) suggests that greywater consumption is not associated with a higher incidence of reported health concerns. This could indicate that only less-contaminated sources of greywater are being used for UA. This result does not mean that using greywater is risk-free because the study did not evaluate water quality or hygiene procedures. Although less harmful than wastewater, untreated greywater may have microorganisms and contaminating chemicals requiring risk management strategies. The multiple barrier strategy recommended by the WHO (2006) includes on-site and off-site treatment to reduce pathogens; crop restrictions; proper handling and application; appropriate food preparation measures, which include washing, disinfecting,

peeling, cooking; and human exposure control and hygiene education.

Another study done by Tsion Adugna in 2019 showed that 84.1% of the entire waste generated in housing areas is organic waste that can be composted (Adugna 2019). If organic solid waste is separated at the source (by providing a garbage chute), recycled, composted, and added to the green space of condominiums, it will have a substantial positive impact on both the environment and the residents (Adugna 2019). Moreover, only 4% of households use biogas technology to generate energy for cooking.

The potential of UA to close the nutrient loops in neighborhoods is limited. The lack of resource recycling in the neighborhoods has led most households to practice seasonal farming. Farmers who have been recycling their greywater usually live close to their farm plot. So, distance has an impact on the reuse of grey water for irrigation. Other households that do not recycle grey water either wait for the rainy season or struggle to water the plants, as their plants wilt because of a lack of water. On the other hand, river-side vegetable farmer cooperatives have the advantage of year-round access to irrigation water.

The survey findings showed that only 31% of the respondents were able to increase the population of birds and pollinating insects such as bees and butterflies, because of UA. This could be due to the limited flowering plants and trees in their neighborhoods. Moreover, residents also plant Kale, Swiss Chard, and Lettuce, which are perishable produce that do not attract pollinators.

Many of the respondents stated that UA has improved their outdoor environment, reduced air pollution and carbon emissions, and contributed to neighborhood greening. Half of the respondents confirm that UA enhanced neighborhood aesthetics and provided them with opportunities to exercise and relax.

Commercial farmers constitute 21% of the respondents. They provide fresh food for the local markets at a reasonable price, contributing to the local economy. The lower number of commercial farmers could be due to warning notifications and media coverage of contamination of riverbank-cultivated vegetables, which eventually reduced the marketability of the goods and risked the livelihoods of farming communities (Habtemariam, et al. 2018).

Most of the farmers employed people, mostly migrants from the countryside. 34% of the respondents agreed that UA creates employment opportunities for many, while 29% stated that it promotes youth development. The potential of UA to provide a circular economy through market linkages between horticulture producers, livestock and poultry farmers, and compost cooperatives has not been fully realized yet. Respondents also shared the need for better market linkages and supply chain connections.

UA fostered social interaction for 43% of the households. Sharing produce and manure strengthened social ties, and the tradition of exchanging herbal medicines built the community's resilience. It also provided three-fourths of the respondents with fresh food and increased physical activity, especially among retirees and housewives. However, there is a lack of community programs or initiatives centered at UA.

Sharing medicinal plants has helped preserve cultural heritage and local knowledge about herbal medicines. Most farmers have inherited their agricultural skills from their families. This highlights the cultural role of UA in transferring and preserving local knowledge. Very few individuals had formal education related to UA. underscores the need to bridge the gap between traditional and institutional knowledge systems.

KII with government officials revealed a shared understanding of the sustainability of housing and neighborhood development. All participants have emphasized the need to balance social, economic, and environmental dimensions, though each of them had unique interpretations of sustainability. The urban planners and housing development professionals highlighted the various efforts to incorporate UA into NDPs as a strategy to enhance sustainability; however, there are challenges in implementation. UA development professionals highlighted the improvements in support and resources, even though there are ongoing challenges related to land permits and investment needs. Unreliable tenure status is one of the reasons urban farmers are unable to access formal bank credit and insurance (Habtemariam, et al. 2018). Additionally, the sanitation departments have discussed the role of composting cooperatives in recycling organic solid waste and producing compost for the local farmers. The overall findings emphasized UA's potential to contribute to sustainable neighborhoods in Addis Ababa, as well as the need for improved integration, policy support, and community engagement.

CONCLUSION

The survey findings suggest that household dynamics, education, and UA-related training are essential aspects that shape UA. About 40% of the household members are actively engaged in the production and processing of UA. There is a gap between formal training in UA and engagement, since only 7% of the respondents have taken UA-related training. It also shows the important role of community-based knowledge in sustaining UA in the neighborhoods. UA is also practiced for family consumption, since Many of the respondents practice UA for household consumption (79% of horticulture producers and 20% of the animal keepers).

Homeownership and plot size are factor that impacts the practice of UA in residential developments. About 83% of the respondents own their land/ housing unit, and more than half use their property exclusively. Residents who own bigger plots are encouraged to practice animal husbandry. Even though woreda administrators have been supporting the practice of both horticulture and poultry in condominium housing as part of their sustainable neighborhood scheme, only horticulture thrived, because of challenges of community acceptance due to its potential risks.

The marked horticulture activities expose the degree of flexibility that households demonstrate in resource use, although their potential is drastically undermined by a lack of access to water, infrastructure, and market systems. Biodiversity conservation, waste, and energy conservation through UA, as well as greywater and rainwater harvesting, still have a long way to go in being implemented. However, UA fosters social cohesion and revitalizes the economy. It also helps reduce household expenses, provides local employment, helps access fresh produce, and educates people about food and the environment. Nonetheless, UA professionals are needed in the institutional structures of housing development offices for the success of UA integration and productivity.

UA does not need large land areas as it includes small-scale farming for self-consumption or income generation; however, since vertical gardening has not been widely practiced, it limits the number of species grown in residential areas. Through the AAFUADC, urban farmers are provided with better access to inputs and resources like funding, essential training, and technical support.

While animal husbandry poses some issues with getting permits from the local authorities, horticulture is easier to implement. There are several attempts to create a circular economy where waste from UA is used for making compost and biogas. UA enhanced the beauty of urban areas, improved food security, aided the employment landscape, and helped marginalized people. Planners are advised to include UA within housing and urban plans to create self-sustaining communities. Without proper hygiene practices in place, farms, especially animal farms, can increase pollution and cause foul odors.

The combination of international human rights obligations, national laws, and specific UA policies informs the incorporation of UA into the housing policies of Addis Ababa. These frameworks together respond to the state urban policy on urban development, food security, and farmers' rights, which contributes to the complex nature of urban planning that seeks to bridge the gap between housing and UA. Even with the policy provisions on the right to adequate housing and food, the prevailing land tenure system and short leasehold periods stifle UA investments. Fragmented policies, along with urban expansion, negative attitudes towards UA, and inadequate support services further escalate the marginalization of UA activities. On the other hand, the determination and strong sense of optimism to implement sustainable practices among the practitioners is notable because a good number rely on informal knowledge and family labor systems.

The KII results suggest that the incorporation of UA within the spatial planning and design of neighborhoods in Addis Ababa is fundamental for achieving social, economic, and environmental sustainability. There is a common understanding of sustainability among the respondents that captures the three dimensions, but they noted specific gaps in the integration of UA into housing planning. These barriers are classified as institutional, legal, and infrastructural. Policies have not sufficiently addressed the need for essential infrastructure, such as water supply and waste management systems, which are critical for the viability of UA. Addressing these barriers is crucial in promoting sustainable urban development and enhancing food security in the city.

UA does not require a permit if practiced on private property, but permits are needed for selling surplus goods. Moreover, the recent UA Strategy and Structure Plan encourages utilizing unoccupied land for agricultural development, including various public open spaces in residential neighborhoods. Site reconnaissance has shown that community green areas are being misused for construction material storage, waste disposal, and

informal settlements. This undermined the agricultural potential of the sites.

RECOMMENDATIONS

This study reveals that, despite the unique opportunities that UA offers to enhance housing sustainability, significant barriers, including resource gaps, regulations, and a lack of implementation, arise when incorporating UA. The following recommendations are designed to achieve the research objectives and are based on the findings of the household surveys and KII.

Recommendation on the Practice of UA in the Case Study Areas

To ensure year-round food production in condominium neighborhoods, it is essential to address water scarcity. Subsidized, low-cost rainwater harvesting tanks and greywater recycling systems, provided through community cooperatives or microfinance institutions, can guarantee a reliable water supply for UA activities. The multiple barrier strategy recommended by the WHO (2006) has to be implemented and monitored.

The distance between the UA land and the housing units can significantly impact the seasonality of UA practice; therefore, it is recommended to bring the food production close to the farmer's residence through vertical gardening or container gardening on balconies.

To resolve the issue related to the community resistance against animal husbandy, the AAFUADC should create awareness among residents and properly train UA practitioners in the safe and hygienic practice before integrating it with residential neighborhoods. The office should also facilitate the development of neighborhood markets and mobile vending platforms to enable urban farmers to sell surplus produce locally and sustainably. FUAO Extension workers ought to regularly monitor the sustainability, productivity, hygiene, and other aspects of UA in the neighborhoods.

To enhance the sustainable practice of UA in the neighborhood, UA experts should (1) bridge the gap between institutional knowledge and traditional practices through community-based training programs and knowledge-sharing platforms; (2) foster inclusive participation across all age groups and genders in UA initiatives, with special programs for youth, the elderly, and women; (3) provide regular, accessible training on sustainable UA practices, including vertical farming, composting, greywater reuse, and integrated farming systems that incorporates sustainable UA technologies, (4) set up neighborhood-scale compost cooperatives that support both individual farmers and local greening efforts; (5) encourage and incentivize rainwater harvesting and greywater recycling systems for agricultural use; (6) encourage vertical gardening to relieve the over-reliance on ground horizontal space and improve species diversity, especially when there is limited plot size; (7) strengthen market linkages between horticulture producers, animal keepers, and compost cooperatives to enhance local food systems and minimize food miles; and (8) support the development of neighborhood marketplaces and mobile vendors to boost access and income for urban farmers.

Recommendations for the Integration of UA in Residential Neighborhoods

Housing Development Offices should facilitate the coordination of UA activities by designating specific units within the housing development offices for UA. Plus, it is recommended to shift away from just allocating vacant sites for the AAFUADC towards the active designing of neighborhood patterns that enable sustainable UA. The issues with the permit process for renovating animal shelters should also be addressed.

Housing typologies in new developments should incorporate UA-friendly designs that accommodate flat roofs for roof gardening, large balconies for container gardening, designated composting areas, rainwater harvesting, and greywater recycling systems that use natural plant-based purification or keyhole gardening techniques. UA should be used as a platform for neighborhood socialization, health promotion, and community resilience building. It can also preserve indigenous agricultural knowledge and community traditions, if its cultural significance is appropriately recognized.

The housing development office should consider integrating animal husbandry, such as poultry, fishery, and beekeeping, in housing designs, particularly as part of roof-based systems, by adopting international best practices in Zero Acreage Farming that include hydroponics, aquaponics, chicken coops, and beehives on rooftops, which maximizes productivity without expanding land use. Moreover, incentivizing housing projects that integrate sustainable UA technologies is highly recommended.

New neighborhood green development schemes are converting UA spaces into children's playgrounds, parking, and community gathering areas, discouraging community farming activities. Urban Planners should consider UA as a permanent component of neighborhoods to enhance sustainability. Incorporating

multifunctional urban spaces that combine food production, recreation, and waste recycling within residential neighborhoods is also recommended to offset the loss of productive land use. It is also vital to encourage vertical gardening to reduce over-reliance on horizontal ground space and improve species diversity.

Regulatory and Policy Recommendations

Many housing professionals during KII indicate an intention to adopt UA if a proper guideline is established for the integration and long-term investments of UA in residential neighborhoods. Delegating the housing development offices- the design and regulation of residential greenhouses and animal sheds can facilitate the safe and lawful incorporation of UA into housing developments. Circular urban metabolism should be promoted by encouraging resource loops (e.g., waste-to-compost, water reuse) to reduce urban ecological footprints.

Future Research Directions

The study highlights a few crucial areas for future research to enhance the sustainability of housing and neighborhoods through UA in Addis Ababa. Some of the research recommendations include (1) formulating housing policies for incorporating UA within housing developments, (2) developing high-rise urban farming innovations for real estate developments, (3) conducting an in-depth study of UA's role in circular economy concepts as well as other UA functions including economic revitalization, social cohesion, health, energy conservation, waste management, and so on. The investment rationale for integrating different forms of UA, as well as SMART UA technologies (hydroponics and aquaponics) in residential neighborhoods, should also be studied. It is also important to create contextualized indicators of sustainability that represent Addis Ababa's socio-economic and environmental realities and inform UA–housing integrated planning.

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> 'Now unto the King eternal, immortal, invisible, the only wise God, be honor and glory forever and ever. Amen.'
>
> - 1 Timothy 1:17 (KJV)

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Appendix B: Key Informant Interview Questions

1. How do you describe sustainable housing development and its social, economic, and environmental dimensions?
2. Do you think Urban Agriculture (UA) plays any role in the sustainability of housing? How?
3. To what extent does the current practice of housing and neighborhood developments in Addis Ababa consider UA?
4. Are there any policies, regulations, or guidelines that support the integration of UA in housing developments?
5. Do you know any housing/neighborhood projects in Addis Ababa that have incorporated UA to enhance sustainability?
6. What are the key enabling and hindering factors for the integration of UA in residential developments?
7. Have you personally worked on or seen designs that integrate UA or productive landscapes? If so, what were the challenges and benefits?
8. Do you think UA receives adequate attention in housing and neighborhood planning in Addis Ababa? If not, what strategies could improve its integration?
9. How can UA be incorporated into housing at different scales—individual residences, housing blocks, and neighborhoods?
10. What inputs and outputs characterize UA in residential areas, and how can resource management (e.g., waste recycling, water use) enhance its sustainability?

Appendix C: Documents Reviewed

Year	Documents
1948	Universal Declaration of Human Rights
1955	Revised Constitution of Ethiopia
1966	International Covenant on Economic, Social, and Cultural Rights
1975	Government Ownership of Urban Lands and Extra Houses Proclamation No. 47/1975
1987	The Constitution of the People's Democratic Republic of Ethiopia
1993	Urban Lands Lease Holding Proclamation No. 80/1993.
1995	Constitution of the Federal Democratic Republic of Ethiopia
2001	City Development Plan 2001-2010 (Executive Summary)
2002	Re-enactment of the Urban Lease Holding Proclamation No. 272/2002
2003	Condominium Proclamation No. 370/2003
2008	Urban Planning Proclamation No. 574/2008
2009	Land Lease Policy in Addis Ababa
2009	Food, Medicine and Health Care Administration and Control Proclamation No. 661/2009
2011	Urban Land Development and Management Policy
2011	Urban Lands Lease Holding Proclamation No. 721/2011
2013	Urban and Per-urban Agriculture Policy and Strategy for Addis Ababa
2013	Urban Housing Provision Strategic Framework (First Edition)
2014	National Report on Housing and Sustainable Urban Development
2014	Solid Waste Management Strategy
2015	Transforming Our World: The 2030 Agenda for Sustainable Development
2015	Addis Ababa Neighborhood Development Plan - National Urban Development Scheme and Neighborhood Development and Urban Design Plans (Component 2)
2016	Urban Housing Provision Strategic Framework (Second Edition)
2016	Urban Agriculture Strategy
2016	Federal Urban Job Creation and Food Security Agency Establishment Council of Ministers Regulation No. 374/2016
2016	Structure Plan Spatial Framework Implementation Guidelines and Standards: Addis Ababa City Land Use and City Structure Plan (2016-2040)
2017	Agricultural Extension Strategy of Ethiopia
2017	Addis Ababa City Structure Plan (Summary Report) (2017-2027)
2019	Urban Agricultural Development Strategy
2020	Housing Strategy (Revised_ Draft)

Appendix D- Questionnaire

A Questionnaire Prepared for Individuals engaged in Urban Agriculture

This questionnaire is prepared by Tsion Tewodros Assefa, a graduate student in the Housing and Sustainable Development Program at Addis Ababa University. It aims to study the role of urban agriculture (UA) in sustainable housing development. The data collected will be used for educational purposes only, so the identity of the individuals and the information collected will be kept confidential. If you are willing to complete the questionnaire, thank you for your cooperation.

Note: It is prohibited to use/ disclose the collected information to any other party without the researcher's consent.

Part 1: Household Profile

1 Household Size _____

2 No. of family members engaged in UA ___

2.1. No. of men involved in UA _____

2.2. No. of women involved in UA _____

3

	Age of members working in UA	No.
3.1.	Under 14 years old	
3.2.	15-29	
3.3.	30-65	
3.4.	Above 65 years old	

4

	High level of education of farmers	No.
4.1.	No formal education	
4.2.	(KG)	
4.3.	Primary Education	
4.4.	Secondary Education	
4.5.	10+ - Diploma	
4.6.	Bachelor's Degree and above	

5 What is your regular occupation? (1) Farming (2) Government office (3) Private office (4) Self-employed (5) Unemployed (6) Retired

6 Did anyone in the family take agriculture-related training or graduate in the agricultural field? (1) Yes (2) No

6.1. If the answer is 'yes', what is the training/education?_____

Part 2: Housing Profile

7 Tenure type (1) Kebele (2) Rental (3) Private (4) Corporate (5) Condominium (6) Other

7.1. If it is a condominium, the floor it is located on is (1) Ground floor (2) 1st (3) 2nd (4) 3rd (5) 4th

8 Property right (1) Owner (2) Tenant (3) Tenant of a tenant (4) Co-owner (5) Other

9 Area of the residential compound (if the house is a condominium, the area of the condominium)? _____ (Sqm)

10 Are there any other households other than yours living in the compound where you live? (1) Yes (2) No

10.1. If the answer is 'yes', which of the following do you share in the premises? (1) Water meter (2) Electricity meter (3) Kitchen (4) Toilet (5) Green space (6) Non-green open space (7) None

11 How long have you lived in the home? (1) < a year (2) 1-5 years (3) 6-10 years (4) >10 years

12 What is your household's water source? (1) Private meter (2) Shared meter (3) Well water (4) Other

13 How many days a week do access tap water? (1) 1 day (2) 2 days (3) 3 days (4) 4 days (5) 5 days (6) 6 days (7) 7 days

14 How is sewage disposed of? (1) Dumped on the street (2) Dumped in a drain (3) Dumped in a toilet (4) Connected to a septic tank (5) Connected to the city sewer (1) Dumped in a river (6) Other

15 How is black waste disposed of? (1) Discharged into a river (2) Discharged into a drain (3) Connected to a pit toilet (4) Connected to a septic tank (5) Connected to the city sewer (6) Other

Part 3: UA Practice

16 What type of UA is the family engaged in? (1) Horticulture (2) Animal husbandry (3) Both

17 When did you start? (1) Less than a year ago (2) 1-5 years (3) 6-10 years (4) More than 10 years

18 The purpose of farming is (1) for household consumption only (2) for income generation (3) for both.

Animal Husbandry

19 Type of farming (1) Dairy cattle (2) Cattle fattening (3) Sheep/goat (4) Poultry (5) Fish (6) Beekeeping (7) Other

20 Please indicate the number of animals you raise

	Type	Quan.		Type	Quan.		Type	Quan.		Type	Quan.
20.1	Hen		20.2.	Small ruminant		20.3.	Dairy cattle		20.4.	Bull	
20.5	Fish		20.6.	Beehive		20.7.	Pig		20.8.		

21 Where do you farm? (1) Indoors (2) Inside the compound (3) In the neighborhood (4) Outside the neighborhood

21.1. Specific area? (1) In a shed (2) Green space (3) River bank (4) School (5) Public Institute (6) Other

22 Where do you buy feed? (1) We produce it at home (2) Inside the compound (3) In the neighborhood (4) Outside the neighborhood (5) Outside the city

23 How much capital did you start with when you started farming?_____ ETB

24 The total area of land where the animal husbandr is operated_____ (Sqm)/ _____ (ha)

Horticultural UA

25 Types of vegetable cultivation (1) vegetables (2) Fruit (3) Crop cultivation (4) Spices/medicinal (5) Mushrooms

26 Vegetables planted and their monthly yield in kg

	Vegetables	Their types
26.1.	Vegetables	
26.2.	Fruits	
26.3.	Spices	

27 Where is your agricultural area located? (1) Indoor (2) On the balcony (3) On the roof (4) Open space in the yard (5) Open space in the neighborhood (6) open space outside the neighborhood (7) River bank (8) In the school (9) Other

27.1. How are the vegetables grown? (1) In a container (in soil) (2) On the ground (3) vertical (4) Hydroponics

28 Where do you buy fertilizer? (1) In the compound (2) In the neighborhood (3) Outside the neighborhood (4) Outside the city

29 What type of pesticide do you use? (1) Homemade (2) We spray chemicals

30 With how much capital did you start growing vegetables? _____ETB

31 The total area of land where the farm is operated_____ (Sqm)/ _____ (ha)

Part 4 Infrastructure

32 From your experience, to which environmental sustainability indicators is UA contributing to?

(1) Promoted green development
(2) Improved environmental safety
(3) Increased environmental beauty
(4) Local Food Access
(5) Increased bird and butterfly populations
(6) Prevented environmental pollution
(7) Reduced carbon emissions
(8) Reduced flood risk/soil erosion
(9) Recycled rainwater
(10) Recycled greywater
(11) Utilized unused greyland
(12) Utilized biodegradable waste

33 From your experience, to which social sustainability indicators is UA contributing to?

(1) Improved food security
(2) Strengthened social Interaction
(3) Improved sense of place
(4) Promoted youth development
(5) Created opportunities for recreation
(6) Supported gender equality
(7) Improved mental health
(8) Expand knowledge about nutrition/ health
(9) Delivery of fresh food to residents
(10) Encouraged physical activity
(11) Created employment opportunities
(12) Increased land ownership opportunities

34 From your experience, what sustainable economic development indicators does urban agriculture contribute to?

(1) Increased hh income
(2) Employment opportunities
(3) Increased productivity
(4) Hight market linkage
(5) Reduced food costs
(6) Increased house/land prices
(7) Ensured the price of food in the city increased
(8) Enabled the efficient use of domestic resources and wealth

35 What **types of support** did you receive while doing your agricultural work? (1) None (2) Land provision (3) Financial support (4) Input provision (5) Medical services (6) Infrastructure provision (7) Training/capacity building (8) Tax reduction (9) Facilitation of business licenses (10) Facilitation of low-interest loans (11) Creating business linkages (12) Creating knowledge sharing platforms (13) Design services

36 What **types of monitoring** are being carried out while you are doing your agricultural work? (1) None (2) Health monitoring (3) Hygiene monitoring (4) Income/productivity monitoring (5) License monitoring (6) Implementation of policies/rules/guidelines (7) Infrastructure utilization

37 What limitations have you faced while practicing urban agriculture? (1) Land supply problem (2) Temporary tenure system (3) Clean water supply problem (4) Lack of capital and credit supply (5) Lack of training (6) Extension service problem (7) Other

38 Has any health problem ever occurred in your family or among workers due to urban farming practices? (1) Yes (2) No

39 What are the problems you have seen with urban agriculture practices in your yard or neighborhood? (1) None (2) Bad smell (3) Sanitation/environmental pollution (4) Water/river pollution (5) Noise pollution (6) Other

40 In your opinion, can urban agriculture be integrated with residential areas and work sustainably? (1) Yes, it can

Part 6: The family's economic situation

41 Monthly family expenses this year_____(In Birr)

	Monthly expenses	ETB		Monthly expenses	ETB		Monthly expense	ETB
41.1.	For food		**41.2.**	For electricity		**41.3.**	For water	
41.4.	For rent		**41.5.**	For cooking		**41.6.**	For education	
41.7.	For transportation/fuel		**41.8.**	For phone/internet		**41.9.**	For entertainment	
41.10.	Property tax (annual)		**41.11**	Home savings		**41.12**	For health	
41.13.	Savings Edir and Equb)		**41.14**	Labour		**41.15**	others	

42 This year's agricultural expenditure_____(In Birr)

	Monthly Expenses	ETB		Monthly Expenses	ETB		Monthly Expenses	ETB
42.1.	Labour cost		**42.2.**	Water		**42.3.**	Loan payment	
42.4.	Property Rent		**42.5.**	Health		**42.6.**	Pesticide/Insecticide	
42.7.	Property tax		**42.8.**	Insemination/ Seed		**42.9.**	Fertilizer	
42.10	Animal feed		**42.11.**	tools		**42.12.**	Other	

43 Does the family earn income from animal husbandry? (1) Yes (2) No

44 Monthly cost of animal husbandry _____(ETB)

45 Monthly Income from animal husbandry_____(ETB)

46 Does the family earn income from horticulture? (1) Yes (2) No

47 Monthly Cost of horticulture_____(ETB)

48 Monthly Income from horticulture_____(ETB)

የከተማ ግብርና ላይ ለተሰማሩ ግለሰቦች የተዘጋጀ መጠይቅ

ይህ መጠይቅ የተዘጋጀው በአዲስ አበባ ዩኒቨርሲቲ የቤቶች እና ዘላቂ ልማት የድህረ ምረቃ ትምህርት ፕሮግራም ተማሪ በሆነችው በጽዮን ቴዎድሮስ አሰፋ ሲሆን መጠይቁ የከተማ ግብርና በቤቶች ዘለቄታዊ ልማት ላይ የሚጫወተው ሚና ለማጥናት ያለመ ነው። የሚሰበሰበው መረጃ ለትምህርት ዓላማ ብቻ ስለሆነ የግለሰቦች ማንነት እና የሚሰበሰቡ መረጃዎች በሚስጥር የሚያዝ ይሆናል። መጠይቁን ለመሙላት ፈቃደኛ ከሆኑ ስለትብብሮ በጣም አመሰግናለሁ።

ማሳሰቢያ :- ያለ አዘጋጇ እውቅና እና ፈቃድ መጠይቁንም ሆነ የተሰበሰበውን መረጃ መጠቀም ወይንም ለሌላ ወገን አሳልፎ መስጠት የተከለከለ ነው።

ክፍል 1 የቤተሰቡ መረጃ

1 የቤተሰቡ አባላት ብዛት _____

2 ግብርና የሚሰሩ አባላት ብዛት _____

2.1. ግብርና ላይ የሚሳተፉ ወንዶች ብዛት _____

2.2. ግብርና ላይ የሚሳተፉ ሴቶች ብዛት_____

3

	ግብርና የሚሰሩ አባላት እድሜ	ብዛት
3.1.	ከ14 ዐመት በታች	
3.2.	15-29	
3.3.	30-65	
3.4.	ከ65 ዐመት በላይ	

4

	ከፍተኛ የትምህርት ደረጃ	ብዛት
4.1.	መደበኛ ትምህርት የሌላቸው	
4.2.	ቅድመ ትምህርት(ኬ.ጂ)	
4.3.	ከ ፩ – 8 ክፍል	
4.4.	ከ 9 – 10 ክፍል	
4.5.	10+ - ዲፕሎማ	
4.6.	ዲግሪ እና ከዛ በላይ	

5 መደበኛ ስራዎ ምንድን ነው? (1) ግብርና (2) የመንግስት መ/ቤት (3) የግል መ/ቤት (4)የግል ስራ (5) ስራ የለኝም (6) ጡረታ

6 ከቤተሰቡ መሃል በግብርና ሙያ ስልጠና የወሰዱ/ በግብርና የትምህርት ዘርፍ የተመረቁ አሉ? (1) አዎ አሉ (2) የሉም

6.1.መልሶ '**አዎ**' ከሆነ ያገኙት ስልጠና/ የትምህርት ዘርፍ ምንድን ነው? _____

ክፍል 2 የመኖሪያ ቤቱ ሁኔታ ክፍል 1 የቤተሰቡ መረጃ

7 የመኖሪያ ቤቱ ይዞታ አይነት (1) የቀበሌ (2) የኪራይ ቤቶች (3) የግል (4) የድርጅት (5) ኮንዶሚኒየም (6) ሌላ

8 **ኮንዶሚኒየም** ከሆነ የሚገኝበት ወለል (1) ምድር ወለል (2) 1ኛ ፎቅ (3) 2ተኛ ፎቅ (4) 3ተኛ ፎቅ (5) 4ተኛ ፎቅ

9 የመኖሪያ ቤቱ ላይ ያለዎት መብት (1) ባለቤት (2) ተከራይ (3) የተከራይ ተከራይ (4) ባላደራ (5) ሌላ

10 የመኖሪያ ግቢው ስፋት (ቤቱ ኮንዶሚኒየም ከሆነ የኮንዶሚኒየሙ ስፋት) ስንት ነው? _____ (በካሬ ሜትር)

11 በሚኖሩበት ግቢ ውስጥ ከእርሶ ቤተሰብ ውጪ የሚኖሩ ተጨማሪ አባወራዎች አሉ? (1) አዎ አሉ (2) የሉም

11.1. መልሶ '**አዎ**' ከሆነ በግቢ ውስጥ ቢጋራ የምትጠቀሟቸው የትኞቹ ነው? (1) የውሃ ቆጣሪ (2) የኤሌክትሪክ ቆጣሪ (3) ኩሽና (4) መጸዳጃ ቤት (5) አረንጓዴ ቦታ (6) አረንጓዴ ያልሆነ ከፍት ቦታ (7) የሉም

12 በመኖሪያ ቤቱ ለምን ያህል ጊዜ ኖረዋል? (1) አመት አልሆነውም (2) 1-5 አመት (3) 6-10 አመት (4) ከ10 አመት በላይ

13 የቤተሰብዎ የውሃ ምንጭ የትኛው ነው? (1) የግል ቆጣሪ (2) የጋራ ቆጣሪ (3) የጉድጓድ ውሃ (4) ሌላ

14 በሳምንት ለስንት ቀናት የቧንቧ ውሃ ታገኛላቹ? (1) 1 (2) 2 (3) 3 (4) 4 (5) 5 (6) 6 (7) 7

15 የእጣቢ ፍሳሽ በምን መልኩ ይወገዳል? (1) መንገድ ላይ (2) ውሃ መውረጃ ትቦ ውስጥ (3) ሽንት ቤት ውስጥ (4) ሴፕቲክ ታንክ ጋር ተያይዟል (5) ከከተማው ፍሳሽ ማስወገጃ ጋር ተያይዟል (6) ወንዝ ውስጥ (7) ሌላ

16 የመፀዳጃ ቤት ፍሳሽ በምን መልኩ ይወገዳል? (1) ወንዝ ውስጥ (2) ውሃ መውረጃ ትቦ ውስጥ (3) ከጉድጓድ ሽንት ቤት ጋር ተያይዟል (4) ሴፕቲክ ታንክ ጋር ተያይዟል (5) ከከተማው ፍሳሽ ማስወገጃ ጋር ተያይዟል (6) ሌላ

ክፍል 3 የከተማ ግብርና አሰራር ዝርዝሮች

17 ቤተሰቡ የተሰማራበት የግብርናው አይነት ምንድን ነው? (1) አትክልት ልማት (2) እንሥሳት እርባታ (3) ሁለቱም

18 መቼ ጀመራቹ (1) አመት አልሆነውም (2) 1-5 አመት (3) 6-10 አመት (4) ከ10 አመት በላይ

19 የግብርናው አላማ (1) ለቤት ፍጆታ ብቻ (2) ገቢ ማስገኛ (3) ሁለቱም

የእንስሳት እርባታ አሰራር

20 የእርባታው አይነት (1) የወተት ከብት (2) የከብት ማድለብ (3) የበግ/ፍየል (4) የዶሮ (5) የአሳ (6) ንብ ማነብ (7) ሌላ

21 የሚያረቧቸውን እንስሳት ብዛታቸውን ይግለጹ

	አይነት	ብዛት		አይነት	ብዛት		አይነት	ብዛት		አይነት	ብዛት
21.1.	ዶሮ		21.2.	በግ/ ፍየል		21.3.	የወተት ከብት		21.4.	በሬ	
21.5.	አሳ		21.6.	የንብ ቀፎ		21.7.	አሳማ		21.8.		

22 እርባታ የምትሰሩበት ቦታ የት ነው የሚገኘው? (1) ቤት ውስጥ (2) ግቢ ውስጥ (3) ሰፈር ውስጥ (4) ከሰፈር ውጪ

22.1. ምን አይነት ቦታ ነው? (1) ሼድ ውስጥ (2) አረንጓዴ ቦታ (3) ወንዝ ዳርቻ (4) ት/ቤት (5) የህዝብ መገልገያ ቦታ (6) ሌላ

23 መኖ የት አካባቢ ይገዛሉ? (1) ቤት ውስጥ እናመርታለን (2) ግቢ ውስጥ (3) ሰፈር ውስጥ (4) ከሰፈር ውጪ (5) ከከተማ ውጪ

24 እርባታው ሲጀምሩ በስንት ብር ካፒታል ጀመሩ _____ ብር

25 እርባታው የሚሰራበት አጠቃላይ የቦታ የመሬት ስፋት _____ (በካሬ ሜትር)

የአትክልት ልማት መረጃ

26 የአትክልት ልማቱ አይነት (1) የጓሮ አትክልት (2) ፍራፍሬ (3) የሰብል ልማት (4) ቅመማ ቅመም/መድሃኒትነት ያላቸው (5) እንጉዳይ

27 የየተከሏቸውን አትክልቶች እና በወር የሚገኘው ምርት በኪ.ግ

	አትክልቶች	አይነታቸው
27.1.	የጓሮ አትክልቶች	
27.2.	ፍራፍሬዎች	
27.3.	ቅመማ ቅመም	

28 የግብርና የምትሰሩበት ቦታ የት ነው የሚገኘው? (1) ቤት ውስጥ (2) በረንዳ ላይ (3) ጣራ ላይ (4) ግቢ ውስጥ ከፍት ቦታ (5) ሰፈር ውስጥ ከፍት ቦታ (6) ከሰፈር ውጪ ባዶ ቦታ (7) ወንዝ ዳርቻ (8) የትምህርት ቤት ውስጥ (9) ሌላ

28.1. አትክልቶቹ እንዴት ነው የተተከሉት? (1) በእቃ ውስጥ (በአፈር) (2) መሬት ላይ (3) ሽቅብ (4) ሃይድሮፖኒክስ ቴክኖሎጂ

29 ማዳበሪያ የት አካባቢ ይገዛሉ? (1) ግቢ ውስጥ እናዘጋጃለን (2) ሰፈር ውስጥ (3) ከሰፈር ውጪ (4) ከከተማ ውጪ

30 ምን አይነት የተባይ ማጥፊያ ትጠቀማላቹ? (1) ቤት ውስጥ የተዘጋጀ (2) ኬሚካል እንረጫለን

31 አትክልት ልማቱን ሲጀምሩ በስንት ብር ካፒታል ጀመሩ _____ ብር

32 አትክልት ልማቱን የሚሰራበት አጠቃላይ የቦታ የመሬት ስፋት _____ (በካሬ ሜትር)

ክፍል 4 መሰረተ ልማት

33 ለግብርና የሚጠቀሙትን ውሃን ከየት ያገኛሉ? (1) ከቧንቧ (2) ከዝናብ (3) ከወንዝ (4) የጉድጓድ ውሃ (5) ሌላ

34 የእጣቢ ፍሳሽን ለግብርና አገልግሎት ትጠቀማላችሁ? (1) አዎ እንጠቀማለን (2) አንጠቀምም

35 የዝናብ ውሃን አጠራቅማችሁ ለግብርና አገልግሎት ትጠቀማላችሁ? (1) አዎ እንጠቀማለን (2) አንጠቀምም

36 የሚበሰብሰውን ደረቅ ቆሻሻን ለይታቹ ማዳበሪያ ትጠቀማላቹ? (1) አዎ (2) አንጠቀምንም

37 ከእንስሳት የሚወጣው ፍሳሽ (እዳሪ)/ተረፈ ምርቶችን በምን መልኩ ይወገዳል? (1) ወንዝ ውስጥ (2) ውሃ መውረጃ ትቦ ውስጥ (3) ከጉድጓድ ሽንት ቤት ጋር ተያይዟል (4) ሴፕቲክ ታንክ ጋር ተያይዟል (5) ከከተማው ፍሳሽ ማስወገጃ ጋር ተያይዟል (6) ሌላ

38 የጸሃይ ብርሃንንና ባዮጋዝን መሰል ታዳሽ የሃይል ምንጮችን ትጠቀማላችሁ? (1) አዎ እንጠቀማለን (2) አንጠቀምም

39 የግብርናን ለማዘመን የምትጠቀሟቸው ቴክኖሎጂዎች/ መሳሪያዎች ካሉ ይጥቀሱ_____

ክፍል 5 የከተማ ግብርና ጠቀሜታ፣ ስጋቶች እና ገደቦች

40 ከእርስዎ ልምድ፣ የከተማ ግብርና ለየትኞቹ **የዘላቂ አካባቢያዊ ልማት** ማሳያዎች አስተዋጽኦ እያደረገ ይገኛል?

(9) አረንጓዴ ልማትን አበረታቷል (13) የወፎች እና ቢራቢሮን ቁጥር ጨምሯል (17) የዝናብ ውሃን መልሶ ጥቅም አውሏል
(10) ስለአካባቢ ጥበቃ ግንዛቤን አሻሽሏል (14) የአካባቢ ብክለትን ለመከላከል አስችሏል (18) የእጣቢ ፍሳሽን መልሶ ጥቅም አውሏል
(11) የአካባቢ ውበትን ጨምሯል (15) የአየር ብክለትን/የካርቦን ልቀትን ቀንሷል (19) ጥቅም ላይ ያልዋለን መሬትን ተጠቅሟል
(12) ምግብ ከሰፈር ሳንርቅ እንድናገኝ አግዟል (16) የንርፍ አደጋን/ የአፈር መሸርሸርን ቀንሷል (20)የሚበሰብስ ቆሻሻ ጥቅም አውሏል

41 ከእርስዎ ልምድ፣ የከተማ ግብርና ለየትኞቹ **የዘላቂ ማህበራዊ ልማት** ማሳያዎች አስተዋጽኦ እያደረገ ይገኛል?

(1) የምግብ ዋስትና አሻሽሏል (6) ለመዝናኛ እድሎችን ፈጥሯል (10) ትኩስ የምግብ ግብአቶችን ለአካባቢው ነዋሪዎች ለማድረስ አስችሏል
(2)ማህበራዊ ግንኙነታችን አጠንክሯል (7) የፆታ እኩልነትን ደግፏል
(3)የቦታ ባለቤትነት ስሜትን አሻሽሏል (8) የአእምሮ ጤናችንን አሻሽሏል (11) አካላዊ እንቅስቃሴን አበረታቷል
(4) የመሬት ባለቤትነት እድሎችን ጨምሯል (9) ስለ ምግብ እና ጤና አጠባበቅ እውቀትን ለማስፋት ጥቅም ላይ ውሏል (12) የስራ እድል ፈጥሯል
(5)የወጣቶች እድገትን አበረታቷል

42 ከእርስዎ ልምድ፣ የከተማ ግብርና ለየትኞቹ **የዘላቂ ኢኮኖሚያዊ ልማት** ማሳያዎች አስተዋጽኦ ያደርጋል?

(9) የቤተሰብን ገቢ አሳድጓል (12) የንግድን ትስስርን ጨምሯል (15) በከተማዋ የምግብ ዋጋ ንረትን አረጋግቷል
(10) ለብዙዎች የስራ እድል ፈጥሯል (13) የምግብ ወጪን ቀንሷል (16) የአገር ውስጥ ሀብትና ሀብትን በብቃት ለመጠቀም አስችሏል
(11) ከፍተኛ ምርት አስገኝቷል (14) የቤት/የመሬት ዋጋ ጨምሯል

43 የግብርና ስራውን ስትሰሩ የትኞቹን **<u>የድጋፍ አይነቶች</u>** አግኝታችኋል? (1) ምንም አላገኘንም (2) የመሬት አቅርቦት (3) የገንዘብ ድጋፍ (4) የግብአት አቅርቦት (5) የህክምና አገልግሎት (6) የመሰረተ ልማት አቅርቦት (7) ስልጠና/ አቅም ግንባታ (8) የግብር ቅነሳ (9) መስሪያ ፈቃድ ማመቻቸት (10) አነስተኛ ወለድ ብድር ማመቻቸት (11) የንግድ ትስስርን መፍጠር (12) የእውቀት መጋሪያ መድረኮች መፍጠር (8) የዲዛይን አገልግሎት

44 የግብርና ስራውን ስትሰሩ የትኞቹን **<u>የከተትል አይነቶች</u>** እየተደረገ ይገኛል? (1) ምንም አላገኘንም (2) የጤና ክትትል (3) የንጽህና ክትትል (4) የገቢ/ምርታማነት ክትትል (5) የፈቃድ ክትትል (6) የፖሊሲ/ደንቦች/ መመሪያዎችን ተግባራዊነት ክትትል (7) የመሰረተ ልማት አጠቃቀም

45 የከተማ ግብርናን ሲሰሩ ምን አይነት ገደቦች ገጥመዎታል? (1) የመሬት አቅርቦት ችግር (2) ጊዜያዊ የይዞታ ስርዓት (3) የንፁህ ውሃ አቅርቦት ችግር (4) የካፒታል እና የብድር አቅርቦት እጥረት (5) ስልጠና አለማግኘት (6) የኤክስቴንሽን አገልግሎት ችግር (7) ሌላ

46 በከተማ ግብርና አሰራር ምክንያት የጤና እክል በቤተሰቦ ወይም ሰራተኞቹ ላይ ተከስቶ ያውቃል? (1) አዎ ተከስቷል (2) ትከስቶ አያውቅም

47 በግቢዎ ወይም በመኖሪያ አካባቢዎ የሚሰራ ከተማ ግብርና አሰራር ላይ ያዩት ችግሮች ምንድን ናቸው? (1) የለም (2) መጥፎ ሽታ (3) የንጽህና/ የአካባቢ ብክለት (4) የውሃ/ ወንዝ ብክለት (5) የድምፅ ብክለት (6) ሌላ

48 በእርሶ እይታ የከተማ ግብርና መኖሪያ አካባቢዎች ጋር ተጠቃሎ በዘላቂነት መሰራት ይችላል? (1) አዎ ይችላል (2) አይችልም

ክፍል 6 የቤተሰቡ ኢኮኖሚ ሁኔታ

49 የዚህ አመት የቤተሰቡ የወር ወጪ _____(በብር)

	የወር ወጪዎች ዝርዝር	የወር ወጪ		የወር ወጪዎች ዝርዝር	የወር ወጪ		ወጪዎች	ወጪ
49.1.	ለምግብ		49.2.	ለኤሌክትሪክ		49.3.	ለውሃ	
49.4.	ለቤት ኪራይ		49.5.	ለማብሰያ (ማገዶ፣ጋዝ፣...)		49.6.	ለትምህርት	
49.7.	ለትራንስፖርት/ ነዳጅ		49.8.	ለስልክ/ለኢንተርኔት		49.9.	ለመዝናኛ	
49.10.	ለይዞታ ግብር (አመታዊ)		49.11.	ለቤት ቁጠባ (ኮንዶሚኒየም)		49.12.	ለጤና	
49.13.	ቁጠባ (እድር እና እቁብ)		49.14.	ለቤት ሰራተኛ ደሞዝ		49.15.	ሌላ	

50 የዚህ አመት የግብርና ወጪ _____(በብር)

	የወጪዎች ዝርዝር	የወር ወጪ		የወጪዎች ዝርዝር	የወር ወጪ		የወር ወጪ ዝርዝር	የወር ወጪ
50.1.	ለሰራተኞች ደሞዝ		50.2.	ለውሃ		50.3.	ለብድር	
50.4.	ለመስሪያ ቦታ ኪራይ		50.5.	ለህክምና		50.6.	ለተባይ ማጥፊያ	
50.7.	ለይዞታ ግብር (አመታዊ)		50.8.	ለዘር		50.9.	ለማዳበሪያ	
50.10.	ለመኖ		50.11.	ለ\መሳሪያዎች		50.12.	ሌላ	

49 ቤተሰቡ ከእንስሳት እርባታ የሚያገኘው ገቢ አለ? (1) አዎ (2) የለም

50 ለእርባታ የሚወጣ አጠቃላይ የወር ወጪ _____(በብር)

51 ከእርባታ የሚገኝ አጠቃላይ የወር ገቢ _____(በብር)

52 ቤተሰቡ ከአትክልት ልማት የሚያገኘው ገቢ አለ? (1) አዎ (2) የለም

53 ለአትክልት ልማት የሚወጣ የወር ወጪ _____(በብር)

54 ከአትክልት ልማት የሚገኝ የወር ገቢ _____